Trophic ecology of Southern Ocean sea stars

inferred from stable isotopes ratios of C and N

Baptiste Le Bourg, Alice Blanchard, Bruno Danis, Quentin Jossart, Gilles Lepoint, Camille Moreau, Loïc N. Michel

pictures: Norbert Wu, Dirk Schories

- 12% of known sea star species living in the Southern Ocean
- Important group of Antarctic benthos with known trophic diversity

Predator
(ex: *Lophaster gaini*)

Scavenger
(ex: *Odontaster validus*)

Ciliary mucous-feeder
(ex: *Glabraster antarctica*)

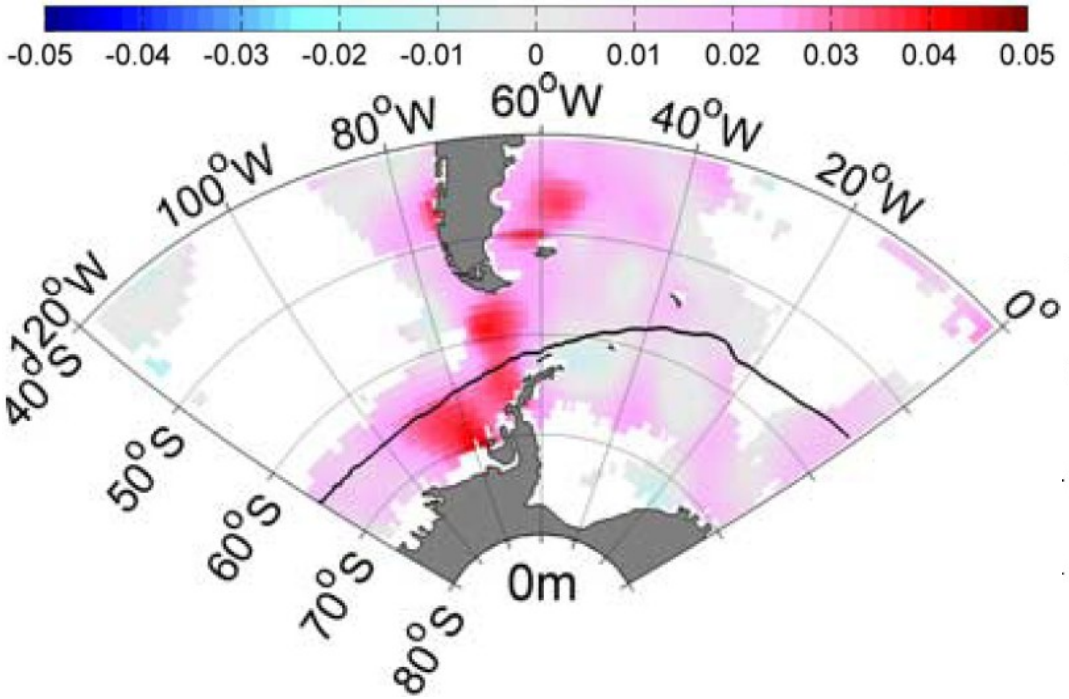
- Sea stars will have to face new kind of stress because of climate change

pictures: Shawn Harper, Norbert Wu

- Antarctic: ice-covered waters during winter

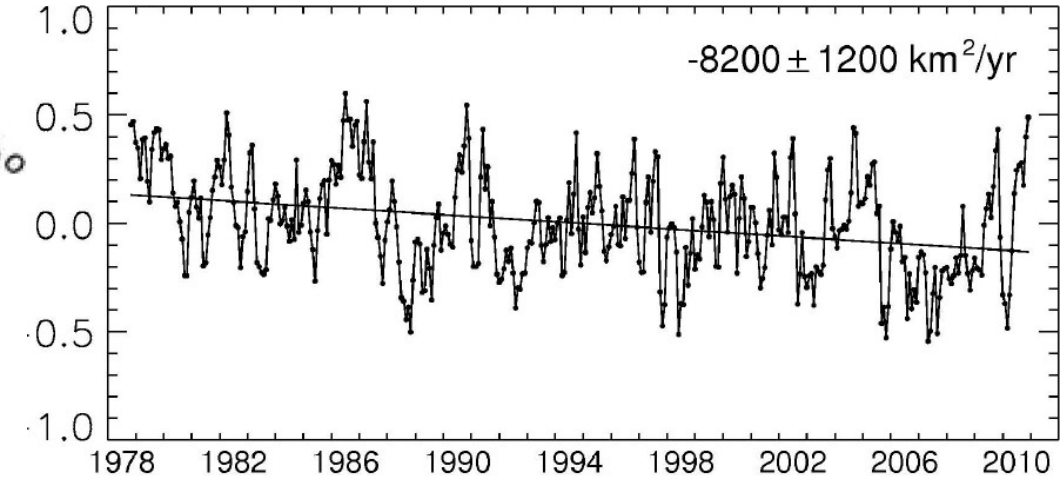
  Subantarctic: ice-free waters during winter

Ocean temperature trend
(°C/yr, 1955-1998)



Meredith and King, 2005

Sea ice extent monthly trend
(10^6 km^2, 1978-2010)



Parkinson and Cavalier, 2012

- Western Antarctic: **increase** of ocean temperature and **decrease** of sea ice extent
- Impact on potential prey of sea stars

Objectives

- To compare regional differences of trophic diversity, variability and plasticity in Antarctic and Subantarctic regions

