HOODED SEALS, SENTINELS OF ENVIRONMENTAL CHANGES IN THE ARCTIC

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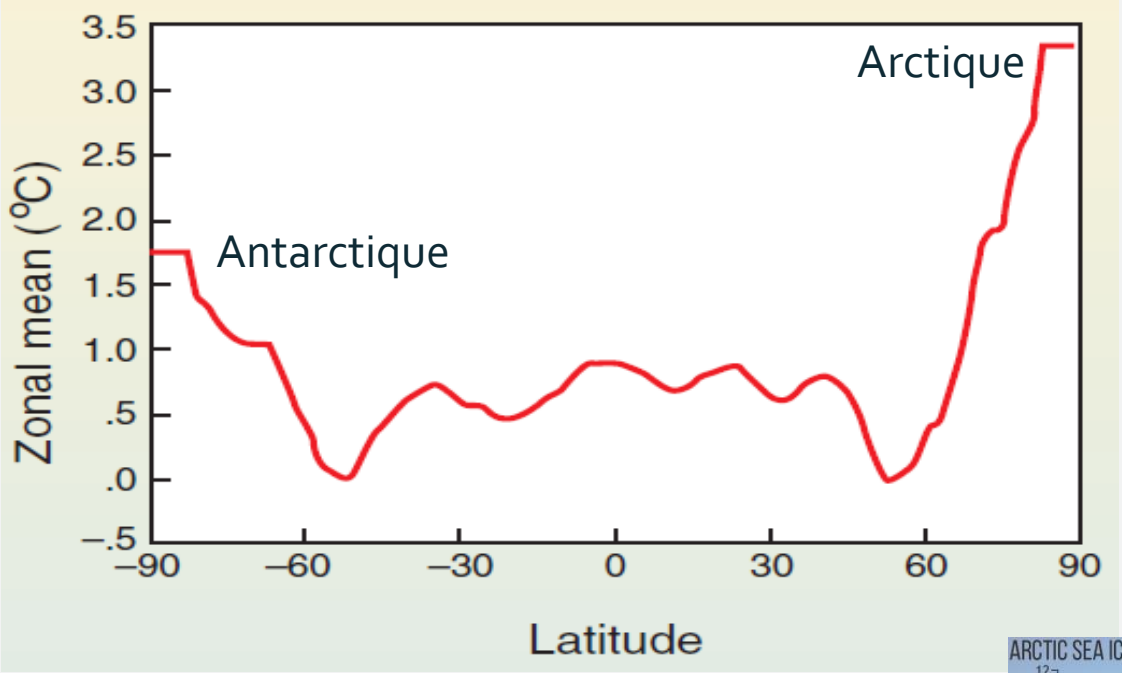
Early Life erc Program

