

Research on polar bears at Norwegian Polar Institute



Jon Aars, NPI

What are Norwegian Polar Institutes (NPI) mandates?

- We are asked by our government to do science based monitoring on Svalbard polar bears, the five Arctic governments having polar bears have signed a treaty (in 1973) stating that all nations should manage their populations based on best available scientific data, and encourage sampling and exchange of data and knowledge based on such programmes
- We have captured and marked polar bears annually since 1987, more sporadic from the 1960s – 1987
- NPI has a research section and also a section for advises, WE ARE NOT RESPONSIBLE FOR POLAR BEAR MANAGEMENT. Management decisions are taken by the governor of Svalbard and by the responsible Norwegian directorate and ministry.
- This has importance for some of the questions raised:
- -It is the management bodies that decide what data should be used as basis for management, we sample and analyze scientific data (and believe that is important), but we do not judge if the management bodies should or should not use alternative sources for their management decisions.
- What data do we sample: observational data is very useful, INCLUDING all the reports we get from the tourist ships and others. It helps us understanding the biology of the bears (there are several scientific notes from Svalbard based on such data). BUT capture-recapture provides other types of data, much of this cannot be acquired just by observations (pollution, diseases, age structure, survival, movement,)
- Who we work with / integrity problems?
- - We think it is important that results of our work reach the public, e.g. through WWF or TV-productions, what is important is that what we believe is the correct conclusions of our work gets out, and that we not in any way are restricted, that has usually not been a problem

Use of pepper spray:

- Is there available research?
- -yes, effect documented to be good, on bears in general
- Discussion of use in Svalbard
- -yes, this is up to the governor of Svalbard, a main issue is it is forbidden used in Norway

Is it correct we only guess how many bears there are in Arctic?

Our best guess (Polar Bear Specialist Group) is based on:

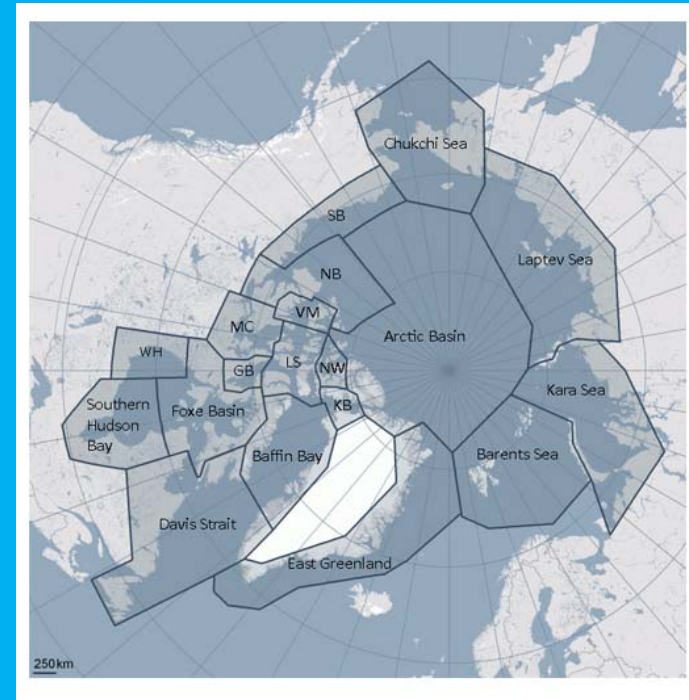
- Good knowledge about numbers from many areas
- less good knowledge from other areas
- very little data from several areas

So the total, 20 000 – 25 000, are based on numbers we feel confident about plus numbers we are much less confident about (based on guesses / typical densities from other areas)

It could thus easily be that the real number is lower or higher than this

<http://pbsg.npolar.no/>

| Subpopulation | Size | | | Trend | | Human-caused removals 2009–2013 | | | | | |
|--------------------------------|-------------------|-----------|---|---|--|---------------------------------|-------------------------|-----------|-------------------------|-----------|-------------------------|
| | Estimate / 95% CI | Year | Method | Relative to historic level (approx. 25-yr past) | Current (approx. 12-yr period centered on present) | 5-yr mean | | 3-yr mean | | Last year | |
| | | | | | | Potential | Actual | Potential | Actual | Potential | Actual |
| Arctic Basin | Unknown | | | Data deficient | Data deficient | | | | | | |
| Baffin Bay | 1546 690-2402 | 2004 | PVA (Based on physical capture-recapture estimate from 1998) | Data deficient | Declining | 156 | 156 | 149 | 152 | 151 | 134 |
| Barents Sea | 2644 1899-3592 | 2004 | Distance sampling | Data deficient | Data deficient | NA | 1 | NA | 1 | NA | 2 |
| Chukchi Sea | Unknown | | | Data deficient | Data deficient | NA | 31 (U.S.) + NA (Russia) | 58 | 36 (U.S.) + NA (Russia) | 58 | 55 (U.S.) + NA (Russia) |
| Davis Strait | 2158 1833-2542 | 2007 | Physical capture-recapture | Data deficient | Stable | 96 | 93 | 98 | 106 | 108 | 111 |
| East Greenland | Unknown | | PVA | Data deficient | Data deficient | 60 | 59 | 64 | 64 | 64 | 60 |
| Foxe Basin | 2580 2093-3180 | 2009/10 | Distance sampling | Not reduced | Stable | 109 | 109 | 108 | 108 | 109 | 106 |
| Gulf of Boothia | 1592 870-2314 | 2000 | Physical capture-recapture | Not reduced | Stable | 74 | 62 | 74 | 60 | 74 | 67 |
| Kane Basin | 164 94-234 | 1994-1997 | Physical capture-recapture | Data deficient | Declining | 11 | 5 | 11 | 6 | 11 | 4 |
| Kara Sea | Unknown | | | Data deficient | Data deficient | | NA | | NA | | NA |
| Lancaster Sound | 2541 1759-3323 | 1995-1997 | Physical capture-recapture | Data deficient | Data deficient | 85 | 87 | 85 | 89.3 | 85 | 91 |
| Laptev Sea | Unknown | | | Data deficient | Data deficient | | NA | | NA | | NA |
| M'Clintock Channel | 284 166-402 | 2000 | Physical capture-recapture | Reduced | Increasing | 3 | 2.8 | 3 | 3 | 3 | 3 |
| Northern Beaufort Sea | 980 825-1135 | 2006 | Physical capture-recapture | Not reduced | Stable | 65 | 37.4 | 65 | 46.7 | 65 | 43 |
| Norwegian Bay | 203 115-291 | 1997 | Physical capture-recapture | Data deficient | Data deficient | 4 | 1.6 | 4 | 2.3 | 4 | 3 |
| Southern Beaufort Sea | 1526 1211-1841 | 2006 | Physical capture-recapture | Reduced | Declining | 46 | 35.6 | 73 | 42.3 | 70 | 41 |
| Southern Hudson Bay | 970 680-1383 | 2012 | Distance sampling | Not reduced | Stable | 45 | 57.2 | 45 | 71.7 | 45 | 49 |
| Viscount Melville Sound | 161 121-201 | 1992 | Physical capture-recapture | Data deficient | Data deficient | 7 | 5.2 | 7 | 6 | 7 | 7 |
| Western Hudson Bay | 1000 715-1398 | 2011 | Distance sampling | Reduced | Declining | 20.2 | 19.6 | 23 | 22 | 28 | 22 |



Info about population sizes
(and removals, mainly hunting)

Hunting:

- About 7-800 bears annually, plus illegal take (mainly Russia)
- It adds up to maybe 3-5% of the world stock
- That should be about sustainable if the world stock is not decreasing due to other factors
- BUT, take is local, so this will depend on area

- What does NPI say/should say?
- This is management, so not our primary role
- We have members (including chair, Dag Vongraven, and myself) in Polar Bear Specialist Group, and PBSG is frequently asked about input when local quotas are set
- PBSG has the view that we do not object to hunting of polar bears when we think it is sustainable, and that quotas should be set according to population sizes and trends based on scientific programmes.
- Quotas are in some areas based on scientific data, in other areas more weight is given to TEK (traditional ecological knowledge) provided by locals. The choice is up to the management authorities in each area
- Excessive hunting was considered the main threat in the 1960s, and this led to the treaty in 1973. PBSG consider climate change/habitat loss to be the main threat today