  ➡ Isotopic niches

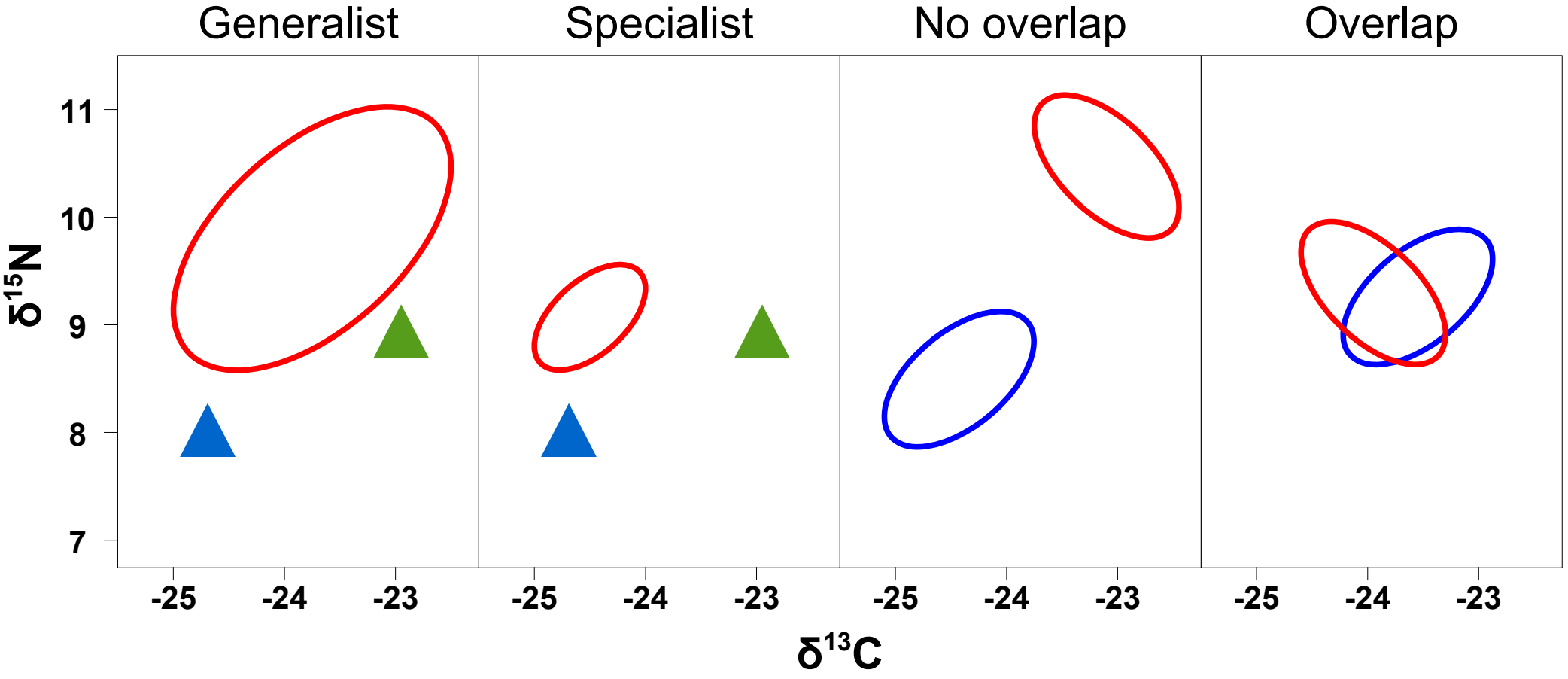
- Trophic diversity: differences in trophic ecology between species?

  Trophic variability: specialist or generalist species?

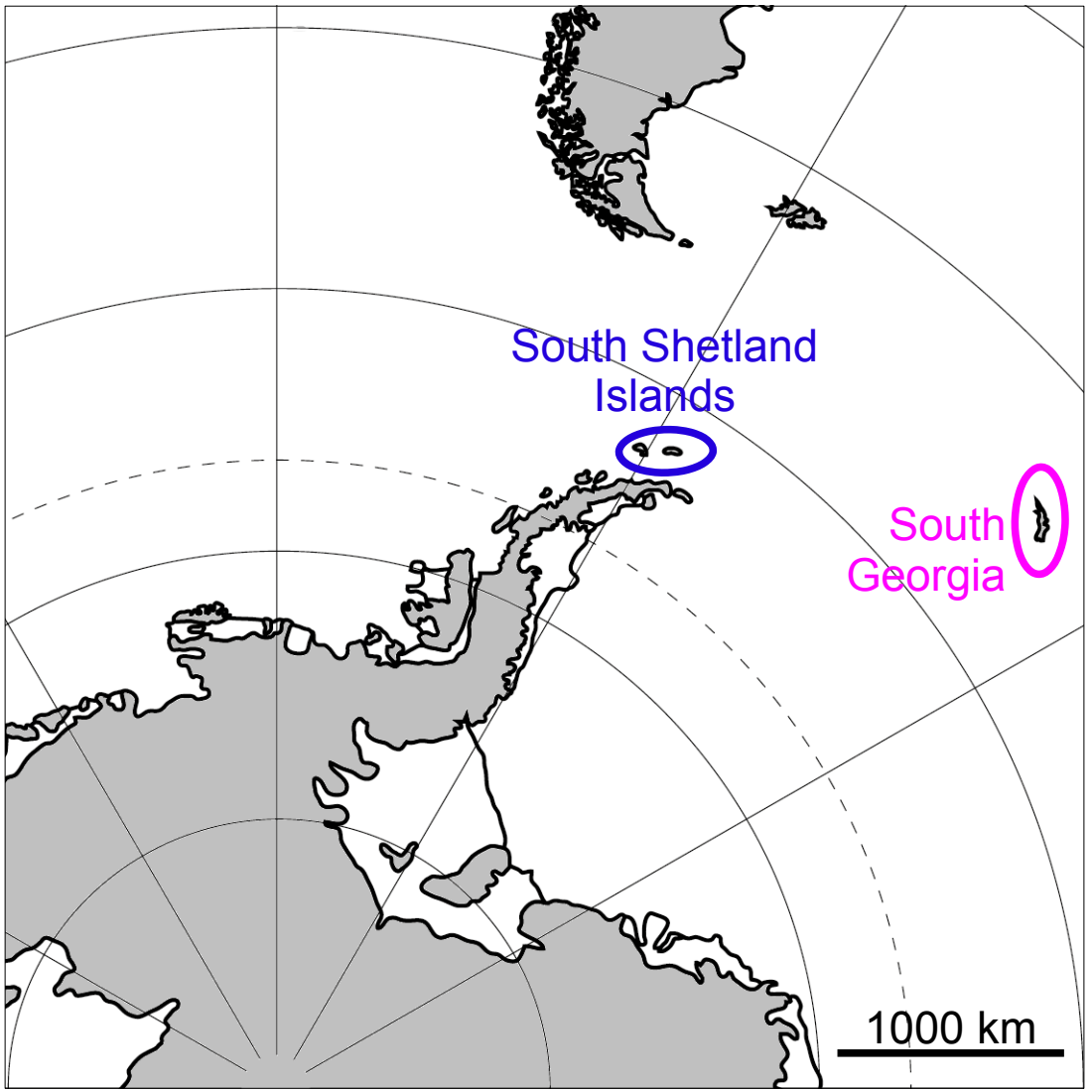
  Trophic plasticity: ability to modify trophic ecology?

