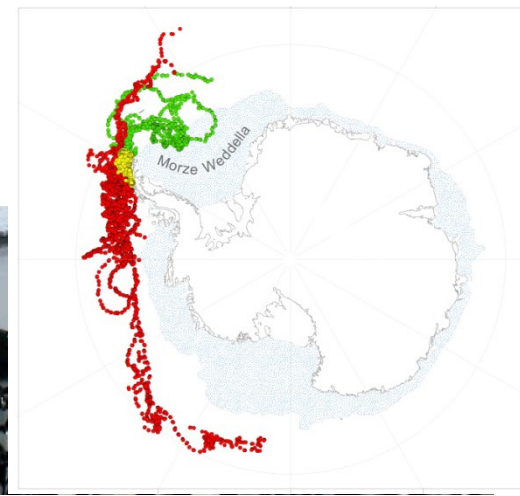




INSTITUTE OF BIOCHEMISTRY AND BIOPHYSICS
POLISH ACADEMY OF SCIENCES



Tracking the overwinter habitat use of *Pygoscelis* penguins in Antarctic Peninsula region

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The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

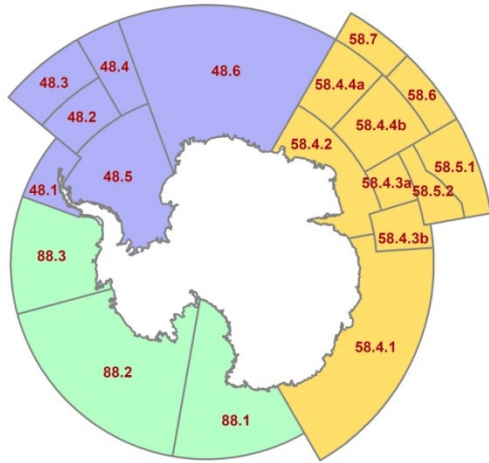


CCAMLR Scientific Committee

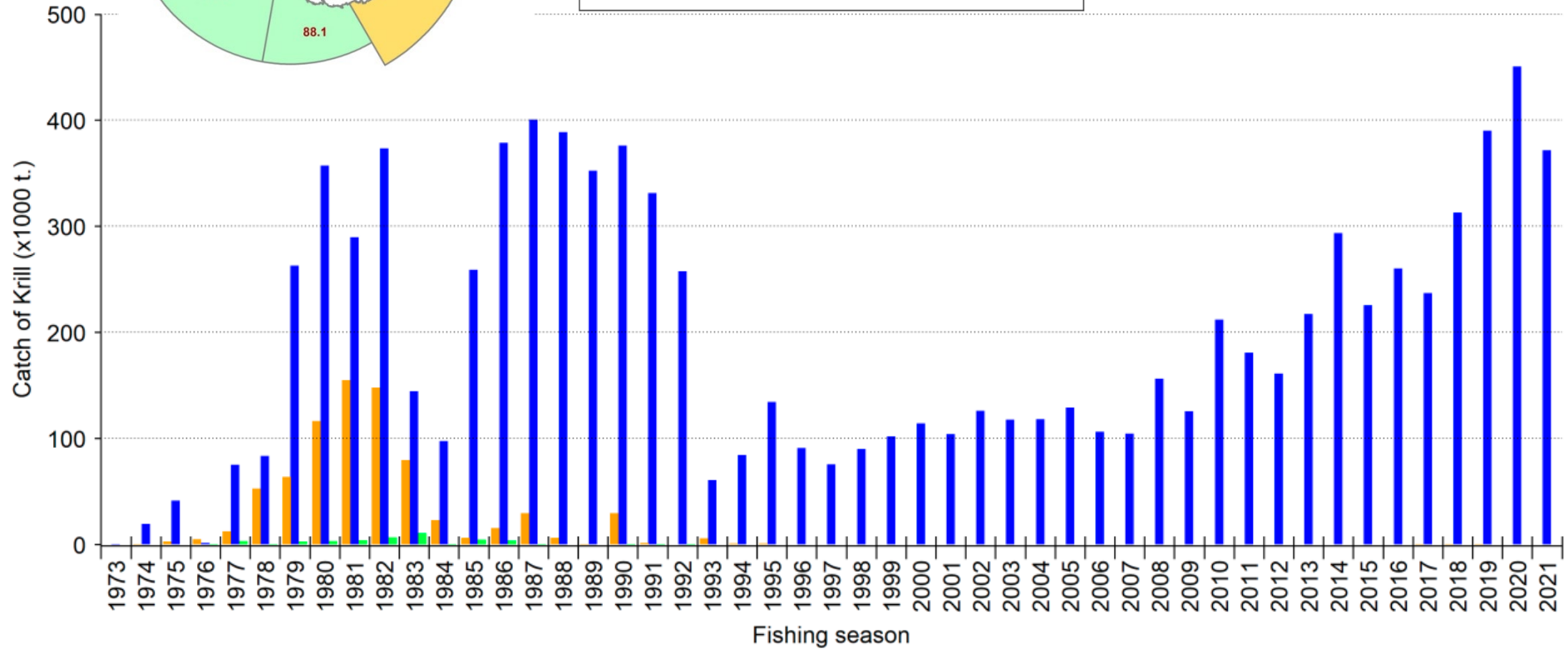


CCAMLR Ecosystem Monitoring Program

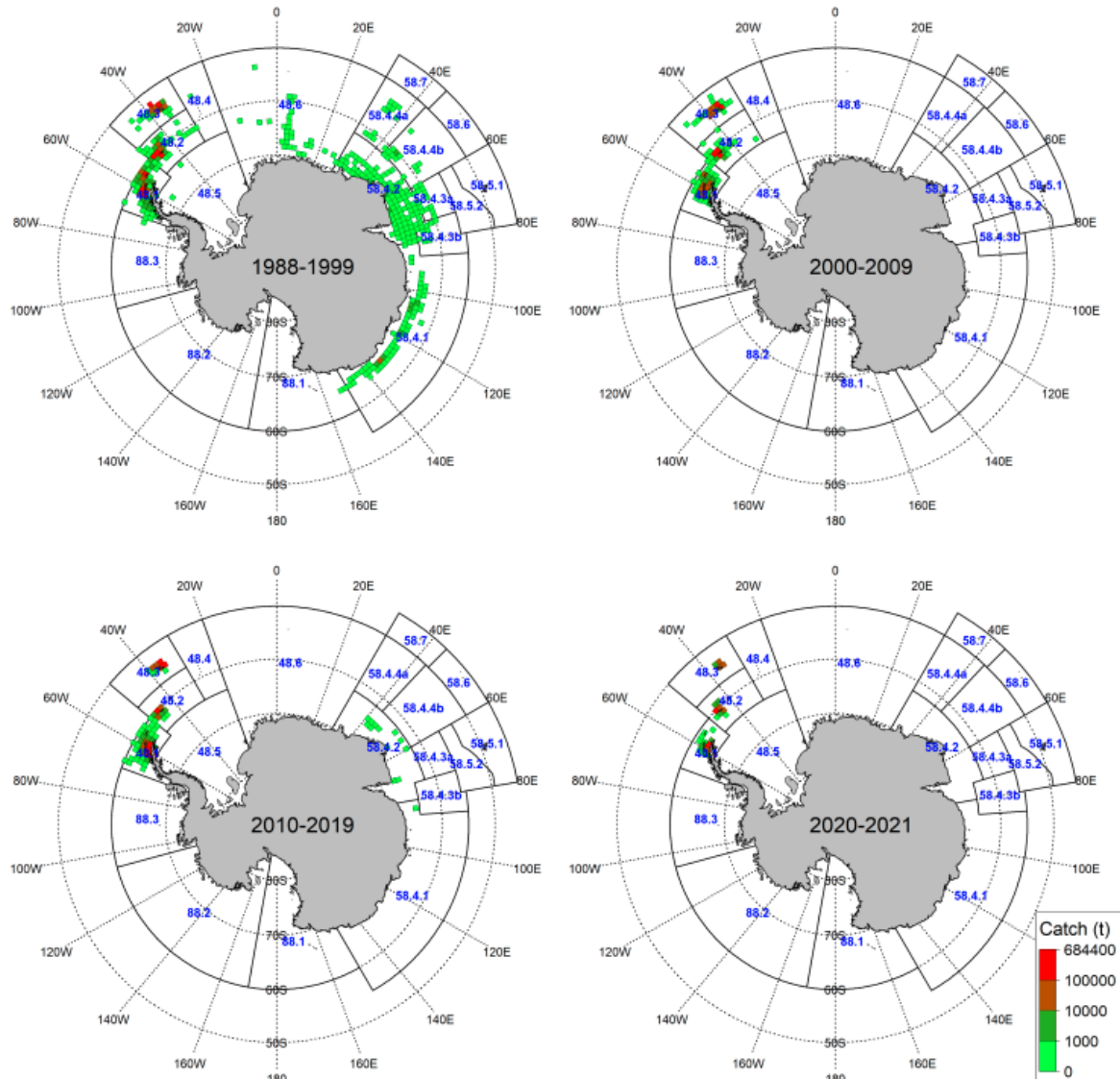




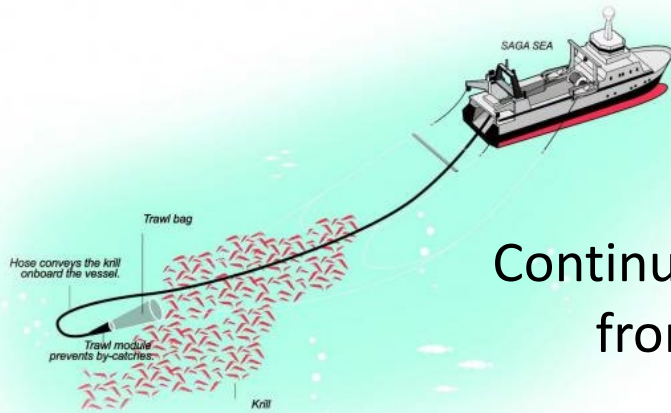
Annual catches of Antarctic krill (*Euphausia superba*) in the CAMLR Convention Area



Spatial distribution of catches by decade in the krill fishery reported to CCAMLR



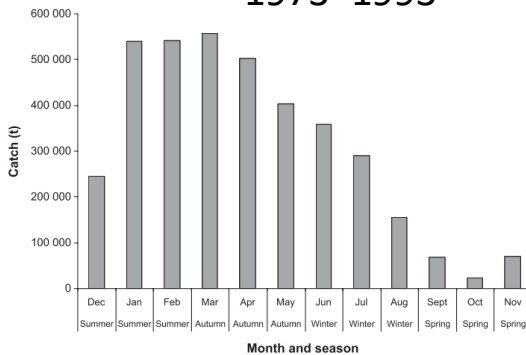
- development of fishing methods



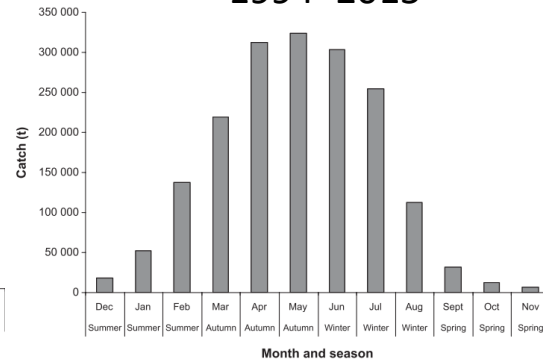
Continuous pumping method increased catch rates from **100** to **800** tonnes per vessel per day

- changes in seasonal distribution of krill catch

1973–1993



1994–2015



