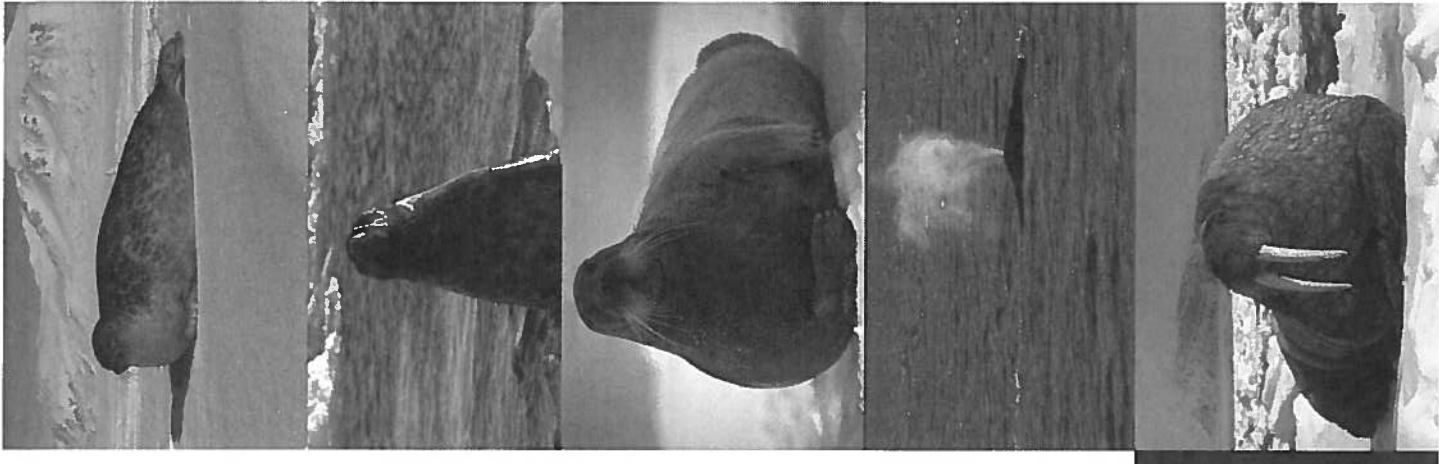


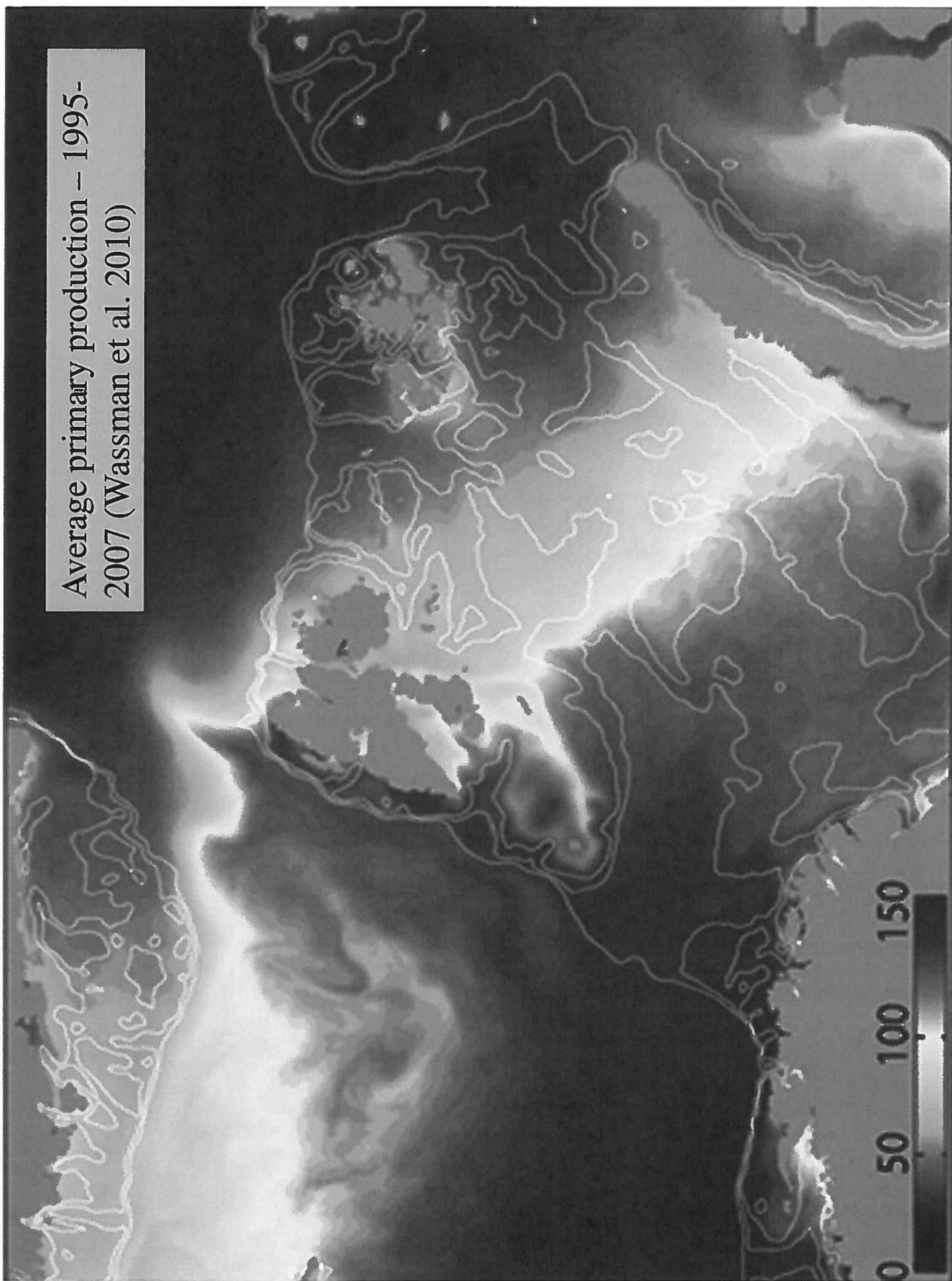


***MPA “connectivity” in planning  
for conservation in the Barents  
Region & beyond.... in a  
changing Arctic***

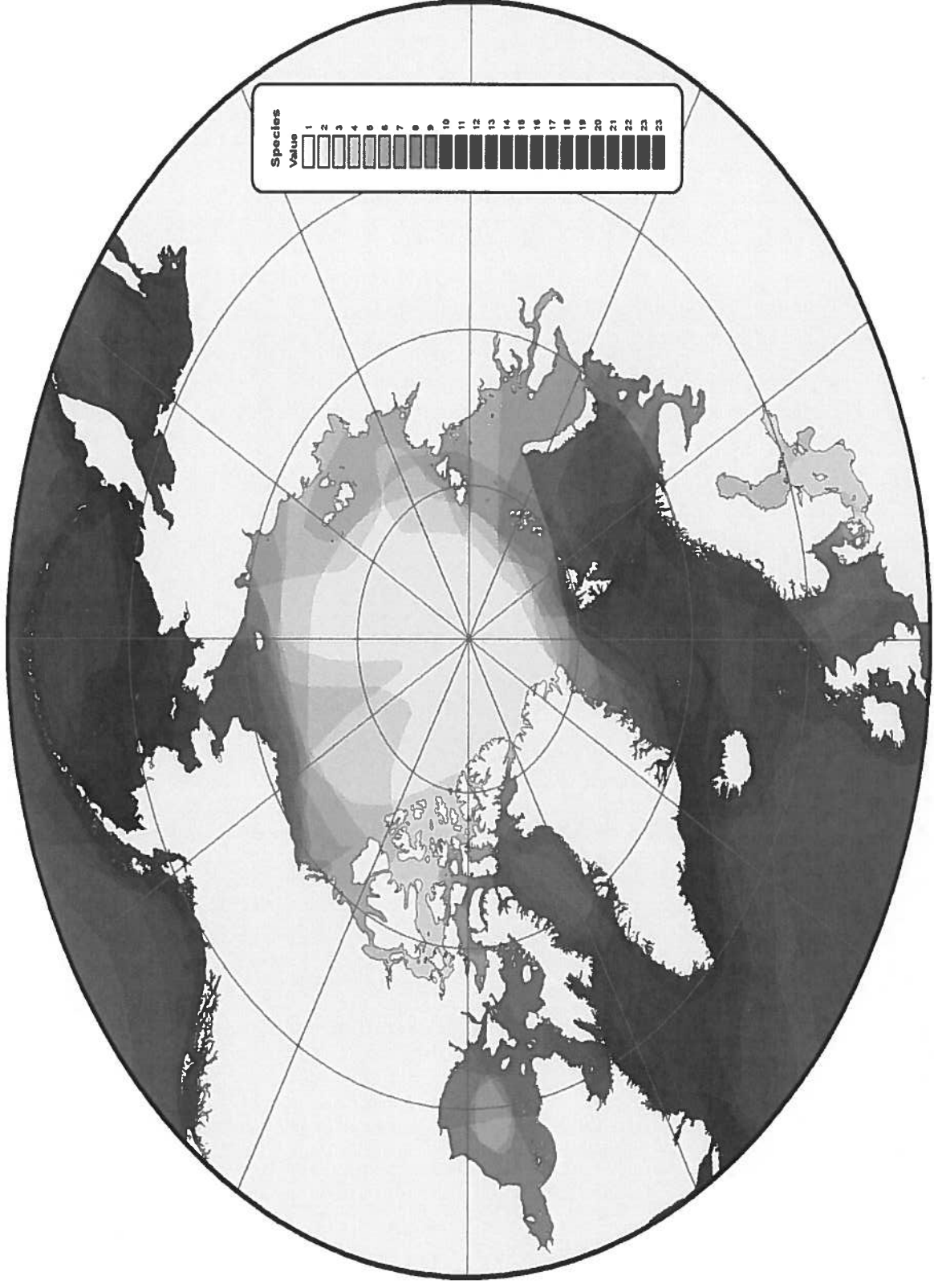
***Kit Kovacs  
(& colleagues)***



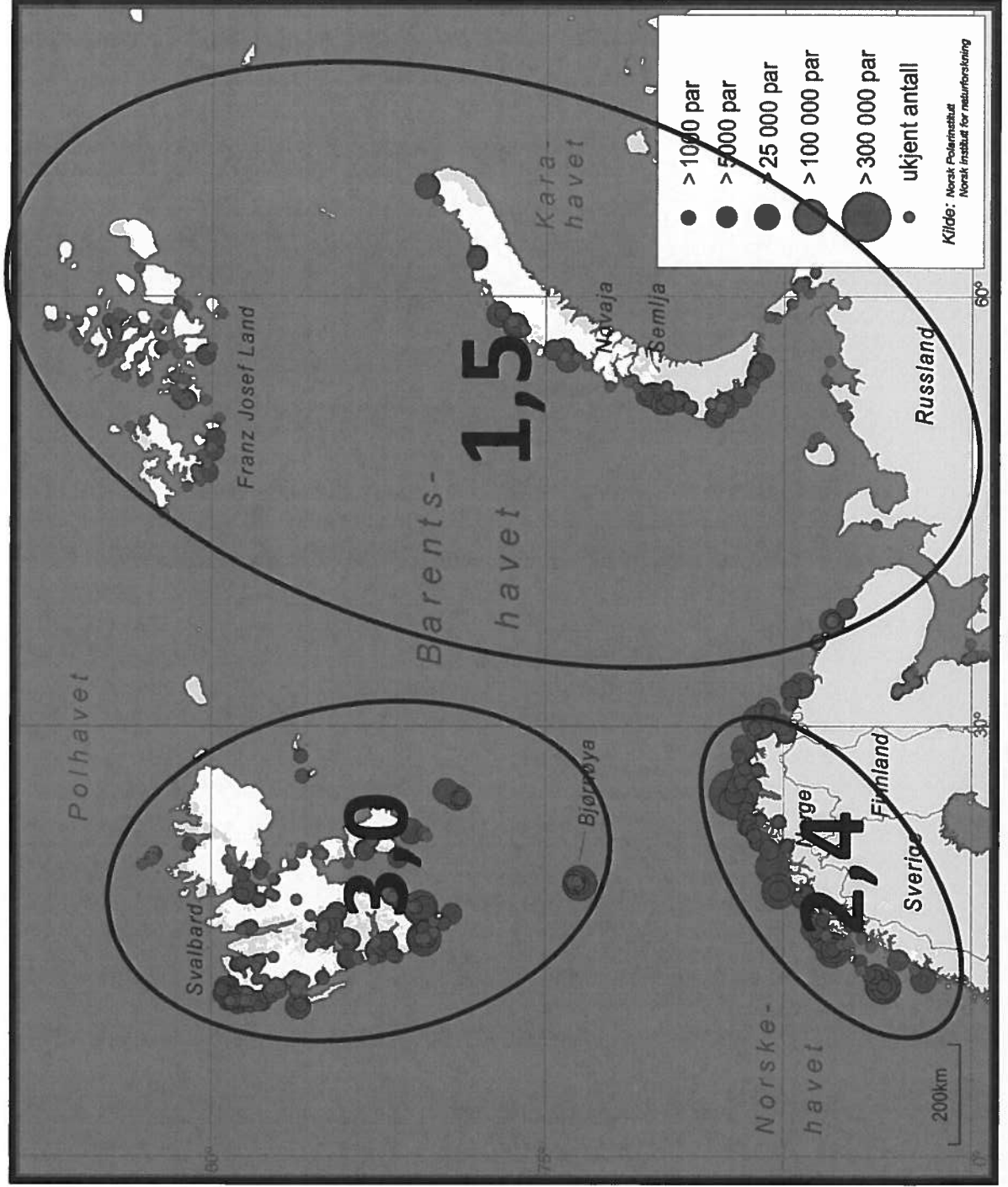
Average primary production – 1995-2007 (Wassman et al. 2010)



# Marine mammal species richness



# Sea birds in the Barents Region



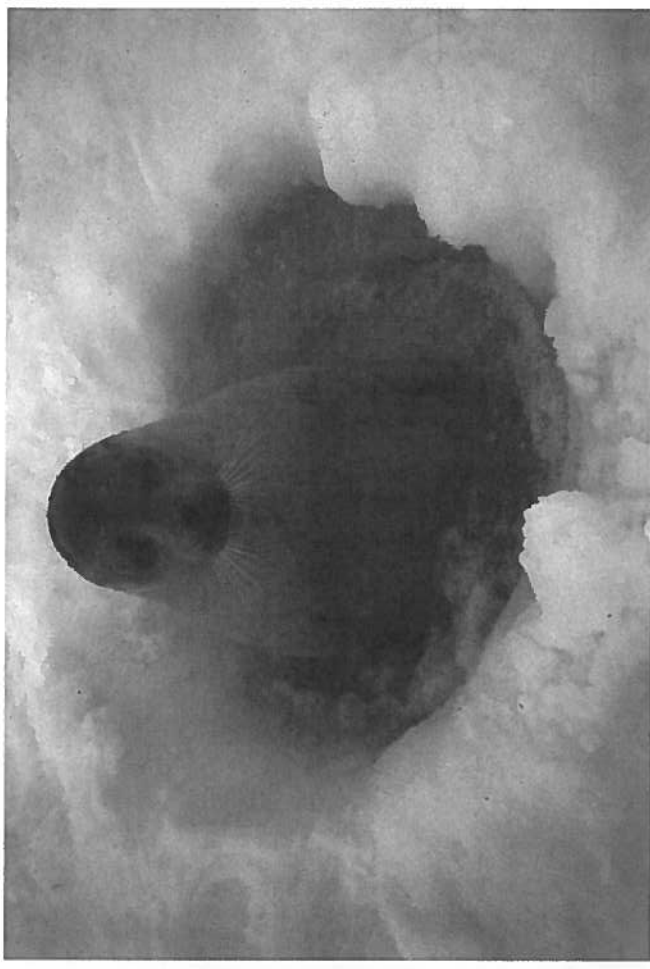
**All three circumpolar Arctic,  
endemic cetaceans have  
populations in the Barents  
Region**