Using stable isotopes in trophic ecology

- Stable isotope composition of an organism reflects stable isotope composition of its food
- Isotopic niche ↔ trophic niches ➡ estimation of trophic diversity, trophic plasticity and diet overlap with ellipse areas (SIBER package of R)



Sampling



13 species (138 specimens)

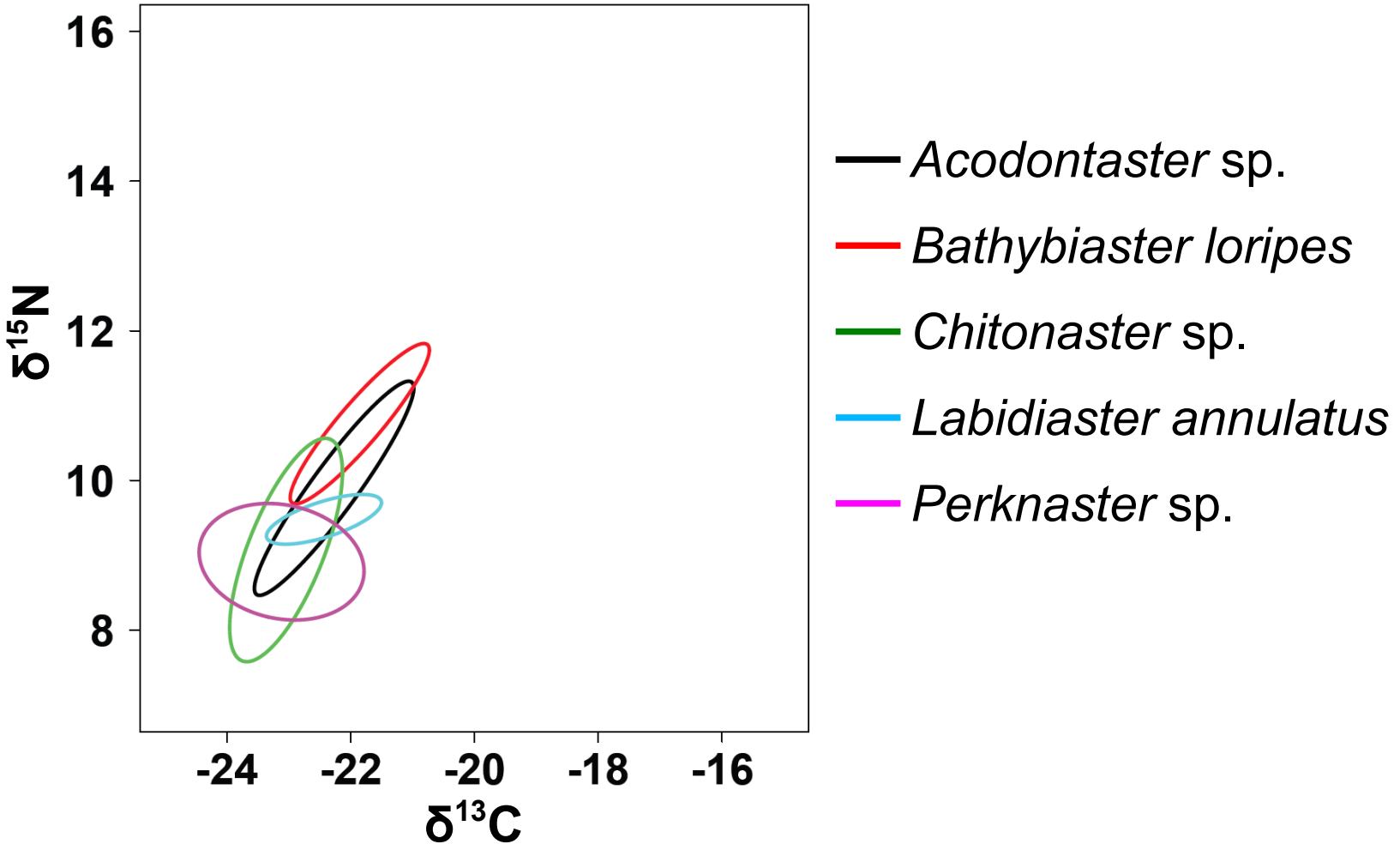
South Shetland Islands: Antarctic