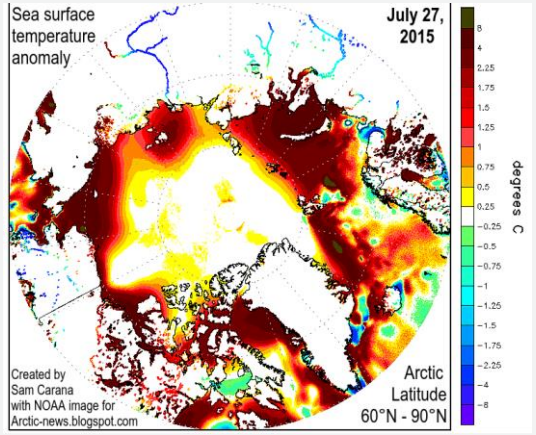
SenSe SENTINELS OF THE SEA ICE

INTRODUCTION

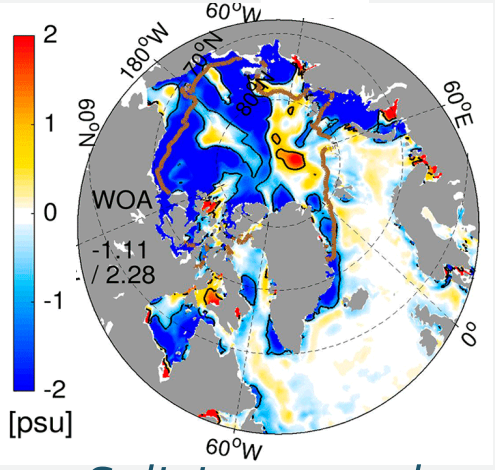
Oceans



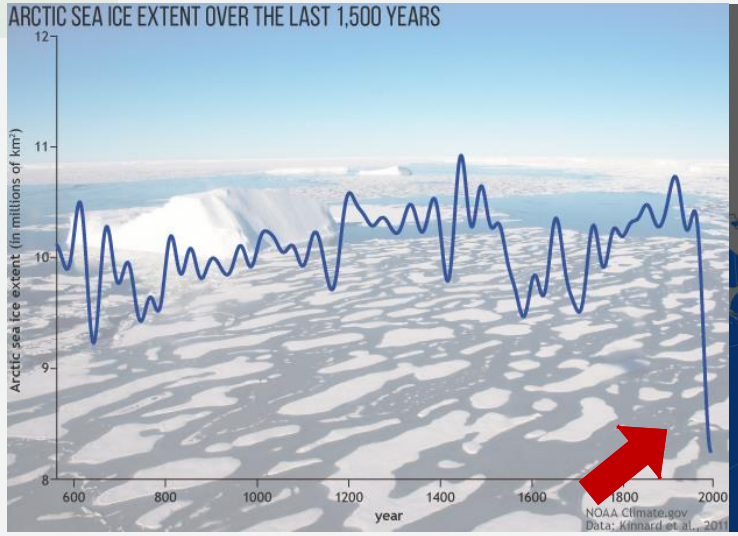
Hoegh-Guldberg & Bruno, 2010, Science

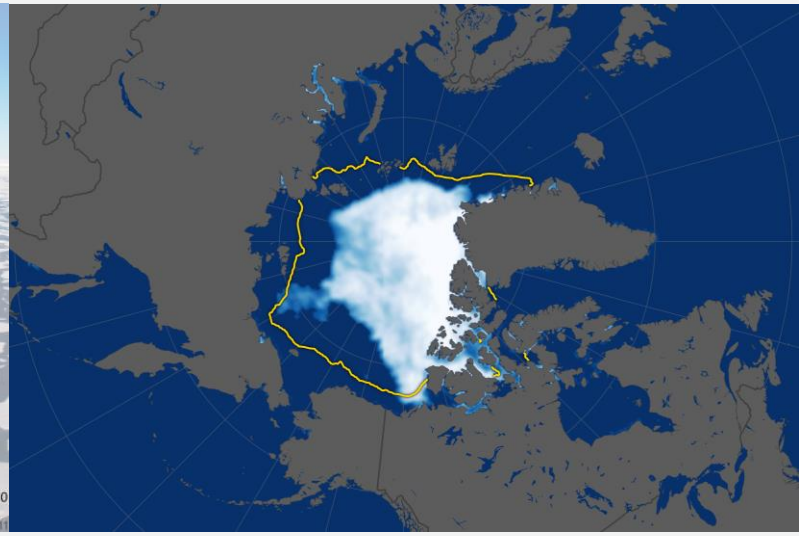


SST anomaly

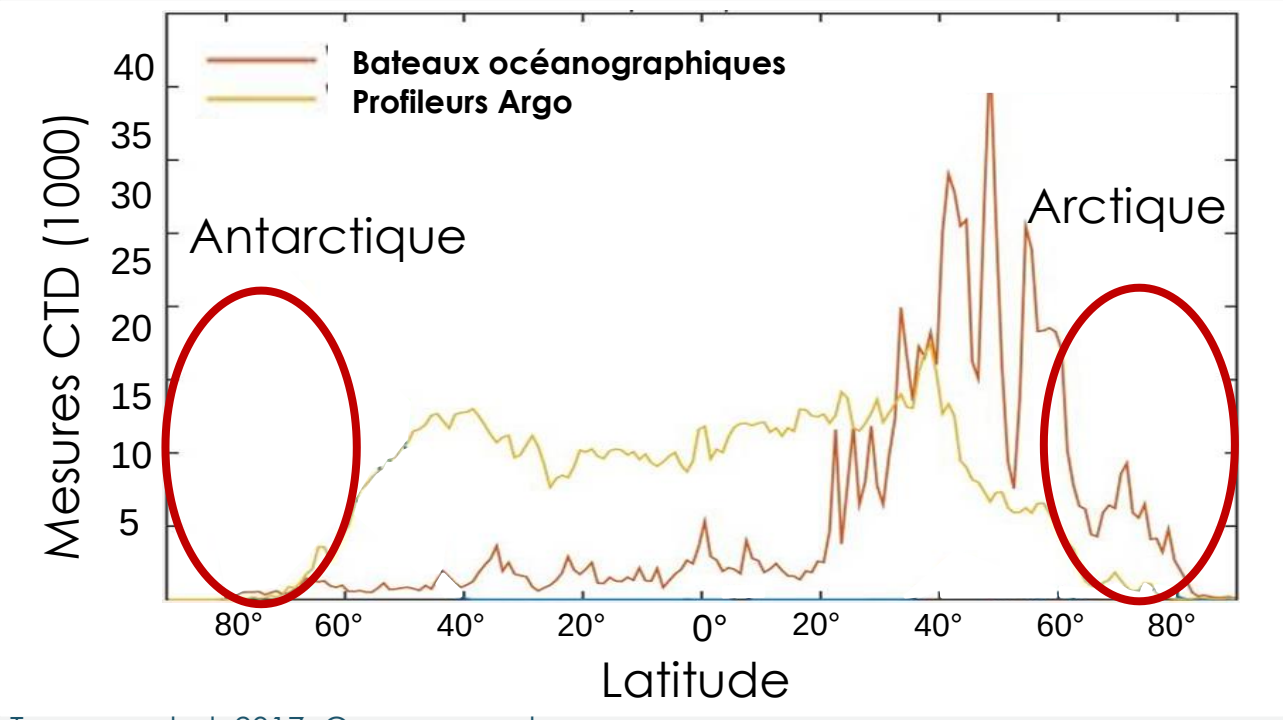


Salinity anomaly





INTRODUCTION



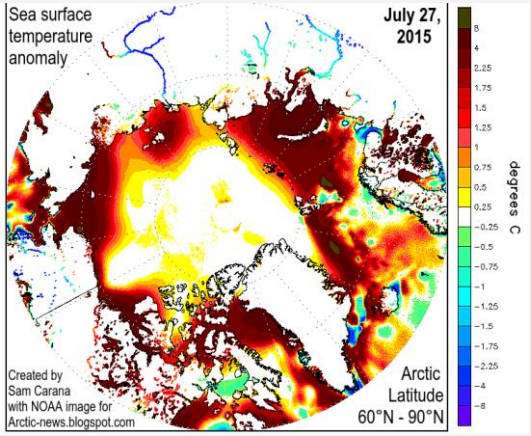
Treasure et al. 2017. Oceanography

Gaps in at the poles where the greatest changes are occurring

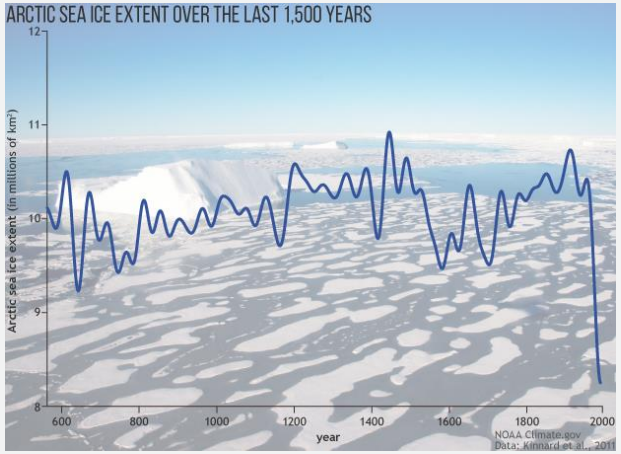
Changes in physico-chemical parameters

- *Fine spatial and temporal scales*
- *Year round*

INTRODUCTION



SST anomaly



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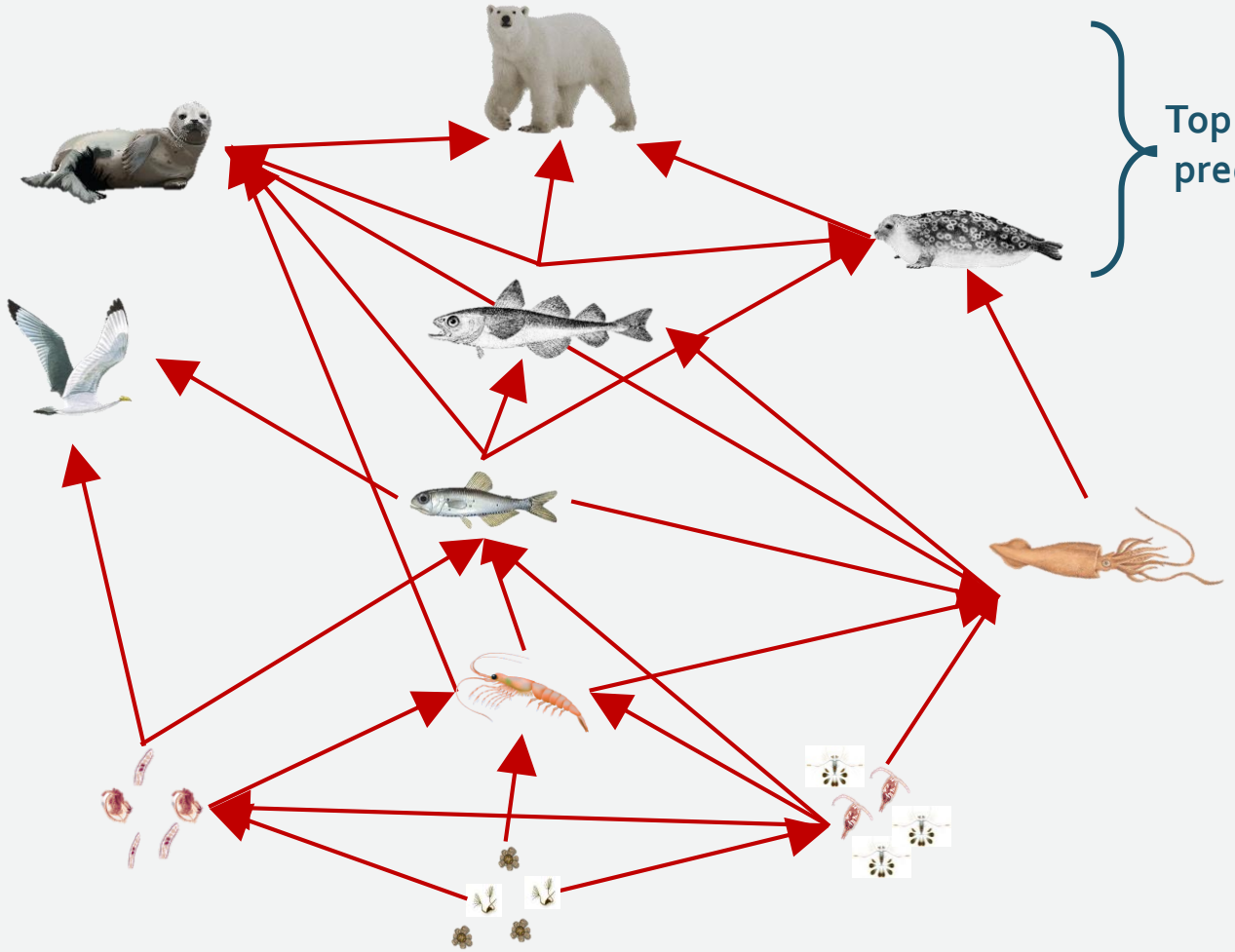
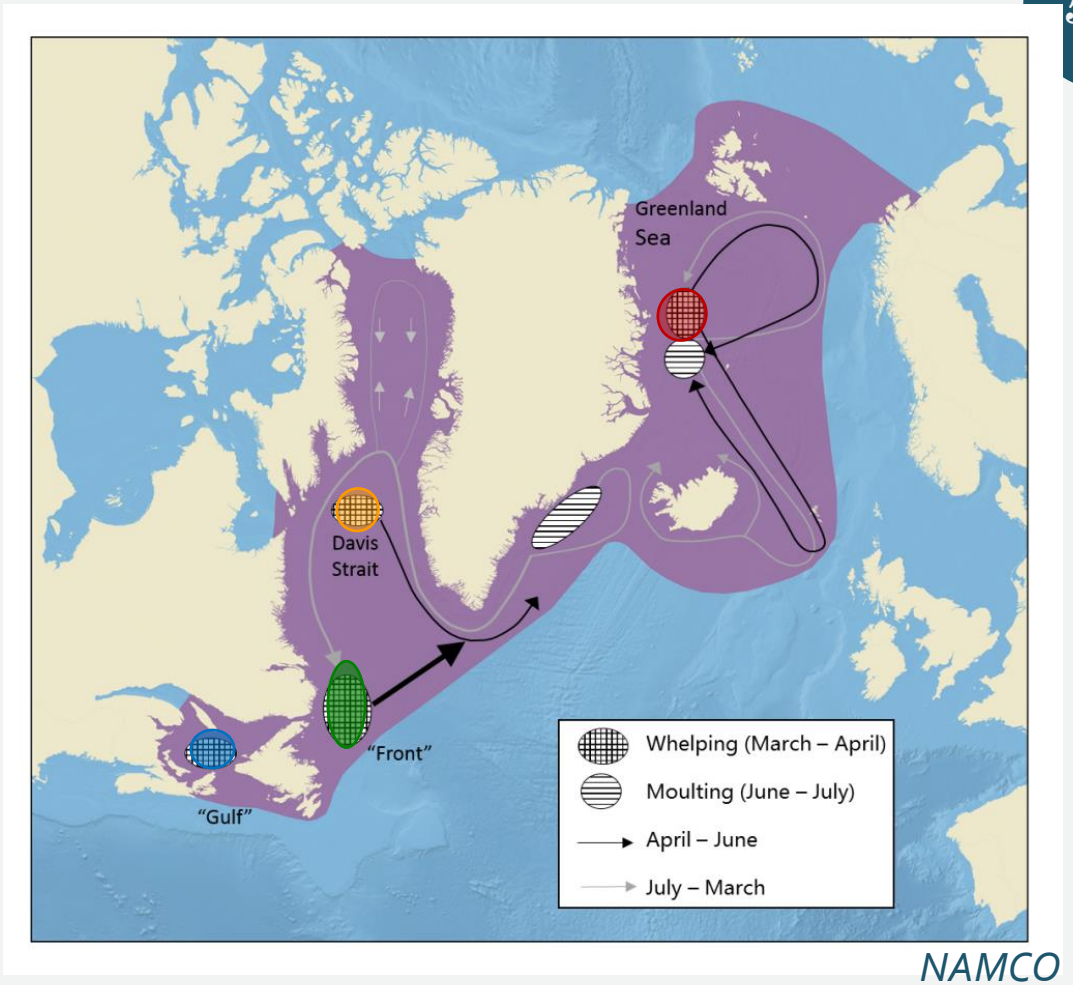


Ecological consequences of physical and chemical changes in oceans?