**(All are also on the Norwegian  
Red List)**

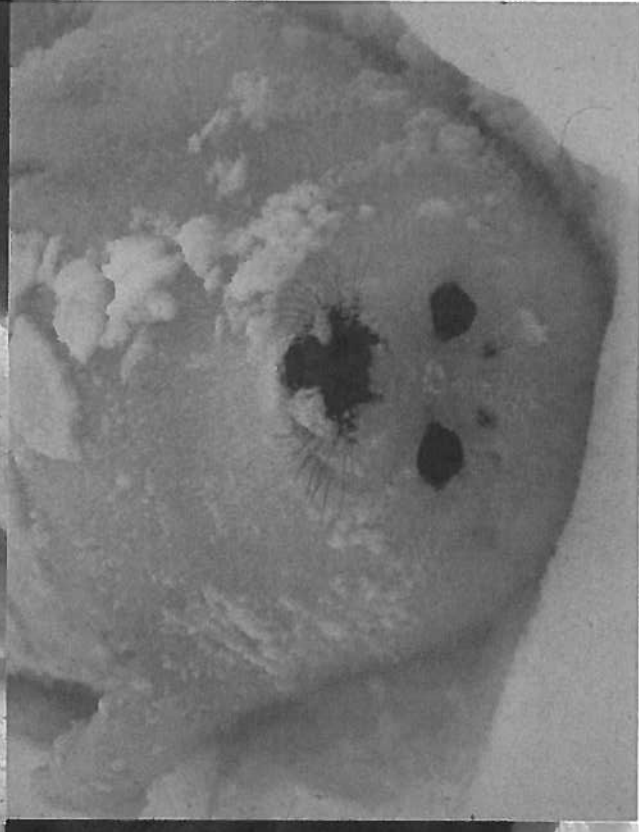
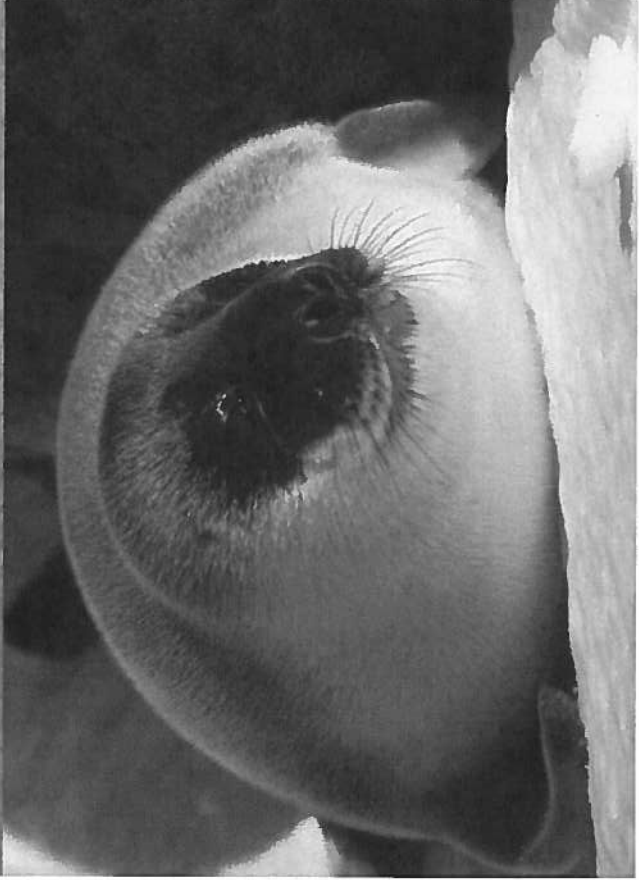


All three circumpolar Arctic,  
endemic pinnipeds have  
populations in the Barents  
Region

(Two of three are on the  
Norwegian Red List)



Both Atlantic pack-ice pinnipeds also reside in the Barents Region  
(One of which is Red Listed)

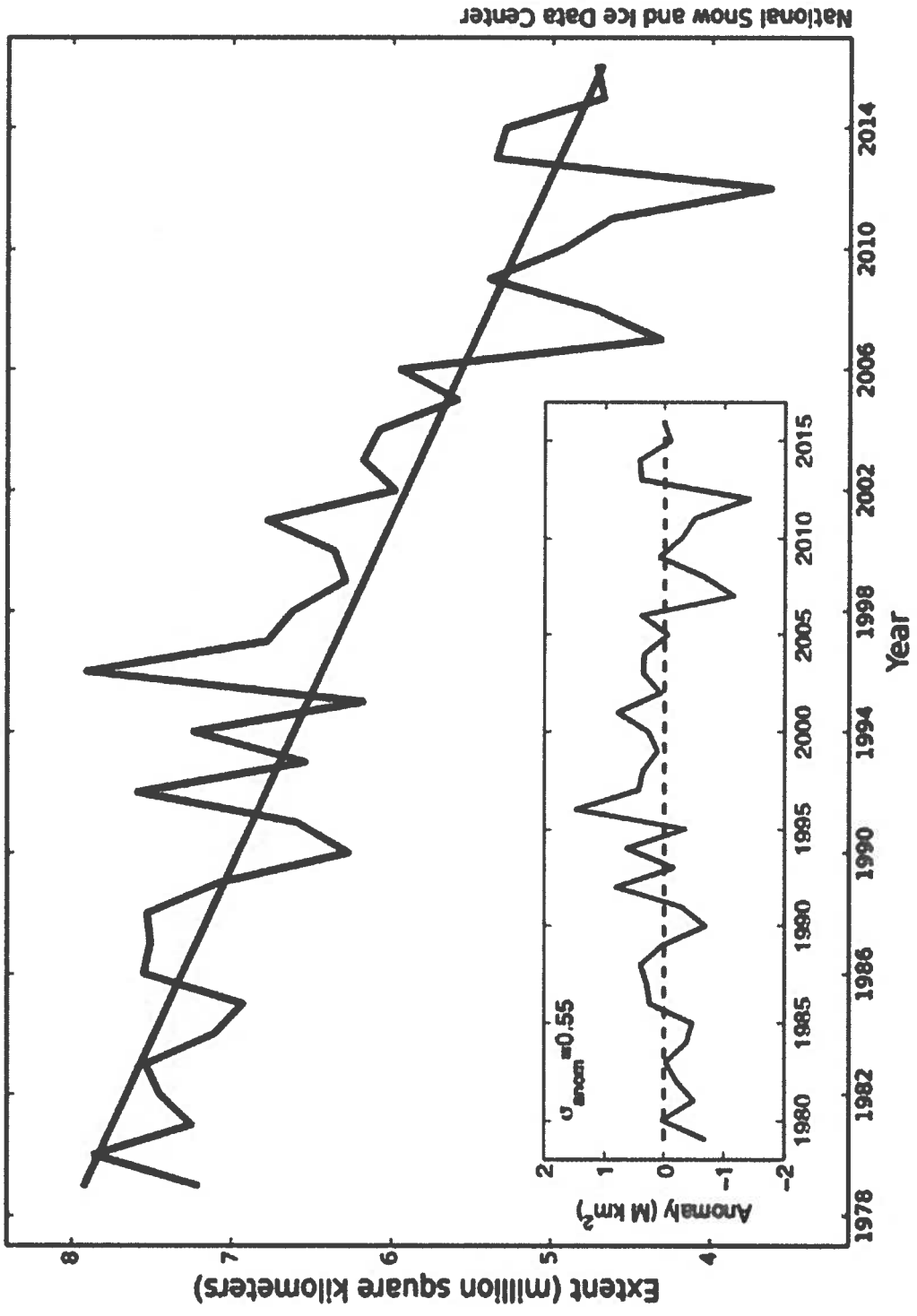






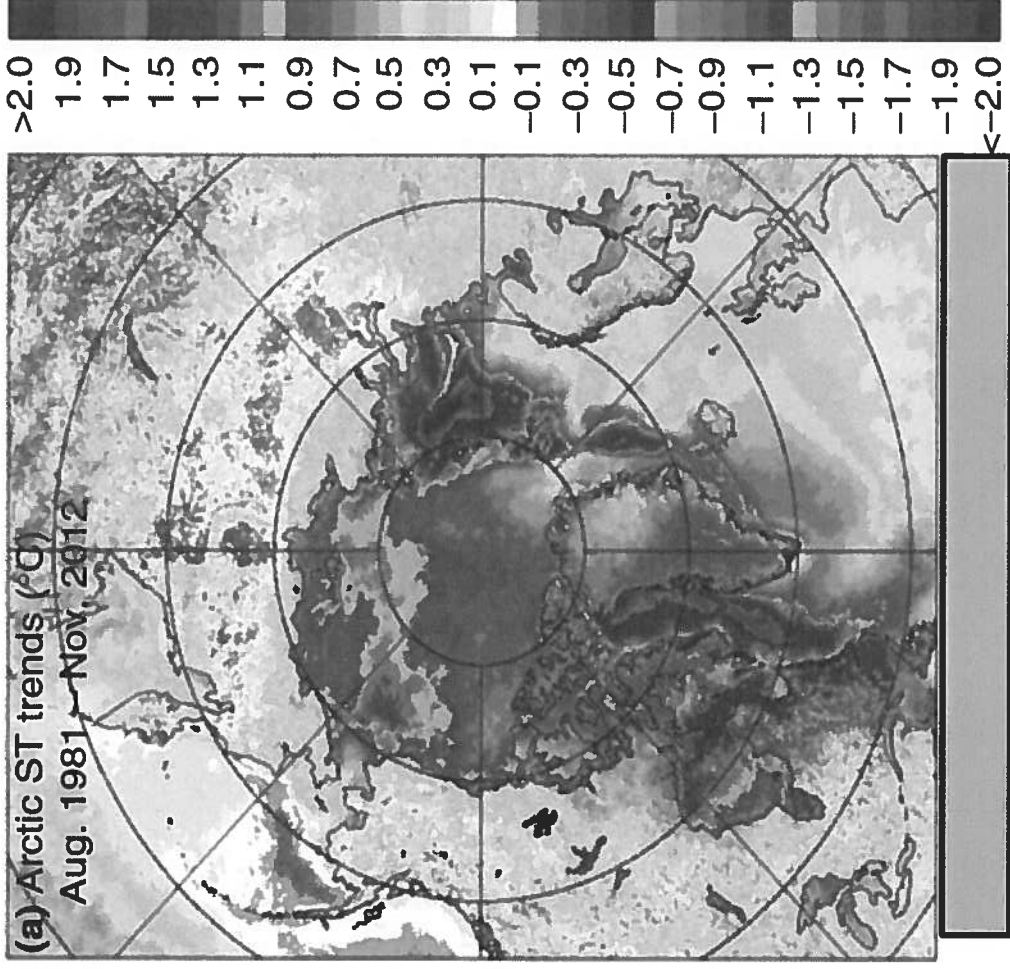
# ALL ice-affiliated species

## Average Monthly Arctic Sea Ice Extent September 1979 - 2016



National Snow and Ice Data Center

# Hot Spot.....



**Background – surface temperature  
(Comiso & Hall 2014)**

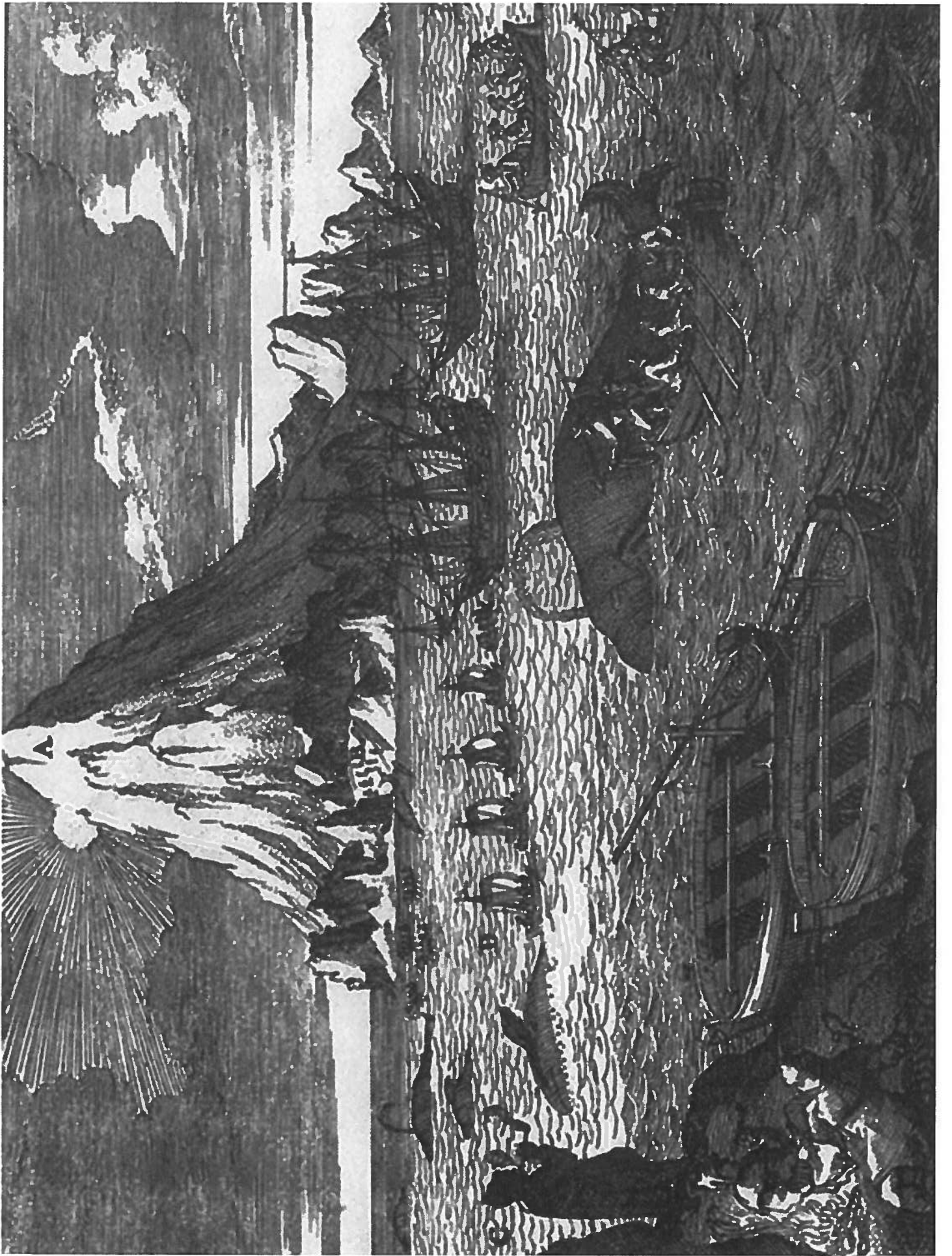
Barents Sea > largest  
decline in duration of  
seasonal sea ice within  
the Arctic

● >20 weeks less ice  
coverage (1970-  
2013)

● 2-4 X other Arctic  
areas

(Laidre et al. 2015)