Antarctic krill fishery

Hakai
magazine

Coastal science and societies



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<https://hakaimagazine.com/article-short/krill-seekers/>

CCAMLR Ecosystem Monitoring Subarea 48.1



| species | colony | colony size | longitude | latitude | year |
|-----------|-------------------|-------------|-----------|----------|------|
| Adélie | Admiralty Bay | 2200 | -58.446 | -62.175 | 2017 |
| | Esperanza | 104139 | -57.01 | -63.4 | 2018 |
| Chinstrap | Admiralty Bay | 698 | -57.01 | -63.4 | 2018 |
| | Cape Shirreff | 2449 | -60.792 | -62.46 | 2017 |
| | Cierva Cove | 4846 | -60.984 | -64.143 | 2017 |
| Gentoo | Cape Shirreff | 705 | -60.792 | -62.46 | 2017 |
| | Cierva Cove | 6270 | -60.984 | -64.143 | 2017 |
| | Lions Rump | 3556 | -58.13 | -62.14 | 2017 |
| | Stranger Point | 4313 | -58.62 | -62.27 | 2017 |
| | Argentine Islands | 1104 | -64.25 | -65.24 | 2017 |



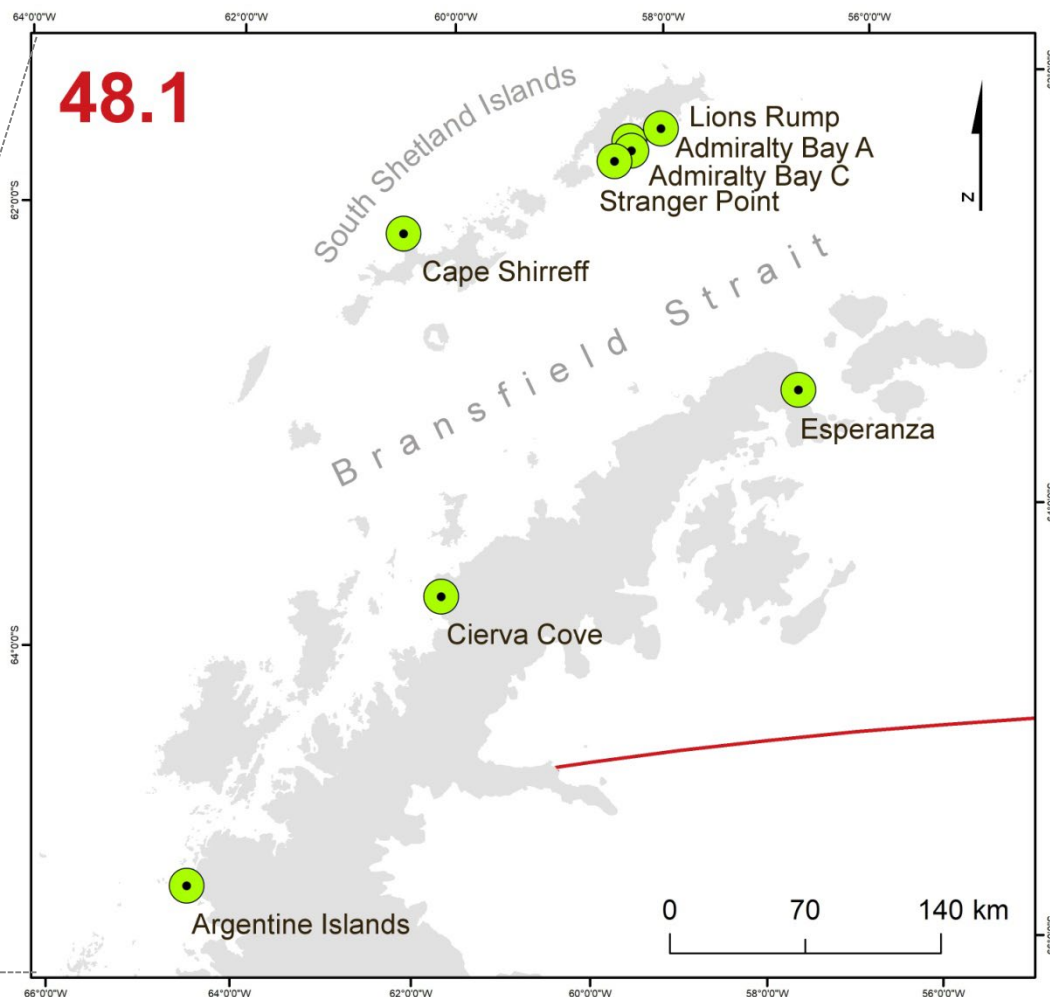
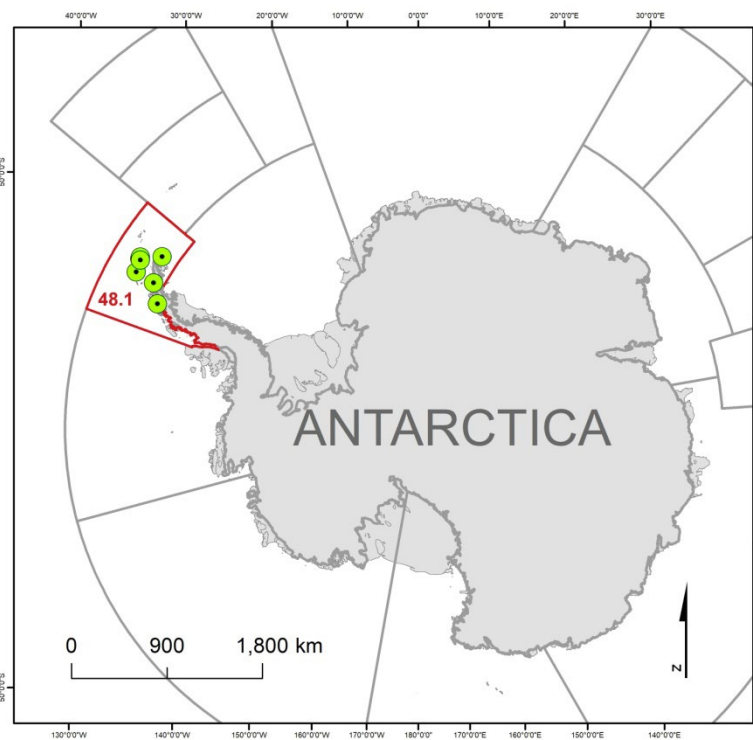
Pygoscelis: adeliae