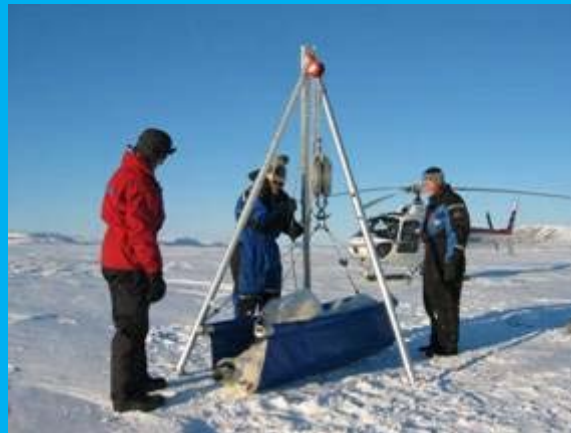
platform: RV Lance



For immobilization: helicopter,
remote darting

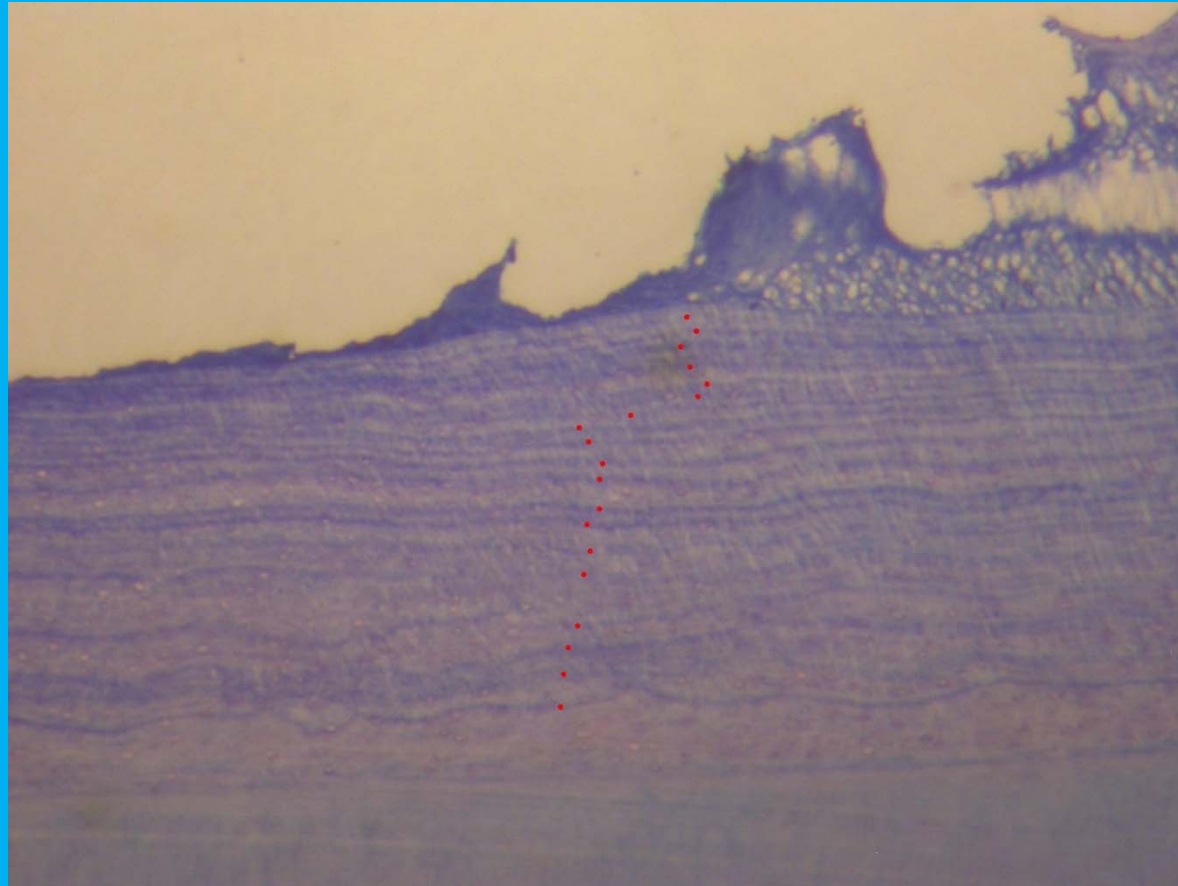


N23732, female, 4 year

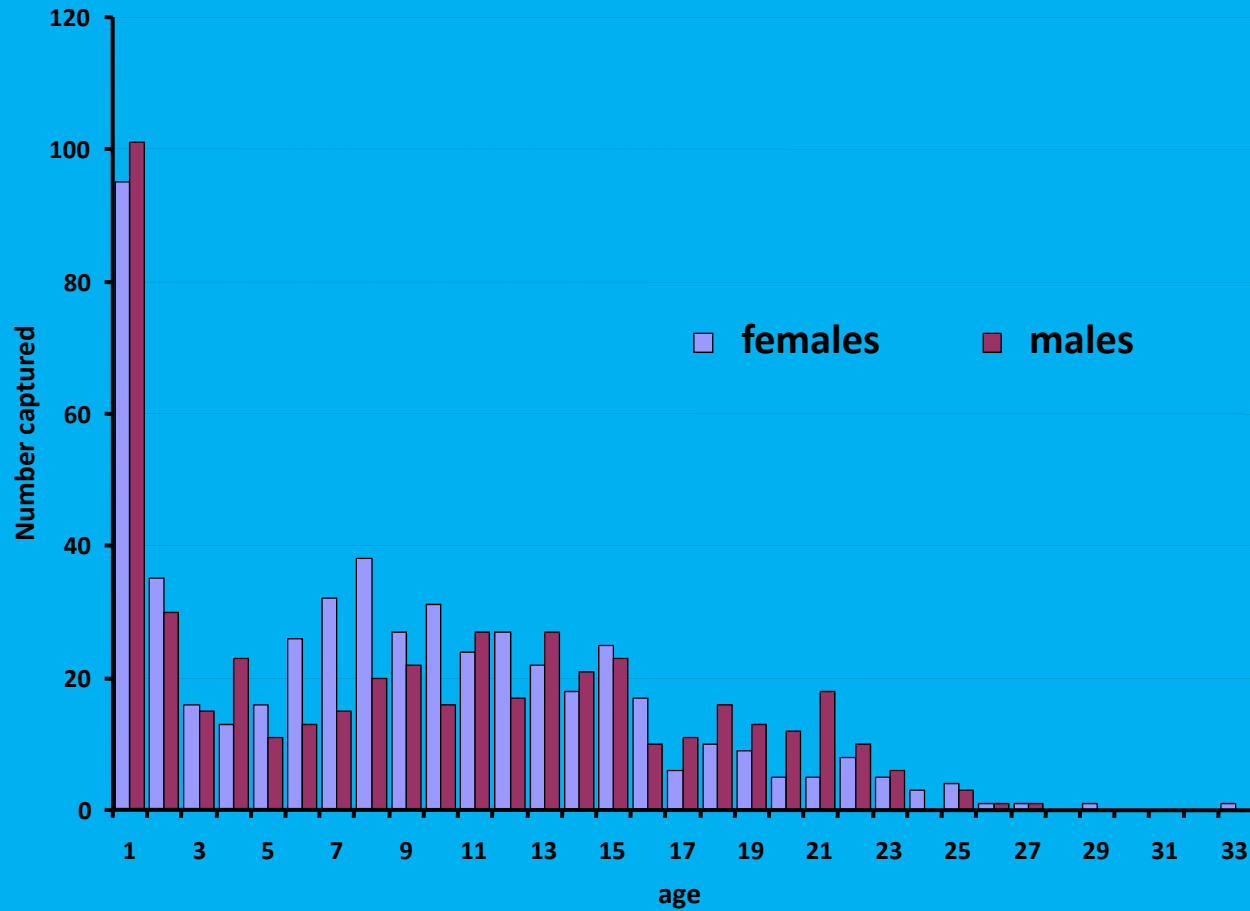


Taking samples and getting data

Section of polar bear teeth, assumed age = 19 years

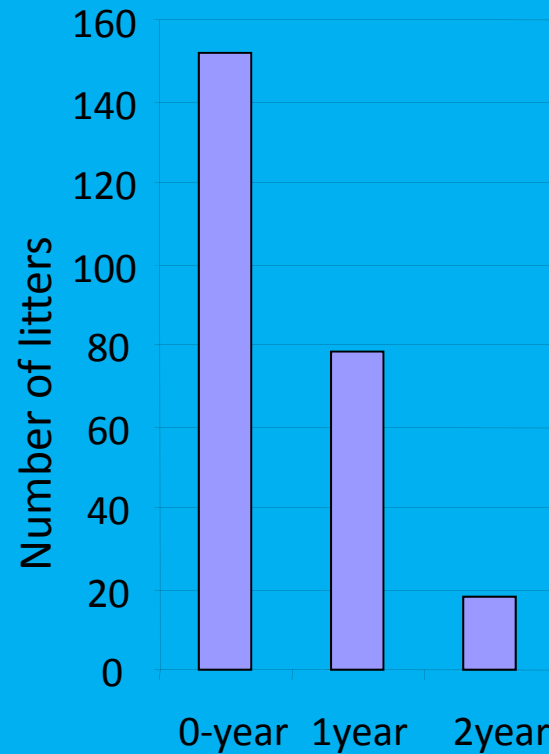
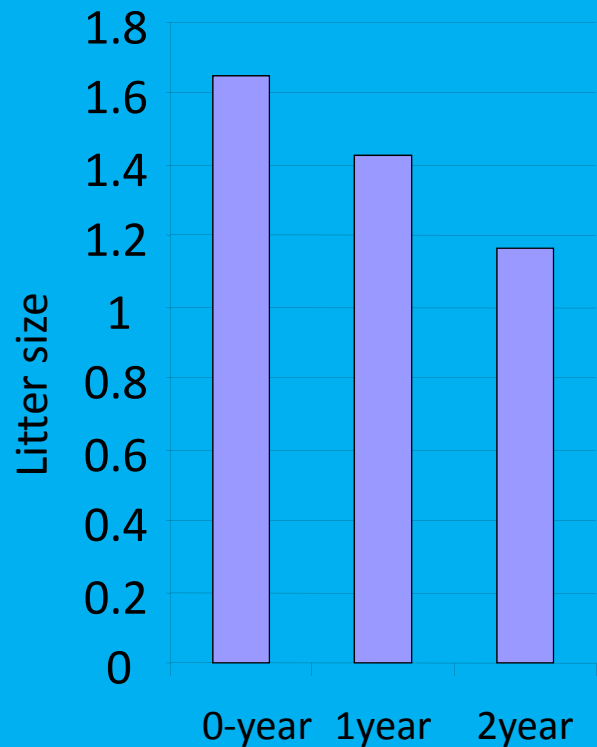


Age structure



Survival low above 15 years, few bears more than 22 years old

Litter sizes and proportion of females with cubs indicate what cub survival is



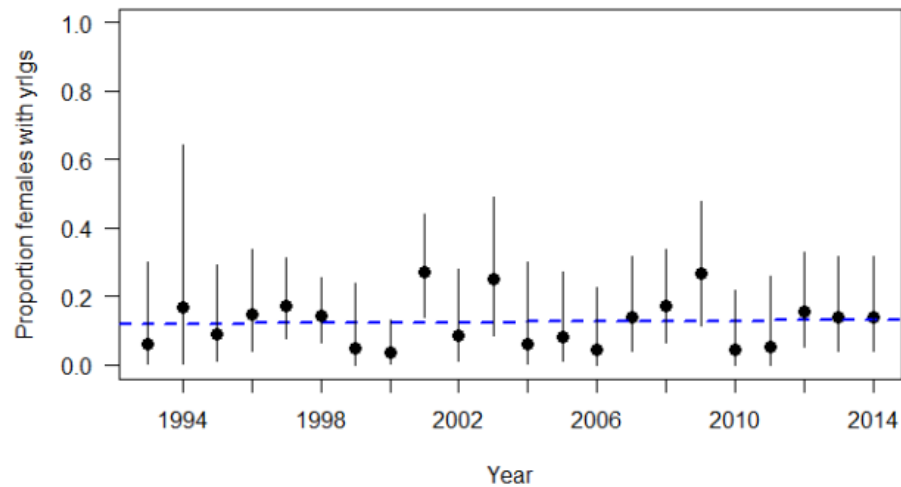
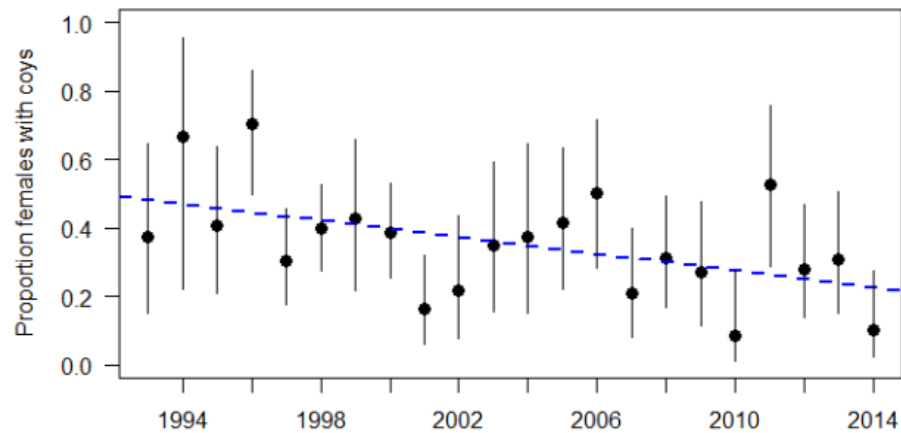
april



