

Influence of environmental conditions on trophic niche partitioning among sea stars assemblages

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



Predator
(ex: *Lophaster gaini*)



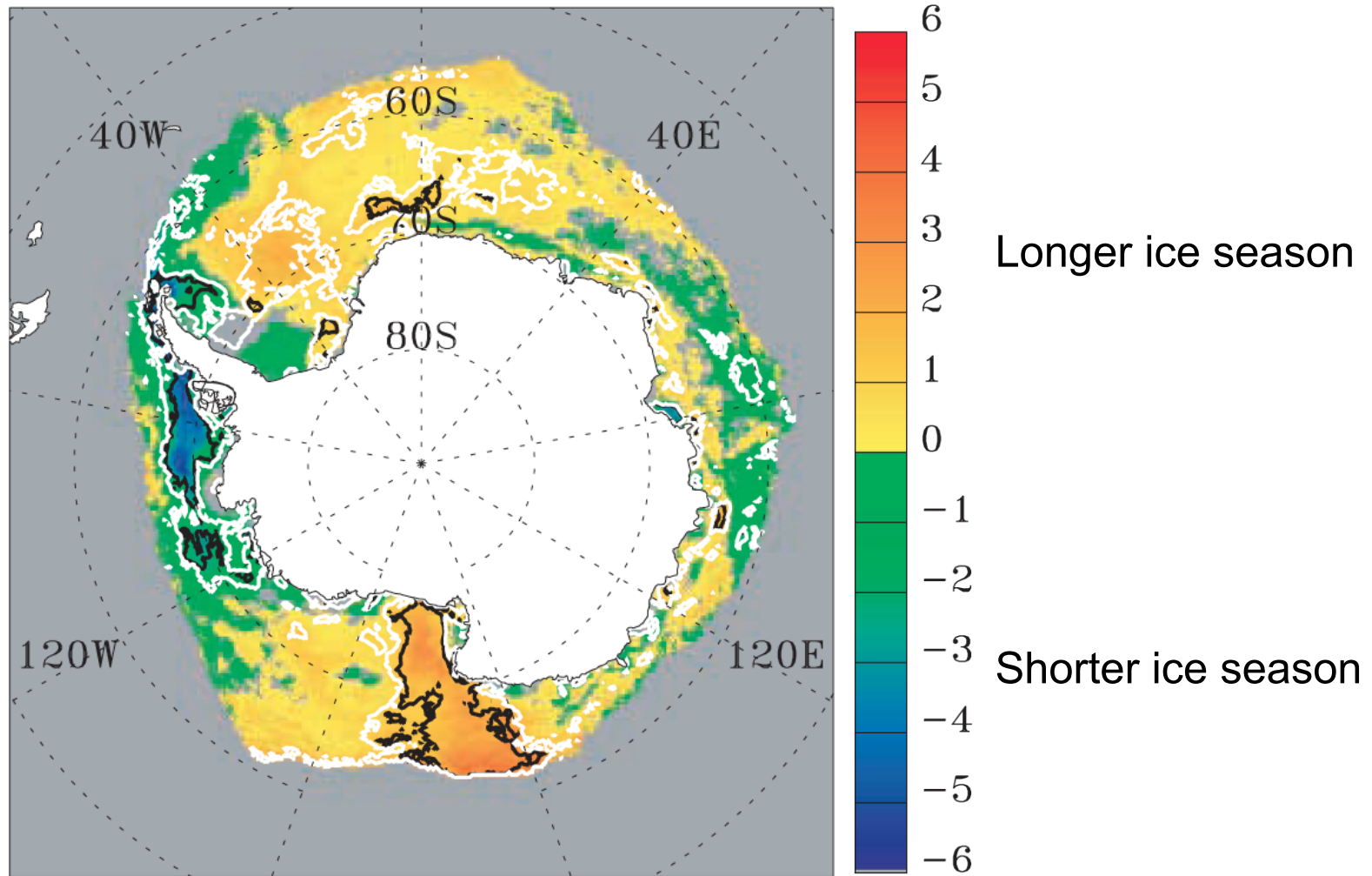
Scavenger
(ex: *Odontaster validus*)



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

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

1979-2004 Ice season duration changes (days/year)