● Svalbard – sea ice  
«collapse» 2006



15°W 0° 15°E 30° 45°  
90° 75°

**AURAL (Autonomous Underwater Recorder  
for Acoustic Listening) array... PAM**



Atwain  
2012

Rijpfjorden  
2013

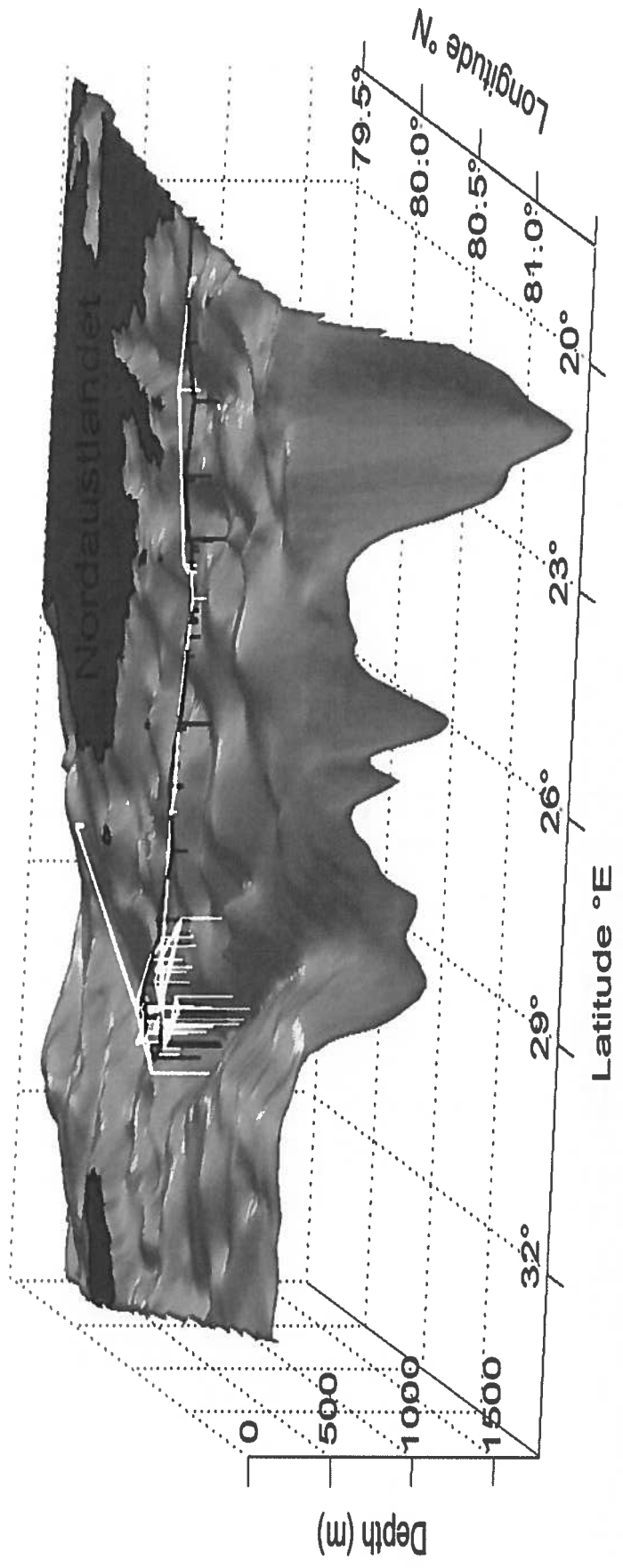
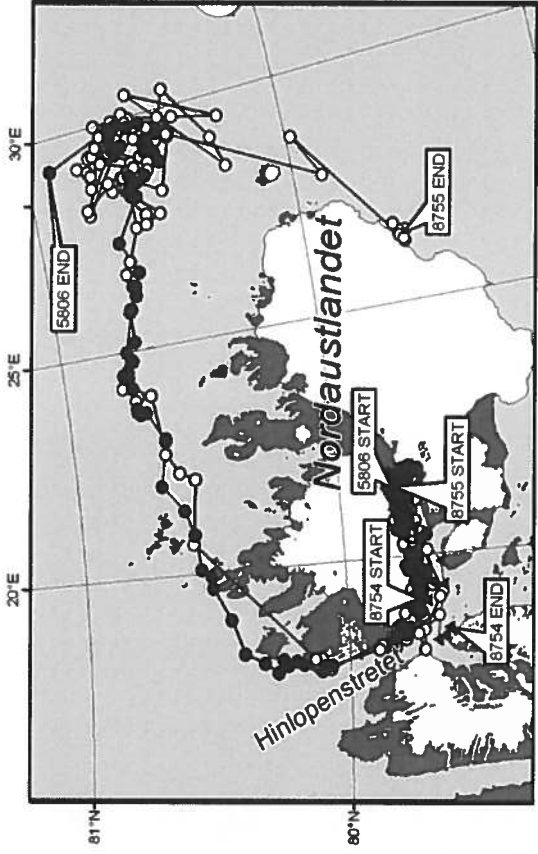
Kongsfjorden  
2013

Isfjorden  
2016

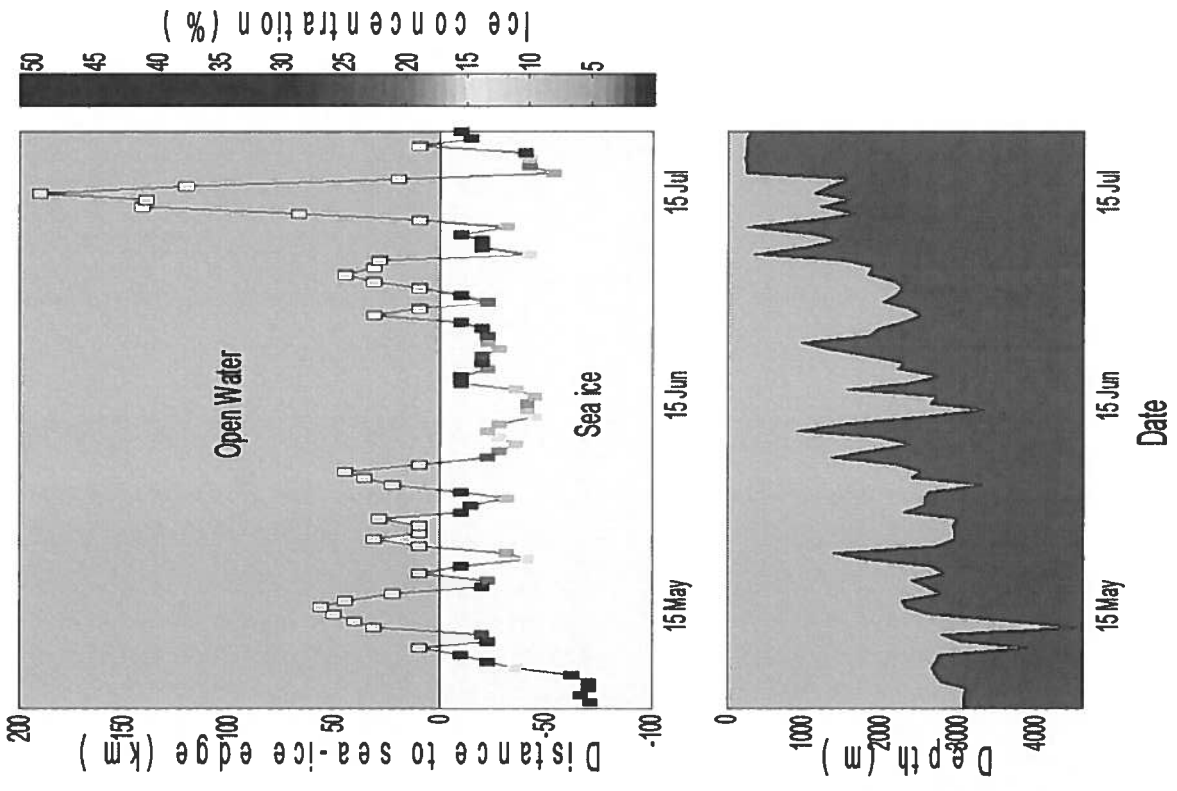
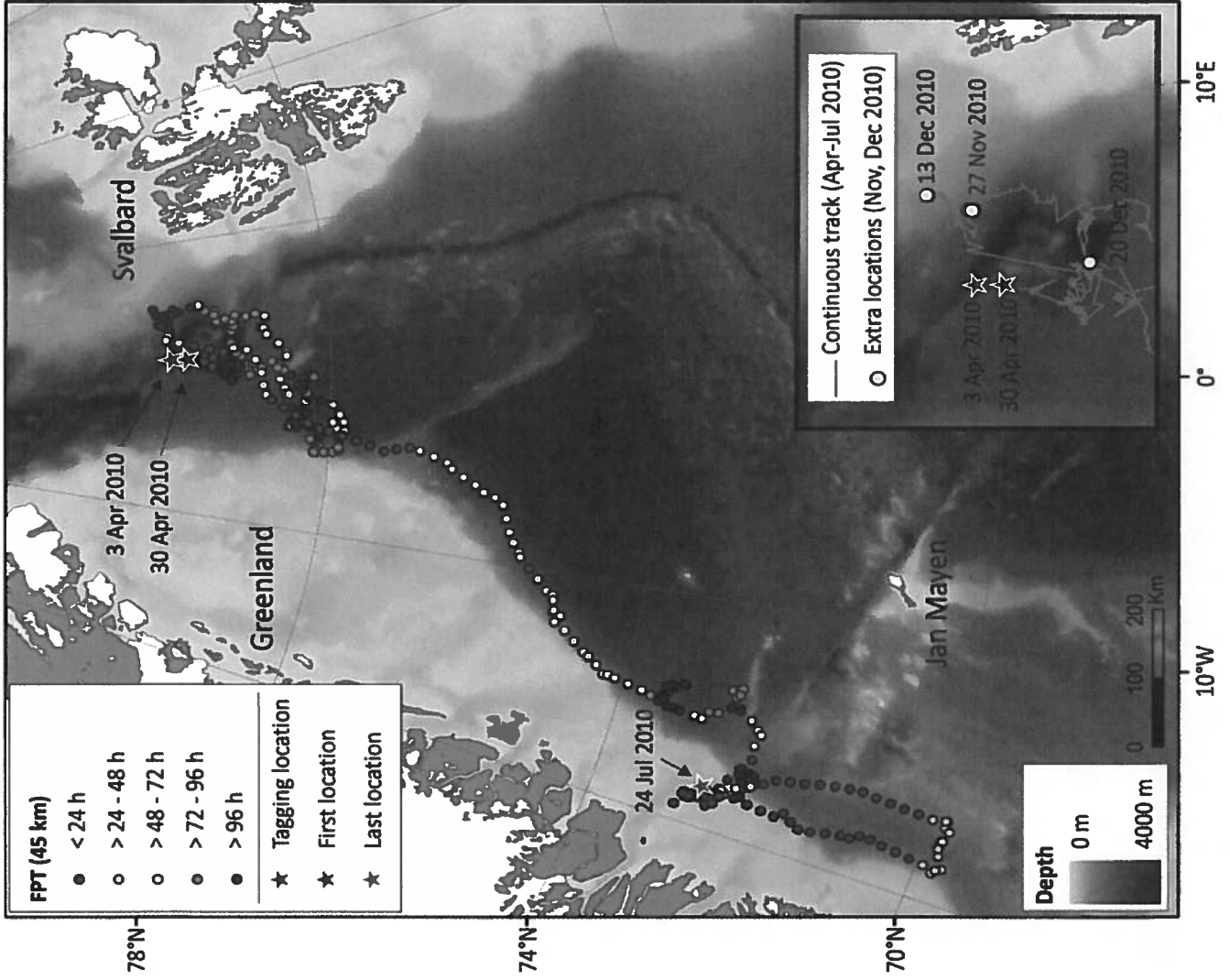
Fram Strait  
2008

00 km







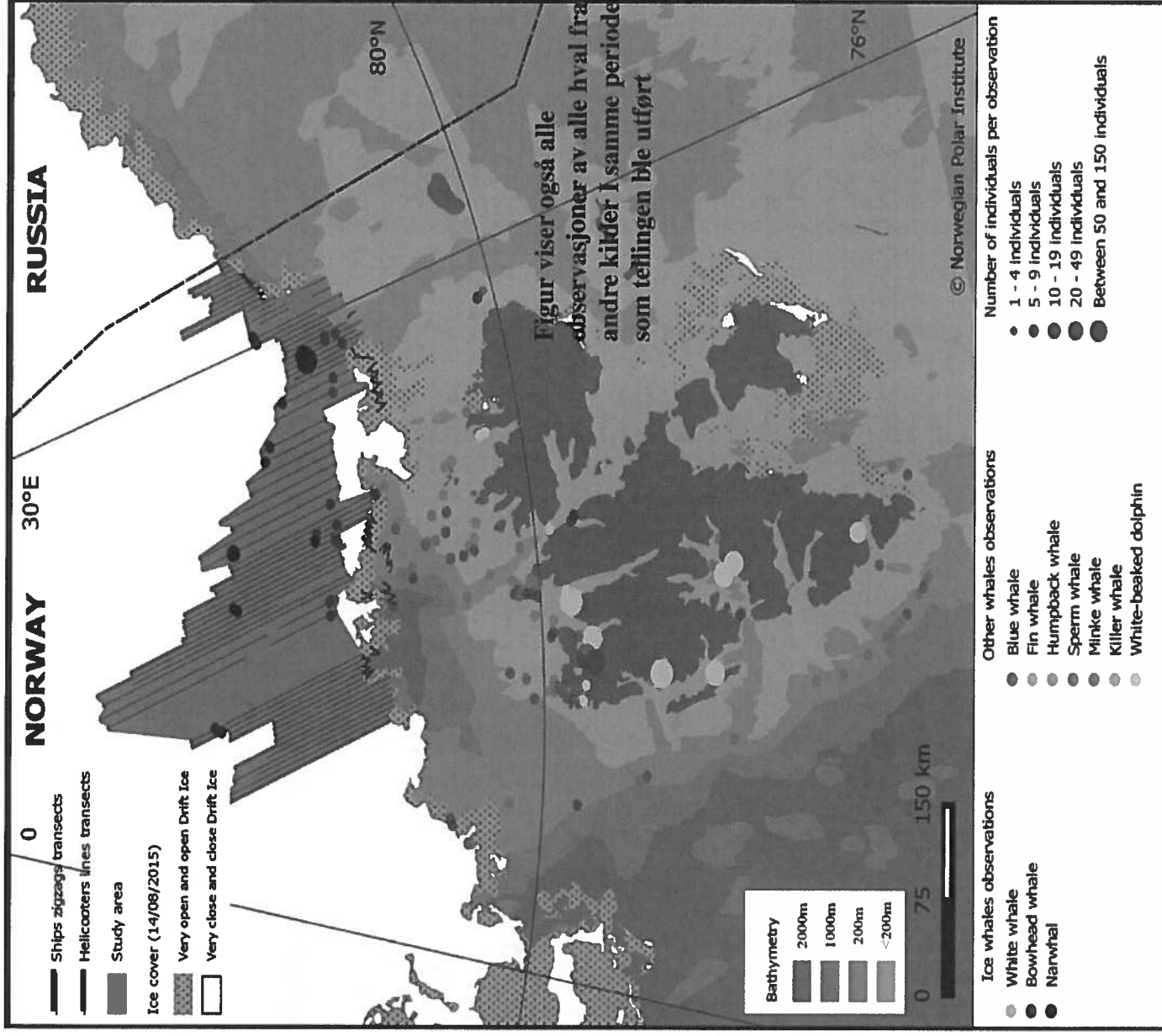


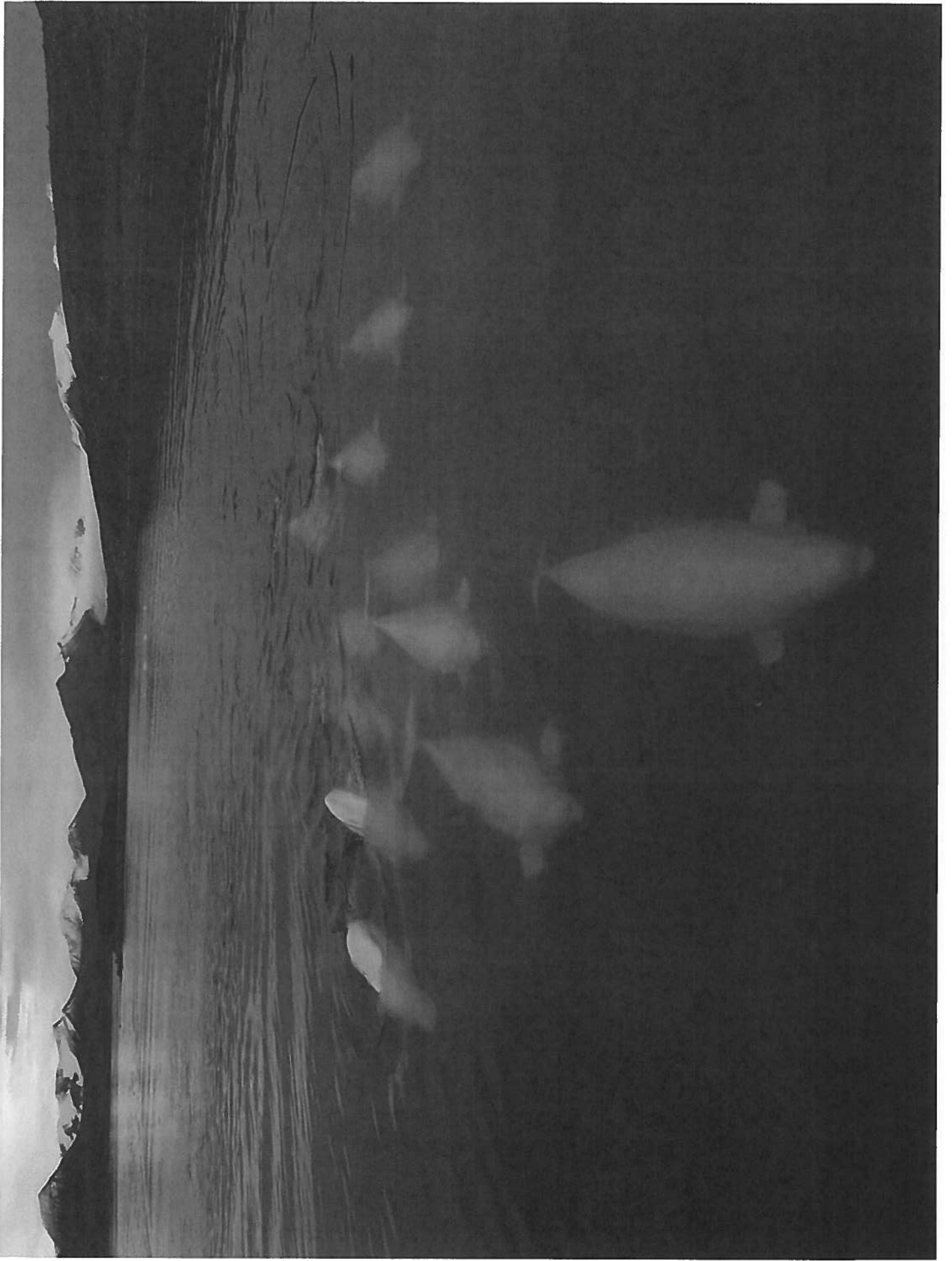


Vacquié-Garcia, J., Lydersen, C., Marques, T. A., Aars, J., Ahonen, H., Skern-Mauritzen, M., Øien, N. and Kovacs, K. M. 2017. Late summer distribution and abundance of ice-associated whales in the Norwegian High Arctic. *Endangered Species Research.*