antarcticus



papua



The telemetry data

ARGOS system

Instrumentation:

- Wildlife Computers Spot-275 satellite transmitters (size 86 x 17 x 18mm, 38g) for adults
- Sirtrack Kiwisat-202 K2G-172A satellite transmitters (size 60 x 27 x 17mm, 34g) for juveniles

Transmit daily for six hours (12:00–18:00 UTC) until battery failure





Adélie



chinstrap

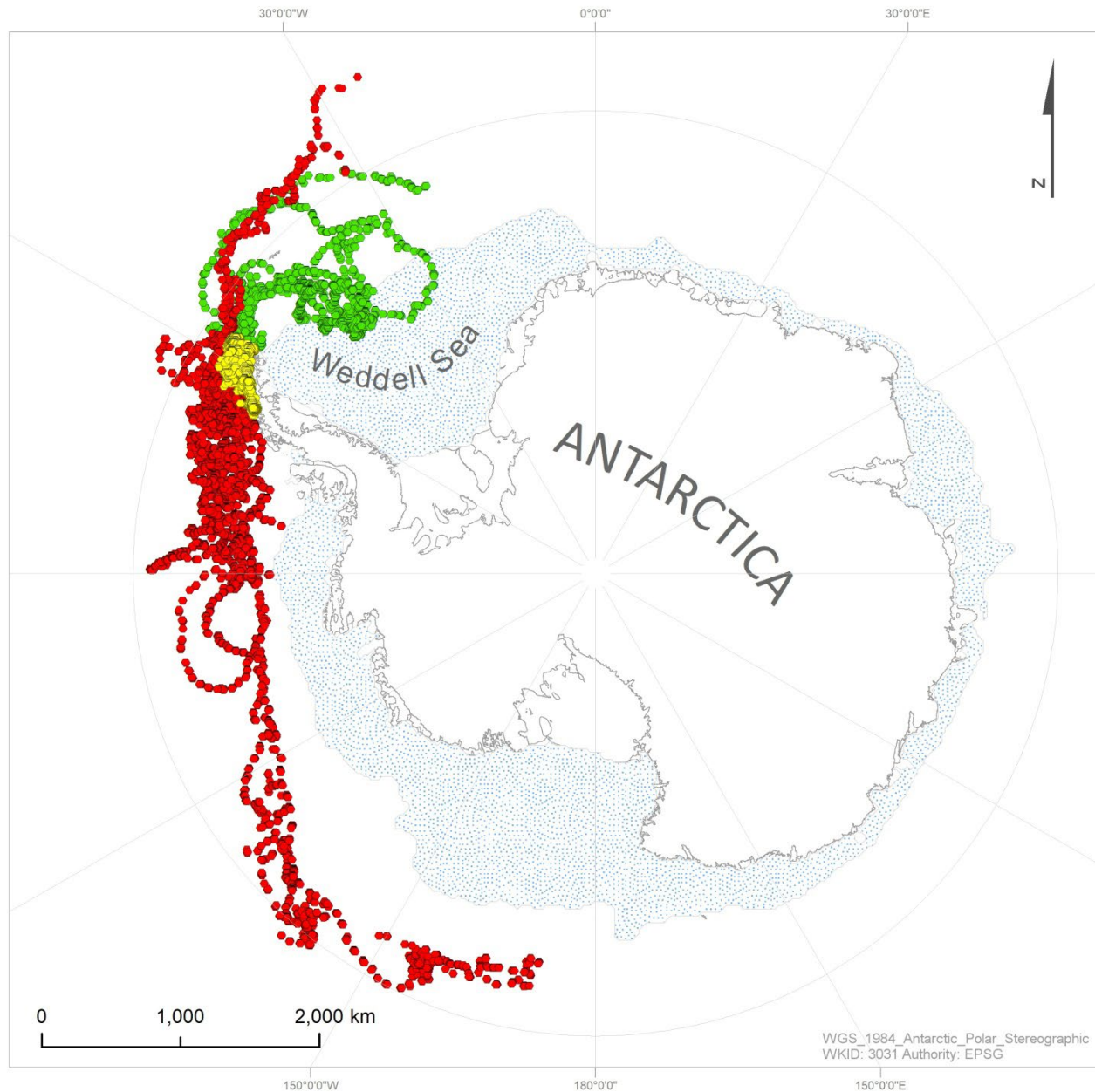


gentoo

Legend

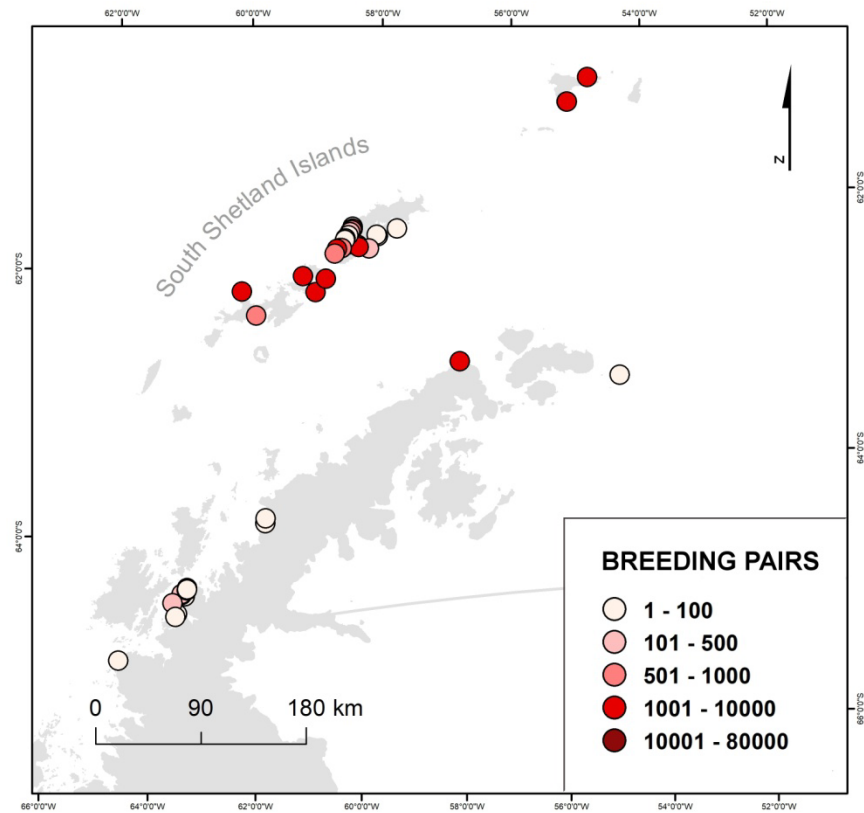
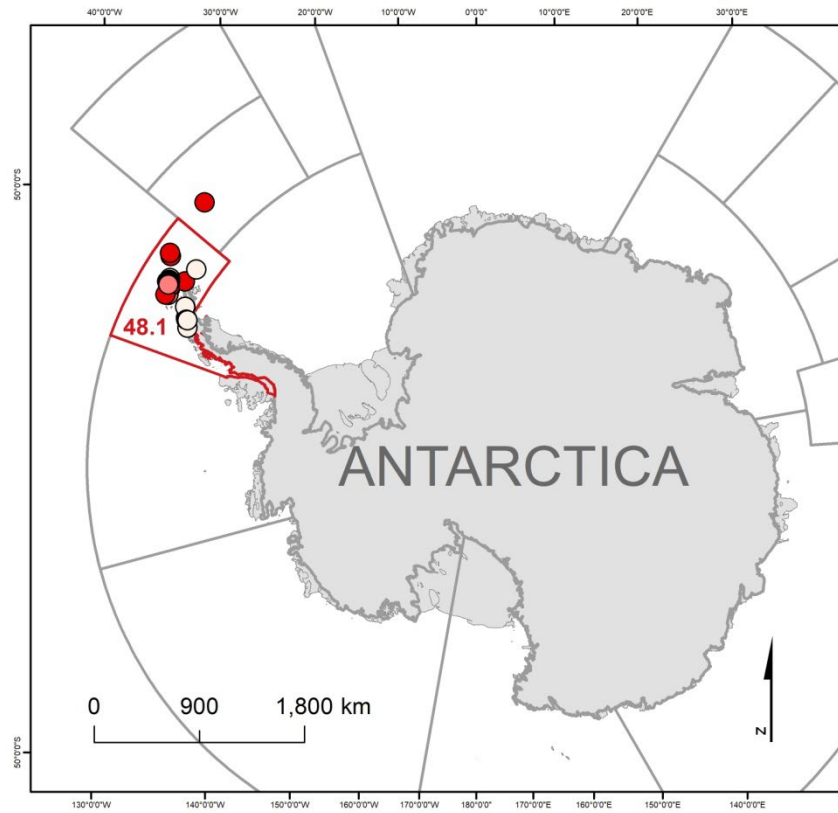
- *Pygoscelis papua*
- *Pygoscelis antarcticus*
- *Pygoscelis adeliae*

historic sea ice extent