Stammerjohn et al., 2008

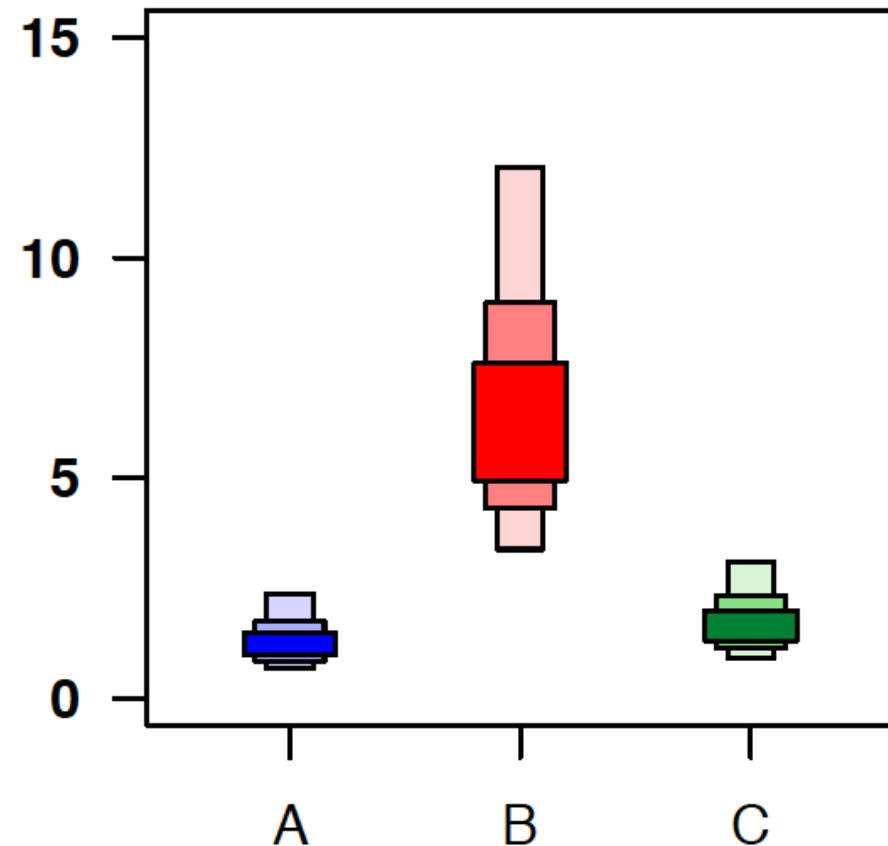
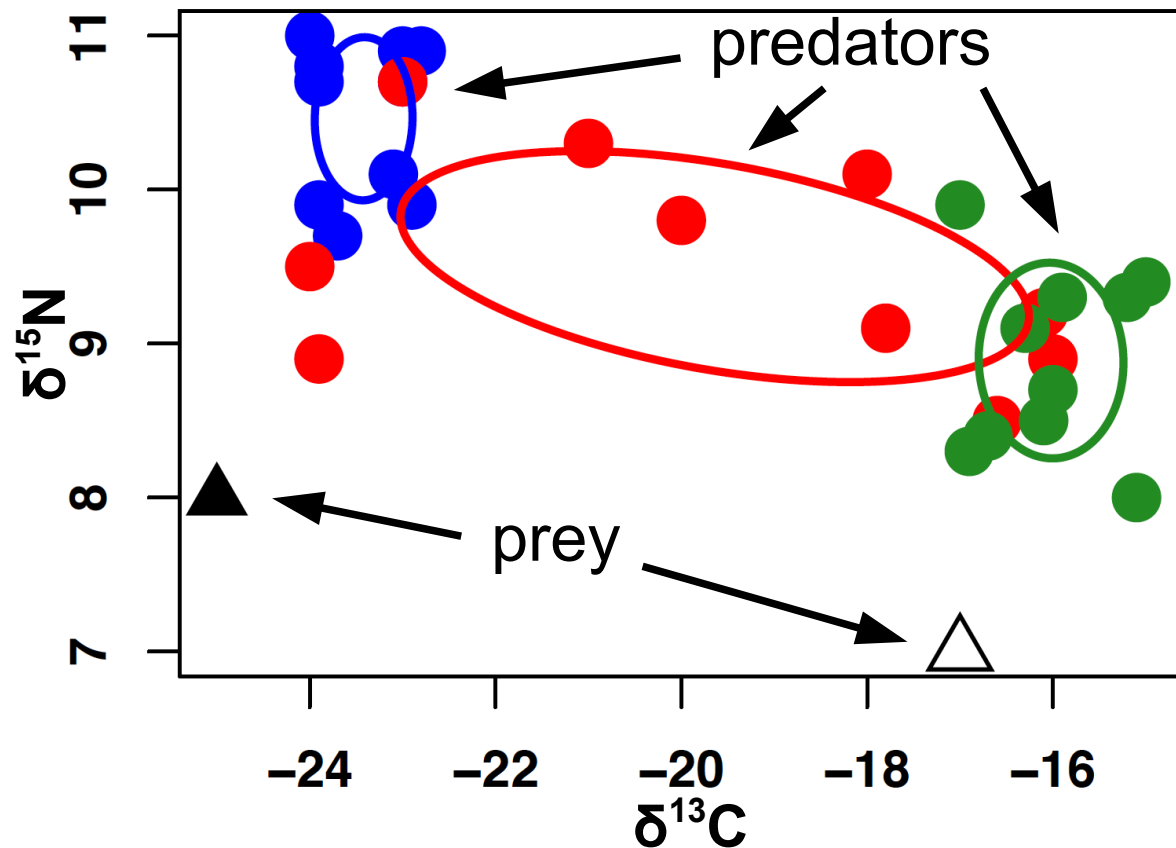
- Regional variations in changes of sea ice extent and ice season duration
- Impact on pelagic food webs and potential prey of sea stars

