Foraging hotspots of Weddell seals in the southern Weddell Sea

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Background

- Filchner Outflow System in south-eastern Weddell Sea
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- Intensive mixing of water masses -> hotspot?

Bornemann et al. 2010
Background

- Southern elephant seals foraged at Filchner Trough
- Weddell seals are residents in the area year-round
- Aim: to characterize and describe potential foraging hotspots

Bornemann et. al. 2010
Material and Methods

RV *Polarstern* research expedition PS82 to Filchner Outflow System in 2014

6 Weddell seals:
CTD-combined satellite-linked dive loggers (CTD-SRDLs)
Material and Methods

• CTD-SRDLs provide...
  – seal locations via Argos satellites
Material and Methods

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  - CTD profiles
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  - seal locations via Argos satellites
  - CTD profiles
  - time-depth profiles of each dive
Material and Methods

- from dive profiles, several parameters for foraging behaviour:
  - maximum dive depth (pelagic / demersal)
  - hunting time
  - index for foraging effort in the bottom phase
Material and Methods

• set of environmental covariates, which may influence foraging behaviour:

  – bathymetry
  – water masses
  – sea ice concentration
  – distance to winter polynya
  – light availability (daily / seasonal)
Material and Methods

- hierarchical state-space model (hSSM) to filter seal tracks and infer hidden behavioural states along track (Jonsen 2016)

- statistical analysis: linear mixed effect model (R package \textit{nlme}; Pinheiro \textit{et al.} 2016)
Results & Discussion

• transmission duration: 174.5 ± 68.9 d (range: 49-246 d); January – October 2014

• 12,256 dives; 70.7% pelagic, 29.3% demersal

• pelagic dive depth: 143.5 ± 119.0 m
• demersal dive depth: 460.5 ± 115.0 m
Results & Discussion
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- maximum dive depth:
  - deeper during day than night (only pelagic)
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  - deeper during day than night (only pelagic)
  - no effect of season
Results & Discussion

• hunting time:
  – higher in winter than in summer
  – higher in shallower waters
Results & Discussion

- foraging effort in bottom phase:
  - negative in autumn and winter
Results & Discussion

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Results & Discussion

- foraging effort in bottom phase:
  - negative in autumn and winter
  - highest in MWDW
Conclusions

• two potential foraging hotspots

• diel variation in dive depths
  ➔ vertical migrations of prey species

• hydrographic conditions (MWDW & ESW) influence foraging activities
Conclusions

• Weddell seals increase hunting time during winter

• generally, sea ice concentration and distance to polynya not important

• foraging effort in the bottom phase decreases during dark season

→ Weddell seals may shift foraging strategies?
References


• Photo of satellite: https://directory.eoportal.org/image/image_gallery?img_id=185284&t=1338451672912
Thank you for your attention!