South Georgia: Subantarctic

$\delta^{13}C$ and $\delta^{15}N$ in tegument measured by EA-IRMS

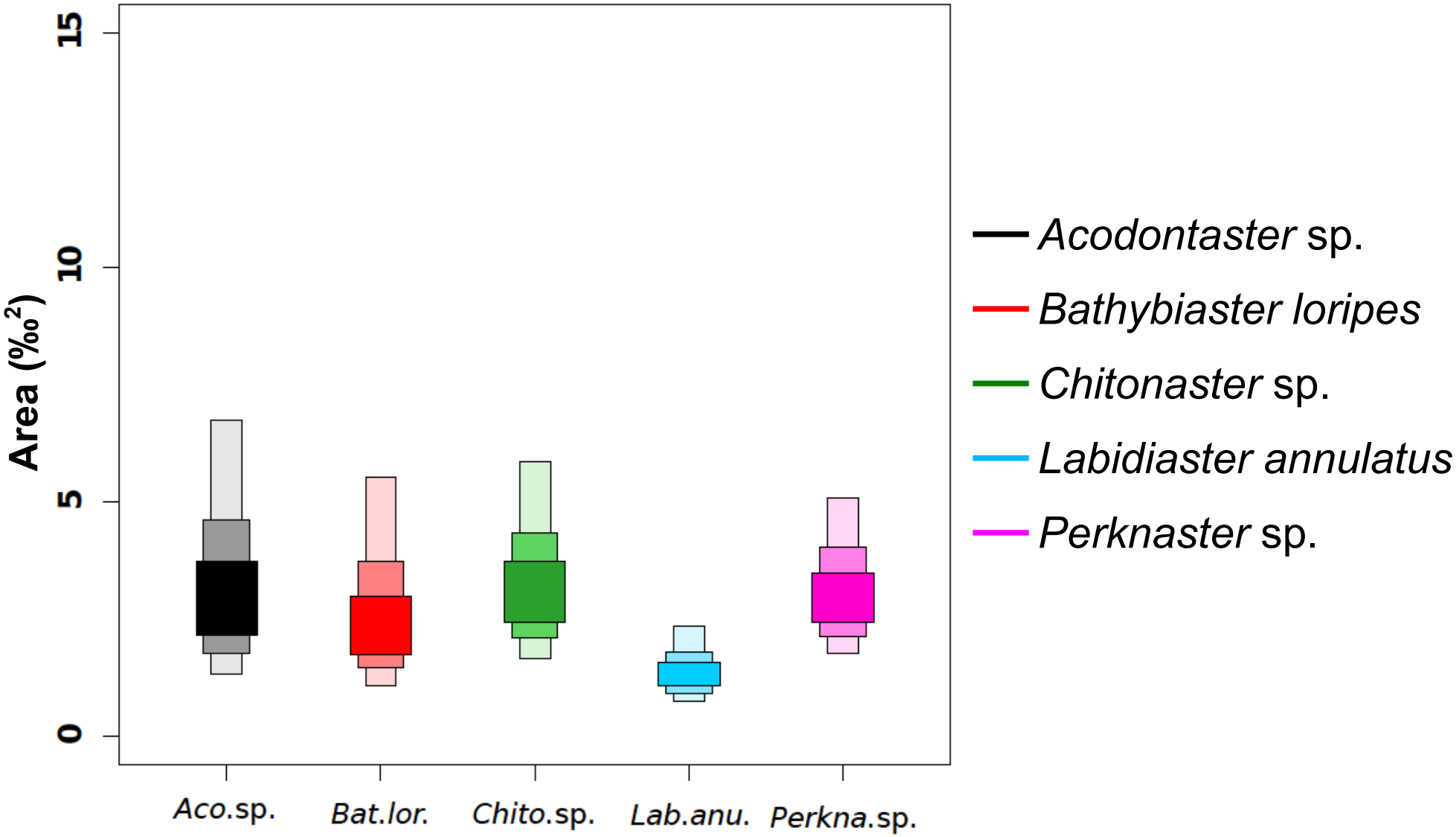
Specimens provided by British Antarctic Survey

South Shetland Islands



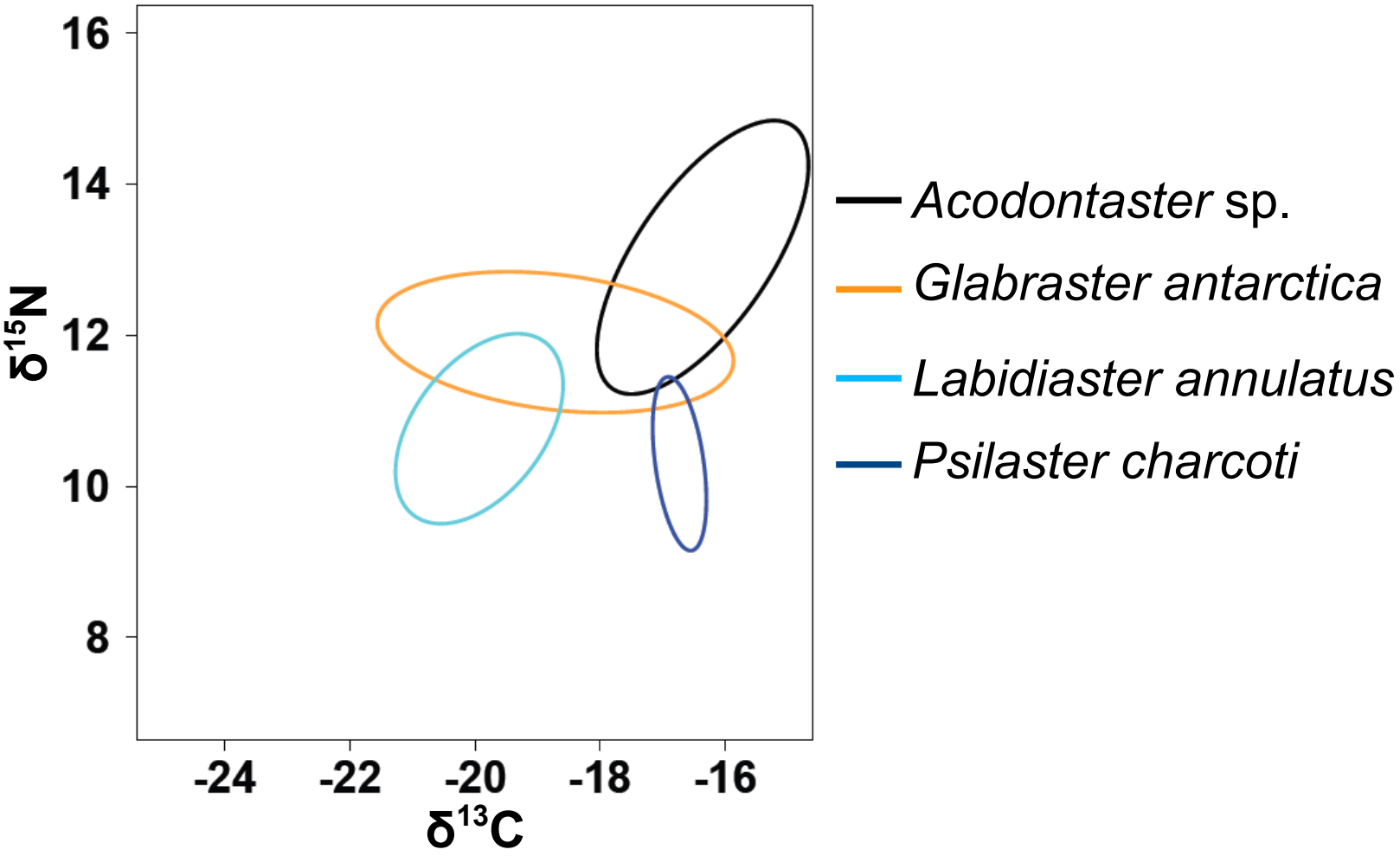
- Few differences between the most sampled species
- Low dispersion of stable isotope ratios
- High overlap (may be higher than 50 % for some species)