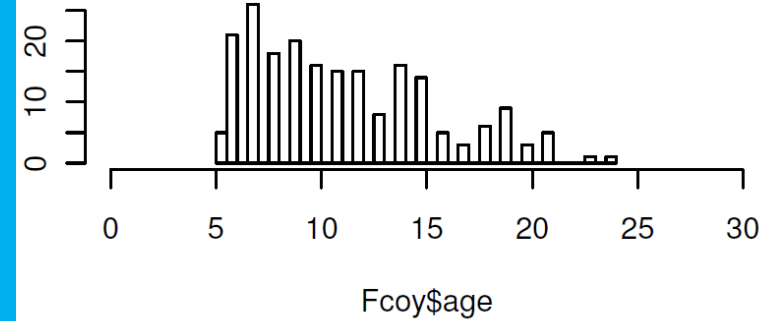
september

Based on this: survival ca 44% first year for cubs after leaving the den

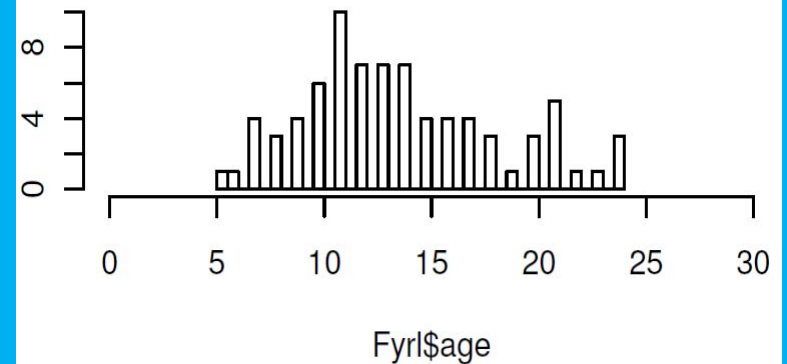
Proportion of females with cubs



Histogram of Fcoy\$age



Histogram of Fyrl\$age



<http://mosj.npolar.no/en/fauna/marine/indicators/polar-bear.html>

Many young females with cubs of the year, but few young females manage to raise them (to yearlings)

Other questions:

decrease in body weight in Svalbard?

- no, not with time, but it does vary between years depending on climate (suggesting we will see a decrease after several years with worse conditions)

shift in ringed seal pupping area?

-Need sea ice, so lost breeding habitat many places, more concentrated on sea ice in smaller areas, often lack of snow for protection, often low survival of pups in these areas due to bears, foxes and gulls..

How large is the population?

August 2004, new survey planned August 2015



In August 2004: ca 2650 bears in Barents
Sea area



Movement based on captures (1987-2010) (between years, spring to spring)

1) Almost no movement between NW and SE Svalbard

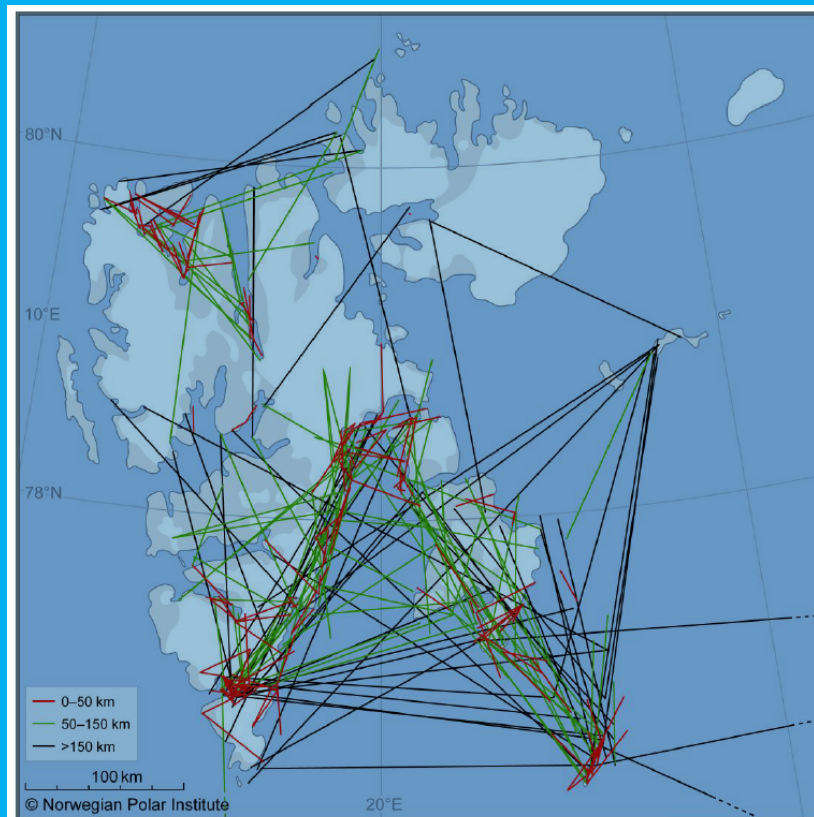
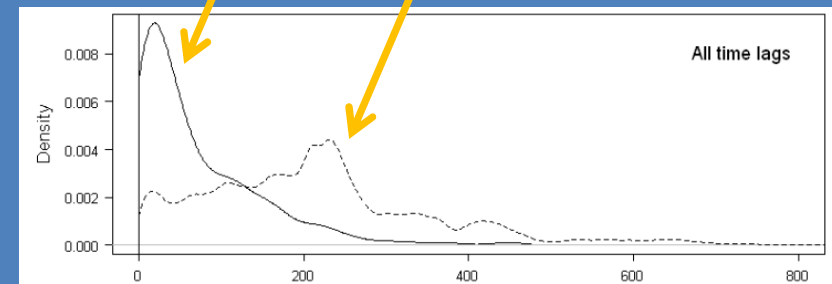


Figure 3: Map of all recorded displacements by marked individuals (n=348), color coded by the length of movement.

2) Observed movement \ll distance between random capture positions

Observed movement

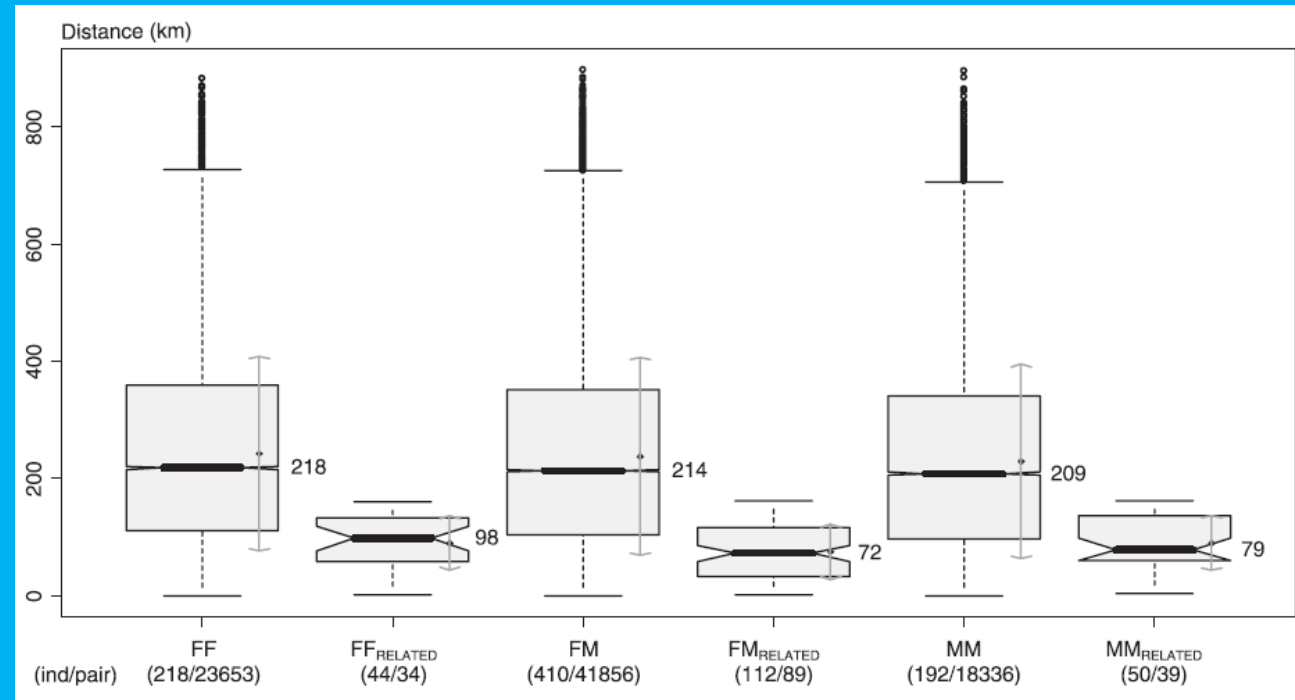
Potential movement



Karen Lone, master degree, 2011

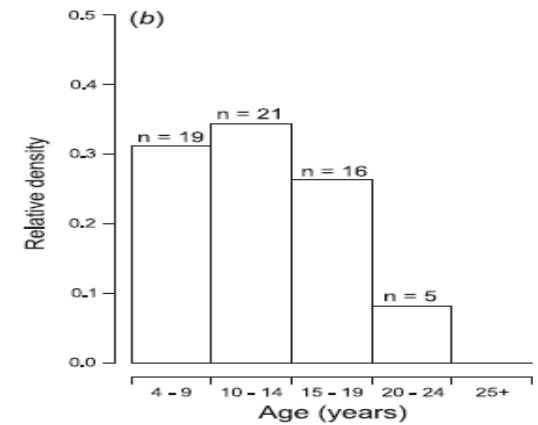
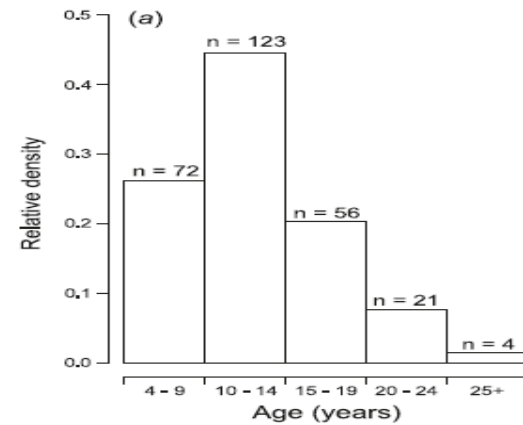
Genetics: related animals use the same areas