**343 bowheads (!)**

**837 narwhals (!)**

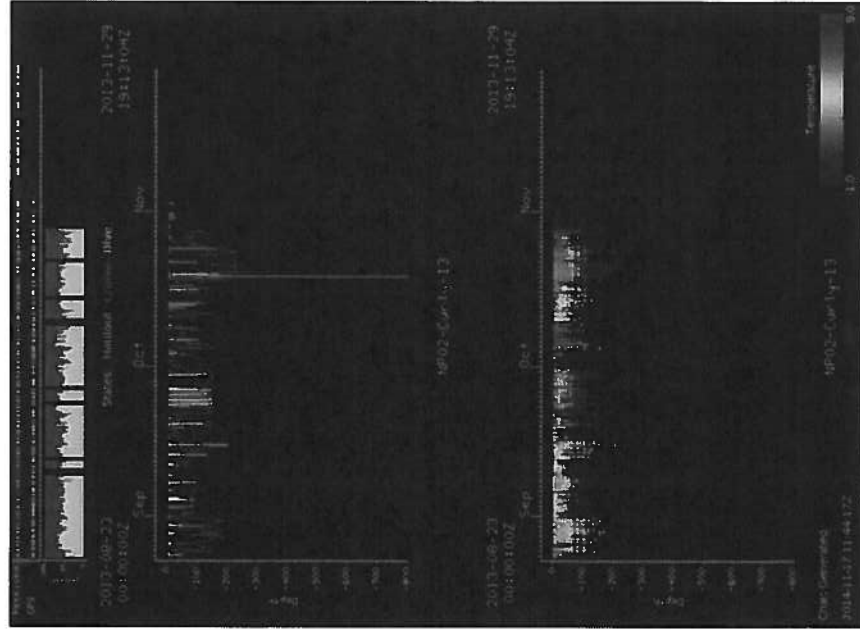
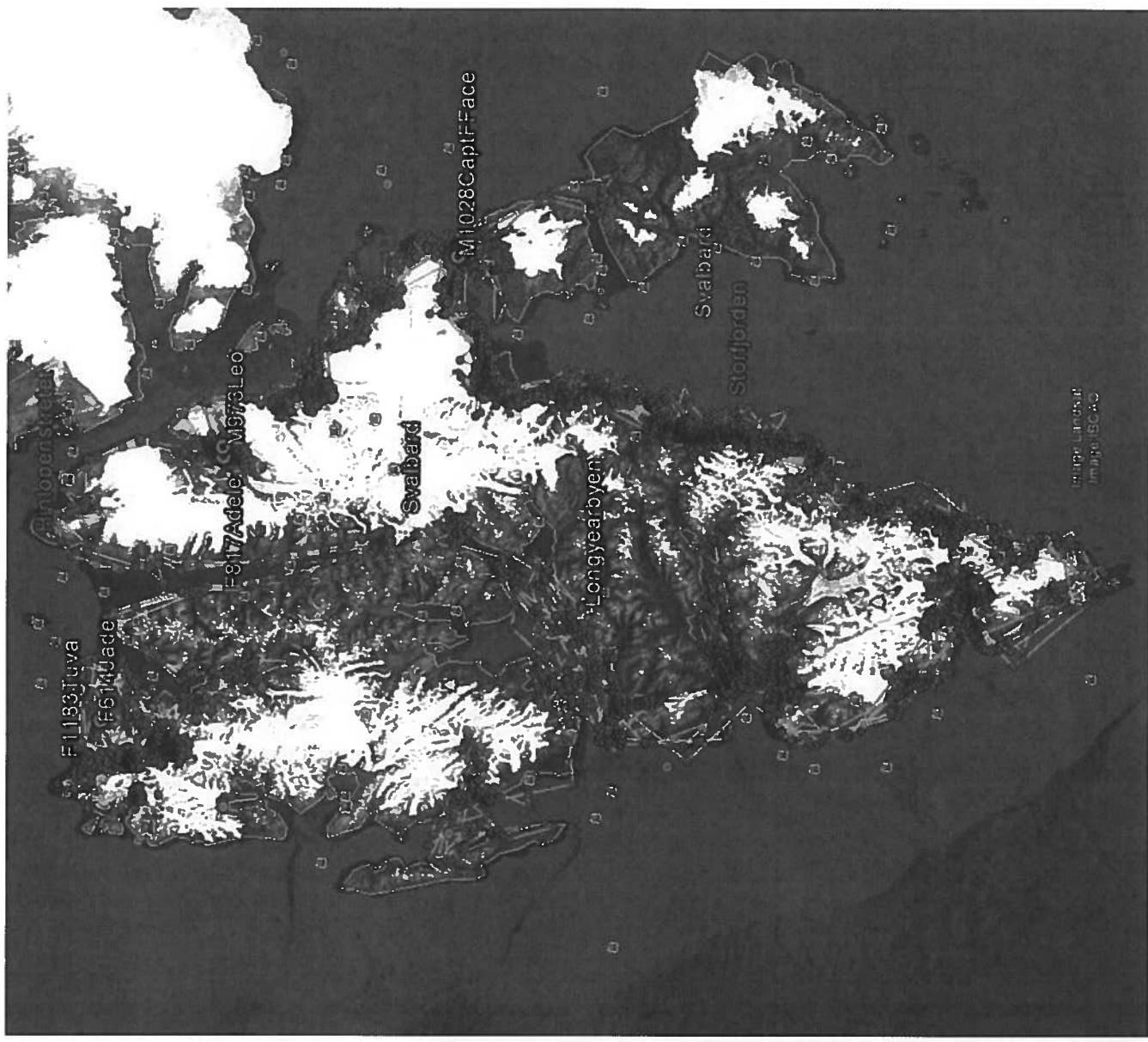




...data from 2016

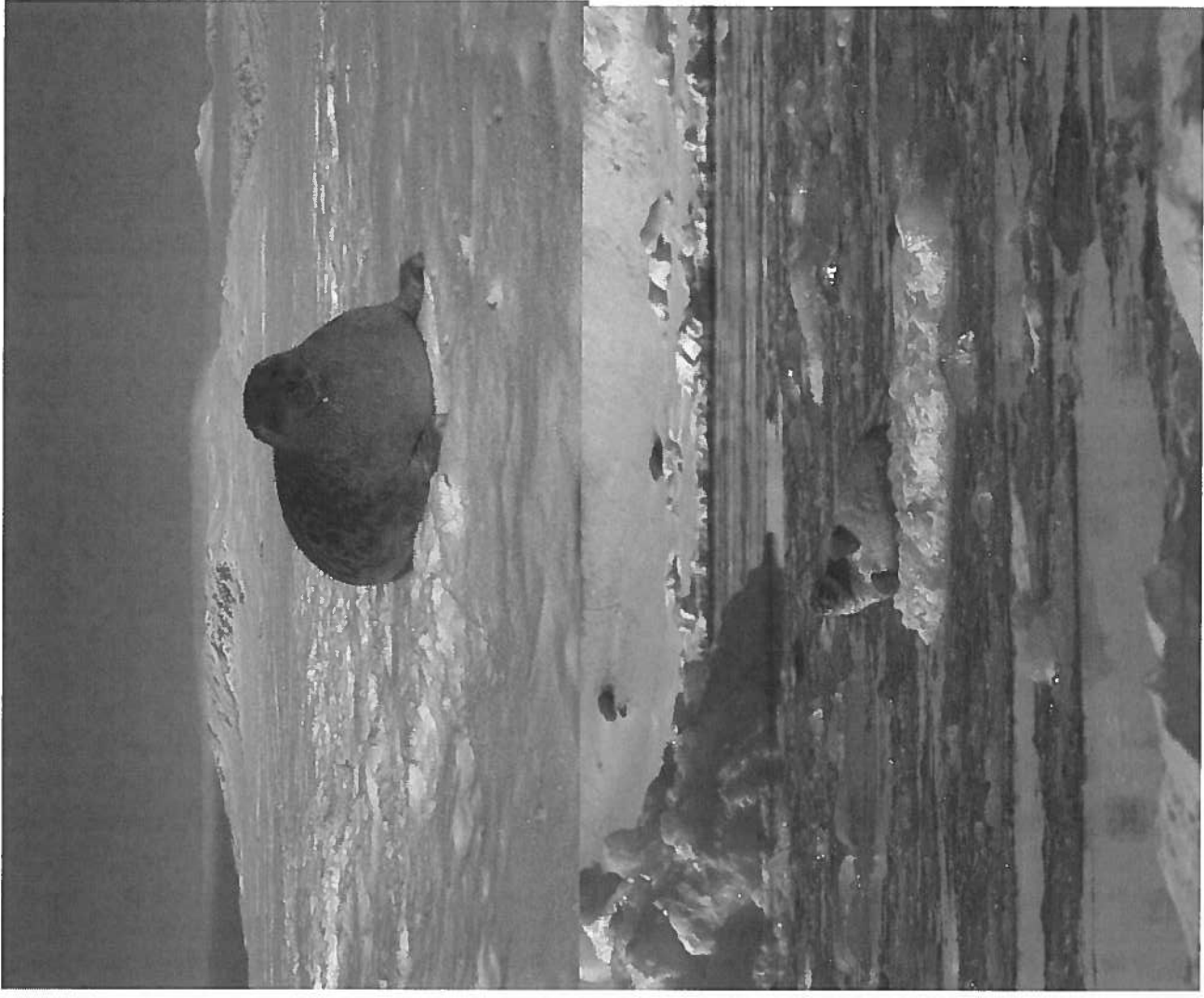
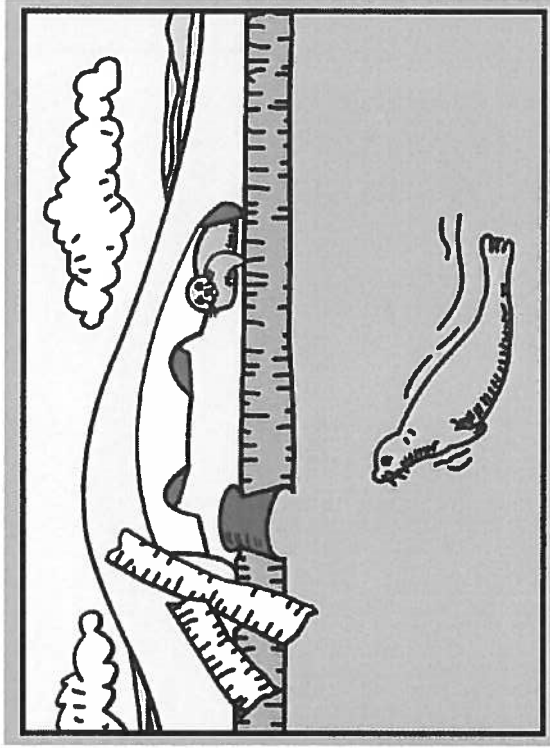
## COASTAL

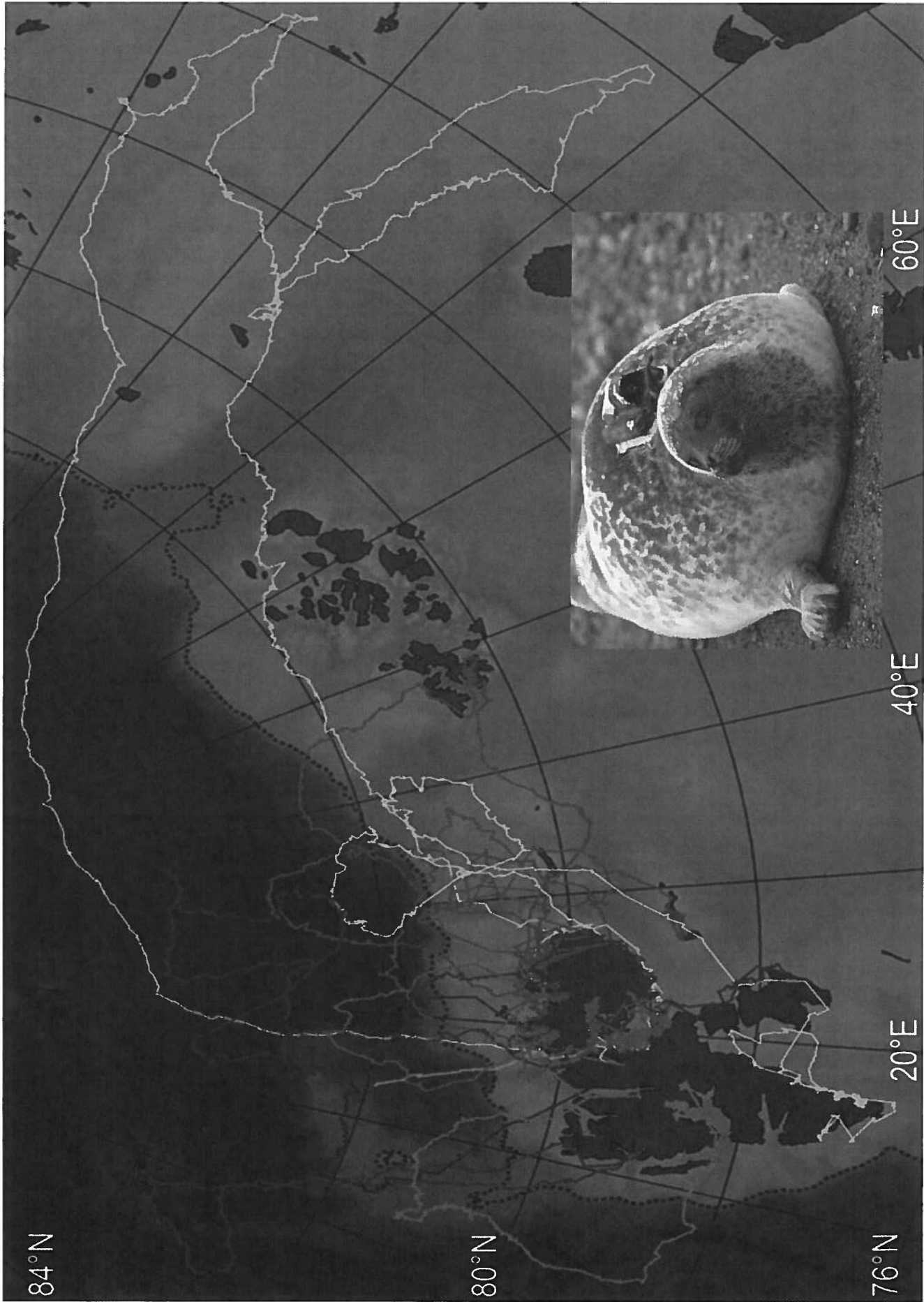
**BUT less glacier  
dependent than a decade  
ago....**