48.1 Subarea ~ 161 250 *Pygoscelis antarcticus* breeding pairs

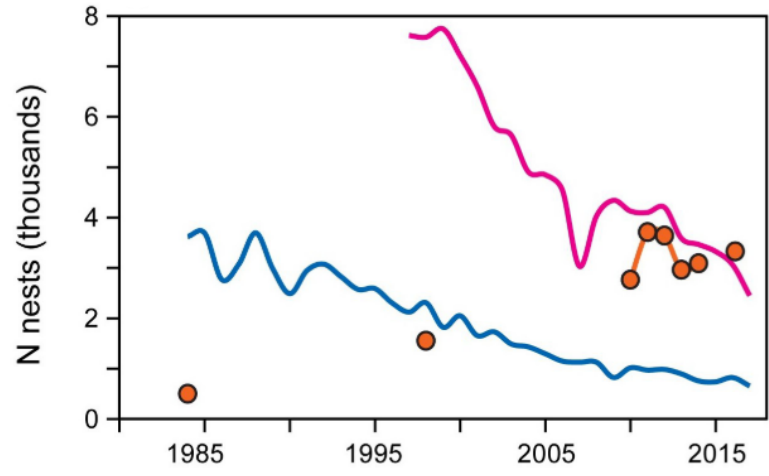
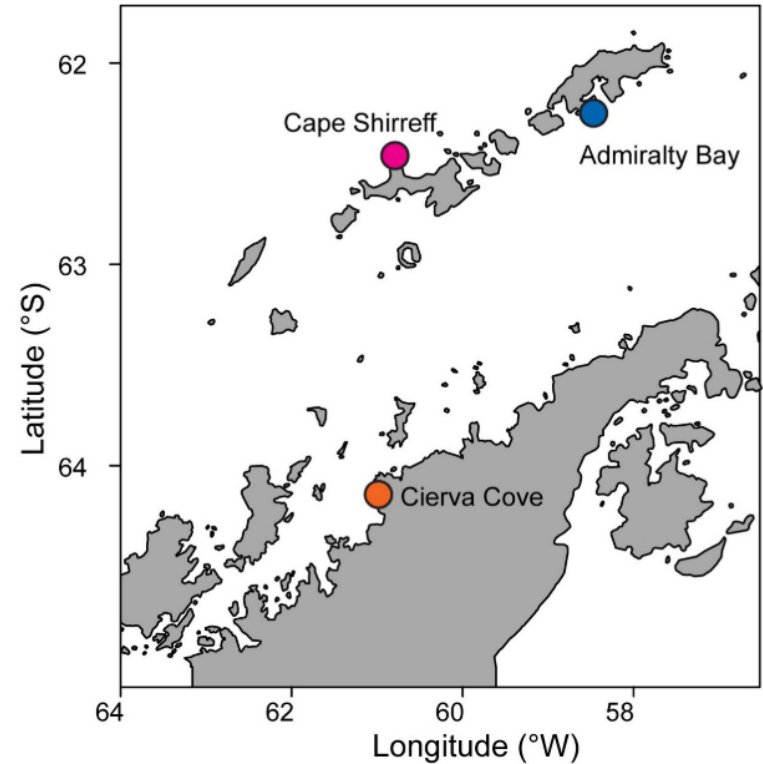




Pygoscelis antarcticus

Aims:

- 1) describe movement patterns from multiple breeding colonies in the Antarctic Peninsula region,
- 2) characterize the physical marine habitats that are used by adult and juvenile chinstrap penguins during the winter period,
- 3) assess the extent of inter-colony and intra-colony overlap in habitat use during winter on a large (e.g., basin-level) and a small (e.g., individual) scales.