F=female
M=male



Distance between individuals, random pairs

Distance between close relatives



Age structure captured males

Age structure males with known offspring

Old males (11-20 year) fight most

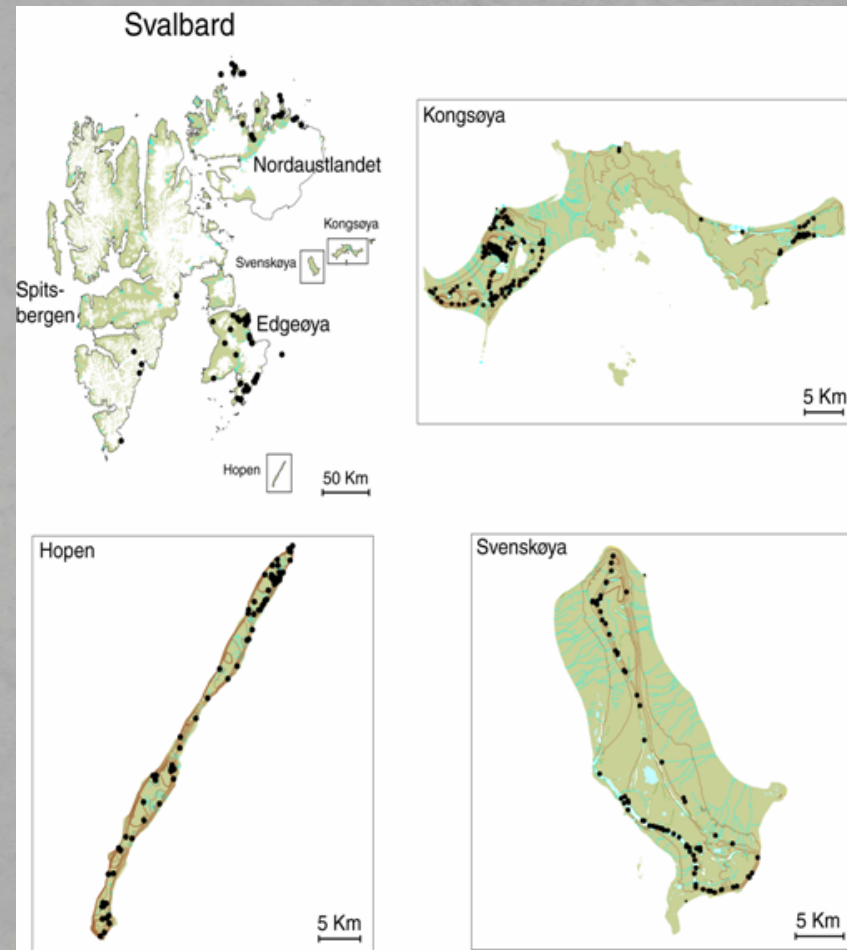
Derocher et al. 2010

Zeyl et al. 2009

So young males may be smarter...

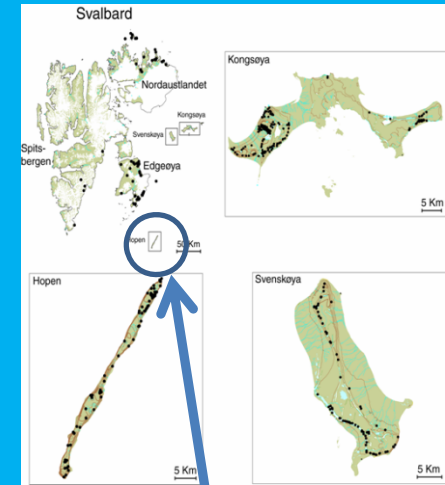
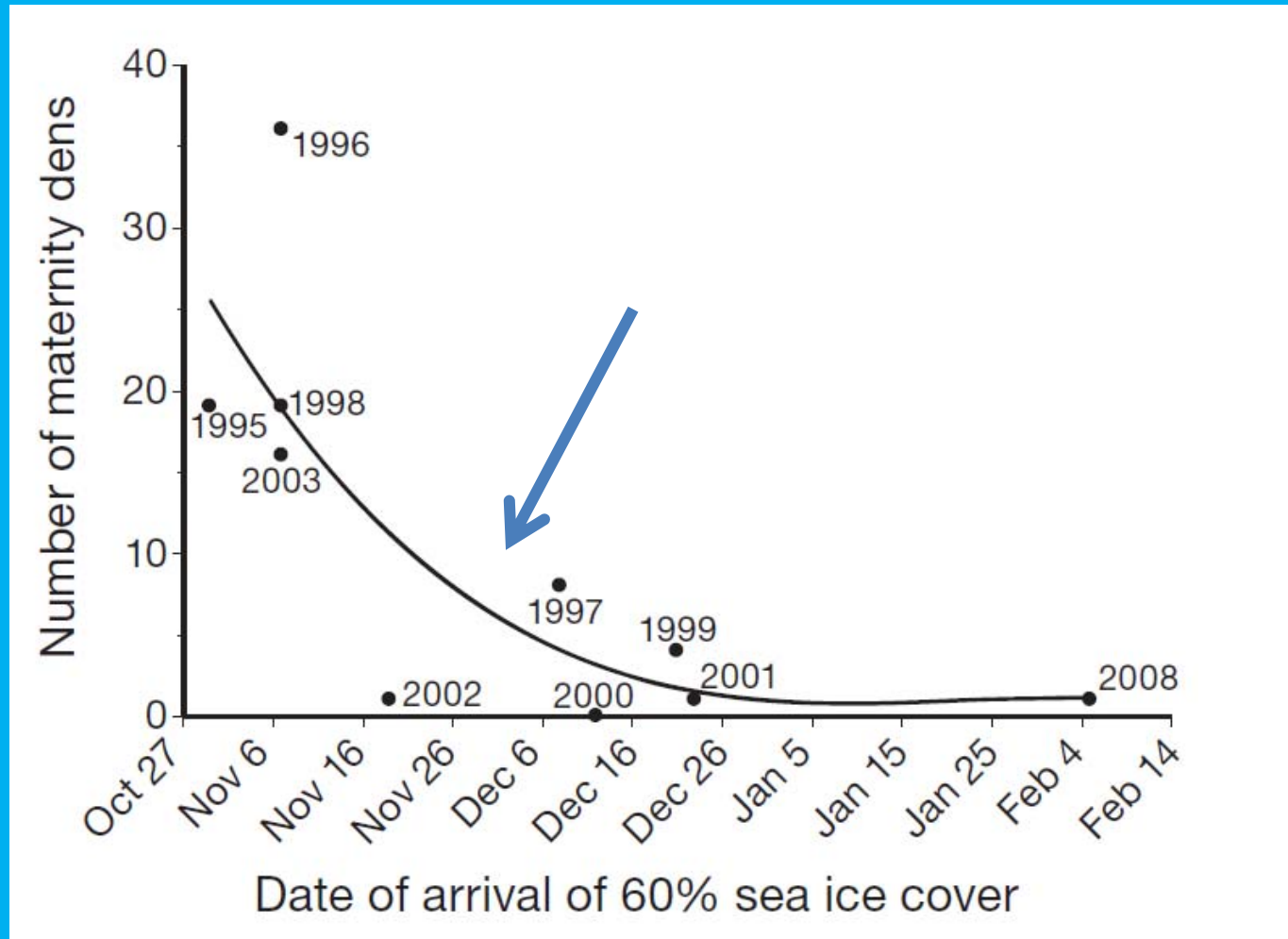