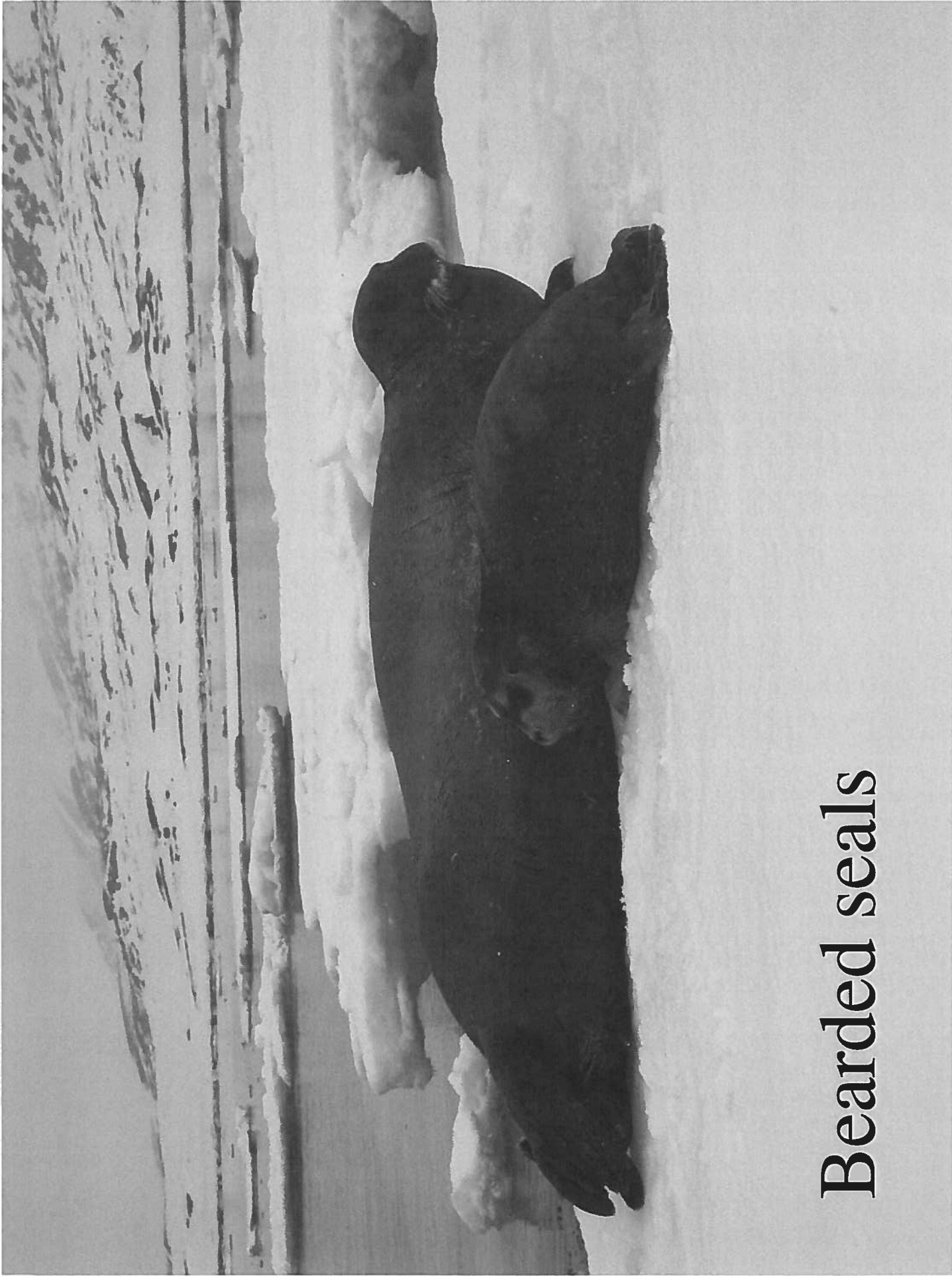
# Ringed seals

- recruitment declines, decreased ovulation rates, decreased body condition with reduced sea ice in some regions.....