South Shetland Islands



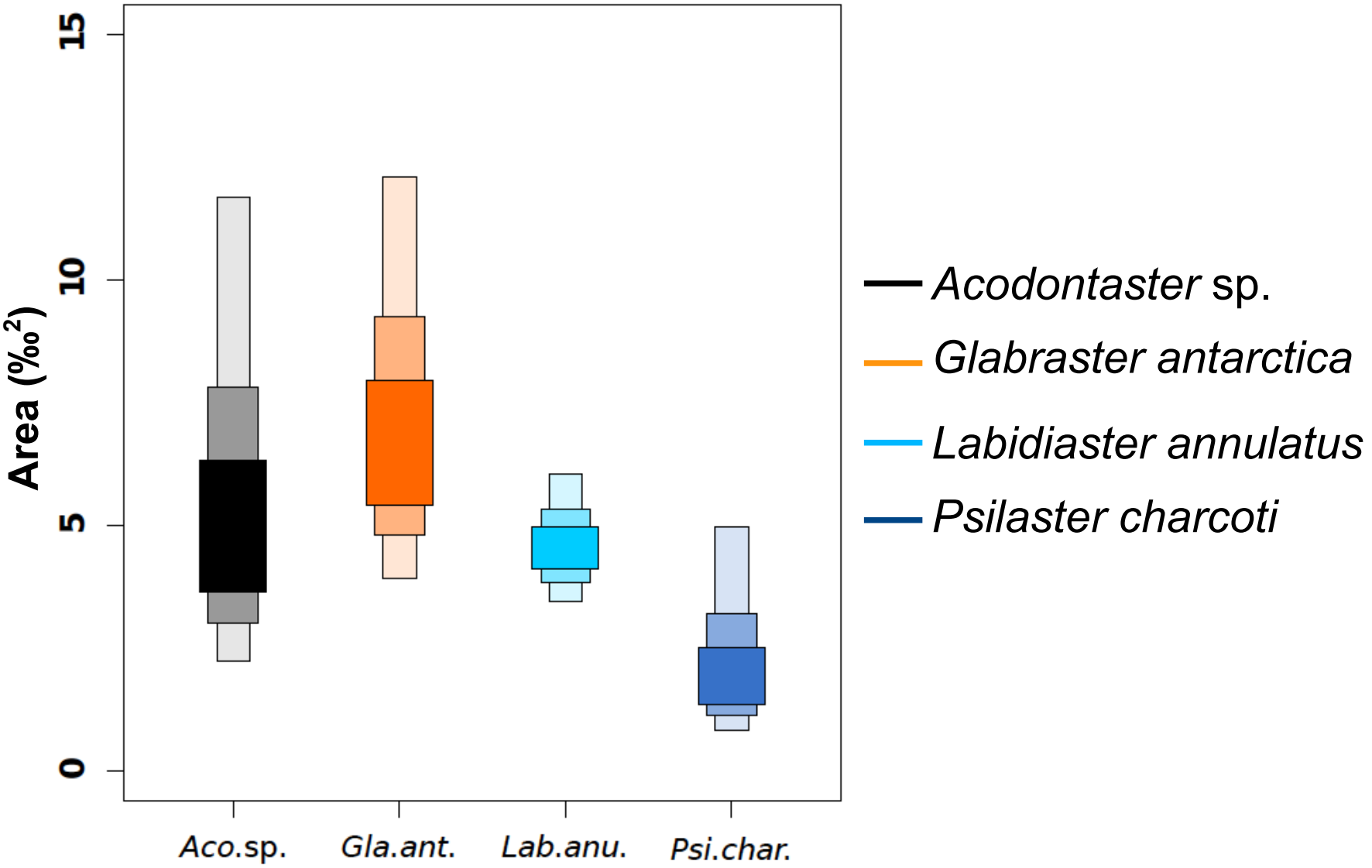
- Few differences in isotopic niche areas between species

South Georgia



- High $\delta^{13}C$ range
- High dispersion of stable isotope ratios
- Low overlap (lower than 50 %)