INTRODUCTION

Hooded seals

- *Pelagic far ranging deep divers*
- *Ice-dependant for both reproduction and moulting*
- *Reproduction in March ⇆ moult in July*
- *Breeding areas: Gulf of St Lawrence, the Front, Davis strait and West Ice*
- *Reproductive strategy: shortest lactation period in mammals: ~ 4 days*



NAMCO

OBJECTIVES

I. *Hooded seals as sampling platform for environment observation*

II. *Impact of environmental changes on hooded seals and their prey/foodweb*

Simultaenous measurements

Environment

- Temperature, salinity, light, …
- Mixed layer depth, thermo/halo-clines
- …

Behaviours / pysiologie

- Trajectories
- Dives
- Swimming effort
- Foraging success
- …

OBJECTIVES

- Changes in movement, distribution and/or range with ice retreat
- Links/impacts environment changesand foraging behaviours / efficiency
- Distribution, foraging ontogeny and survival of pups
- …

Challenges:

- Cannot recapture animals : satellite transmission
- Accurate on-board processing algorithms
- Miniaturisation of tags for pups
- Capture of adults post-moult difficult

METHODS

Pups:

- *14 newly-weaned pups (~ 1-week old) 41.1 ± 4.2 kg*
- *Equipped with 2 biologgers:*
  - ✓ Scout-DSA on the head: 2.5 - 10.5 mo
  - ✓ Argos Spot 5 on the back: 2.5 - 16.5 mo

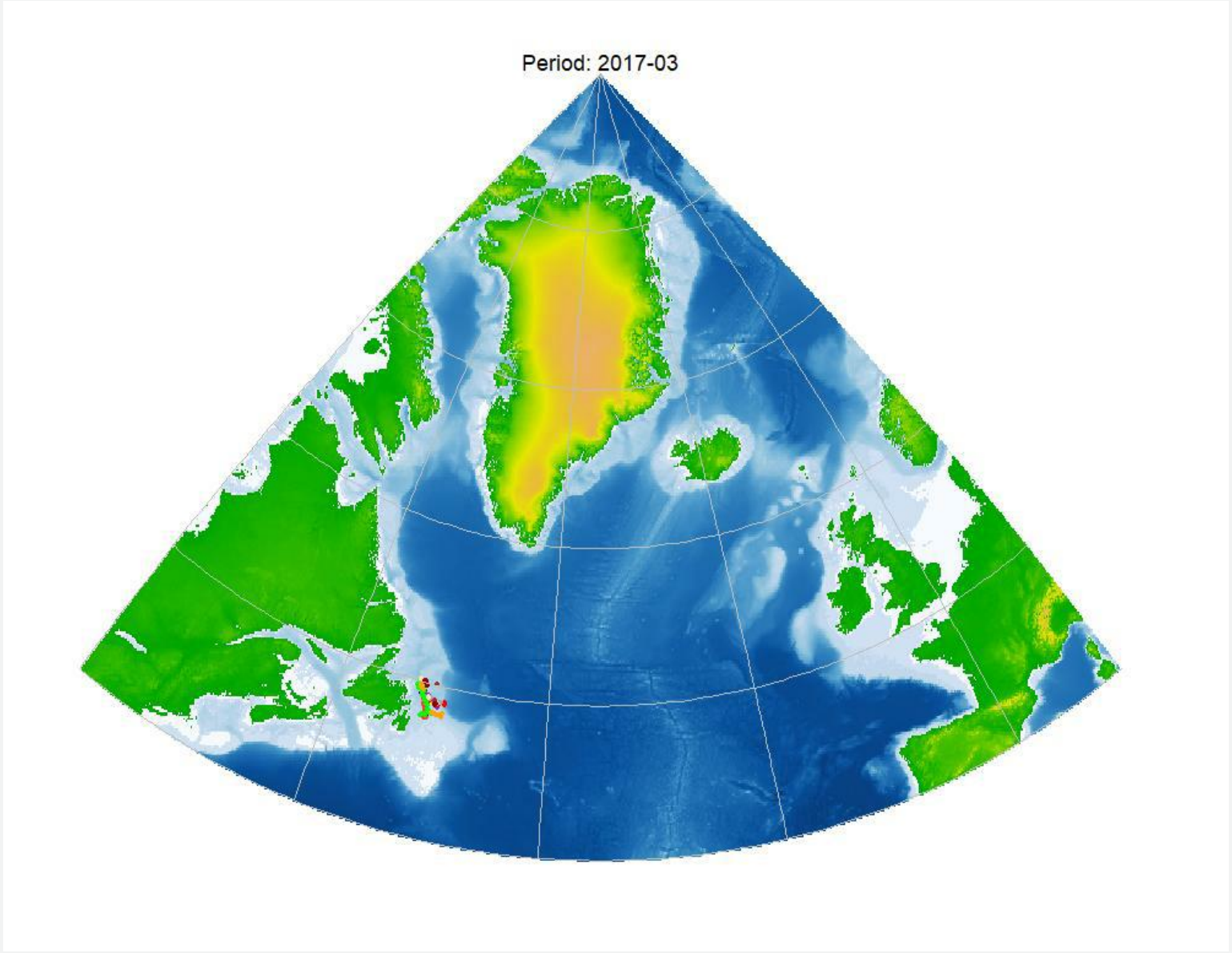
Adults:

- *18 nursing females 236 ± 25 kg*
- *Equipped with SRDL-CTD biologgers: 0 - 3.5 mo*
- *Blood, blubber, whisker, skin, tooth*