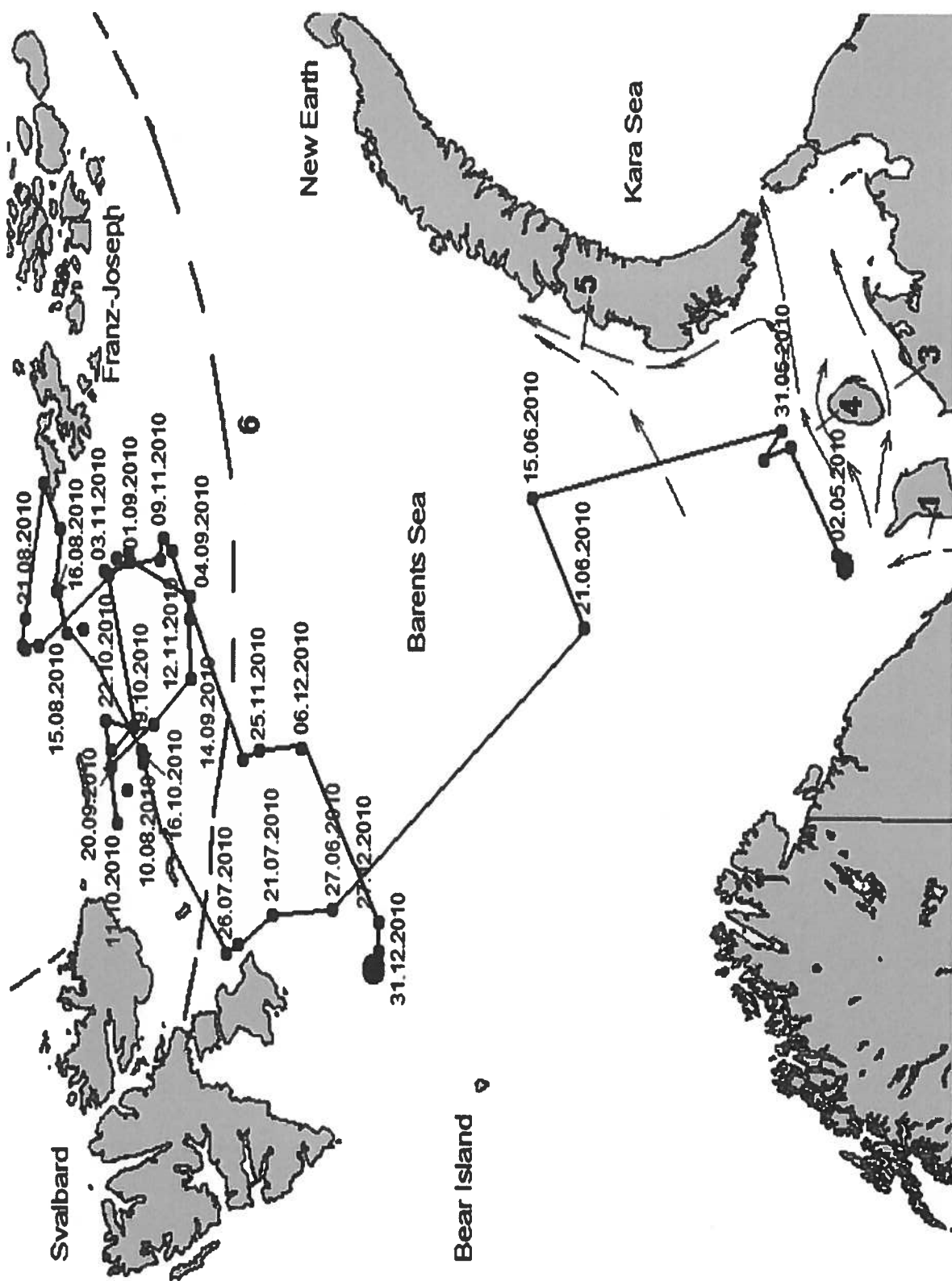


Bearded seals

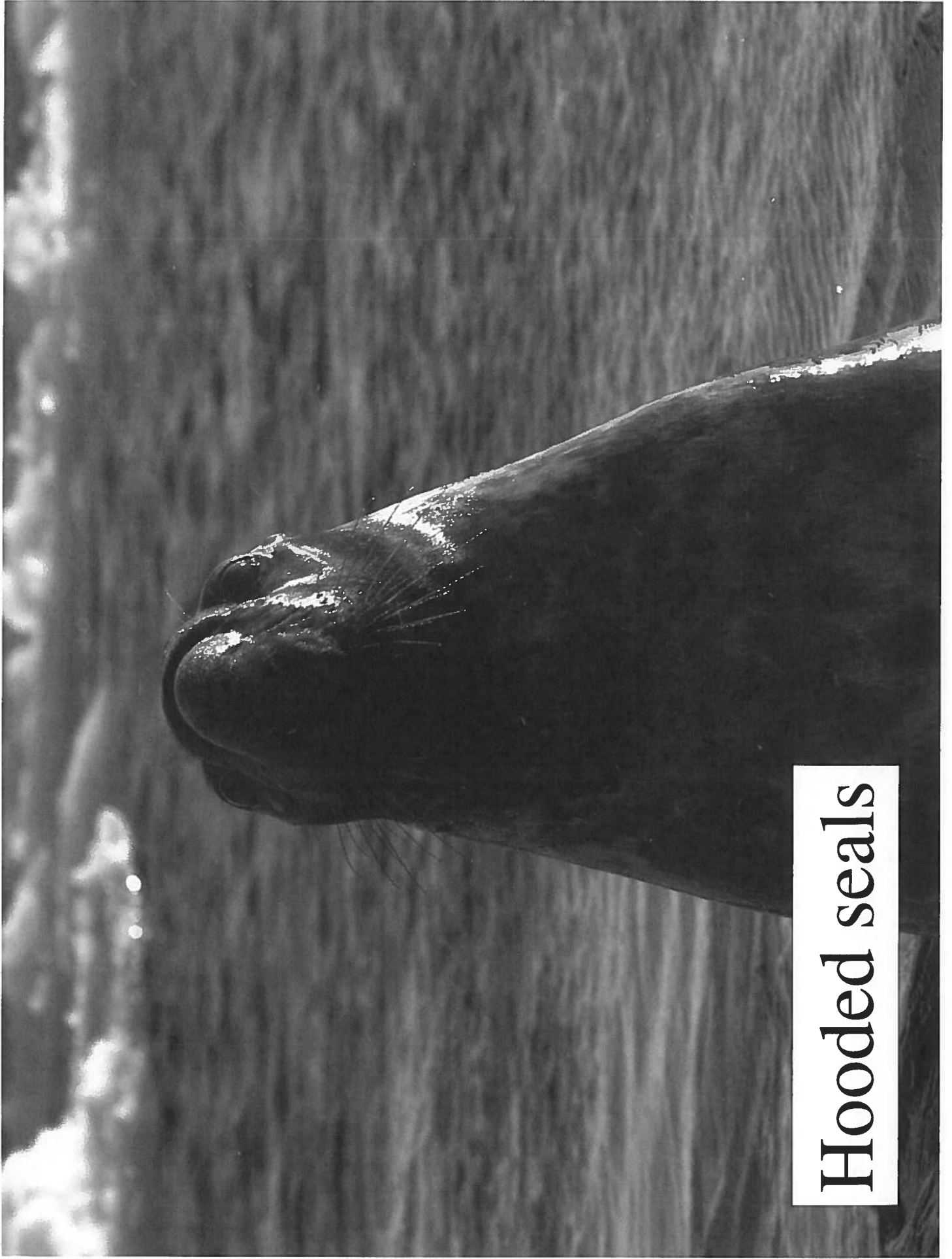


Harp seals



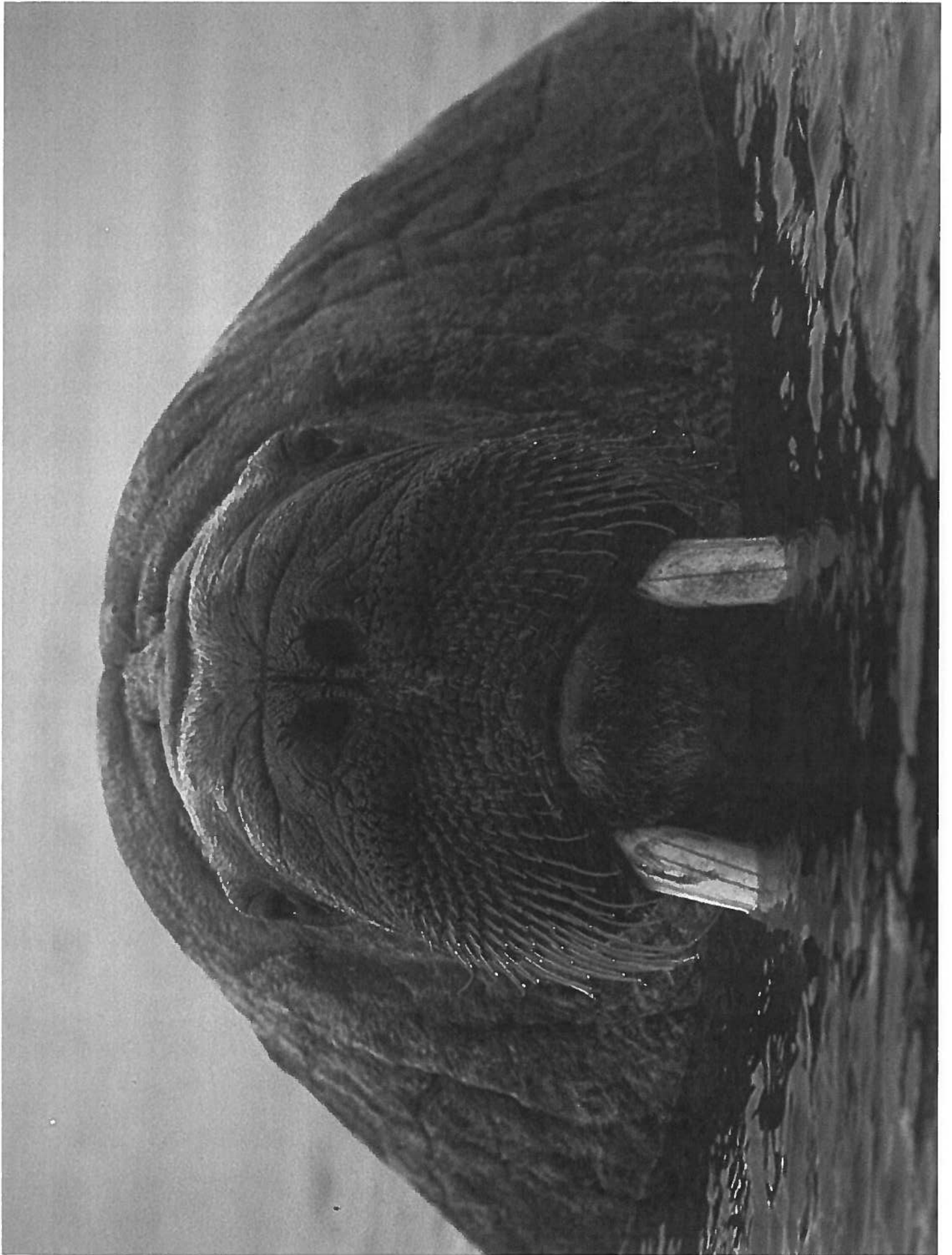


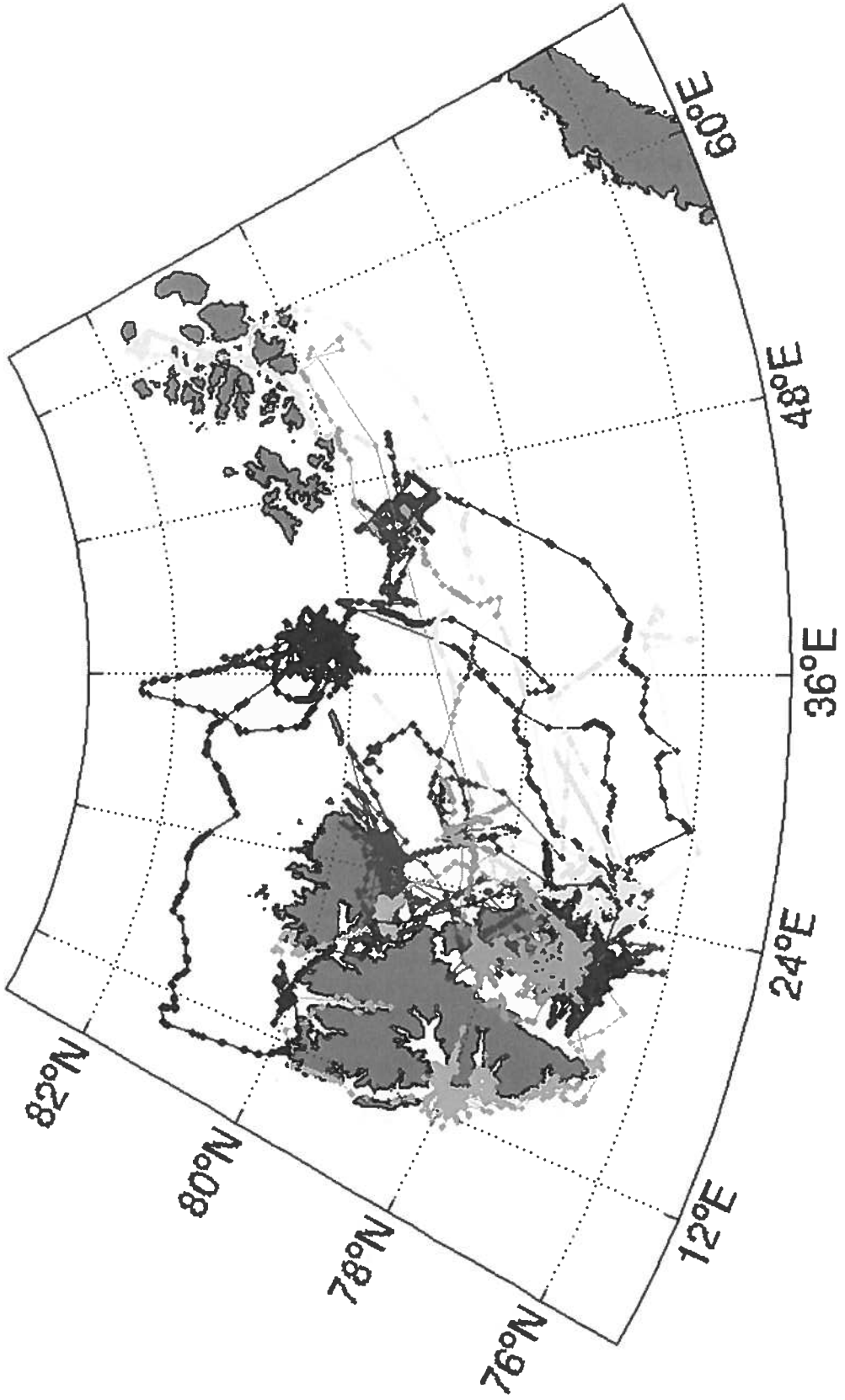
Svetochev et al. 2016. Czech Polar Reports 6: 31-42.