South Georgia

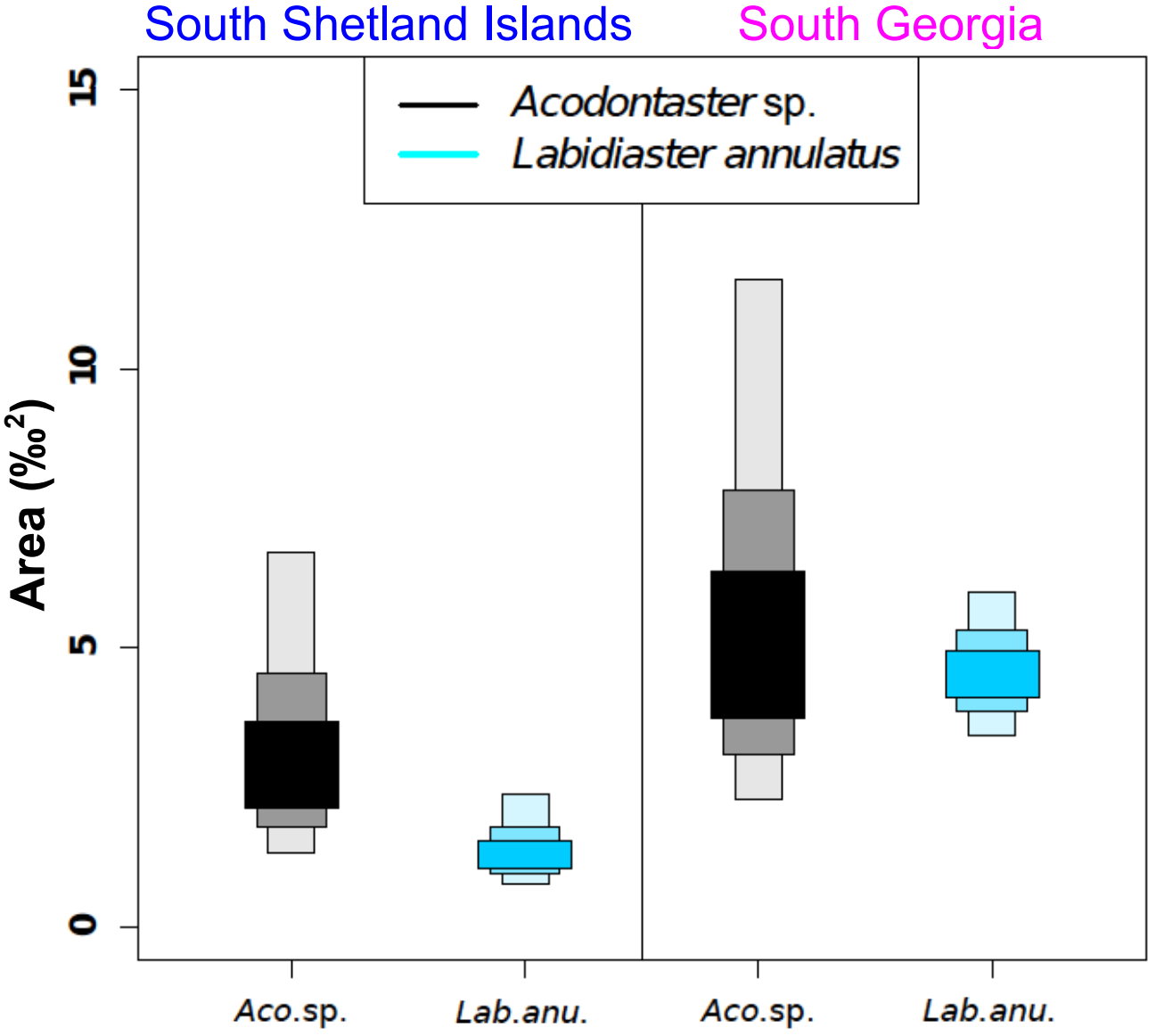


- Few differences between isotopic niche areas

Comparison of isotopic niche areas for two species sampled in both regions

Acodontaster sp.

Labidiaster annulatus

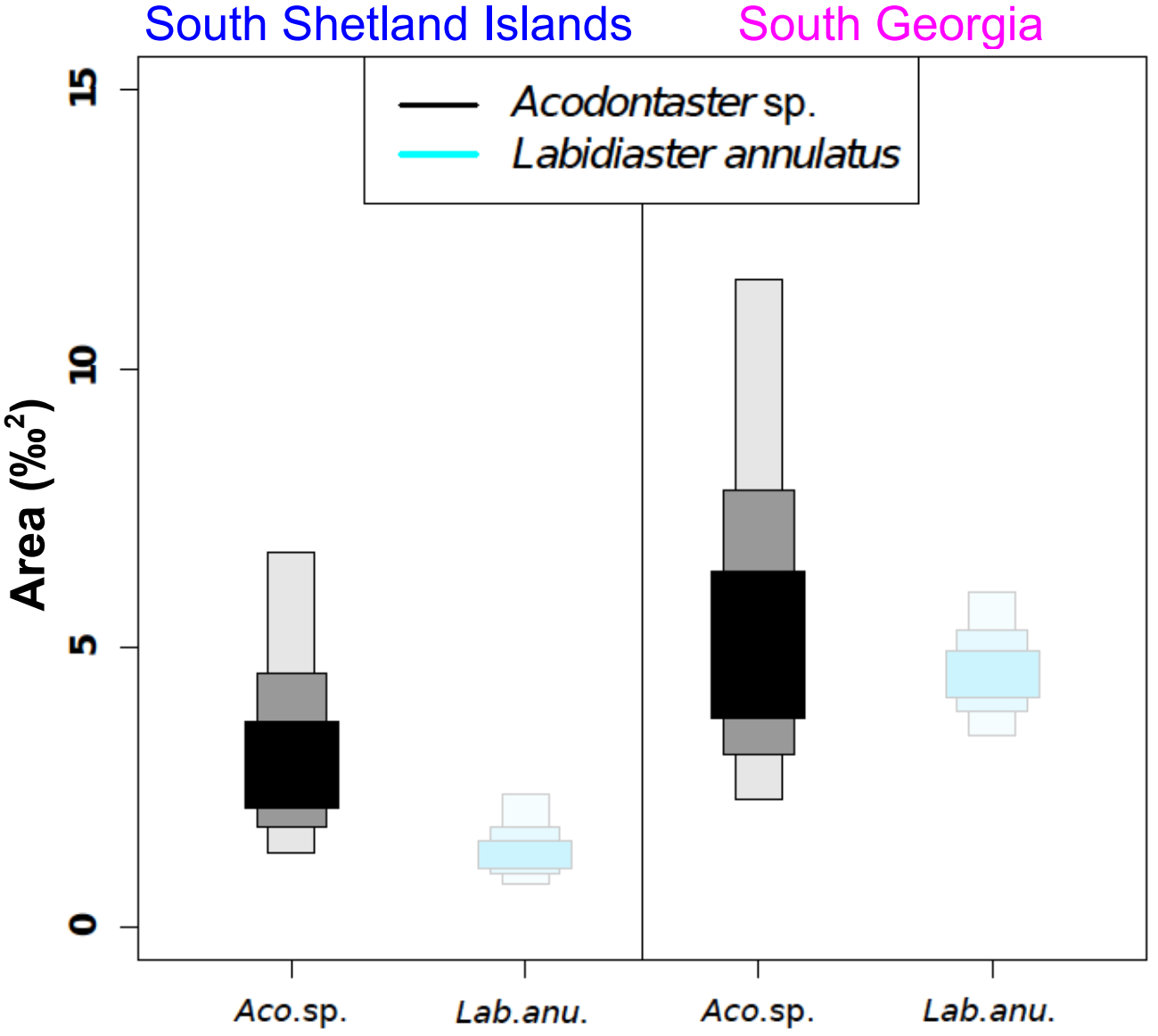


pictures: Paul Cziko, NIWA

Comparison of isotopic niche areas for two species sampled in both regions

Acodontaster sp.