Objectives

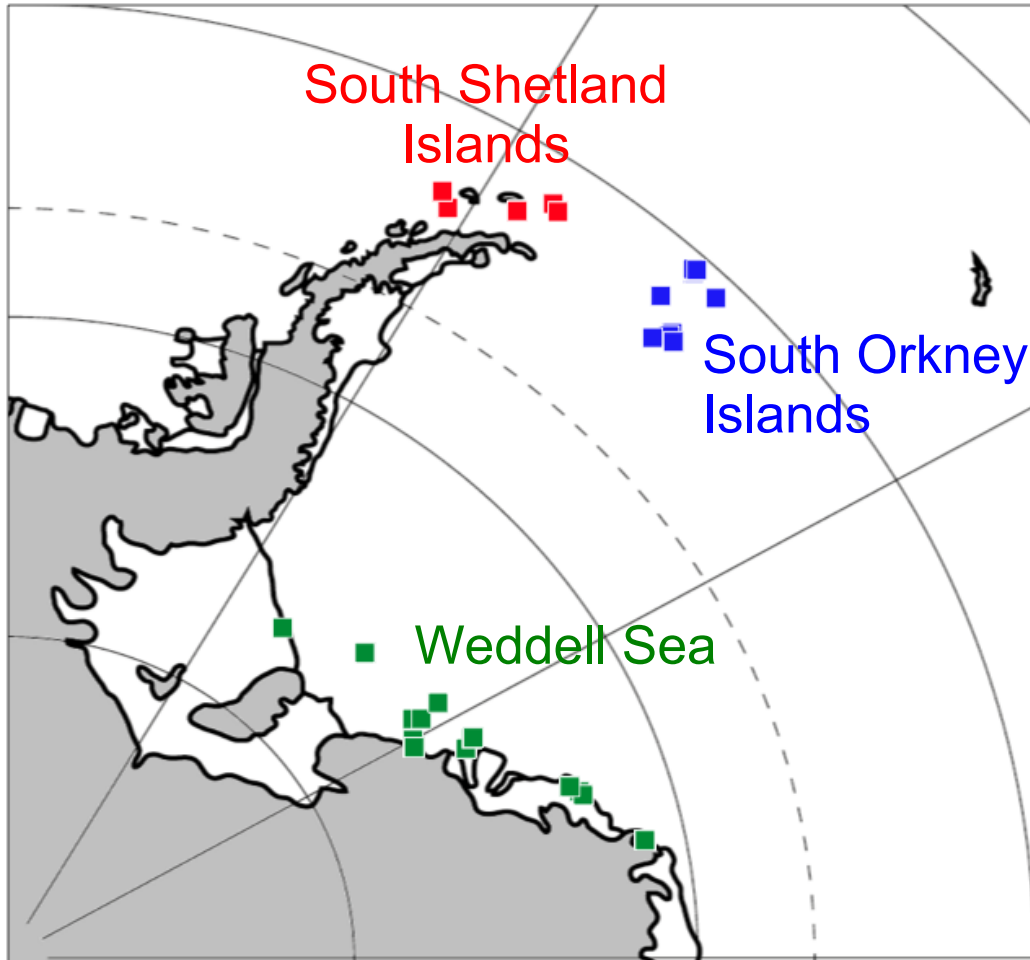
- To compare regional differences of trophic diversity, variability and plasticity in three Antarctic regions
 - Isotopic niches
- Trophic diversity: differences in trophic ecology between species
 - Trophic variability: differences in trophic ecology between individuals
 - Trophic plasticity: ability 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 \leftrightarrow trophic niches \rightarrow estimation of trophic diversity, trophic plasticity and diet overlap with ellipse areas (SIBER package of R)