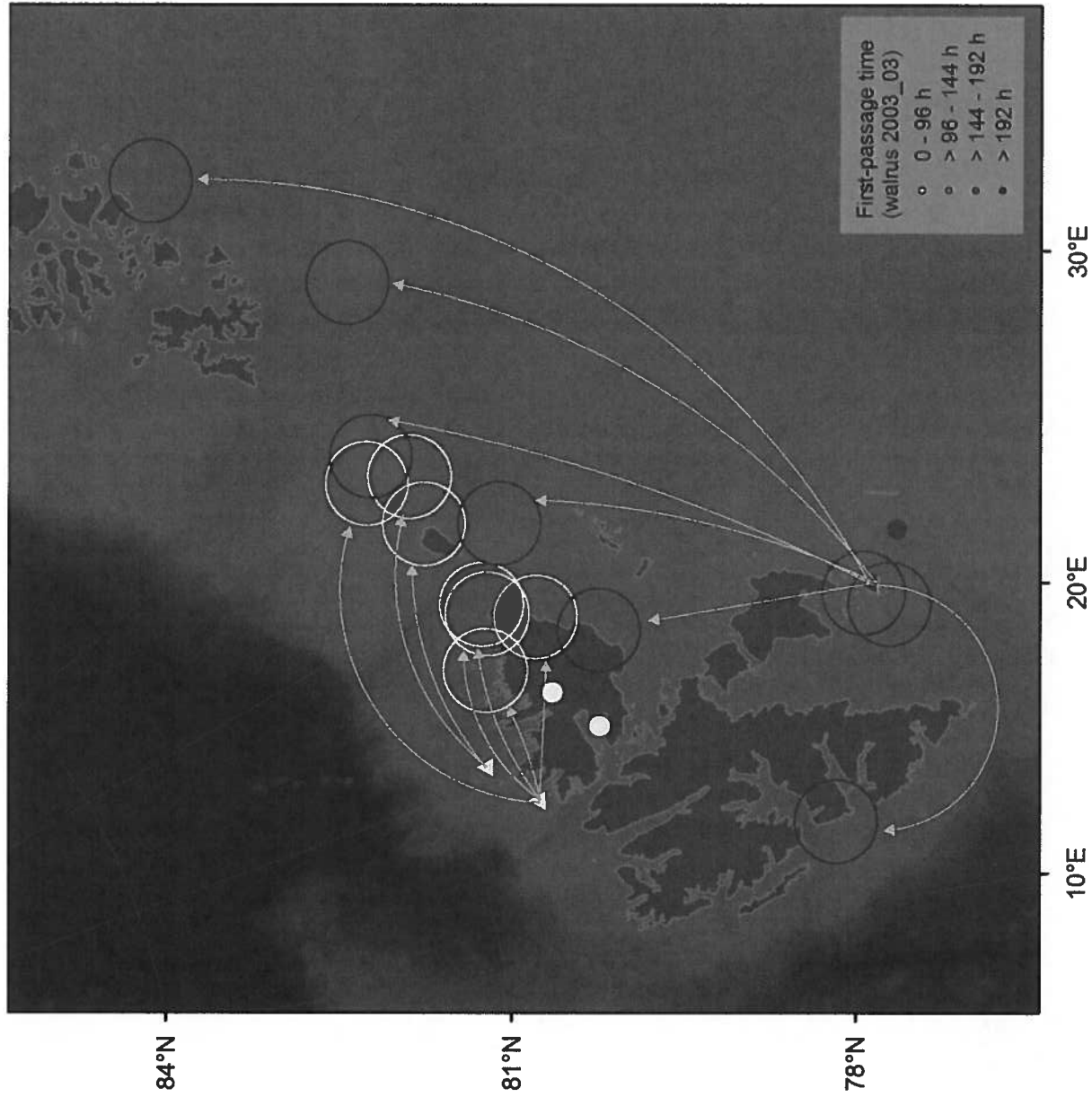
**Hooded seals**





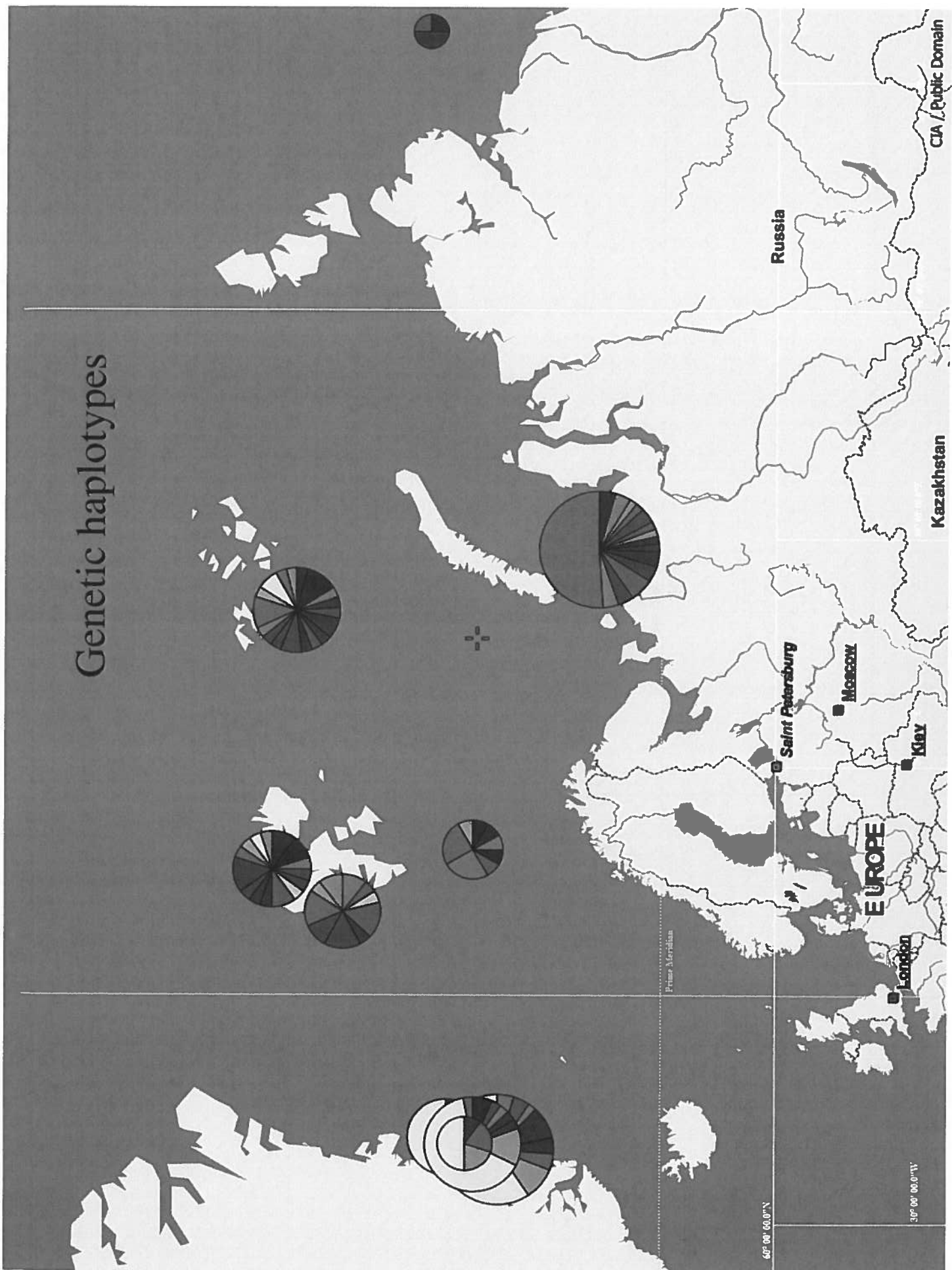


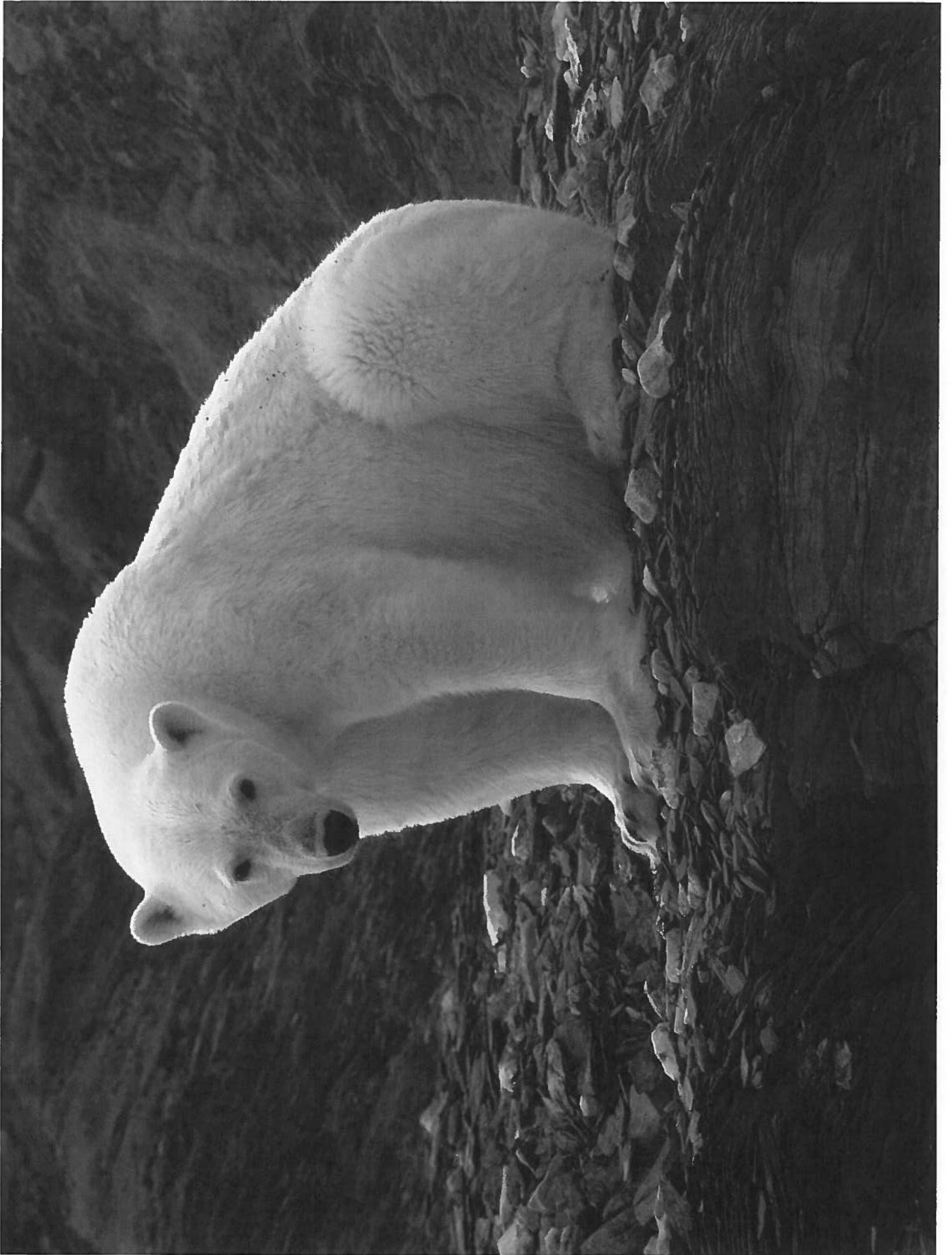
# Breeding locations



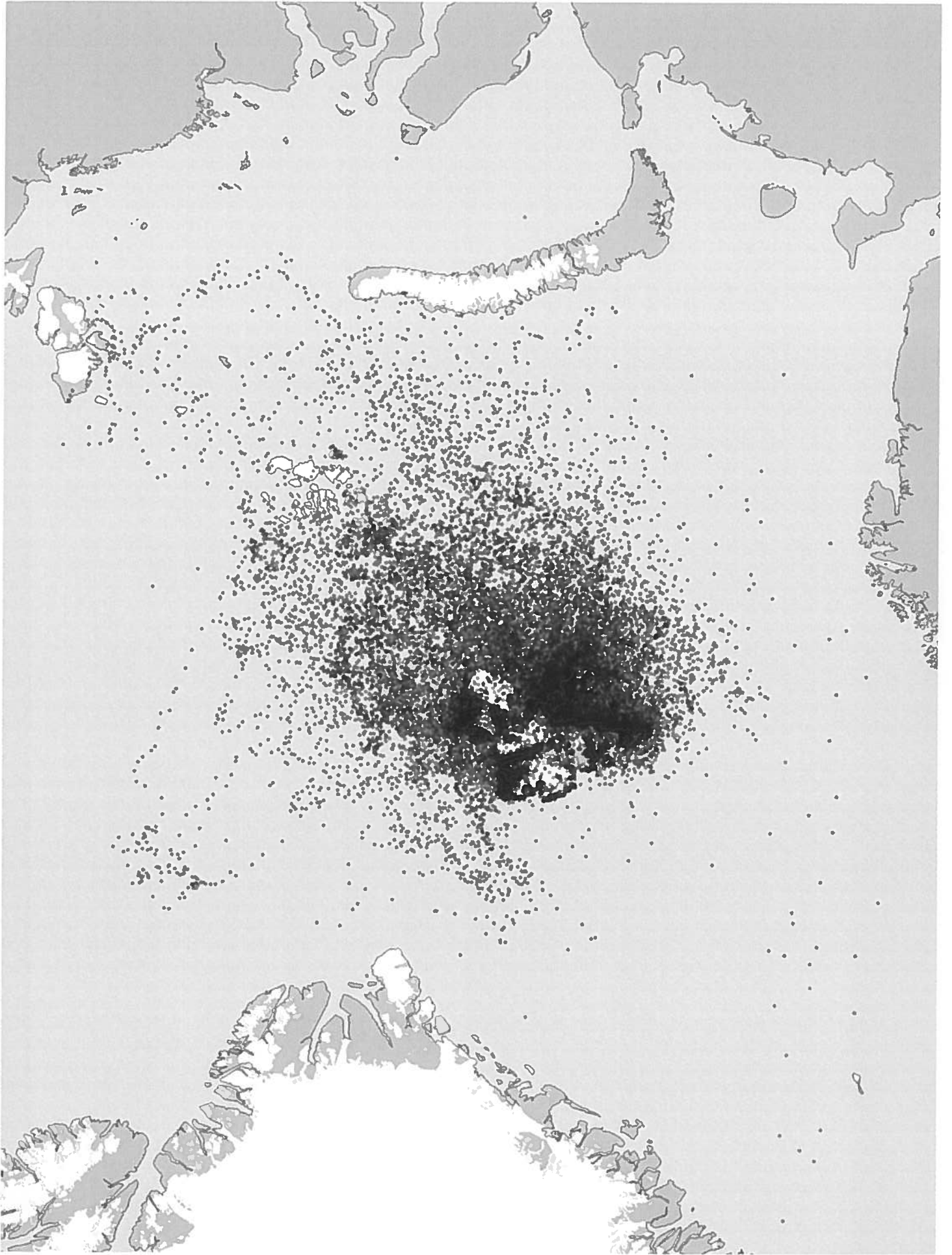
Freitas, C, Kovacs, K. M., Ims, R.A., Fedak, M. A. and Lydersen, C. 2009 Mar. Ecol. Progr. Ser. 375: 247-261.

# Genetic haplotypes

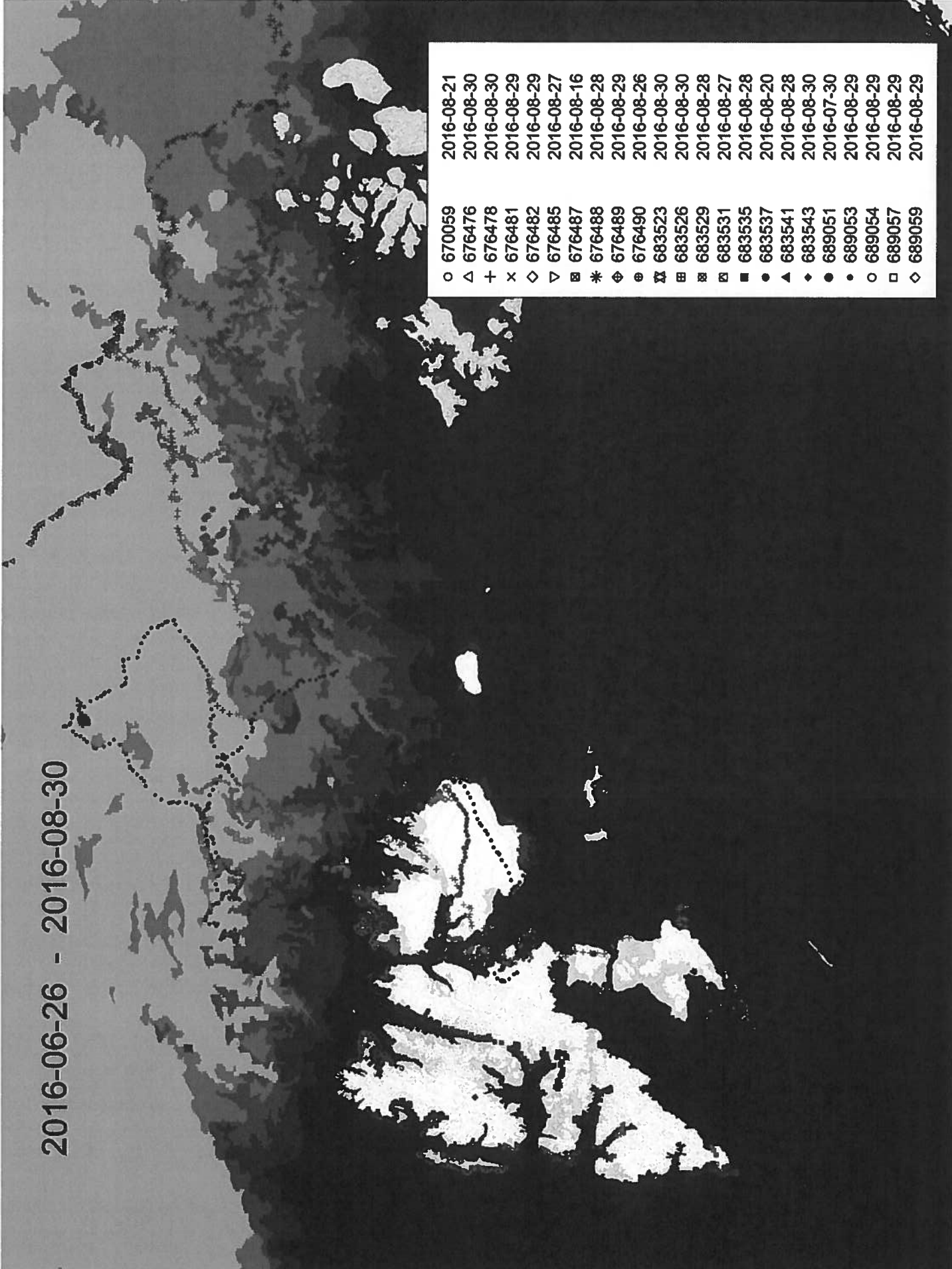






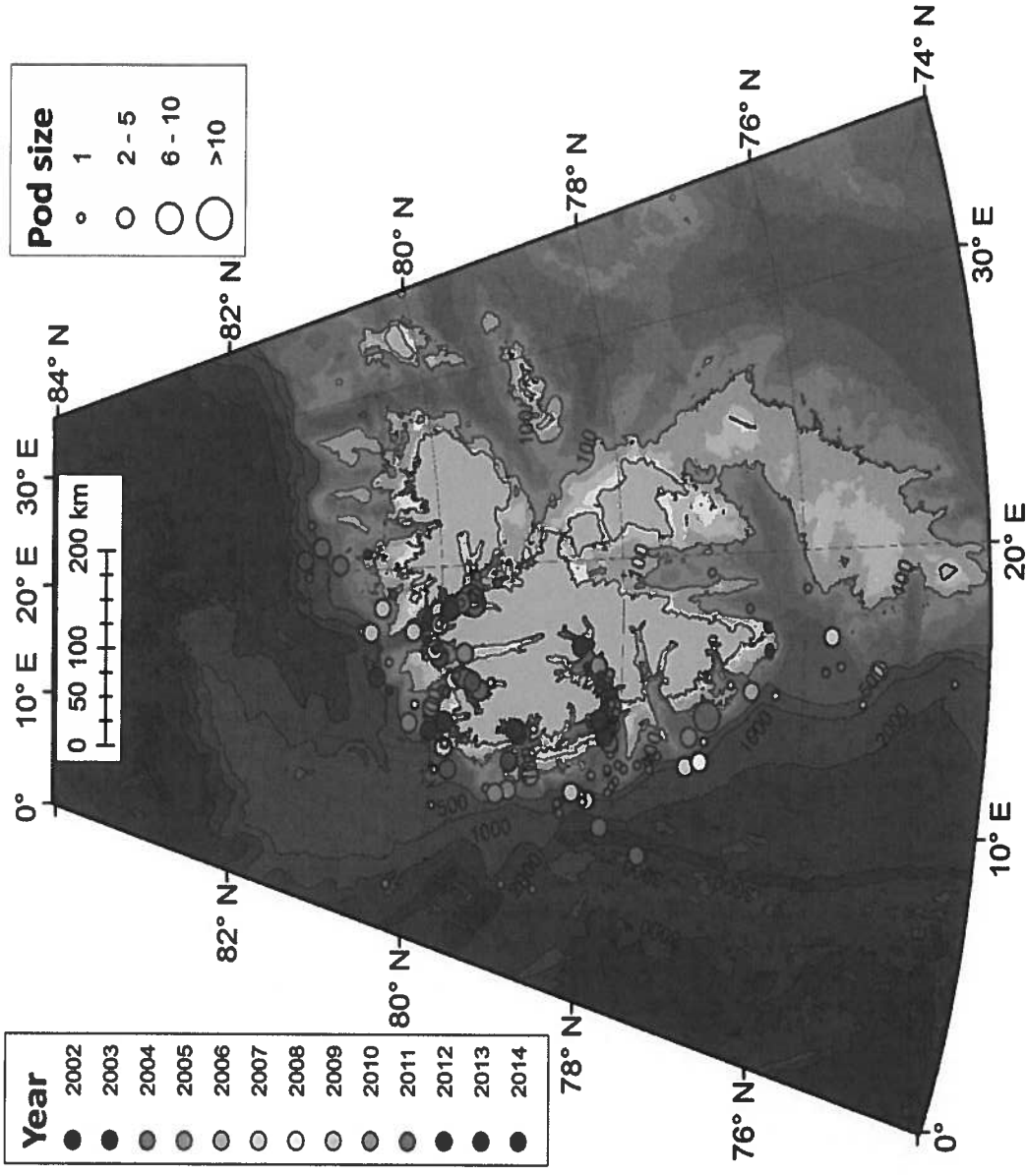


2016-06-26 - 2016-08-30



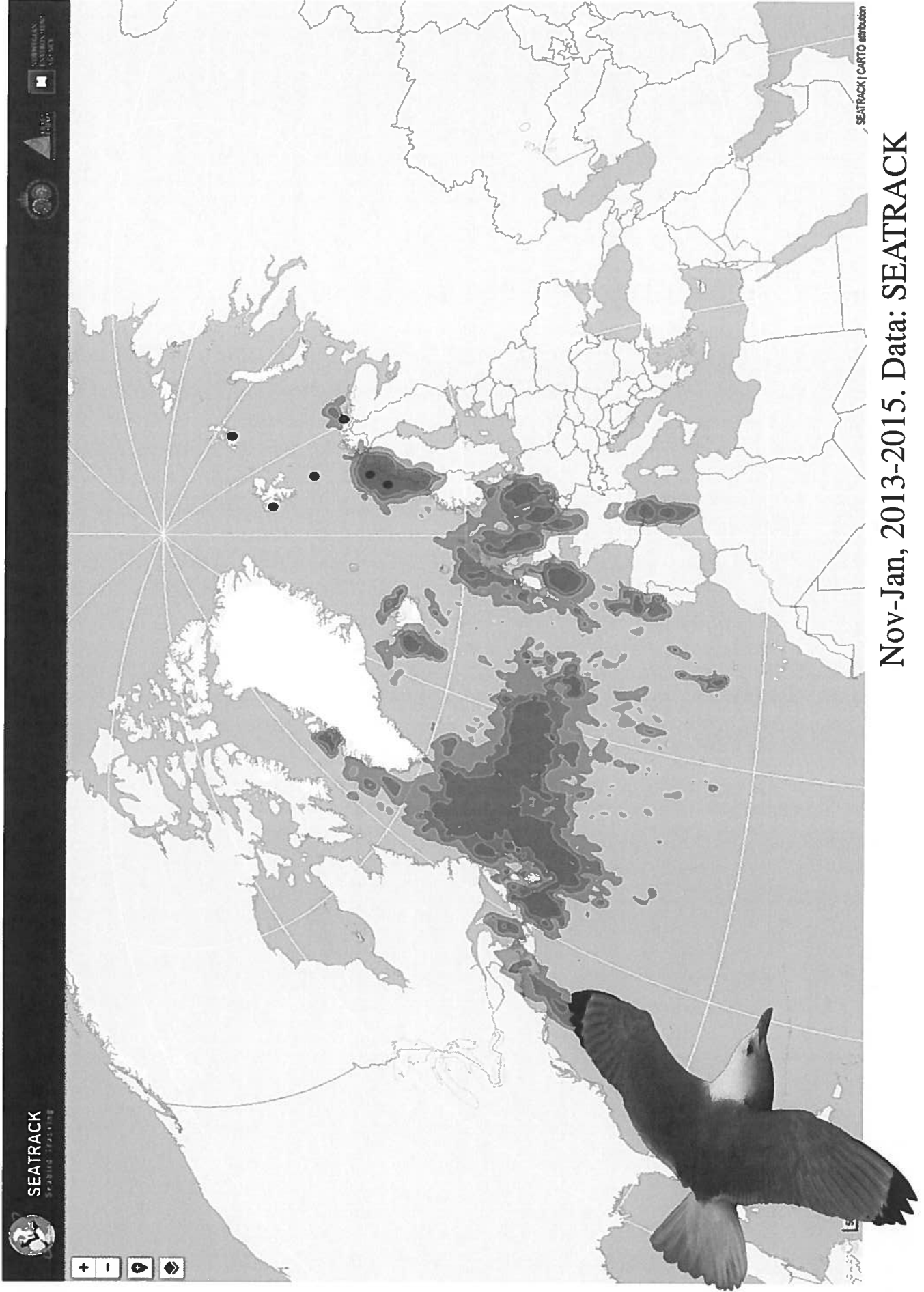
○	670059	2016-08-21
△	676476	2016-08-30
+	676478	2016-08-30
x	676481	2016-08-29
◇	676482	2016-08-29
▽	676485	2016-08-27
■	676487	2016-08-16
*	676488	2016-08-28
⊕	676489	2016-08-29
⊗	676490	2016-08-26
⊠	683523	2016-08-30
⊡	683526	2016-08-30
⊢	683529	2016-08-28
⊣	683531	2016-08-27
■	683535	2016-08-28
●	683537	2016-08-20
▲	683541	2016-08-28
◆	683543	2016-08-30
●	689051	2016-07-30
●	689053	2016-08-29
○	689054	2016-08-29
□	689057	2016-08-29
◇	689059	2016-08-29