dens

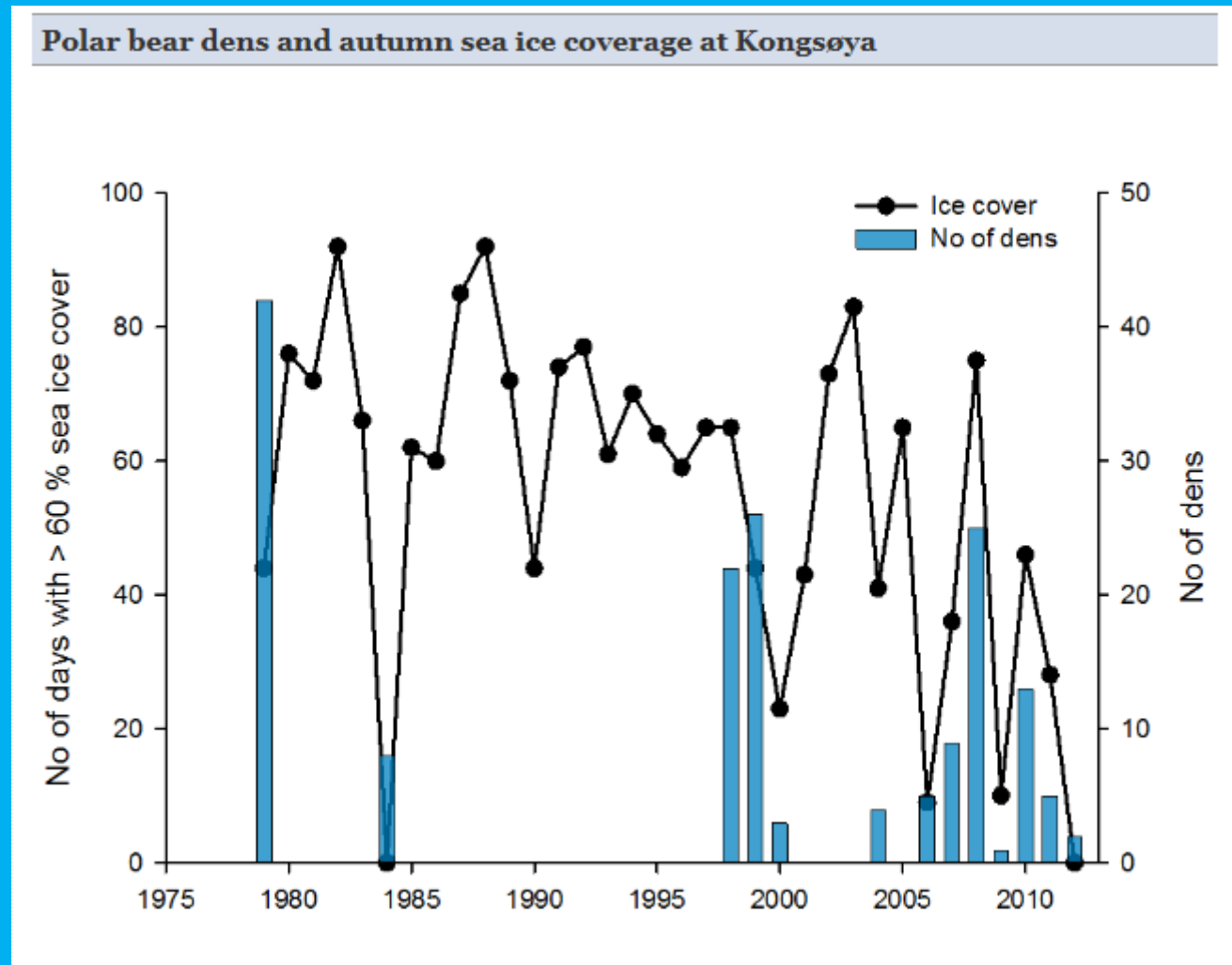


Hopen

Few dens in autumn if late sea ice arrival



Kongsøya, similar relationship



Question: do we predict many females denning on Kongsøya 2014-2015, given ice came early in autumn 2014, YES, WE DO

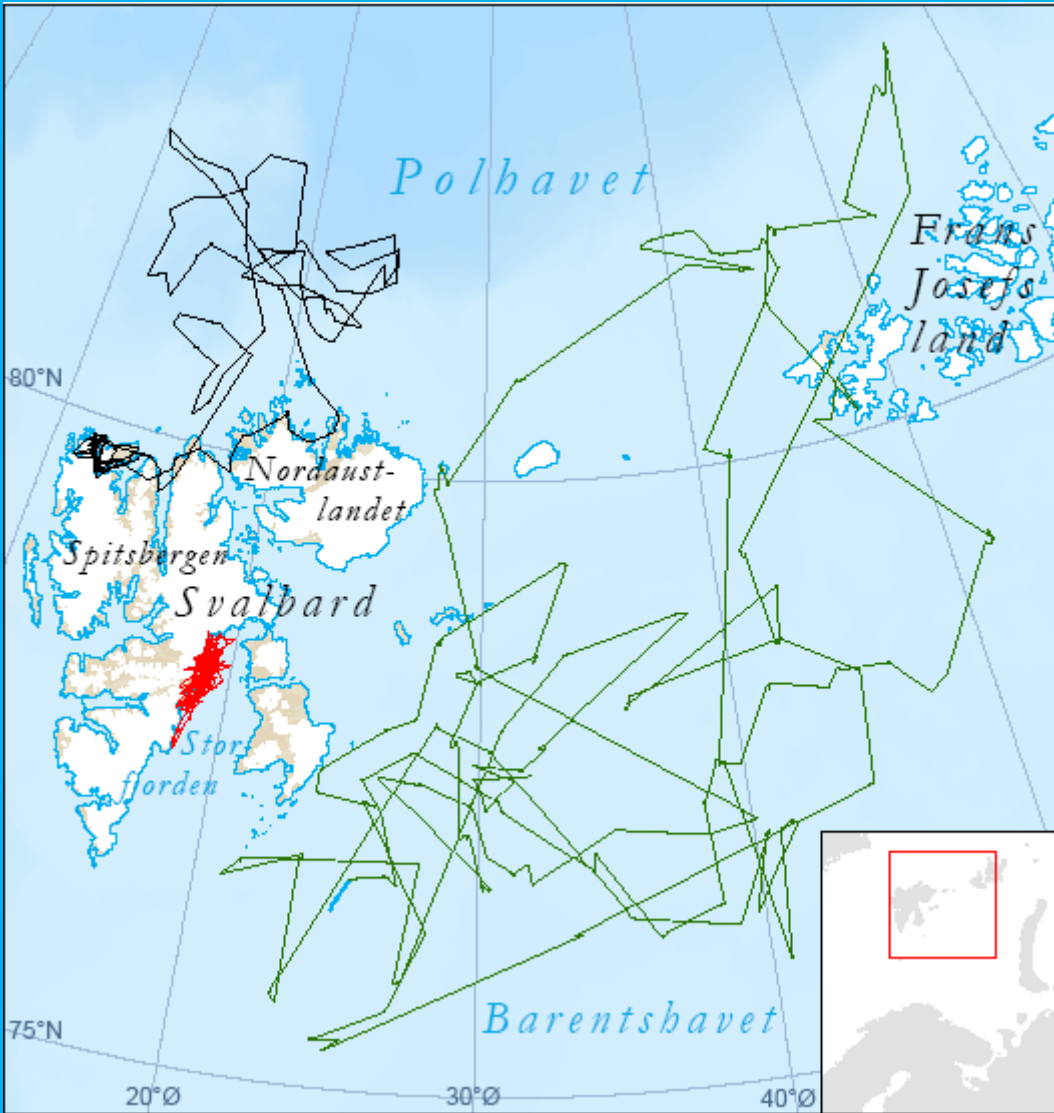
Where do bears den when Kongsøya and Hopen is unavailable?

- Likely most den on Franz Josef Land, other alternatives Edgeøya east, Hinlopen, Nordaustlandet
- This is something we prioritize in future studies (telemetry and geolocation ear tag loggers)

Question:

collaring infer stress to the animals,
are there useful results from the data?