Labidiaster annulatus

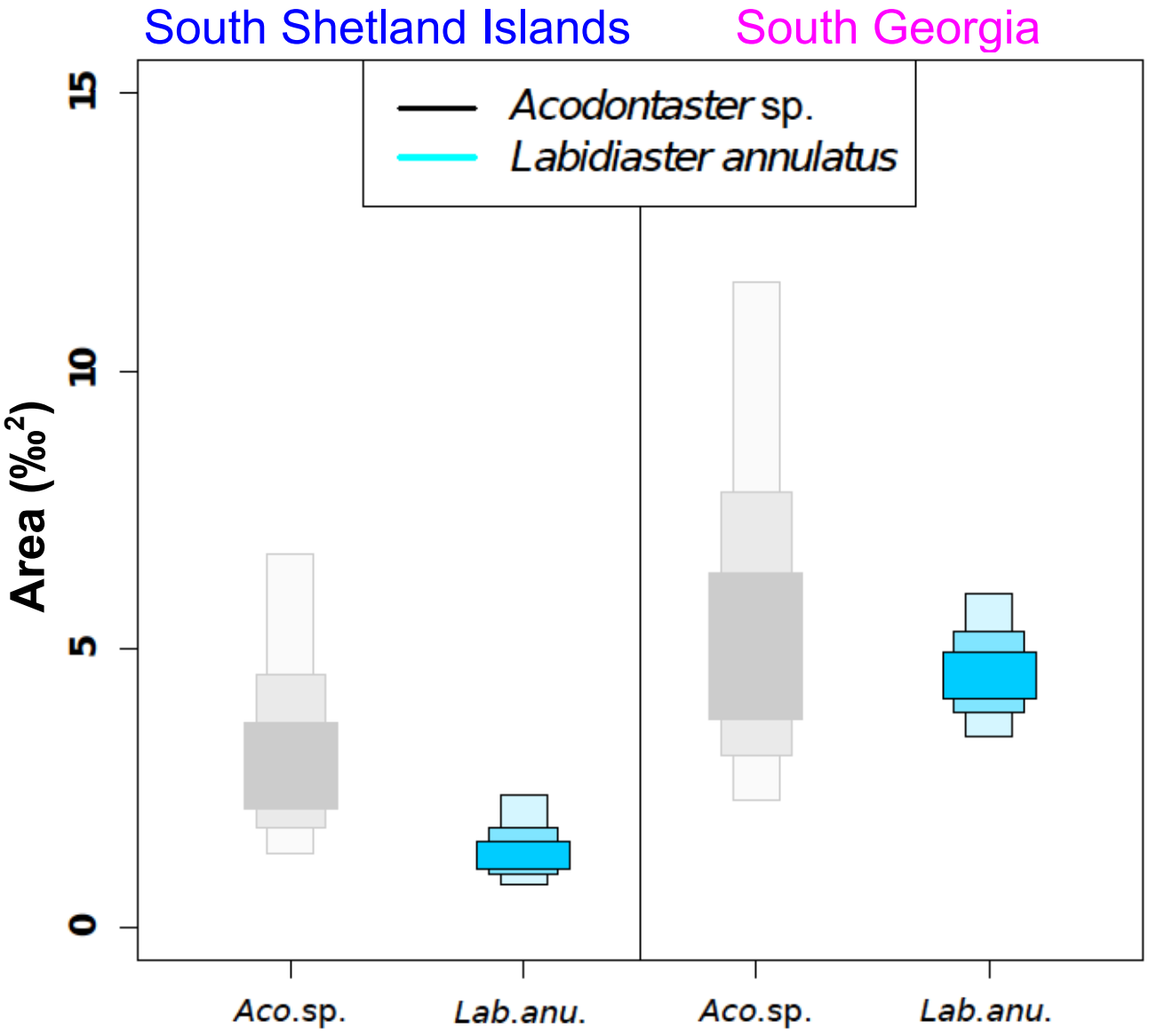


pictures: Paul Cziko, NIWA

Comparison of isotopic niche areas for two species sampled in both regions

Acodontaster sp.