Sampling



26 species (242 specimens)

Antarctic regions with ice retreat

South Shetland Islands

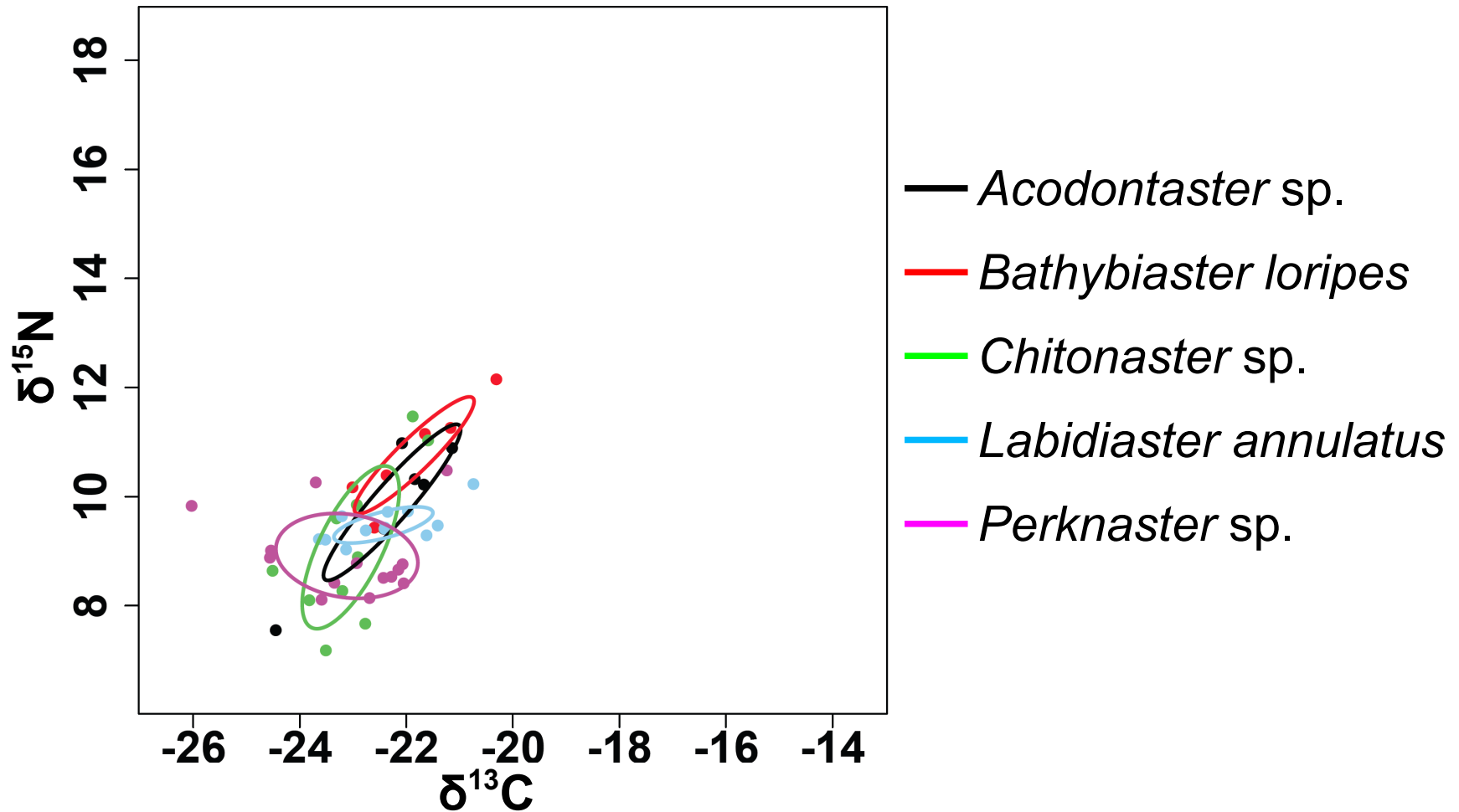
South Orkney Islands

Antarctic regions with ice gain