Distribution

RESULTS- PUPS

2307 ± 547 km / month



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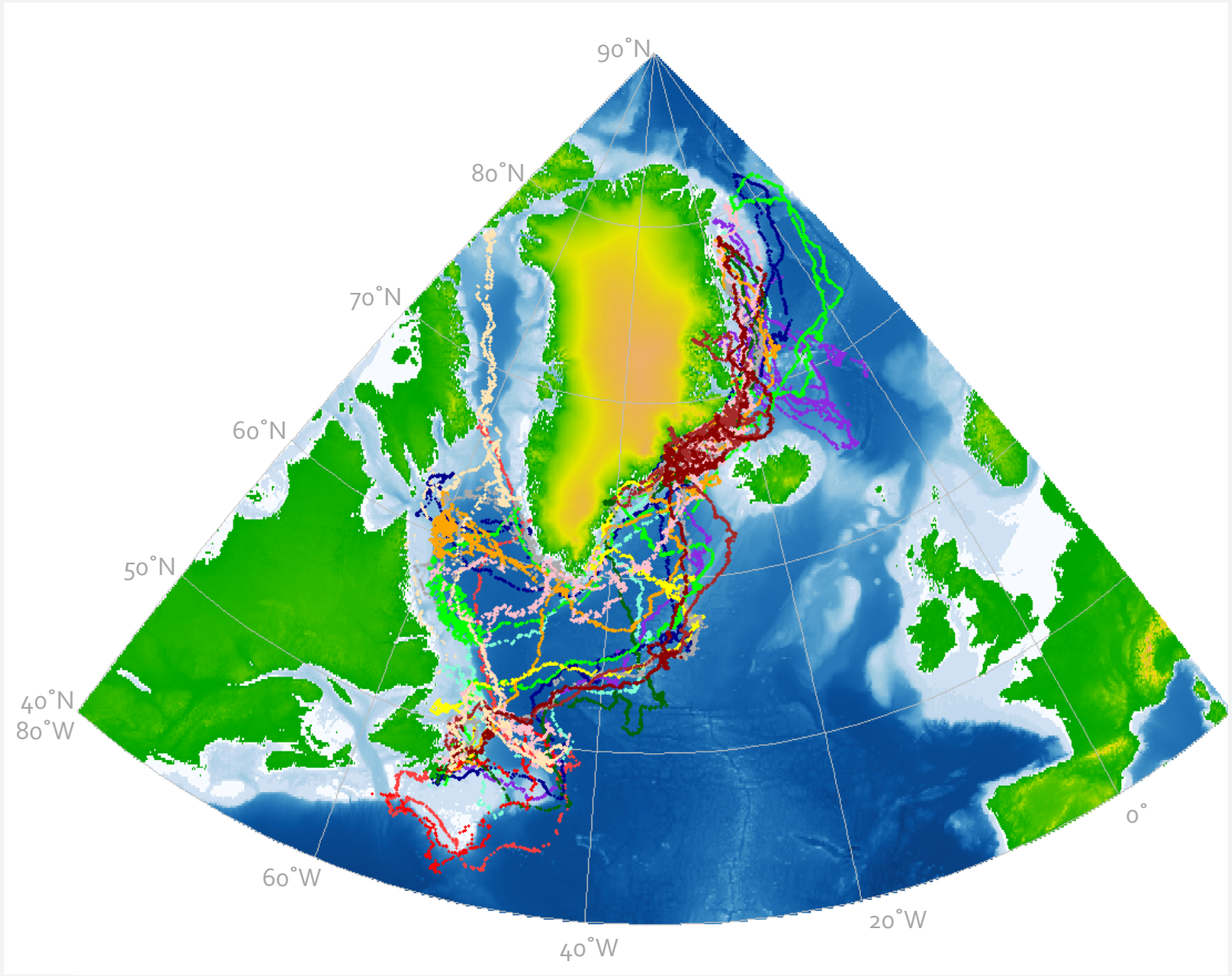
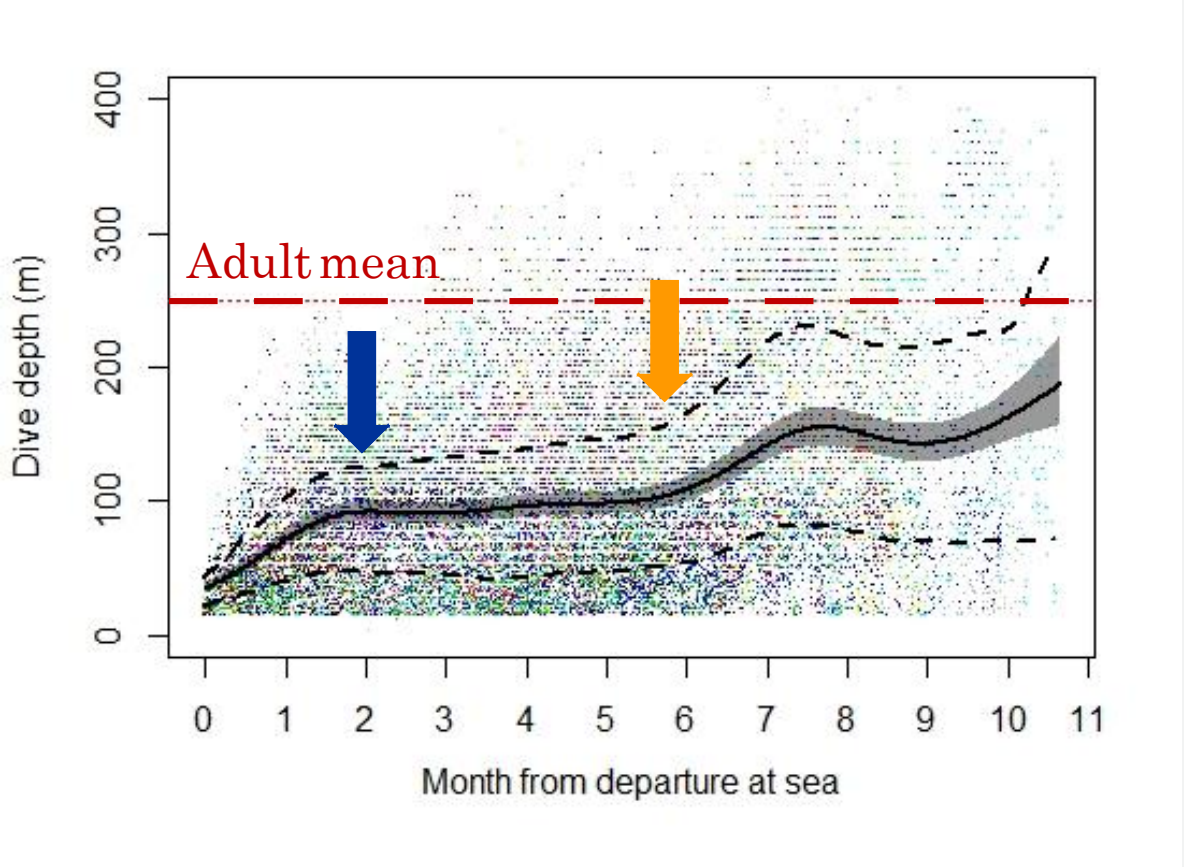
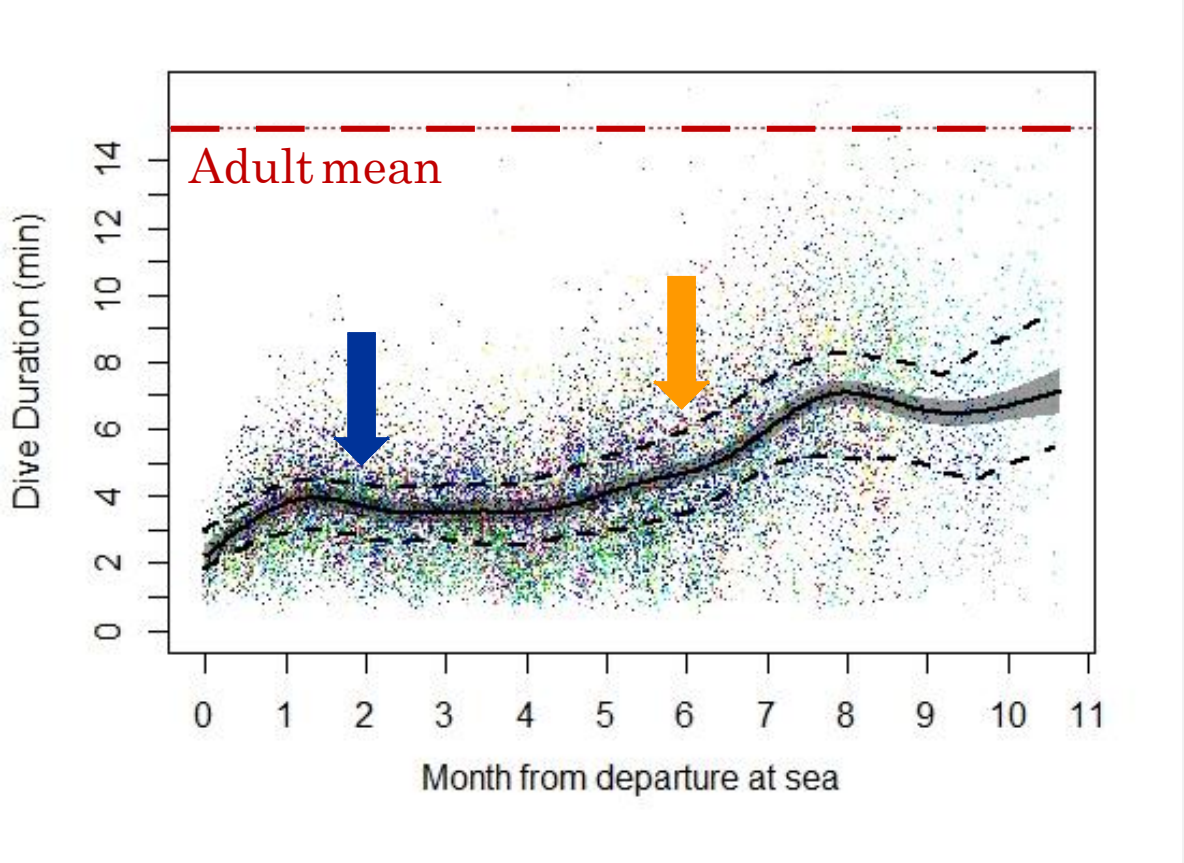