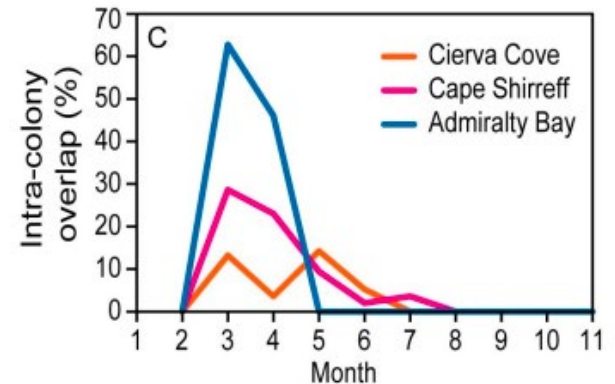
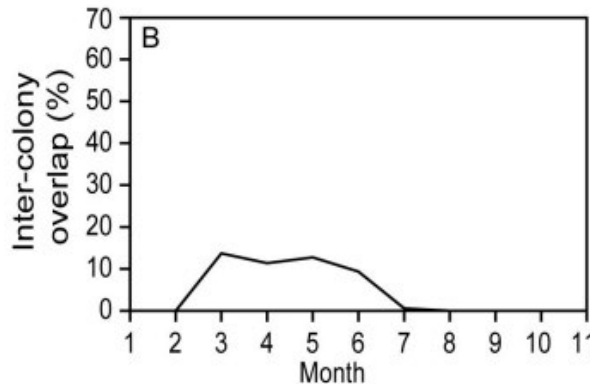
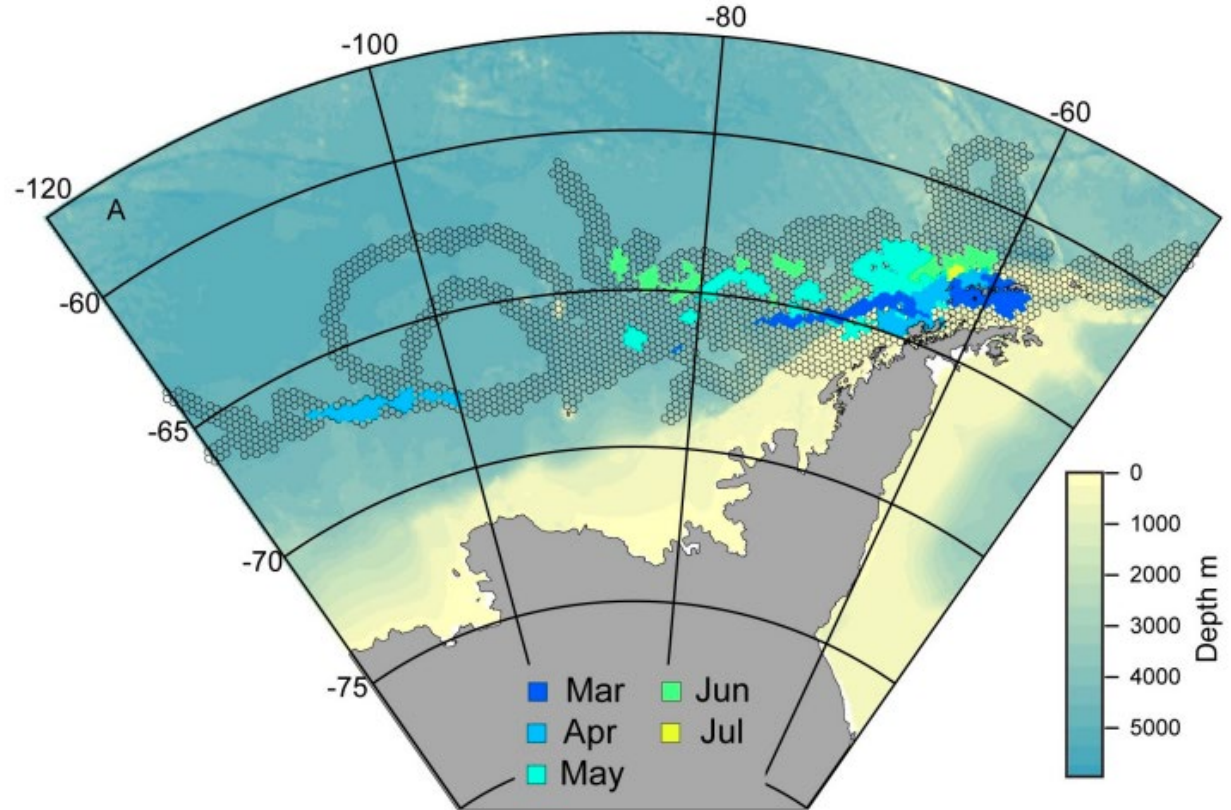


Map and indices of overlap

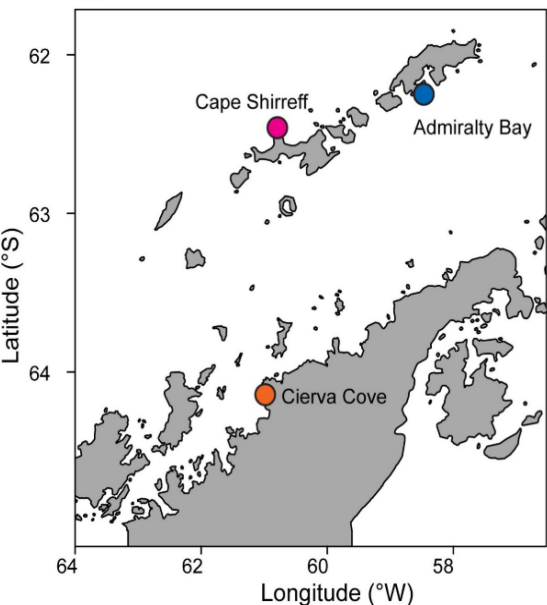
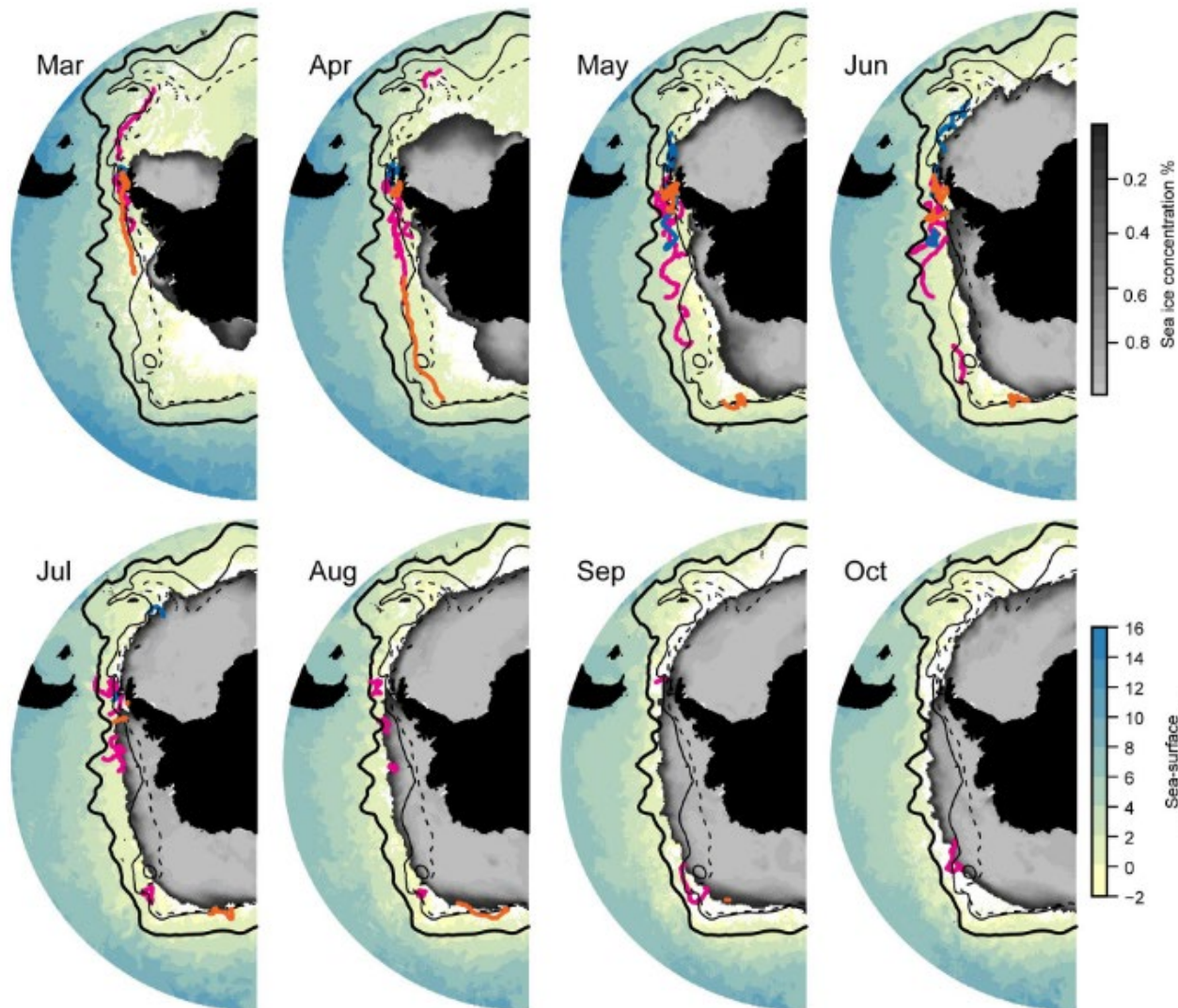
A) Areas of monthly inter-colony overlap from the three tagging locations. For reference, the background HUD (gray) is combined across all months and tagging locations.