Different tracks



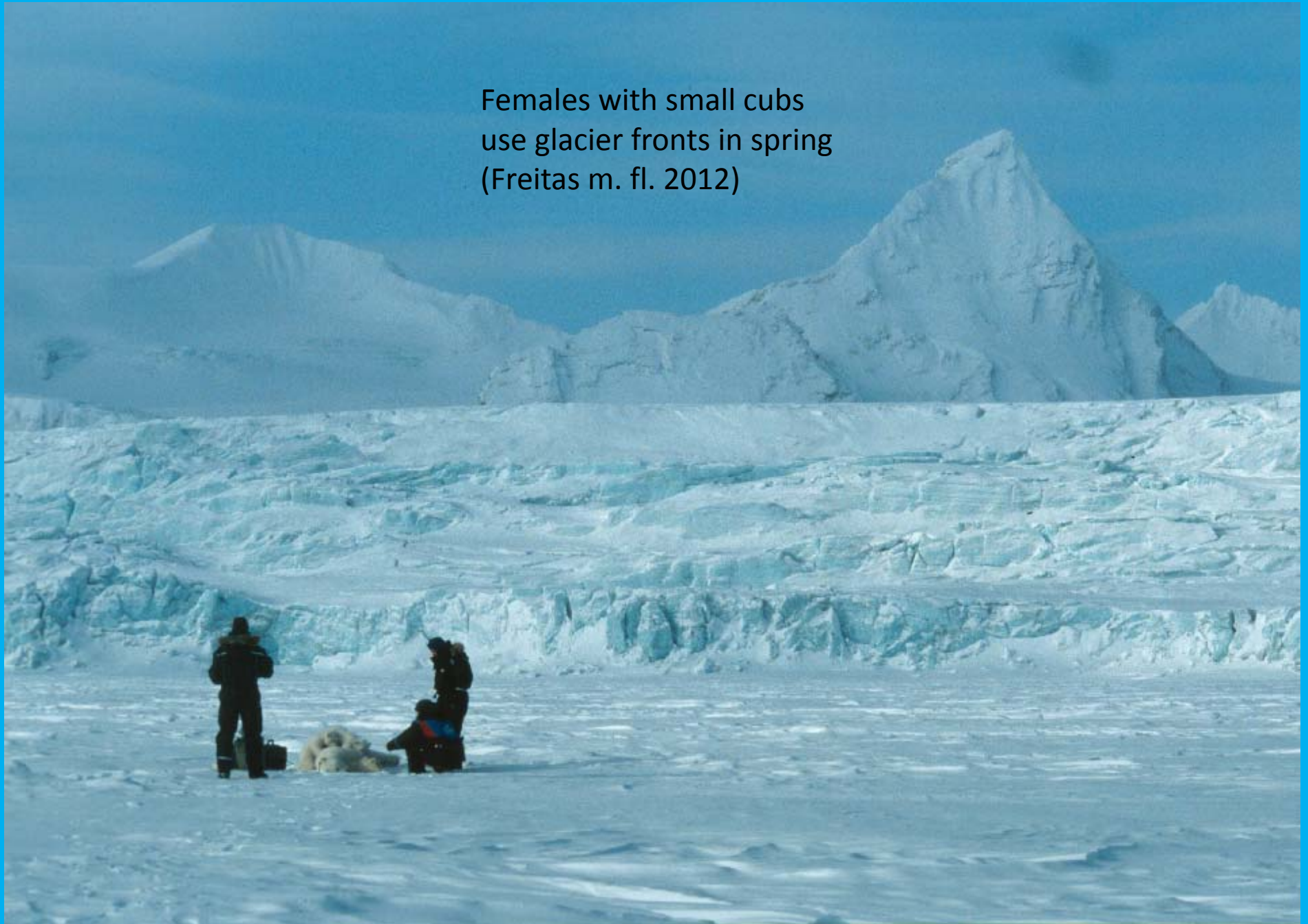
Area use

Mette Mauritsen, PhD

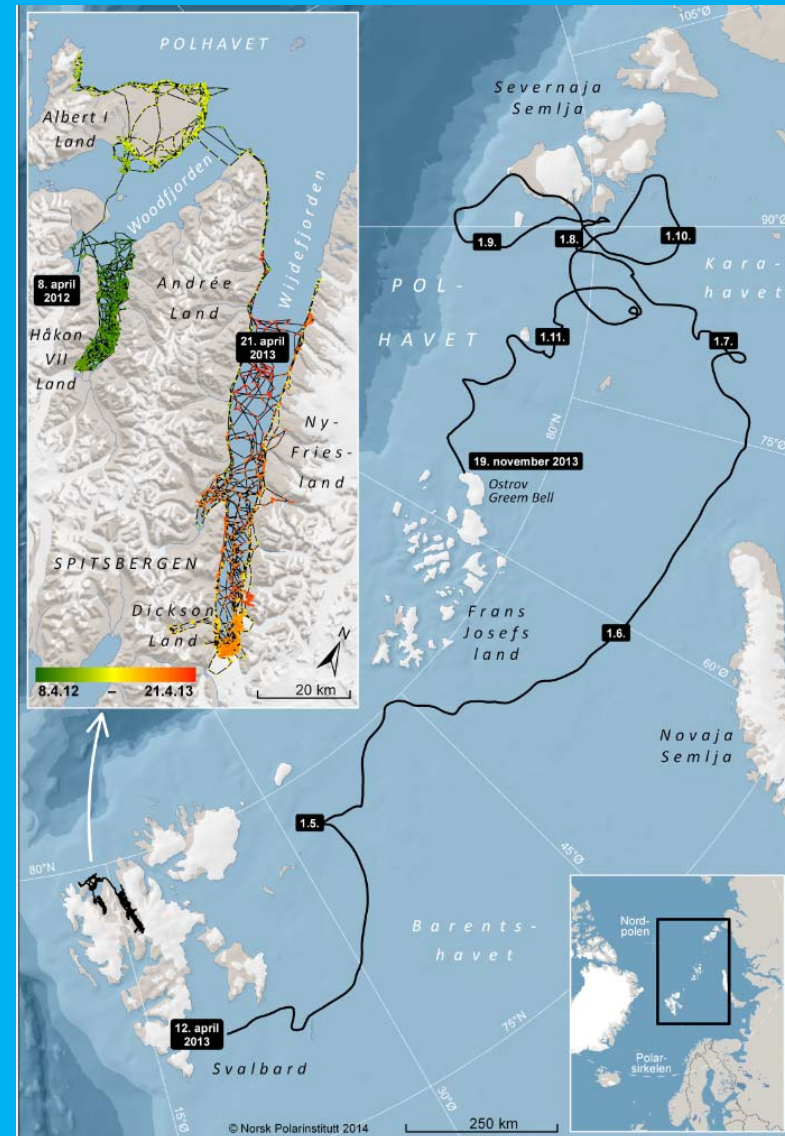


- 1) Two strategies:
local or wide-roaming bears (very different in summer/autumn)
- 2) Bears have to walk against the ice drift to keep in preferred area (energy demanding)
- 3) Seasonal area use (e.g. using same area in Svalbard every spring, but at e.g. Franz Josef Land in summer/autumn)

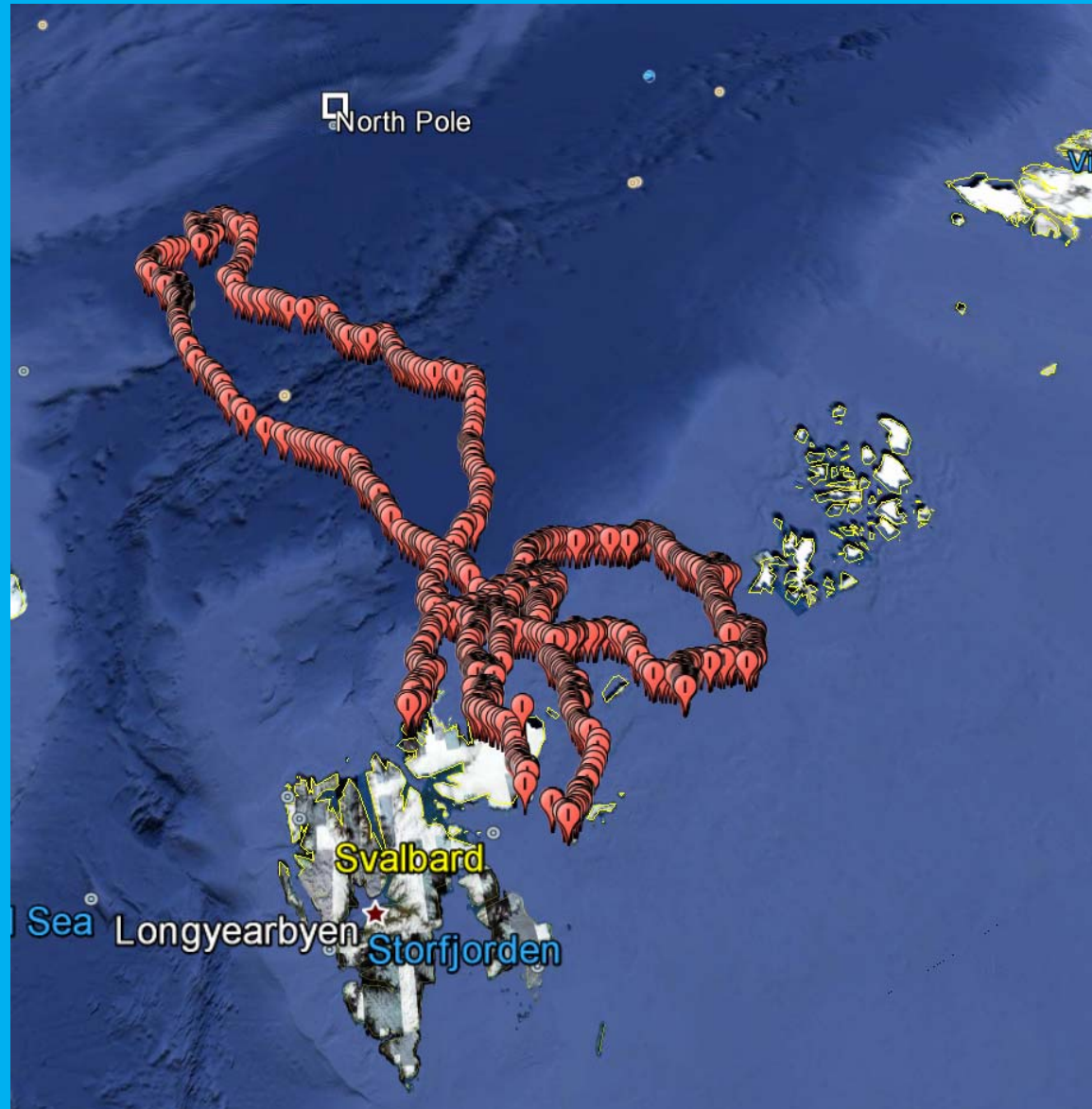
Females with small cubs
use glacier fronts in spring
(Freitas m. fl. 2012)



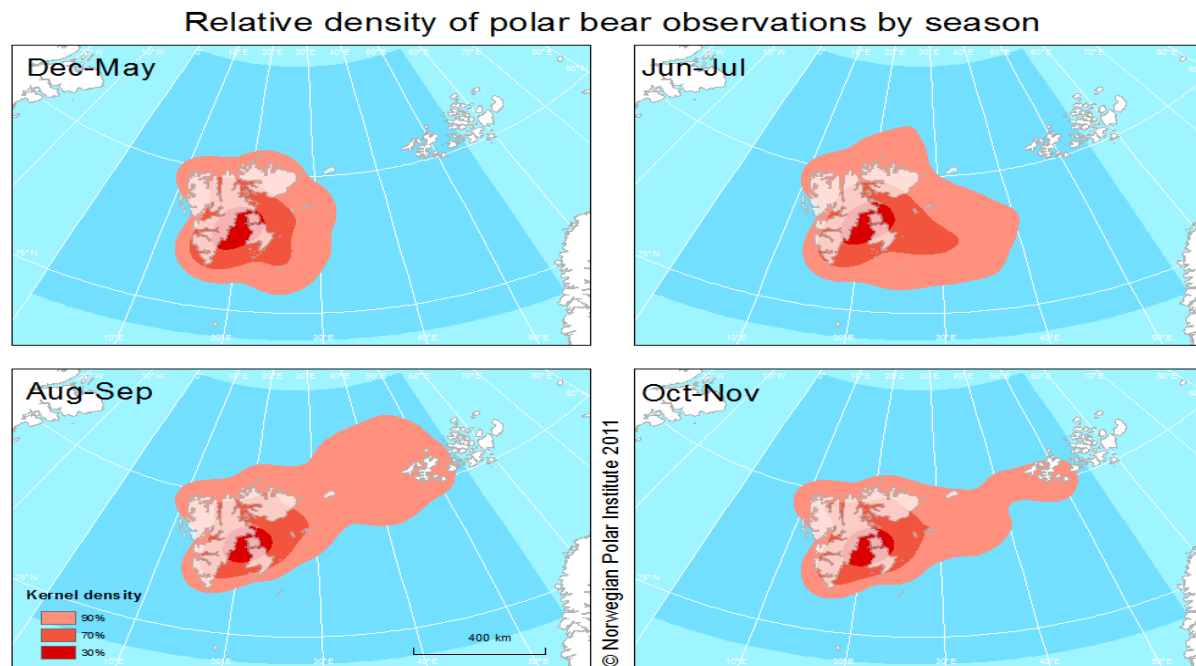
Two very different tracks, illustrating bears are local or have seasonal long migrations