Foraging ontogeny: diving capacities *RESULTS- PUPS*

Dive depth



Dive duration



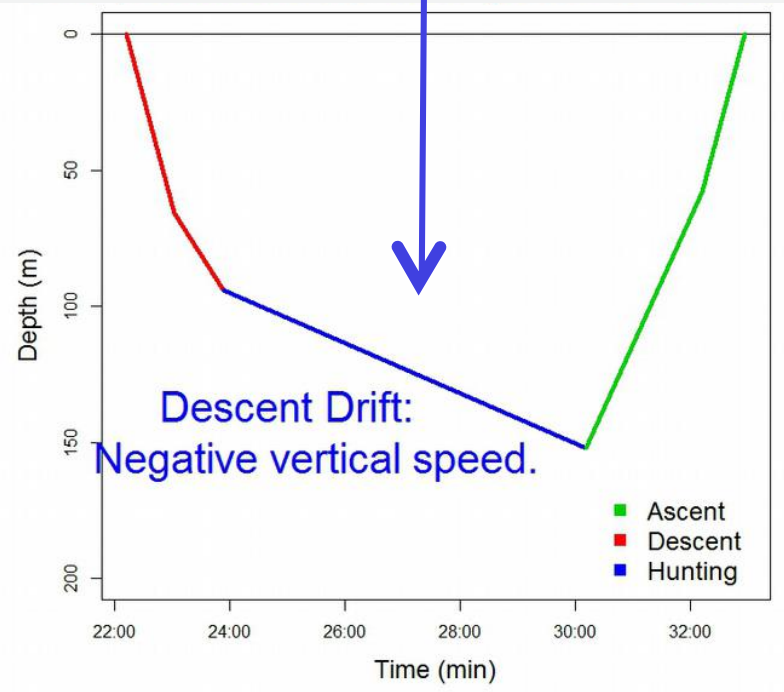
6.5 ± 1.0 dives per day

Foraging ontogeny: body condition

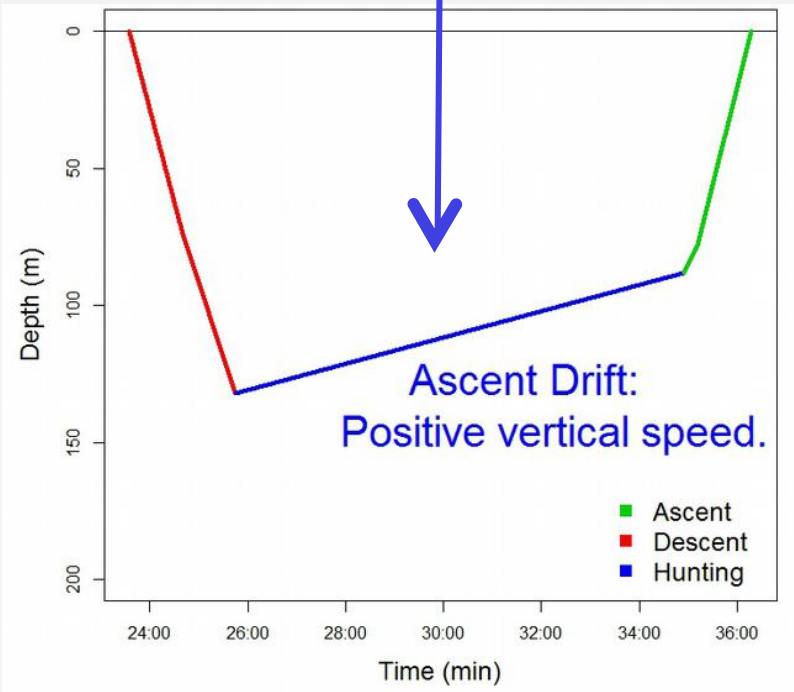
RESULTS- PUPS

Drift rate during glides as an index of body condition

Descend while gliding
Negative buoyancy
Low % body fat
Poor body condition



Ascend while gliding
Positive buoyancy
High % body fat
Good body condition



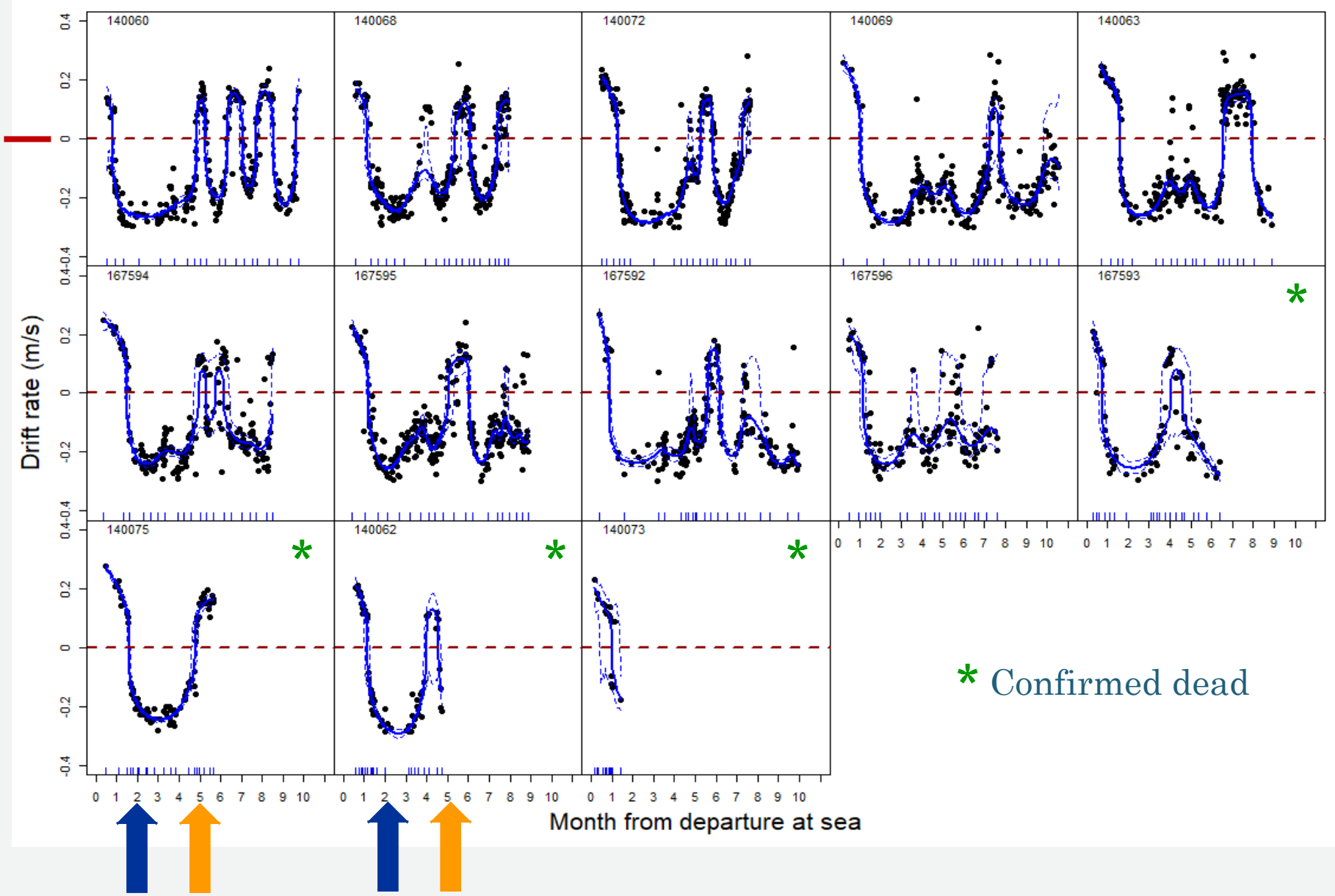
Gesta 2014