B) Monthly inter-colony overlap as a percentage of the total area occupied each month by birds from all colonies.

C) Monthly intra-colony overlap as a percentage of the total area occupied each month by birds from a given colony.

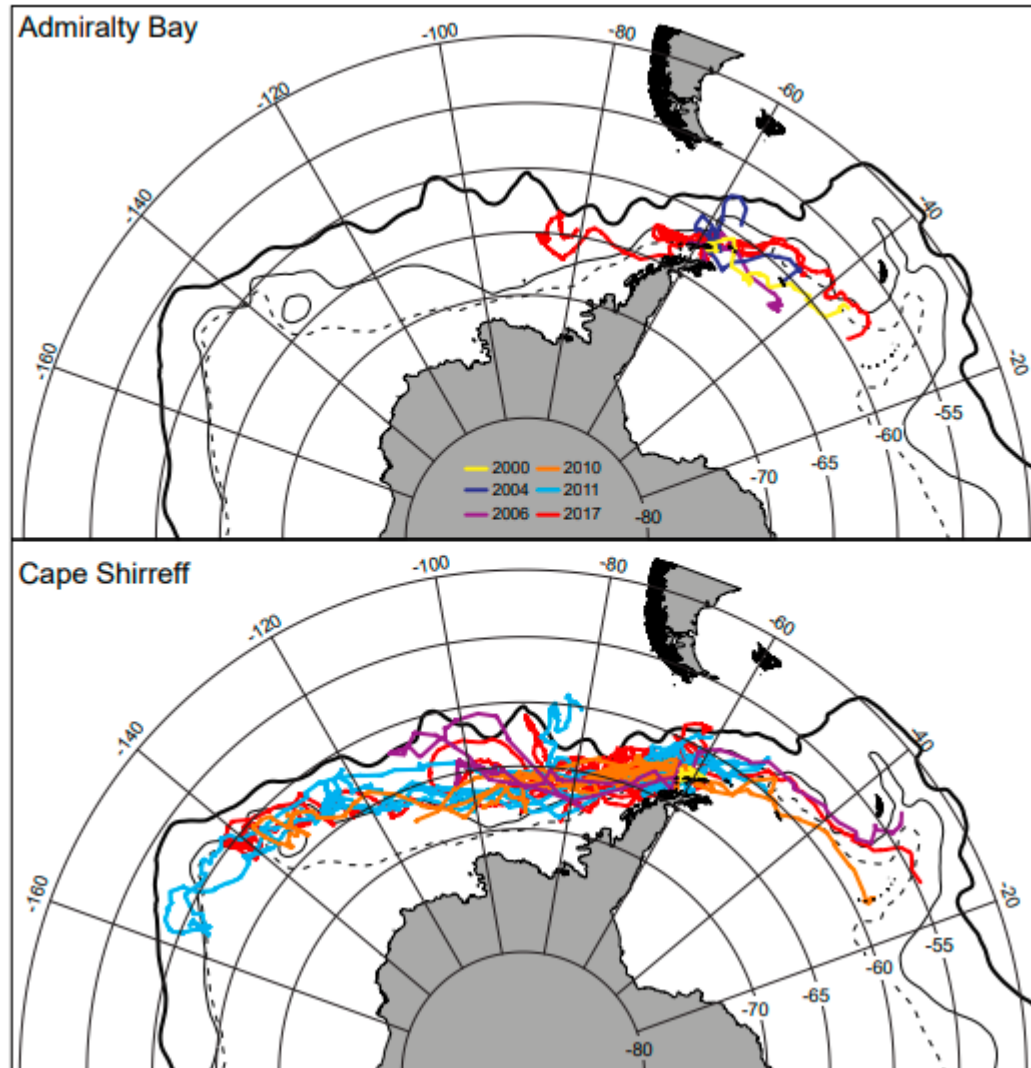


Monthly maps of penguin positions and environmental conditions



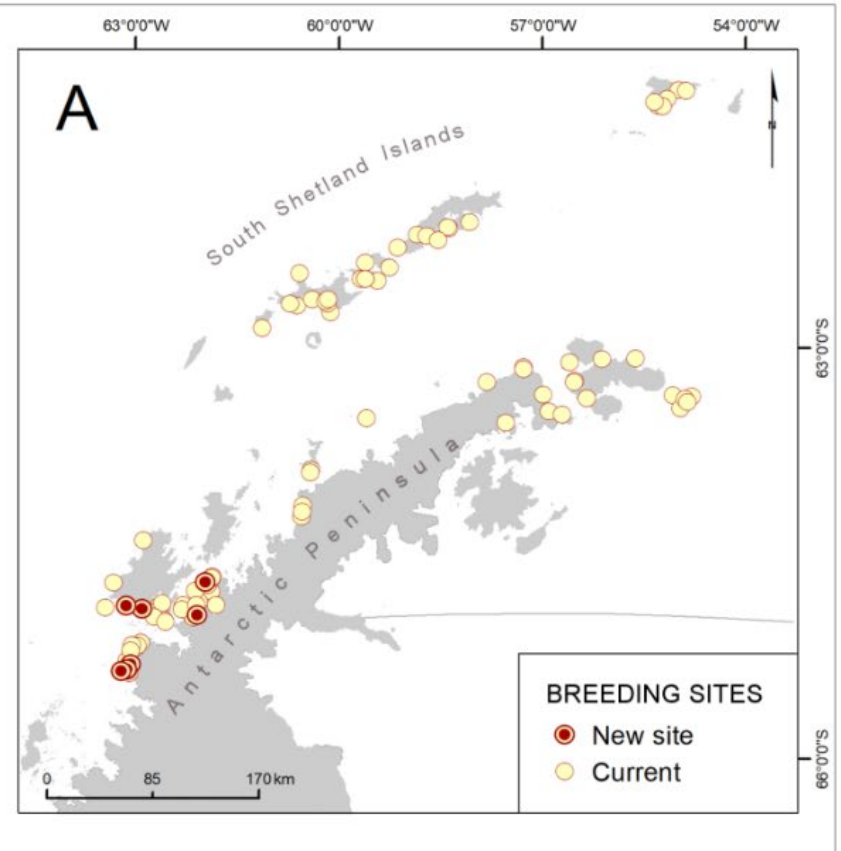
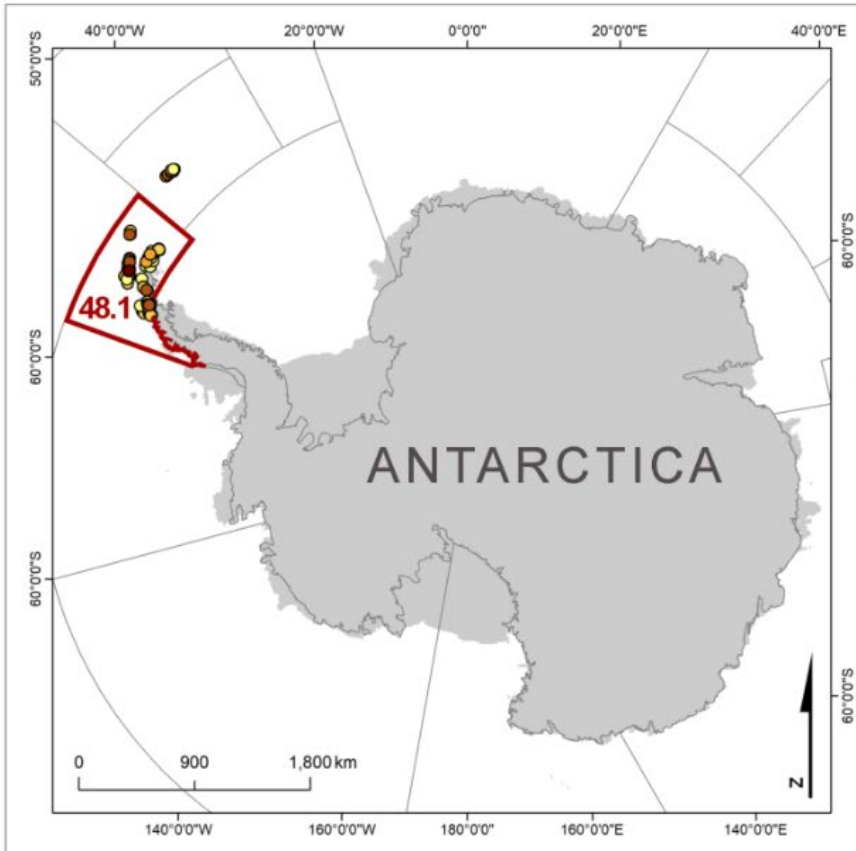


Multi-year tracking data of chinstrap penguins during winter from Admiralty Bay and Cape Shirreff reported previously.