Labidiaster annulatus

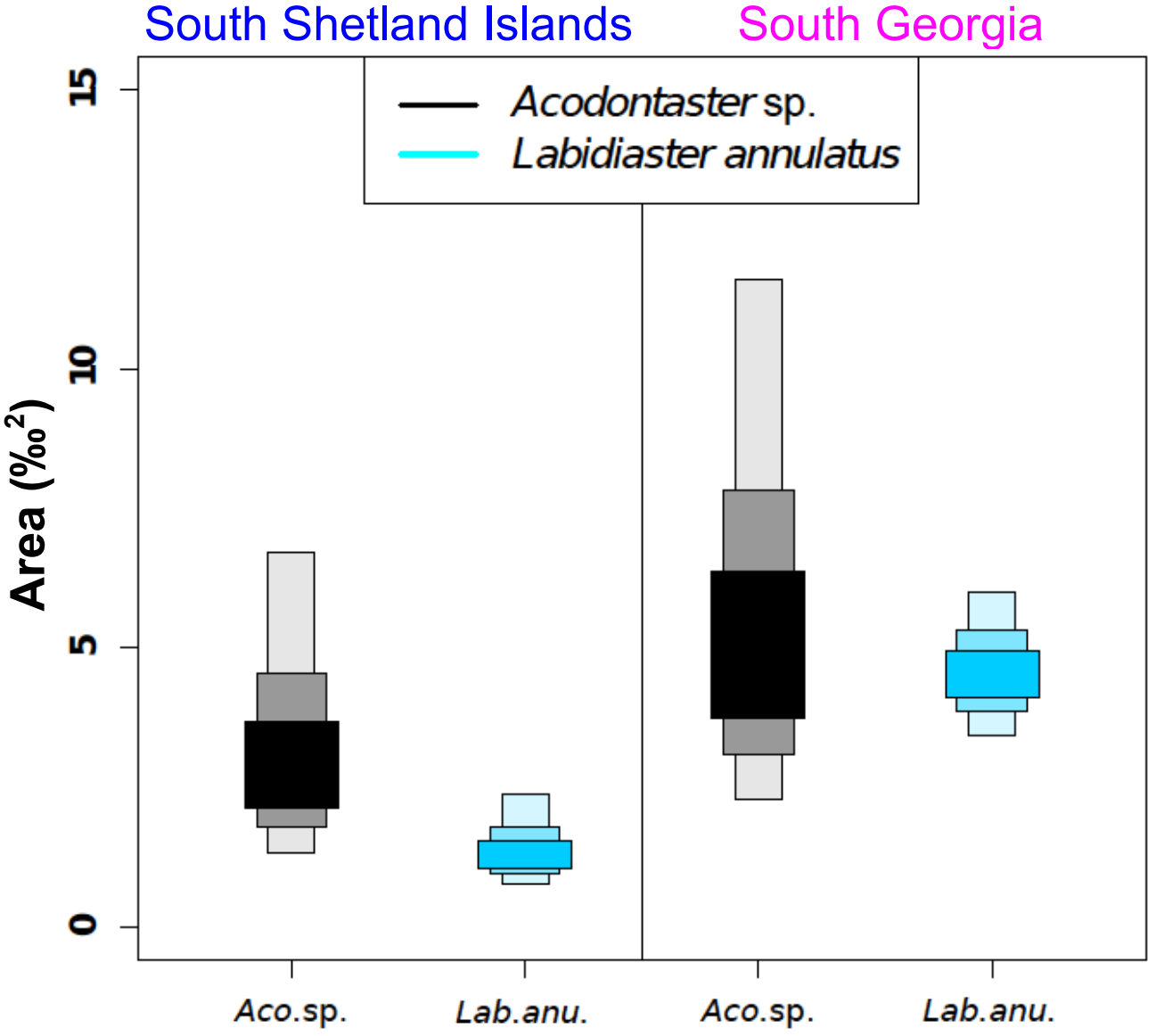


pictures: Paul Cziko, NIWA

Comparison of isotopic niche areas for two species sampled in both regions

Acodontaster sp.

Labidiaster annulatus



pictures: Paul Cziko, NIWA

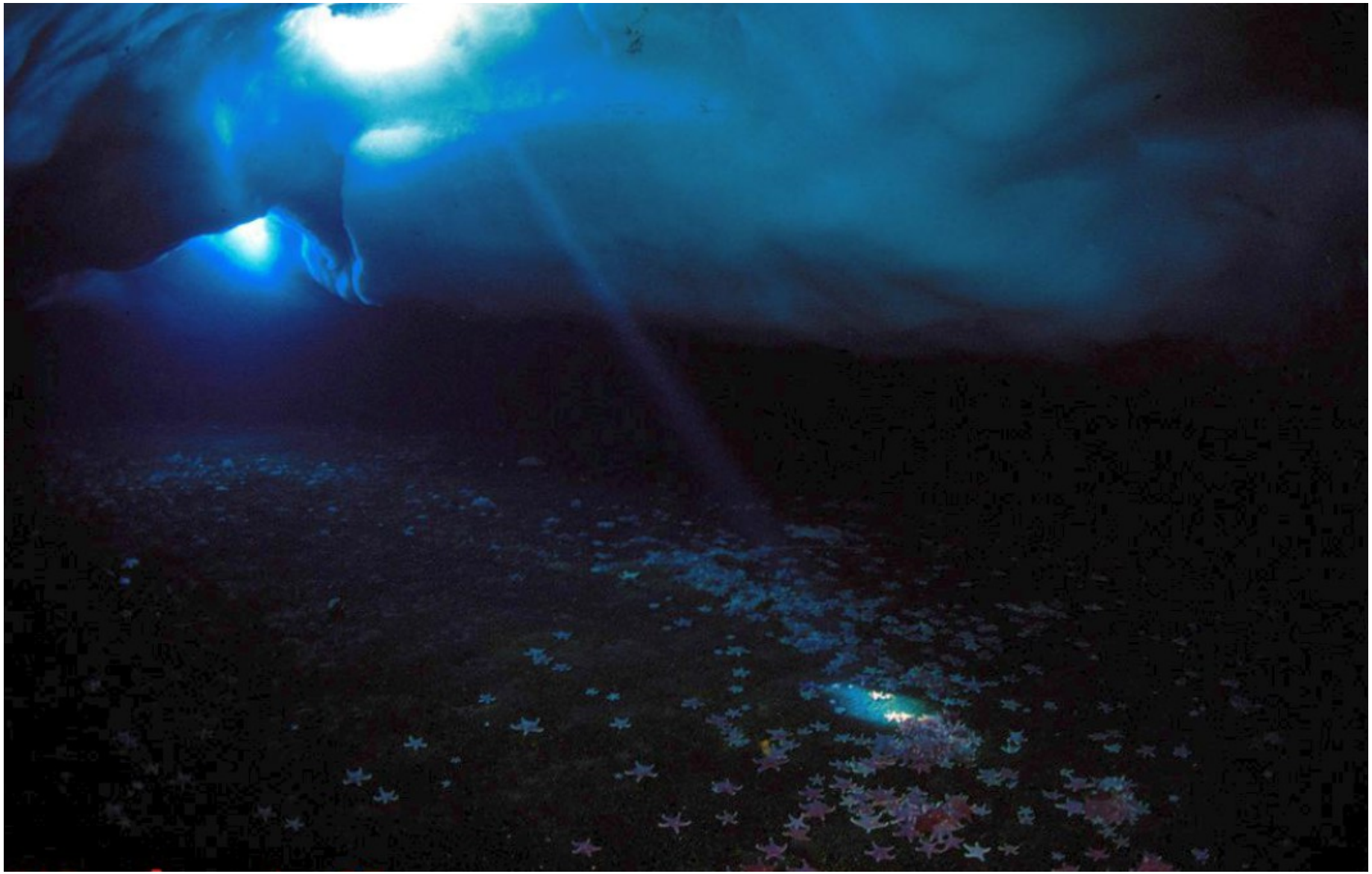
Conclusions

- Specialist and generalist species in both regions

Antarctic (South Shetland Islands)	**Subantarctic** (South Georgia)
Low isotopic diversity	High isotopic diversity
Low isotopic variability	High isotopic variability
High overlap	Low overlap
More specialised diet	**More generalist diet**

How explaining? Differential sea ice covering during winter?

Thank you for your attention



This work is part of vERSO (Ecosytem Response to global change: a multiscale approach in Southern Ocean) and RECTO (Refugia and Ecosystem Tolerance in the Southern Ocean) projects funded by BELSPO

picture: Norbert Wu