Foraging ontogeny: body condition *RESULTS- PUPS*

Fat

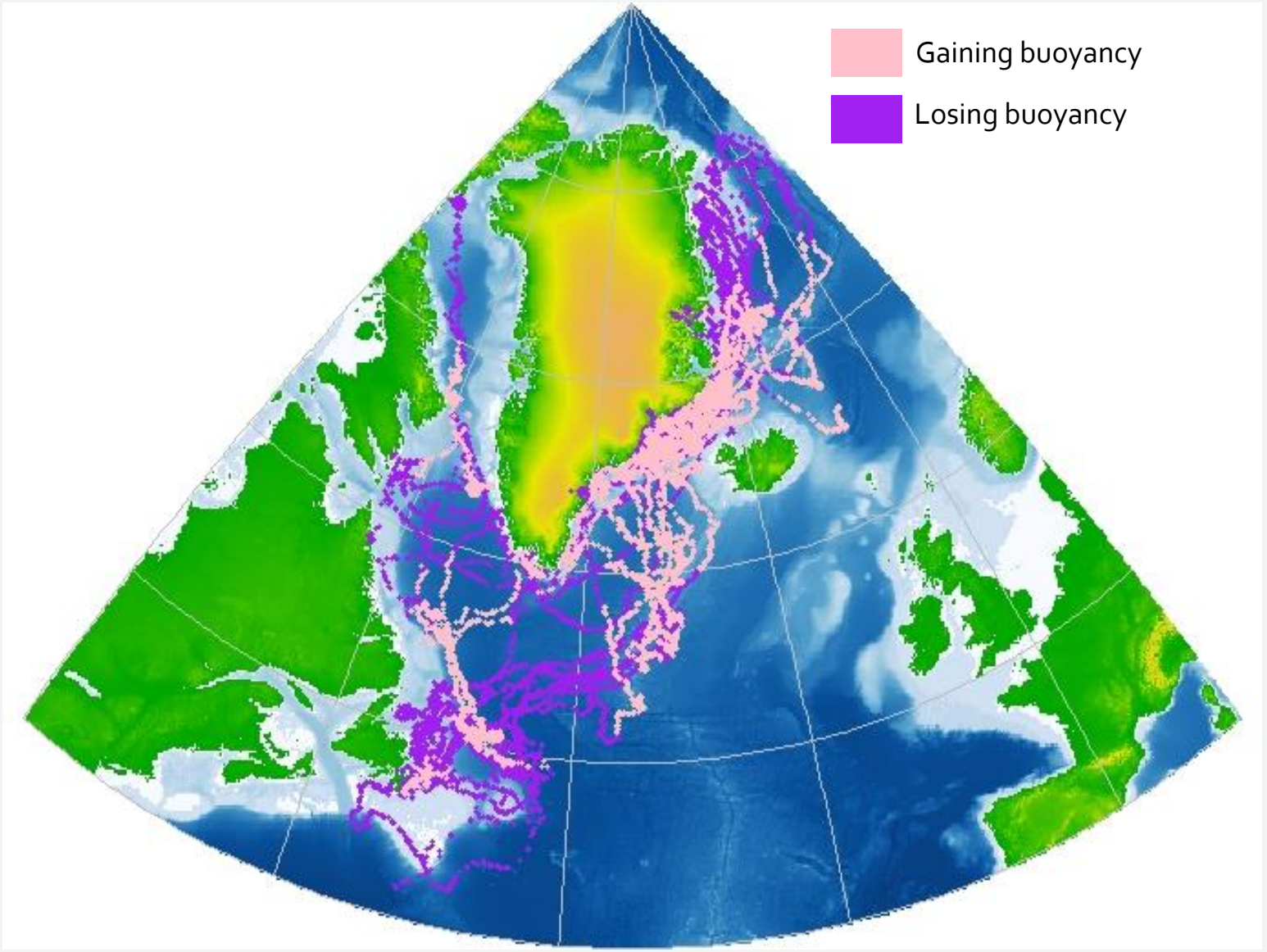
Neutral

Lean



Foraging ontogeny: body condition

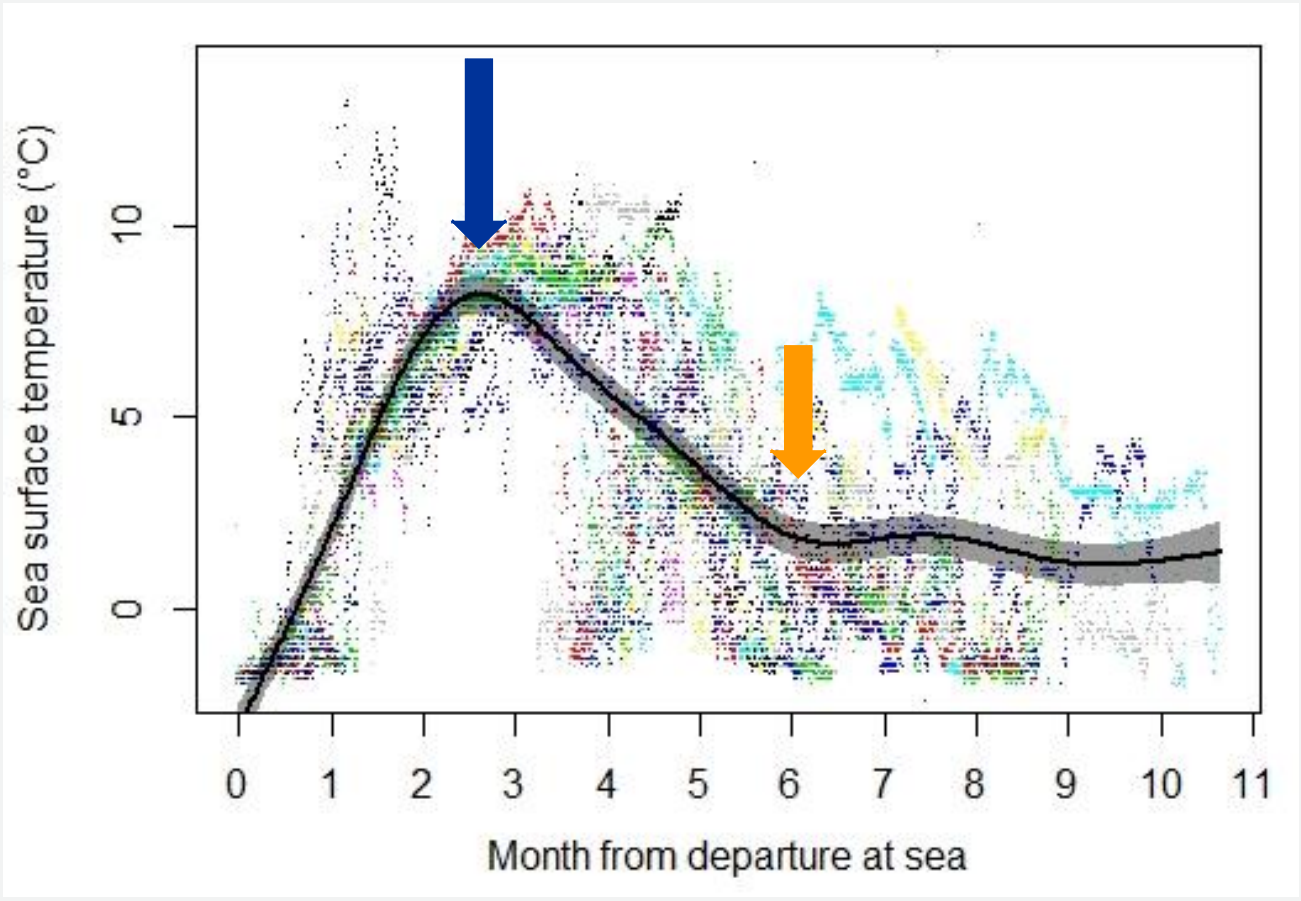
RESULTS- PUPS

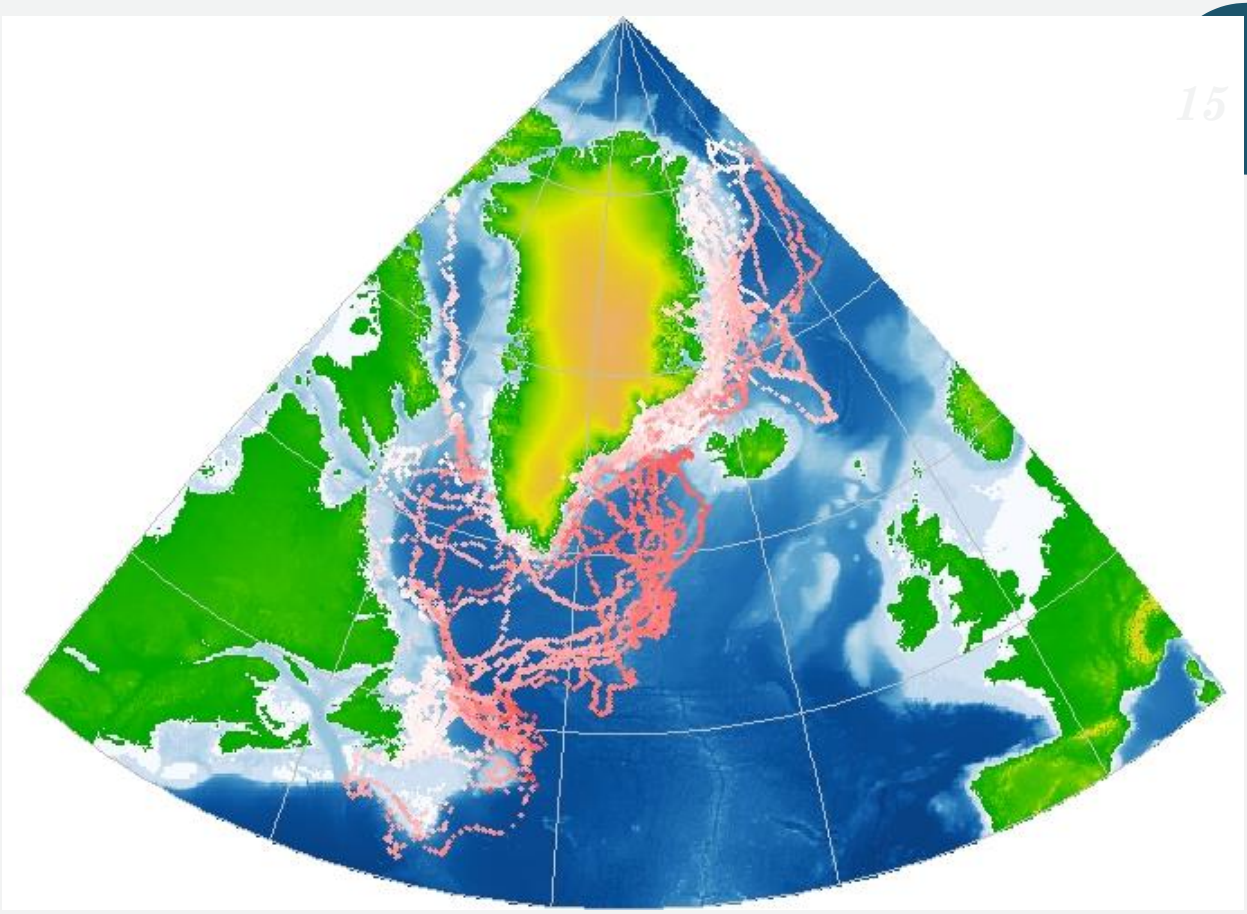


Environmental conditions

RESULTS- PUPS

Measured surface temperature





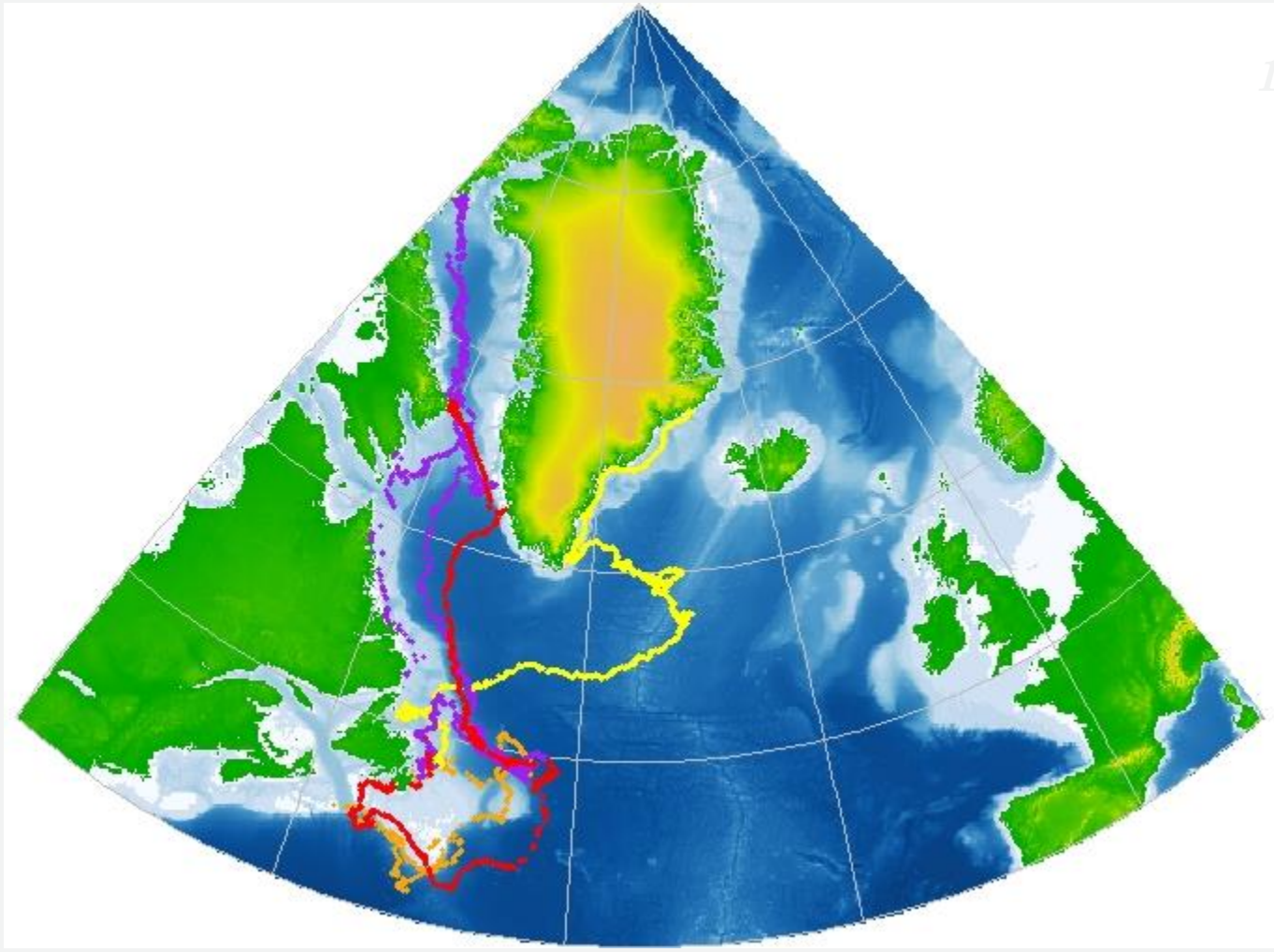
1-3 mo: trade-off between thermoregulation / swimming costs and fasting duration?

Colder sea water temperatures: better foraging conditions ?