48.1 Subarea ~ 96 781 *Pygoscelis papua* breeding pairs

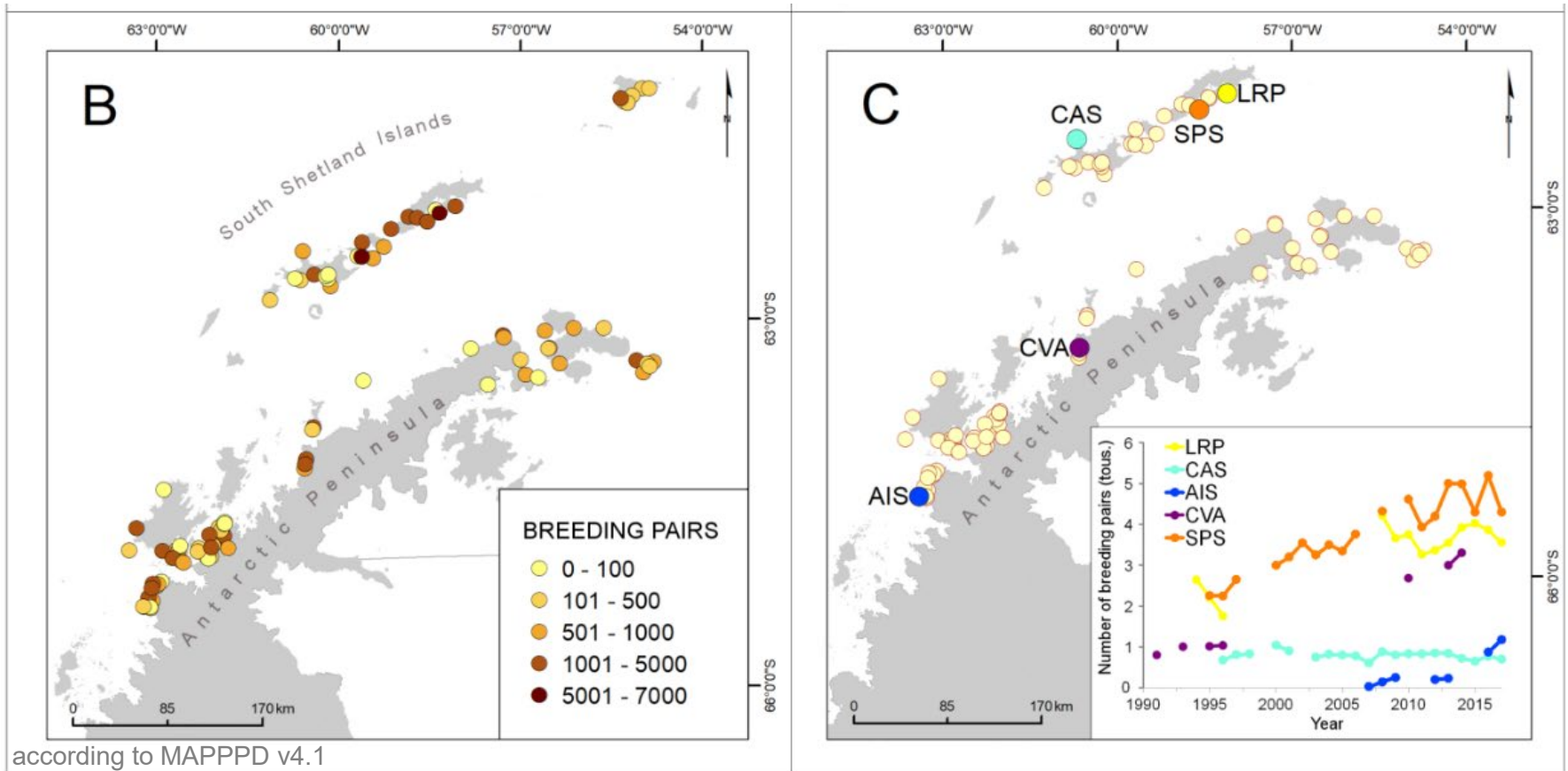


Developed on data according to MAPPPD v4.1

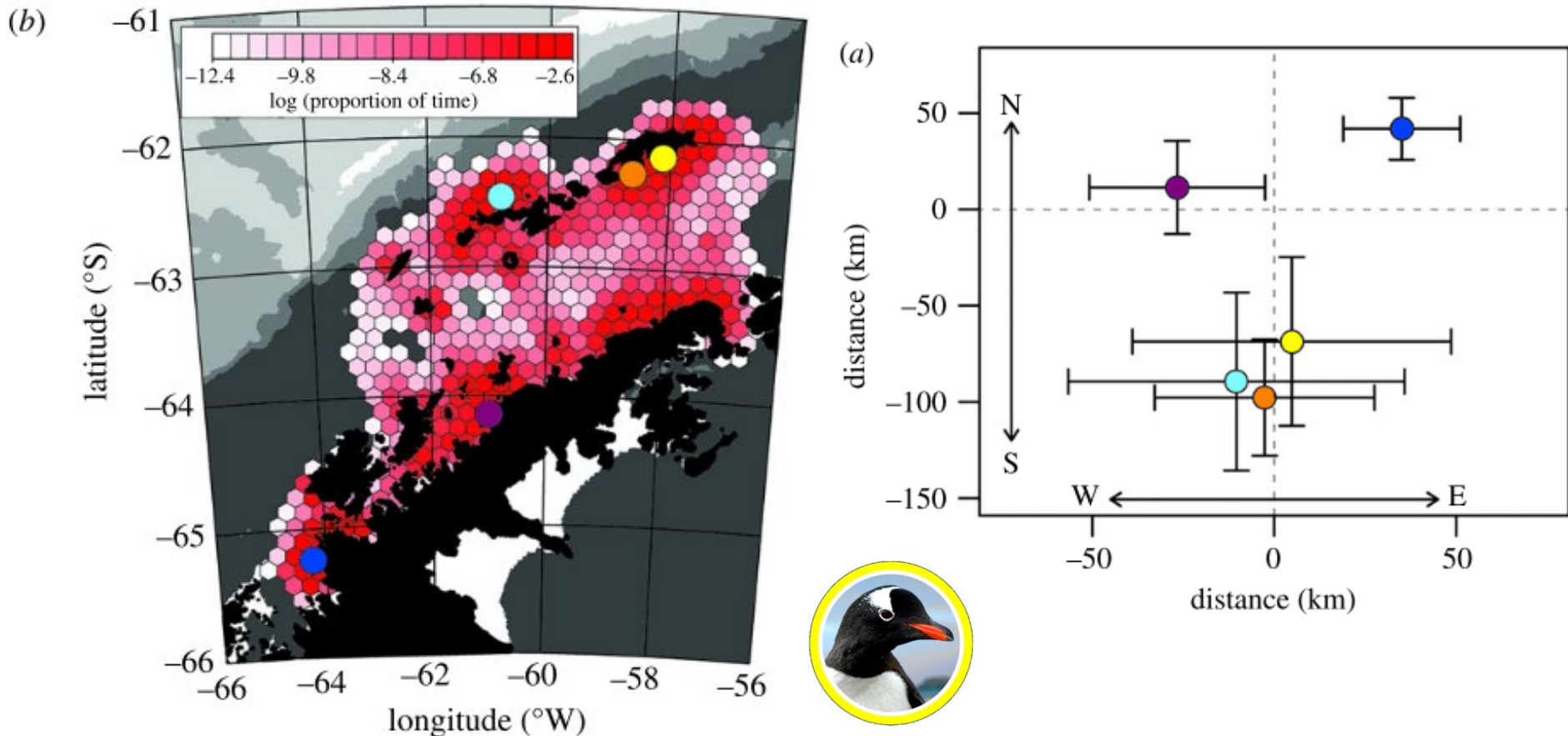


Colony locations are coloured (C):