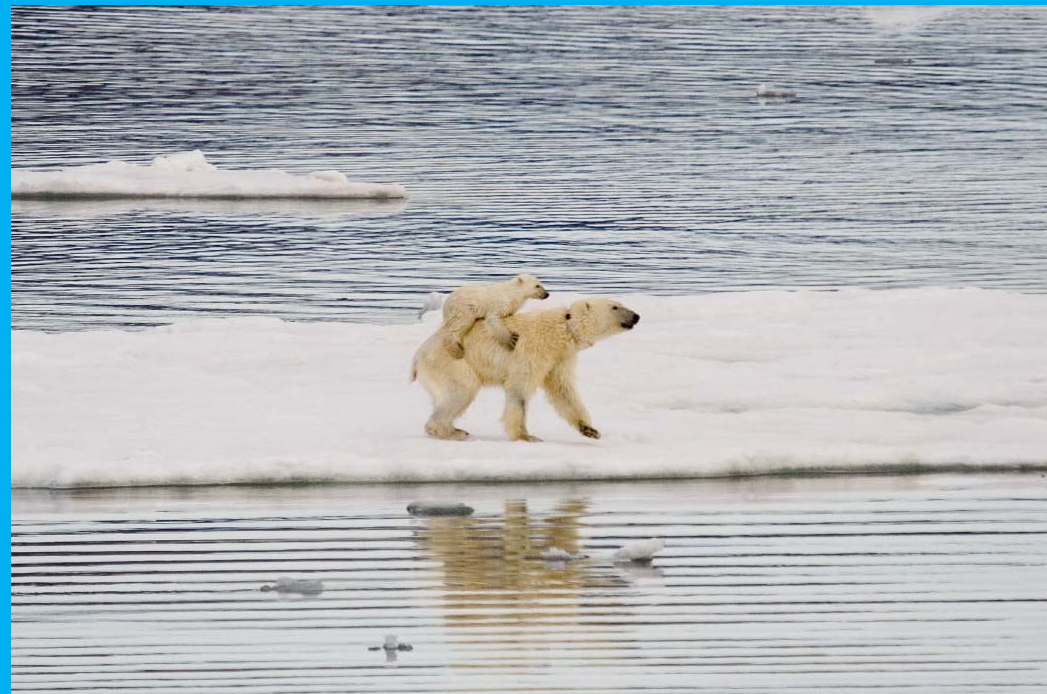
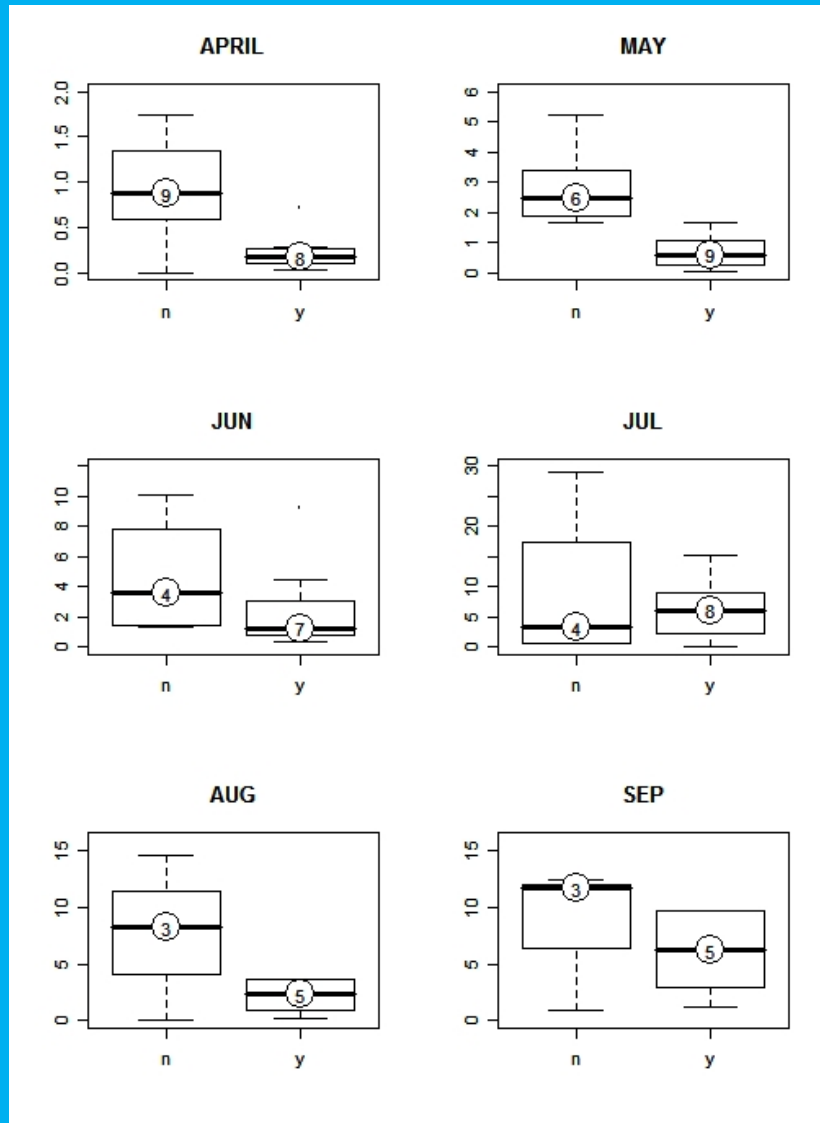
Track for bear, April 2014 – January 2015



Areas used in different seasons, based on collar data

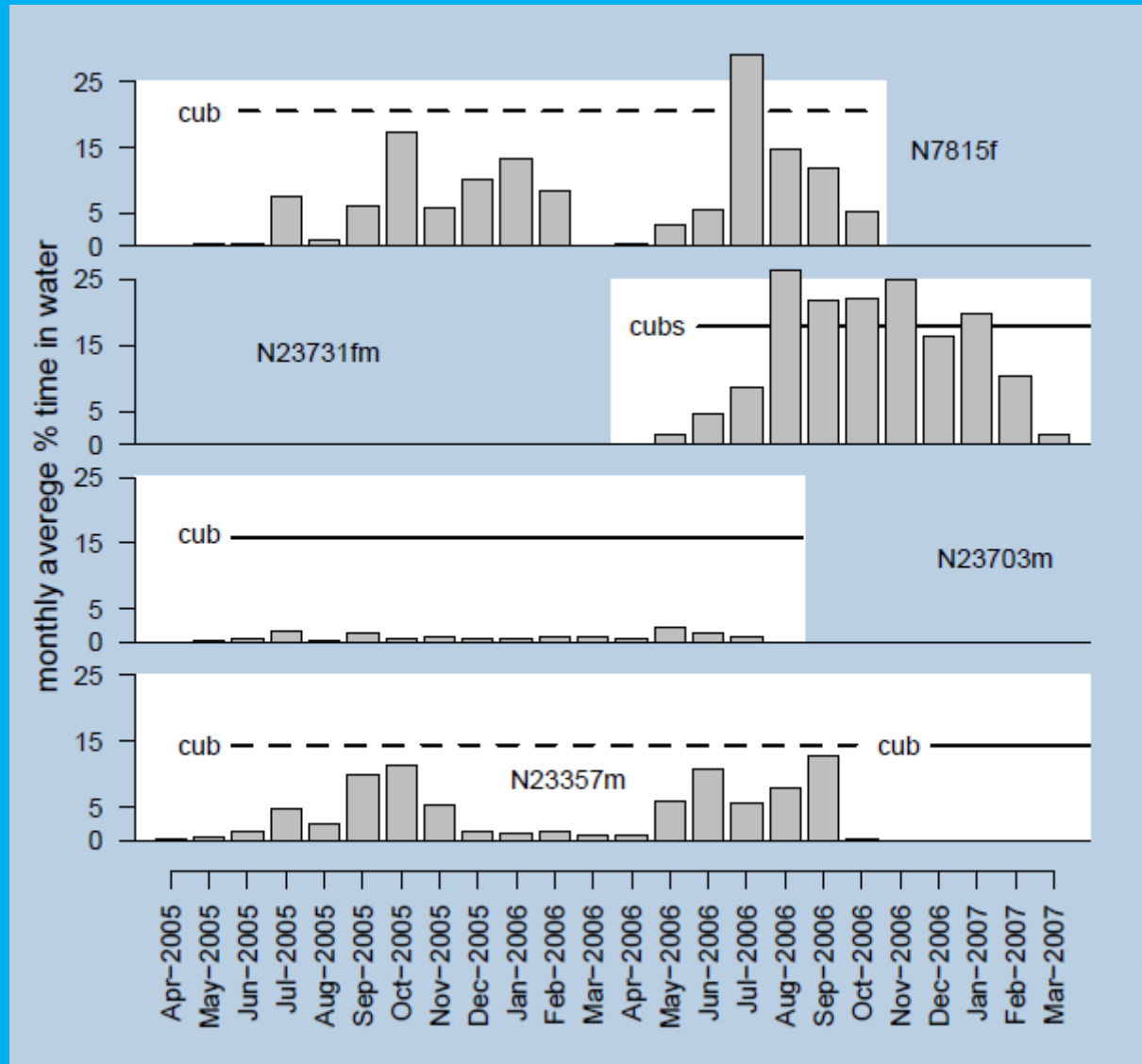


Time in water, adult females with (y) and without (n) cubs of the year, % time in sea



Critical distances of open water for cubs?