Survival

RESULTS - PUPS

- ***Only 4 confirmed dead pups / 14***
- ***Died at 2.5, 5.2, 6.2 and 8.7 mo***
- ***No clear pattern in behaviours, body condition or diving capacity in dead pups: Predation? Entanglement?***
- ***Low sample size***



RESULTS - ADULTS

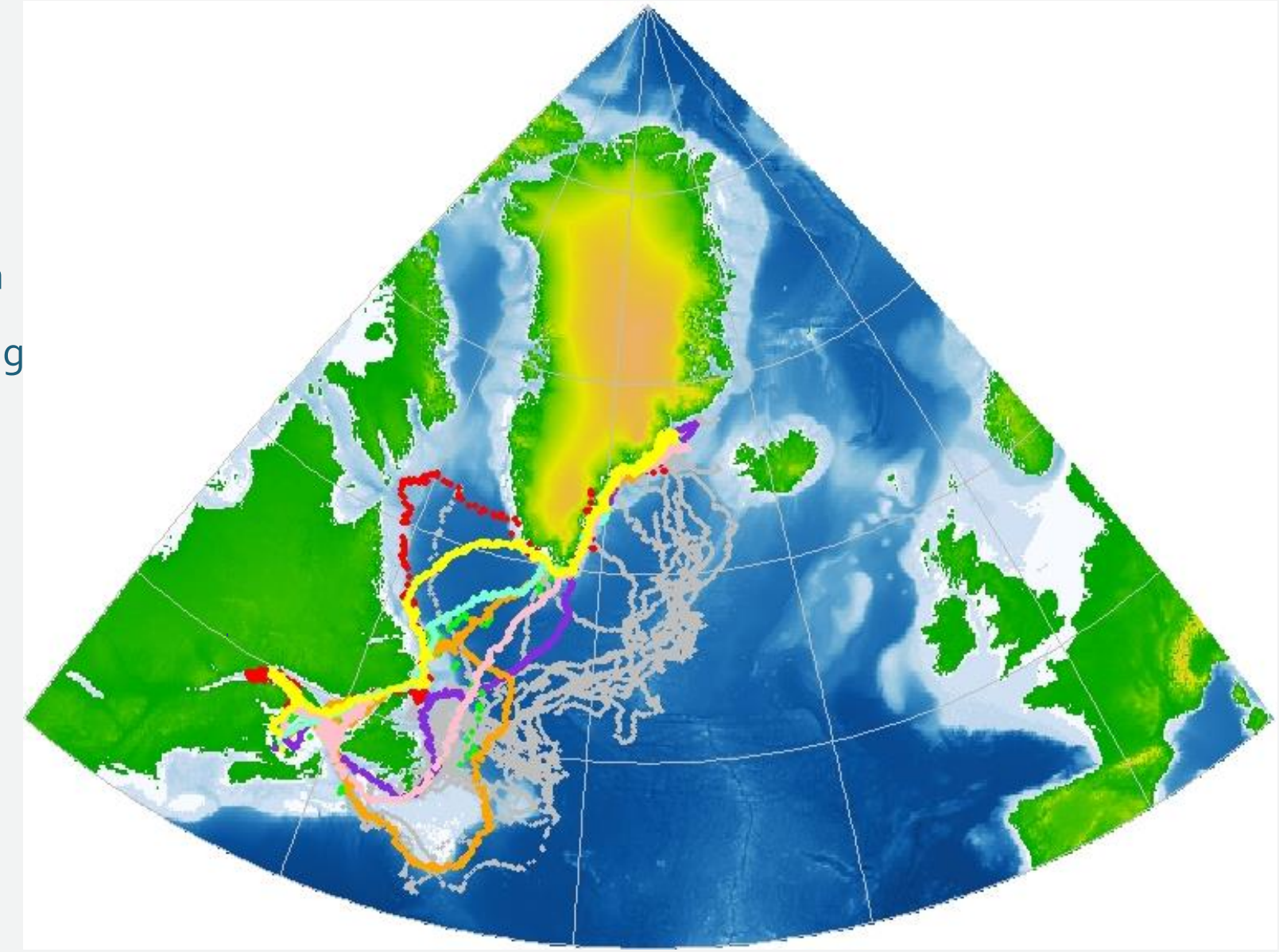
- < 3.5 mo
- 18.5 ± 1.2 dives / day
- 2.7 ± 0.2 CTD profiles / day

Distribution

RESULTS - ADULTS

3218 ± 590 km / month

87 ± 0.4 % of time diving



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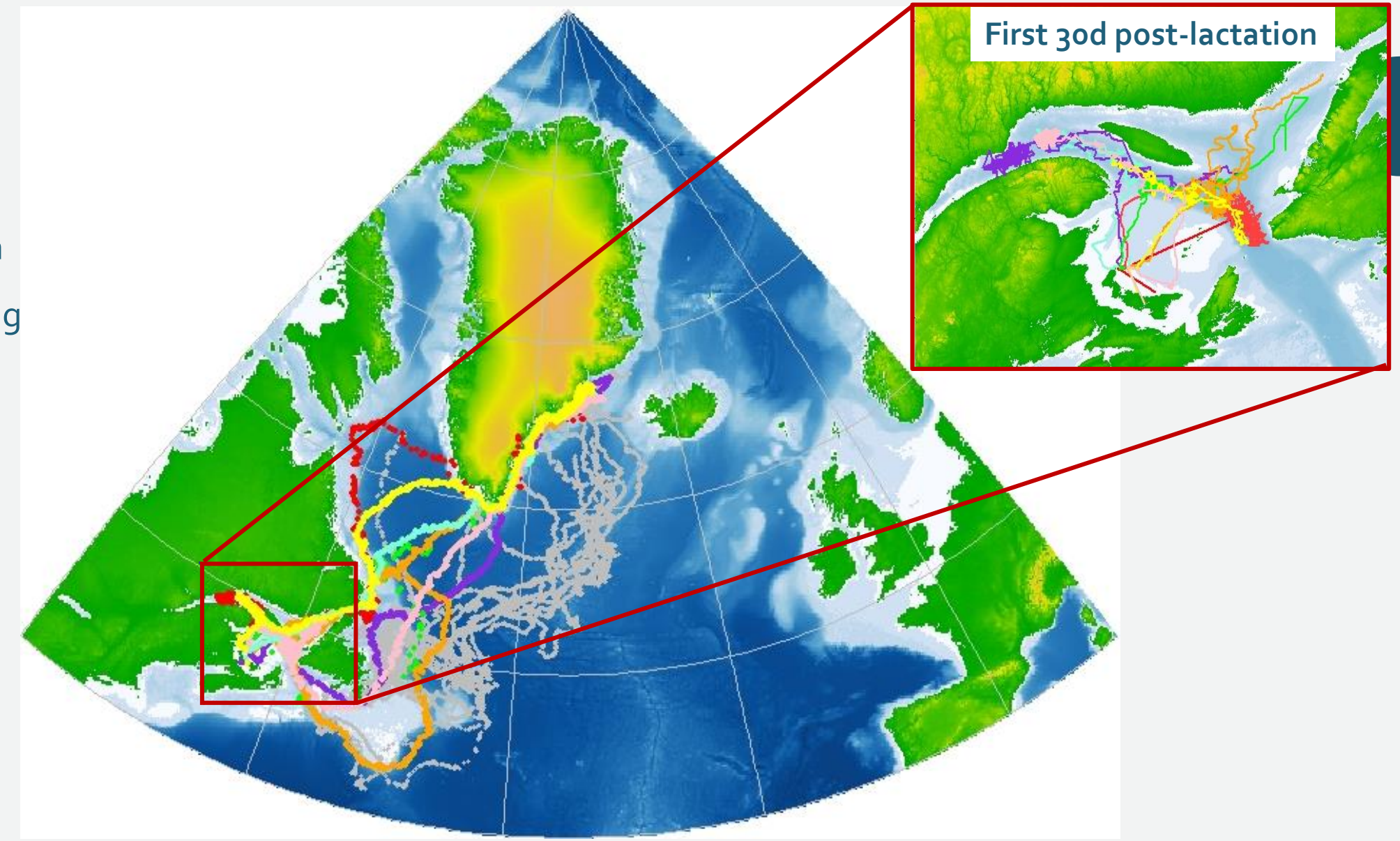