- Argentine Islands
- Cierva Cove
- Cape Shirreff
- Stranger Point
- Lions Rump



Coastal regions of the northern Antarctic Peninsula are key for gentoo populations



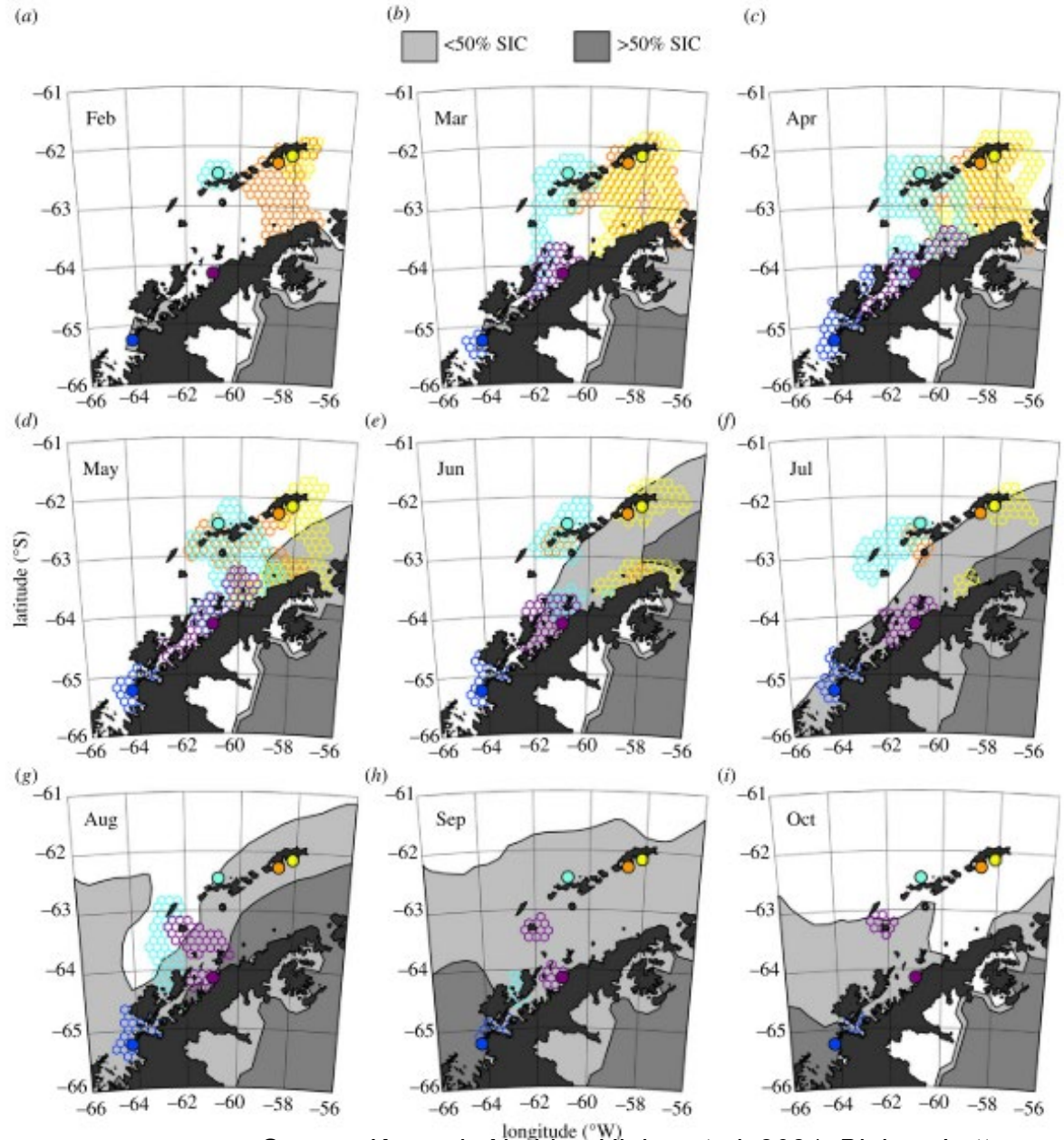
(a) Mean and 95% confidence intervals for positional shifts for birds from the Argentine Islands ●, Cierva Cove ●, Cape Shirreff ●, Stranger Point ● and Lions Rump ●, (b) HUDs for all tracked birds. Colony locations are indicated with circles coloured to match panel (a).



Monthly extents of colony-specific HUDs overlaid on monthly SIC. Colony locations are identified by filled circles.

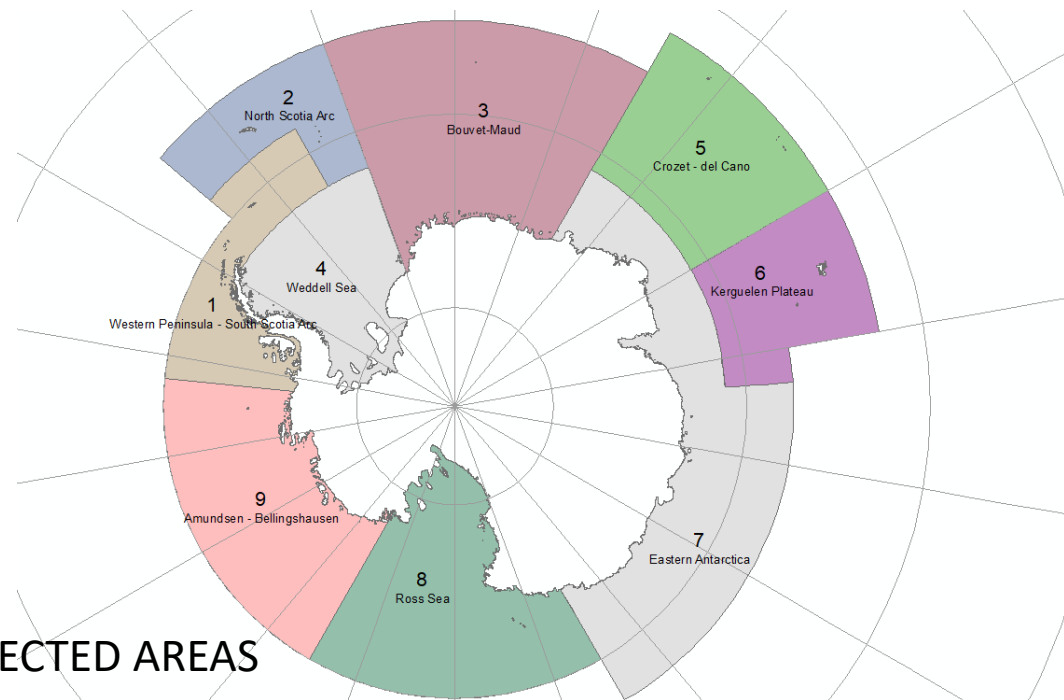
Colony locations and their HUDs are colored :

- Argentine Islands
- Cierva Cove
- Cape Shirreff
- Stranger Point
- Lions Rump.



Estimation of an index of overlap between predator habitats and krill fishing locations to advise the SC-CAMLR on the spatial allocation of krill catches and advance the development of a feedback management strategy.

Data are crucial for ecosystem-based management and ongoing work on the design of marine protected areas (MPAs).



PLANNED DOMAINS of MARINE PROTECTED AREAS

CCAMLR WG- EMM

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(2) The data used in the paper were collected based on Henryk Arctowski Polish Antarctic Station.