Swimming, four females

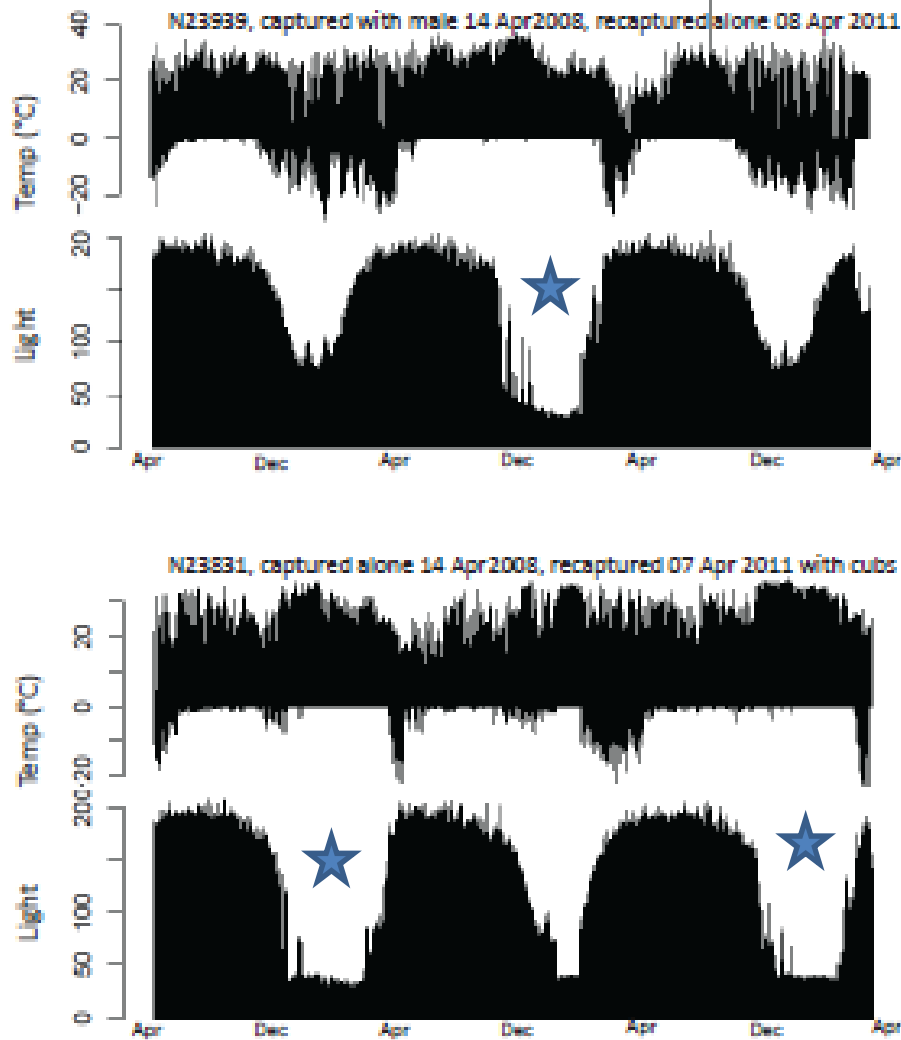


Use of collar data

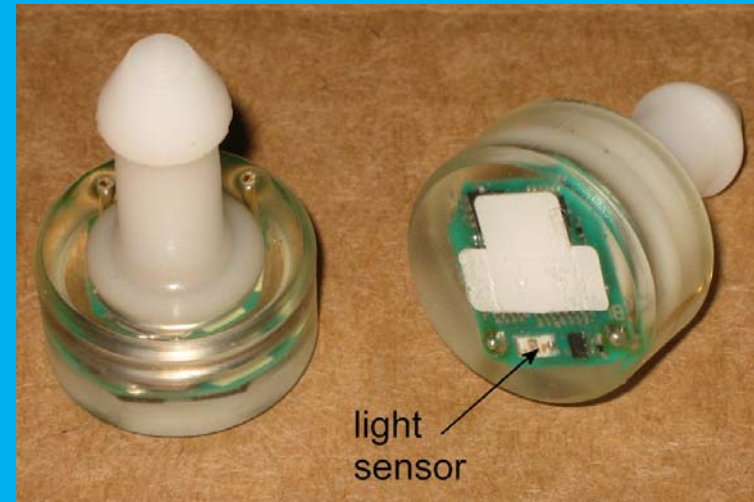
- What areas are used by the bears, and how do bears respond when sea ice disappears
- what is the survival of bears, does it change with conditions
- where, and how frequent, do bears den (give birth)
- movement and activity, energy spent, costs of having to travel further between feeding, mating and denning areas
- swimming behaviour
- Corrections for population size estimates and delineation of populations

Fig 5

Data from tags glued onto collars
"Time Depth Recorders", light and
temp. limt på to halsbånd

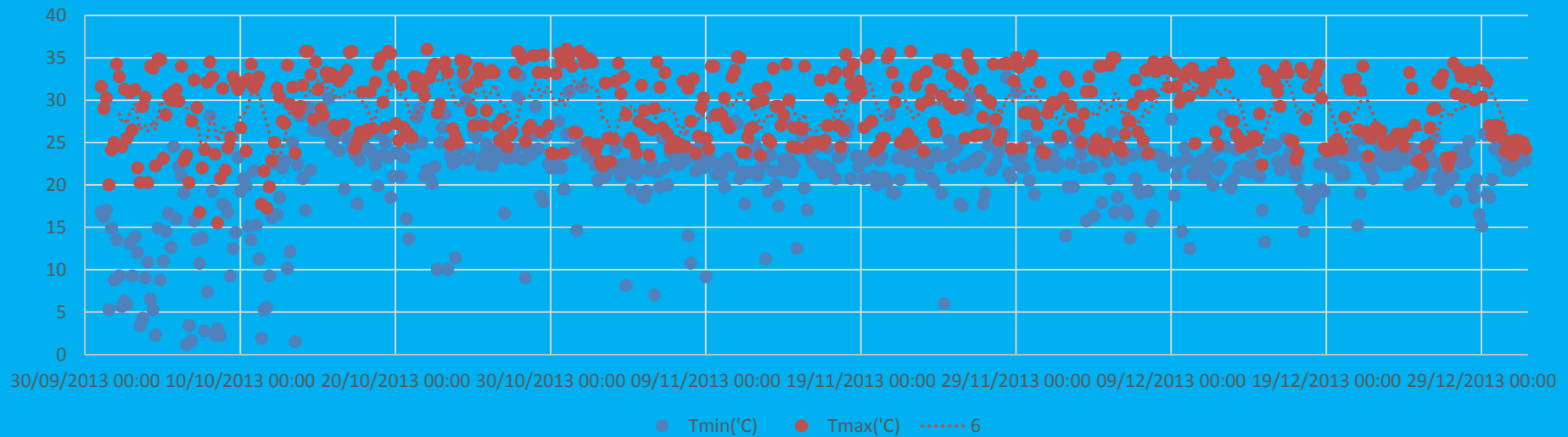


Light loggers to reveal denning /
reproduction

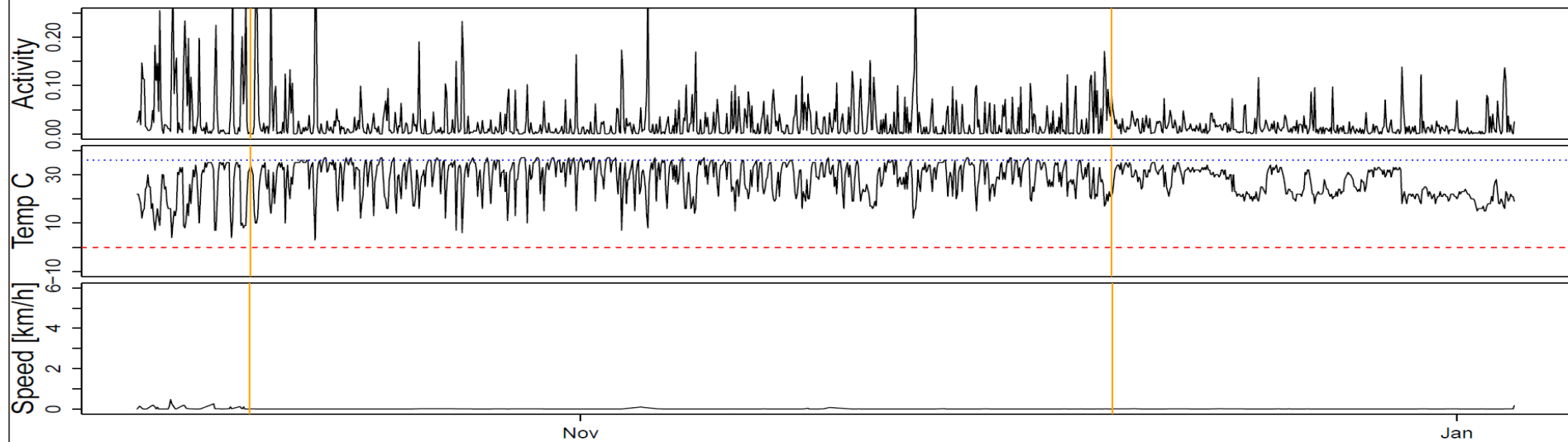


Data from ear tag: temp tells she went into den before mid October

N23980cc temp max and min

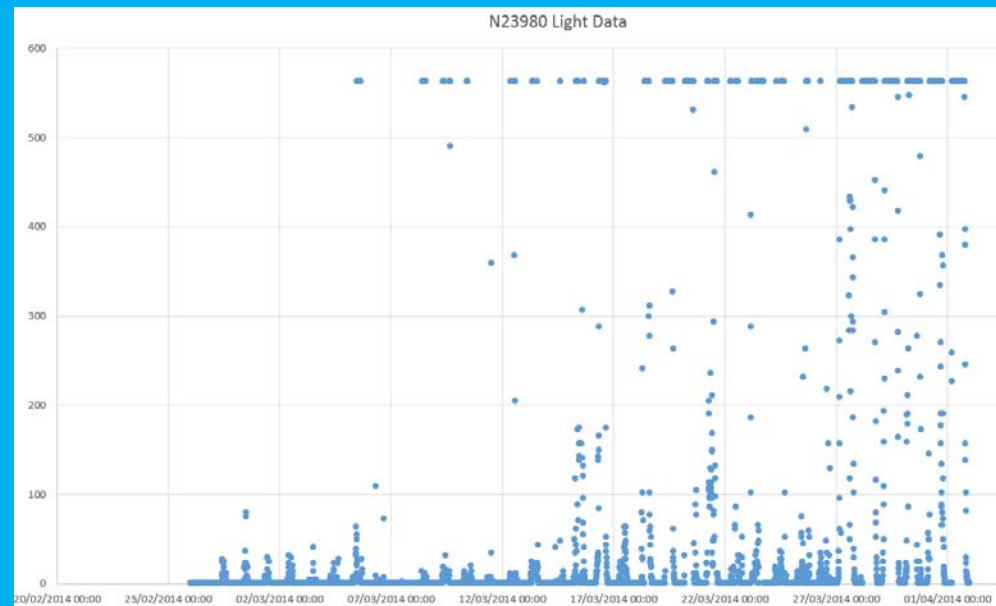
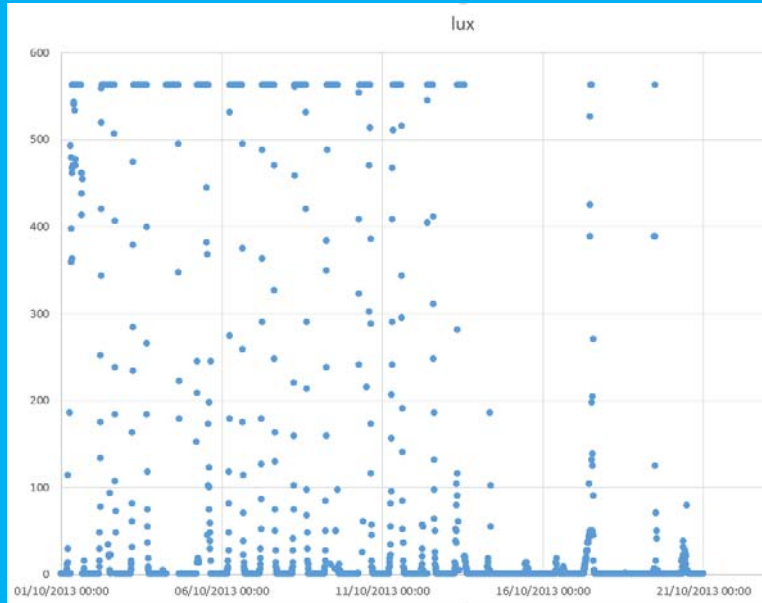


N23980 2013–2014 den 9 Oct birth ca 8 Dec



Lower panel: data from collar, activity, temperature and speed (movement) indicate time of denning; lower temp and activity indicate time female give birth

N23980, light from ear tag also indicate den entry before mid October



Spring: opened den early March, left den about 27th March

Data from ear tags:

- Temp + light indicate:
 - 1) If/When bear enter den, when she leave den in spring
 - 2) Rough position of bears (and dens) from light data, i.e. if bears den in SE Svalbard, on Franz Josef Land, on North Spitsbergen. etc.
 - 3) Battery last 5-10 years, need to recapture bears to get data