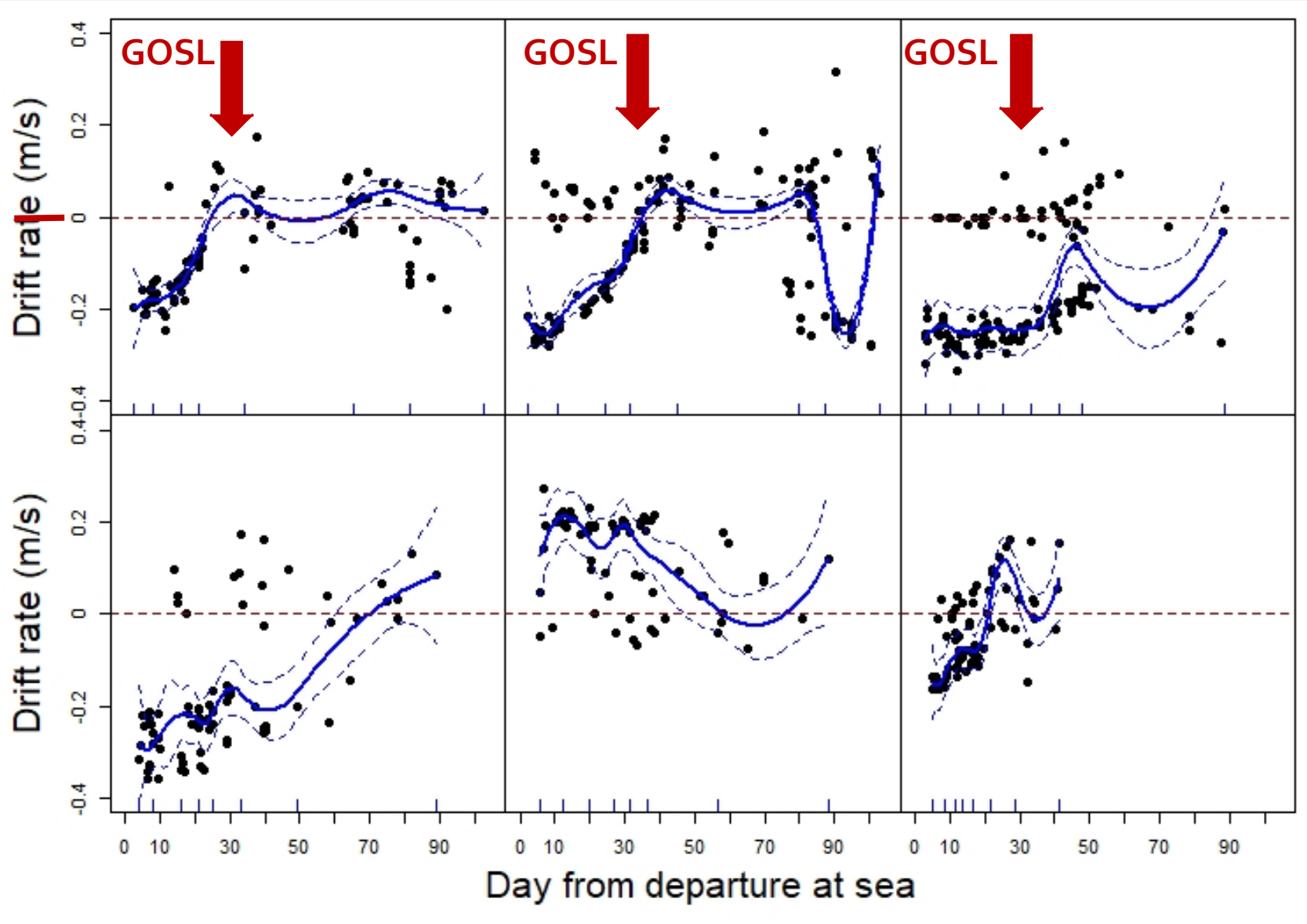
Body condition

RESULTS - ADULTS

Fat

Neutral

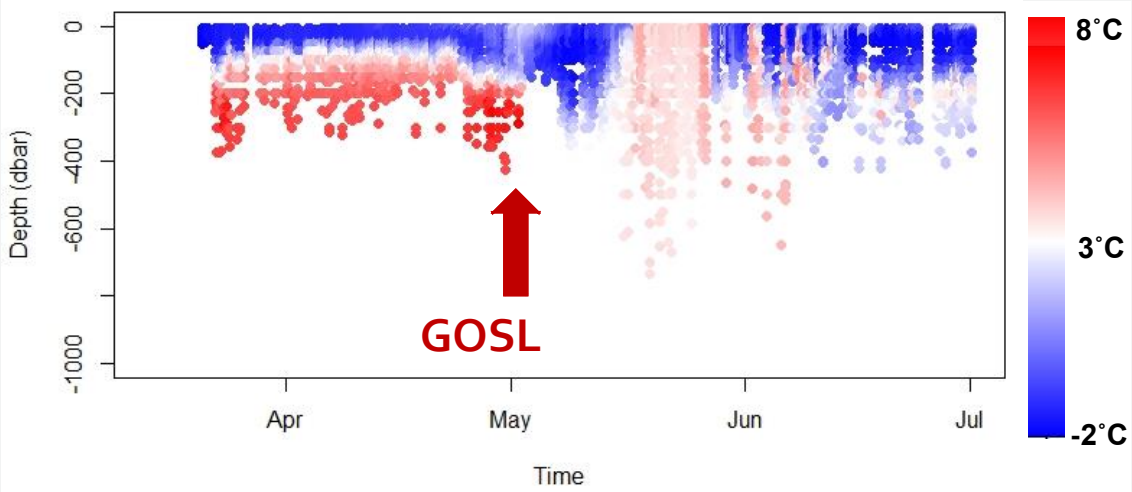
Lean

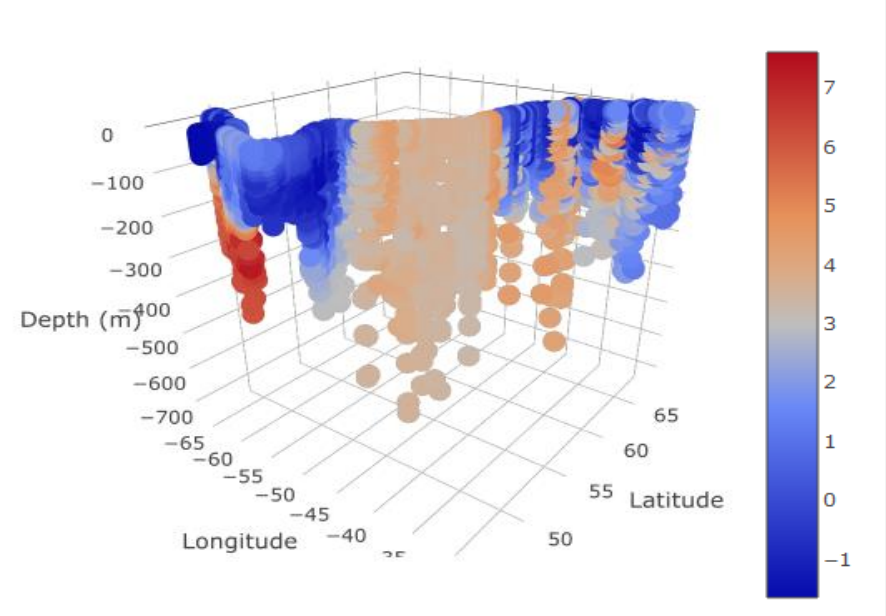


Environmental parameters

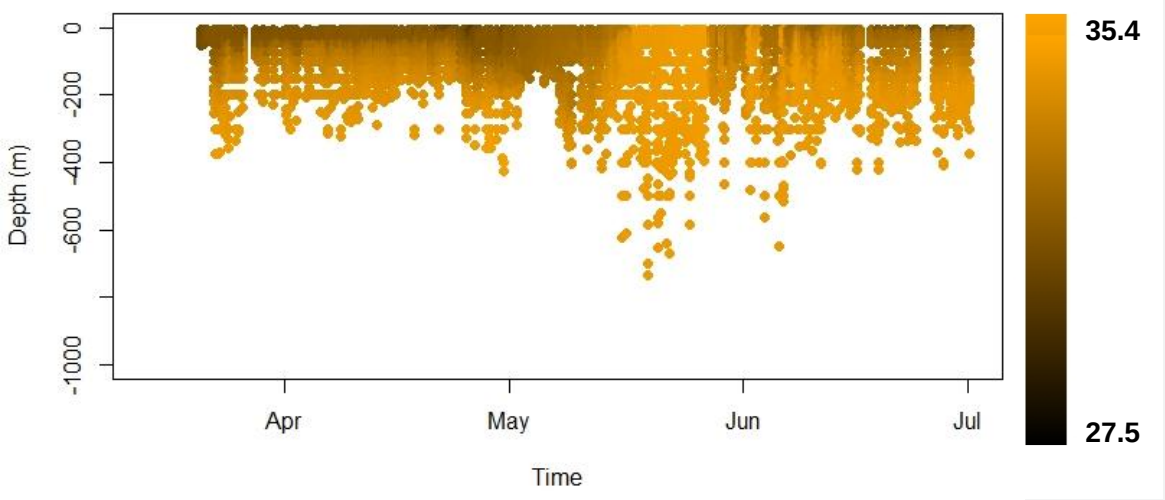
RESULTS - ADULTS

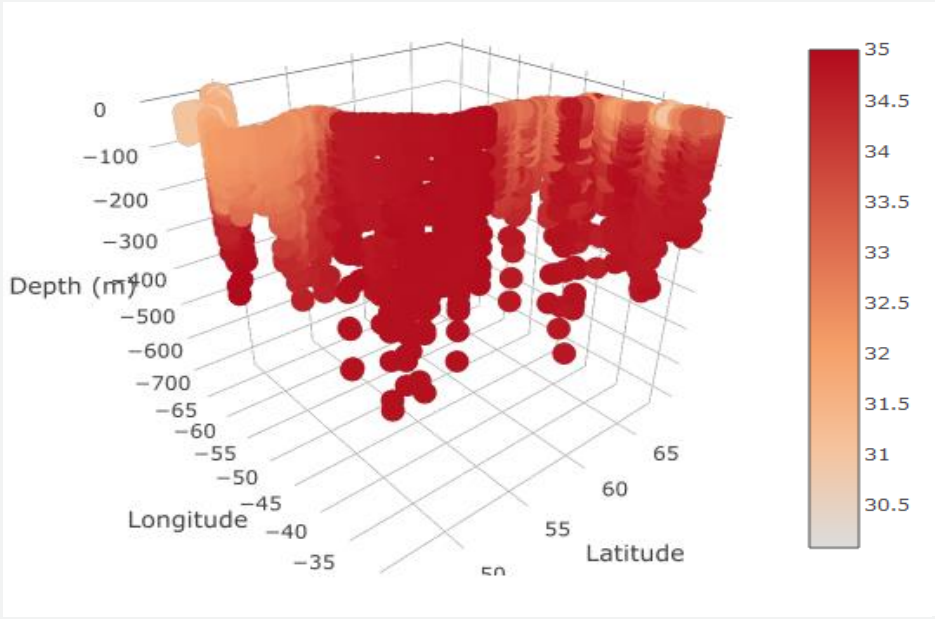
Temperature





Salinity





WHAT'S NEXT

- Technical hurdles:
  - On board processing algorithms os different sensors
  - Processor capacity problem
  - Miniaturisation for pups
- Logistics hurdles:
  - Work easier/cheaper in GoSL breeding patch (helicopter) than at the Front (icebreaker) but ice conditions worse
  - Difficult to capture at moulting
- Next:
  - Compare with data collected previous decades : relationship between foraging and environment
  - Collaboration with Canada and Norway for panmictic study and global coverage
  - More sensors: microsonars, etc…

THANKS!