# Blue whales

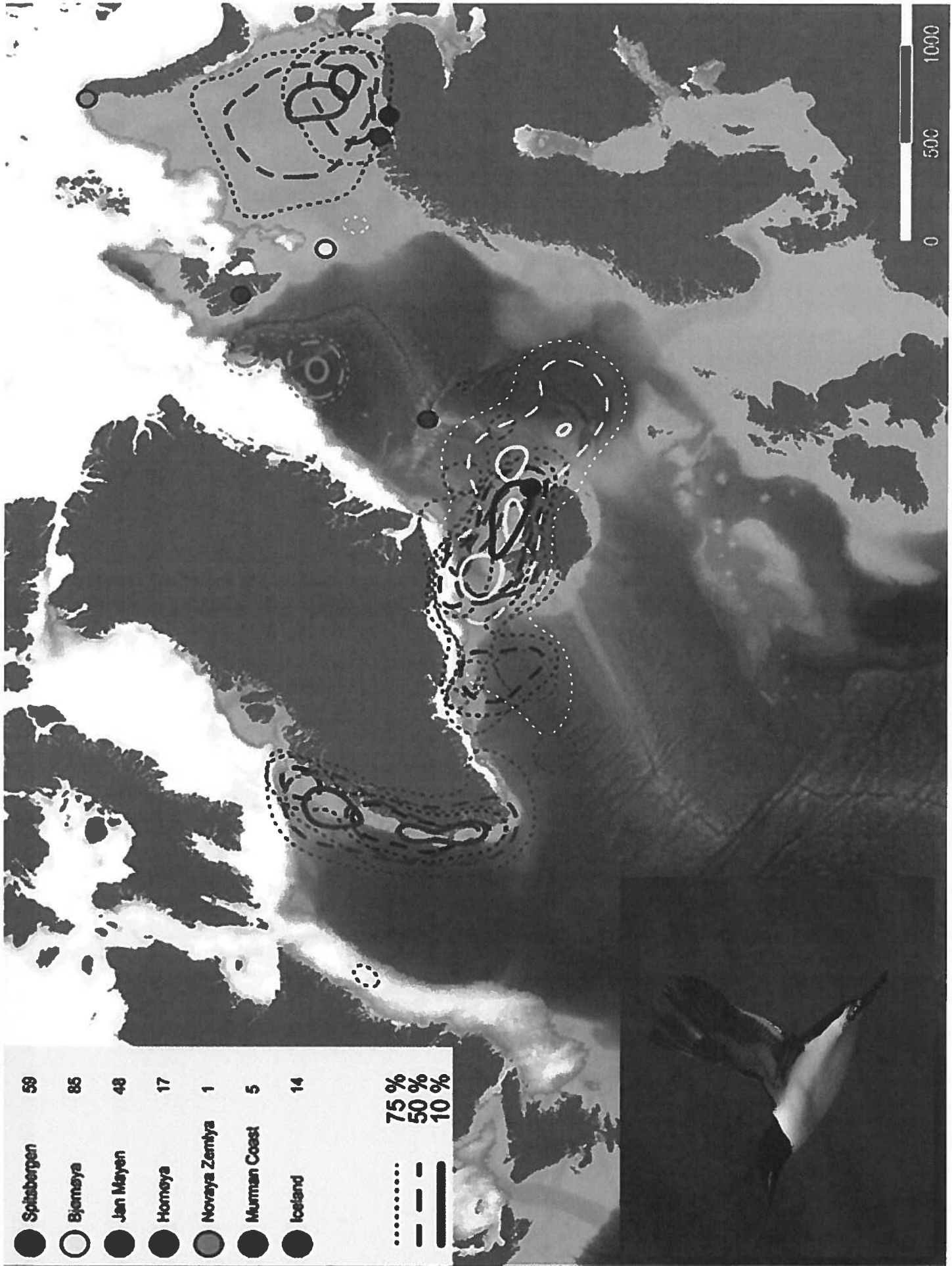


**MIMSD database (2002-2014)**

- ... increasing presence**
- ... shifting (inshore) distribution**



Nov-Jan, 2013-2015. Data: SEATRACK



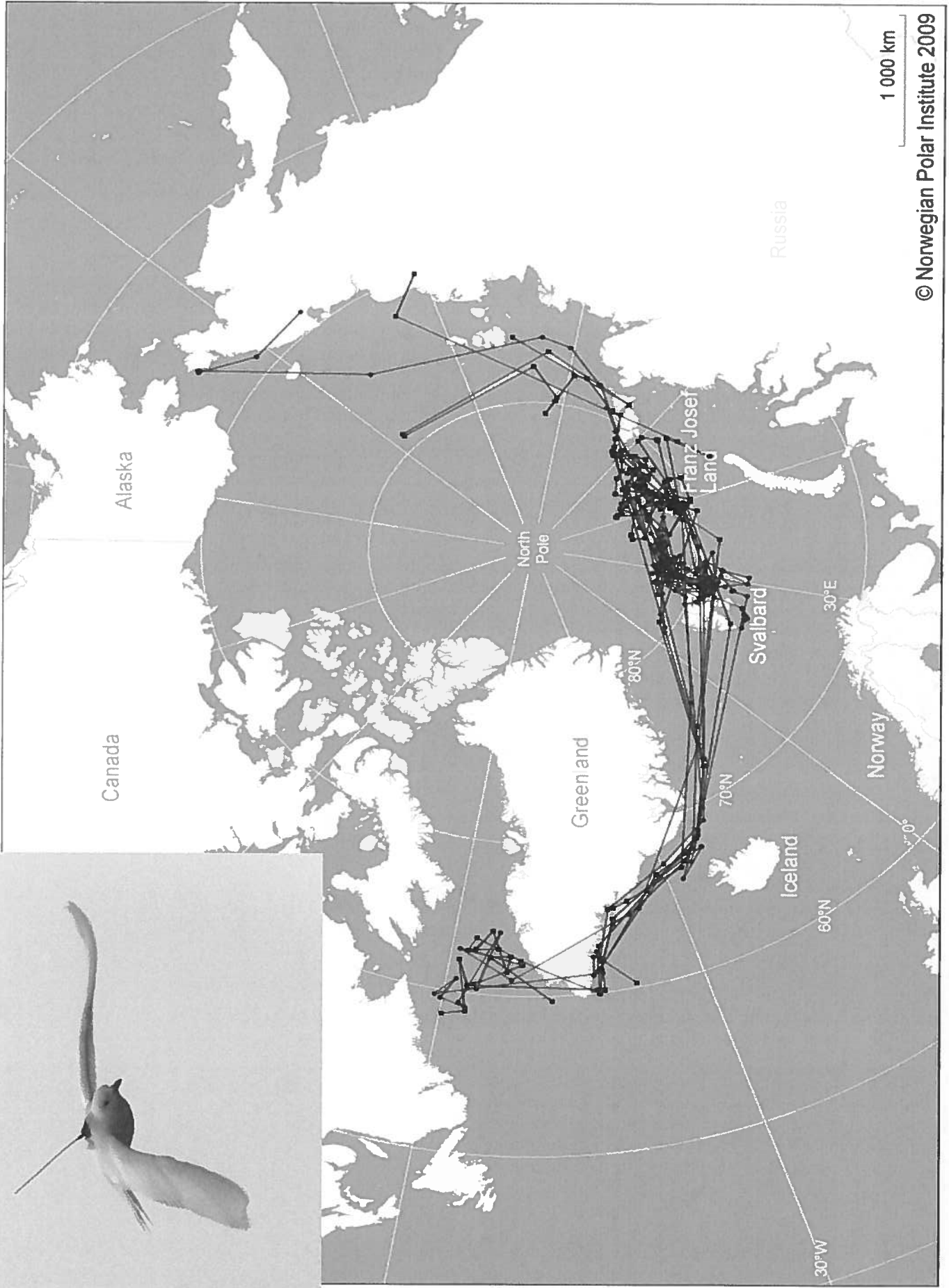
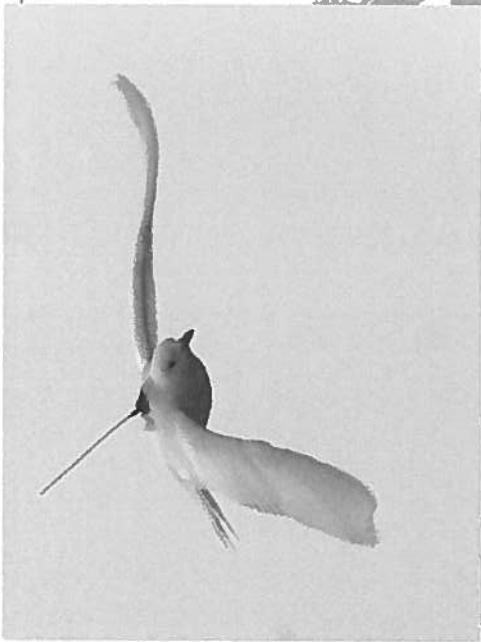
● Spitzbergen	59
○ Bjornøya	85
● Jan Mayen	48
● Hornøya	17
● Novaya Zemlya	1
● Murman Coast	5
● Iceland	14

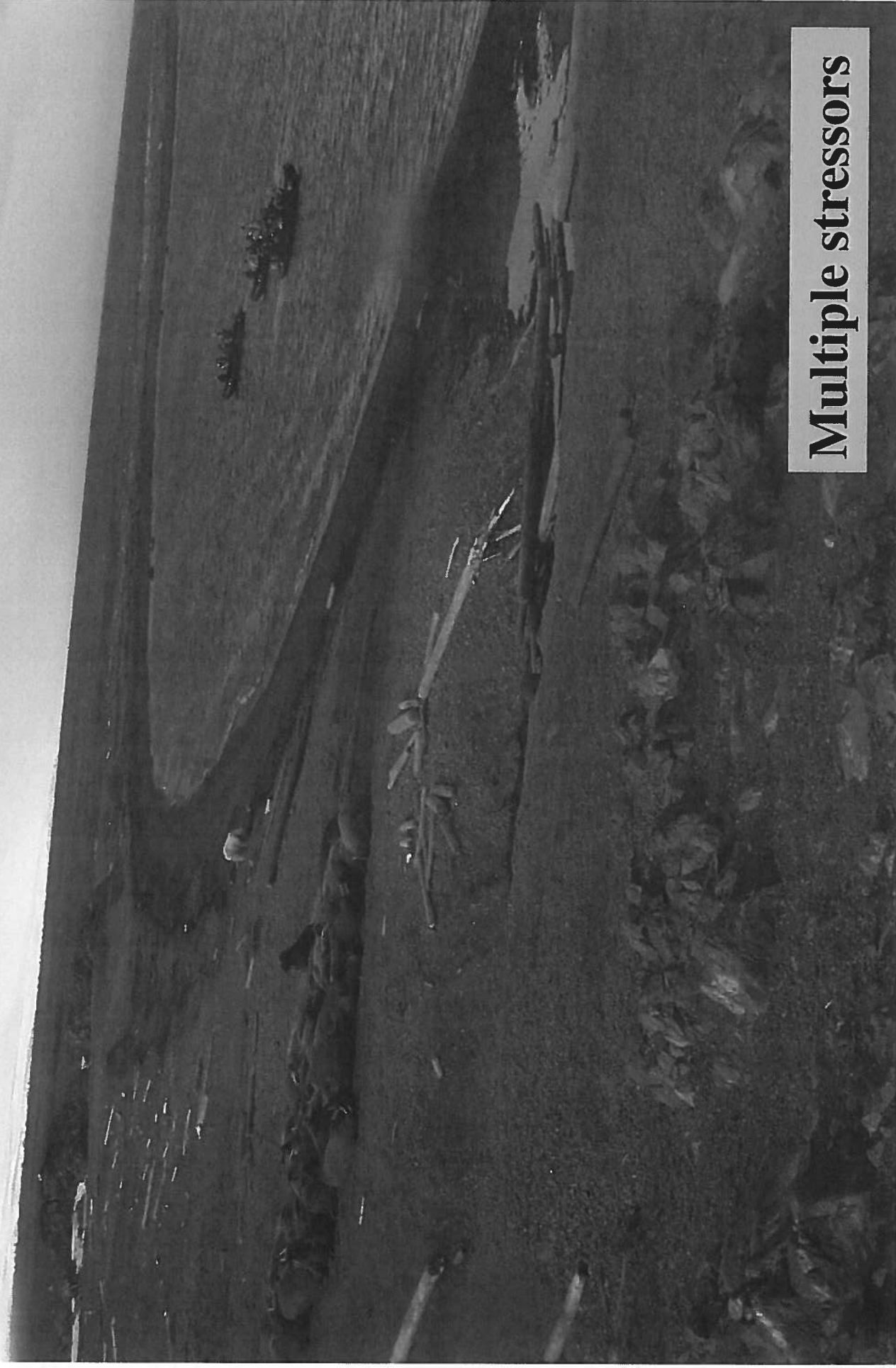
.....	75 %
- - - -	50 %
————	10 %

0 500 1000

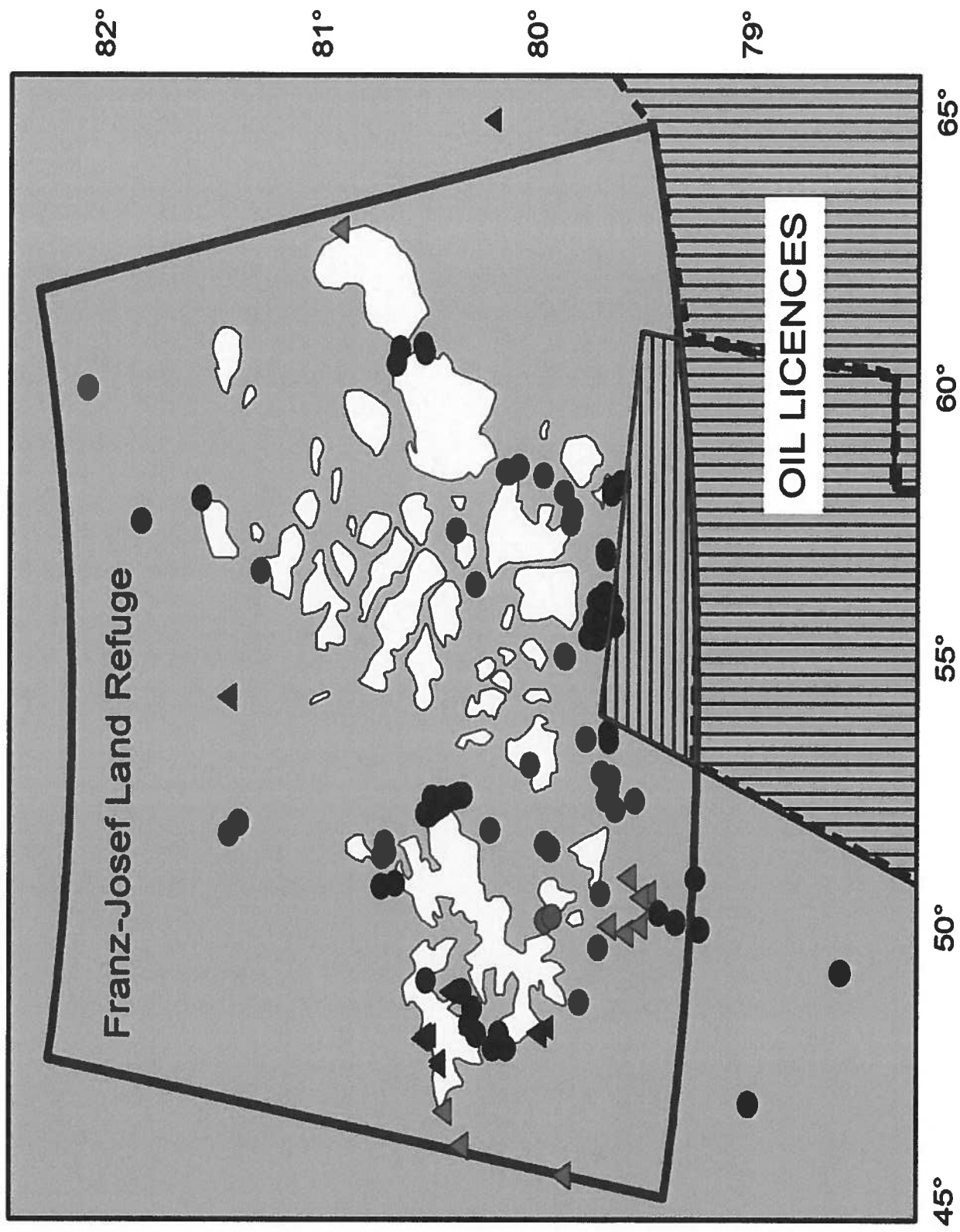




**Traditional “threats” and new ones in combination.....**



**Multiple stressors**



Gavrilo, M. 2015. Bowhead sightings. IWC.



Challenging times.....

## ARCTIC MPAs

**Connectivity**  
(placement/purpose)  
(marine “features”)

**Resilience**  
(SIZE - high mobility)

Climate (ICE) impacts



Arctic  
Industrial development  
Local economies

Regulation of protected areas

(Enforcement)