Weddell Sea

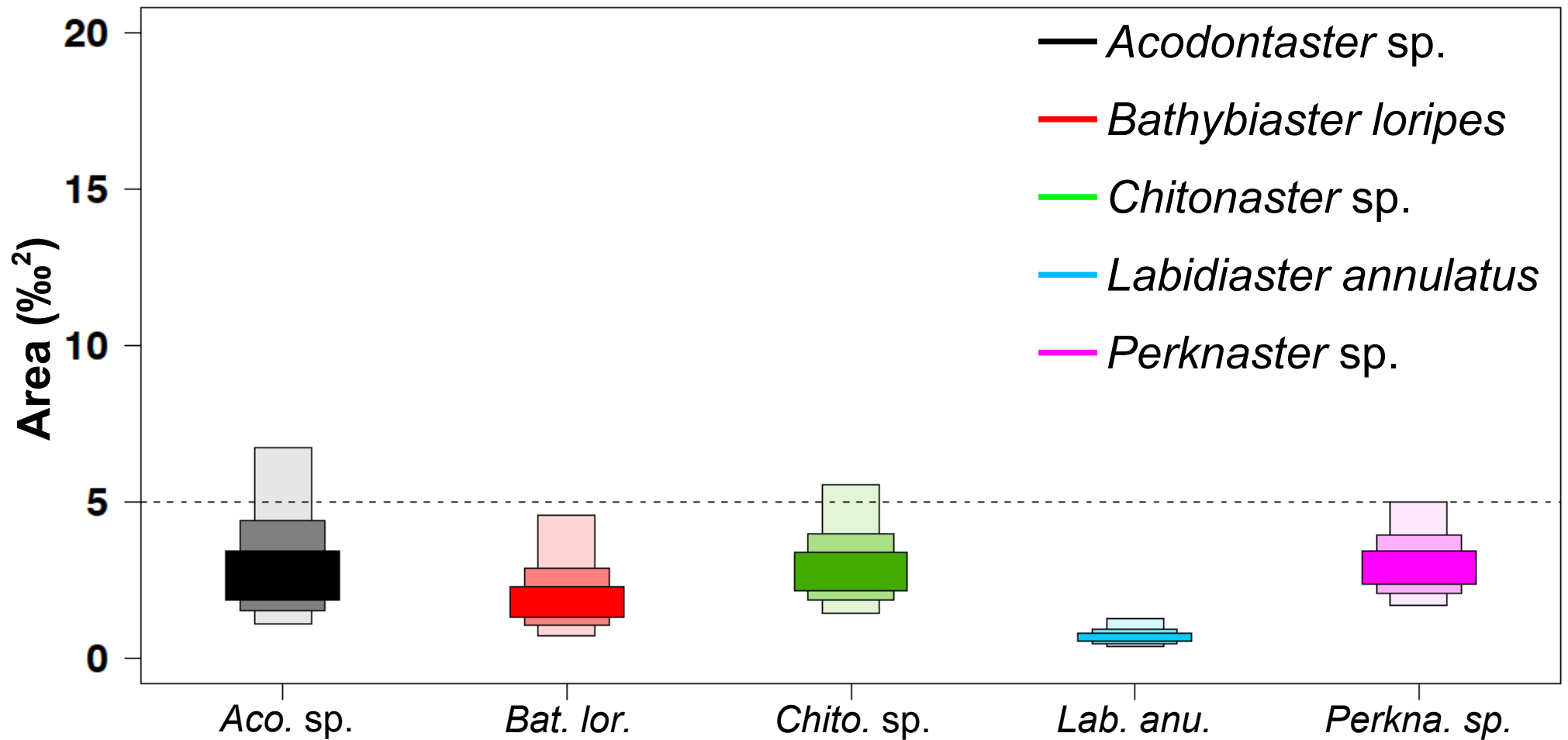
$\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in tegument
measured by EA-IRMS

South Shetland Islands



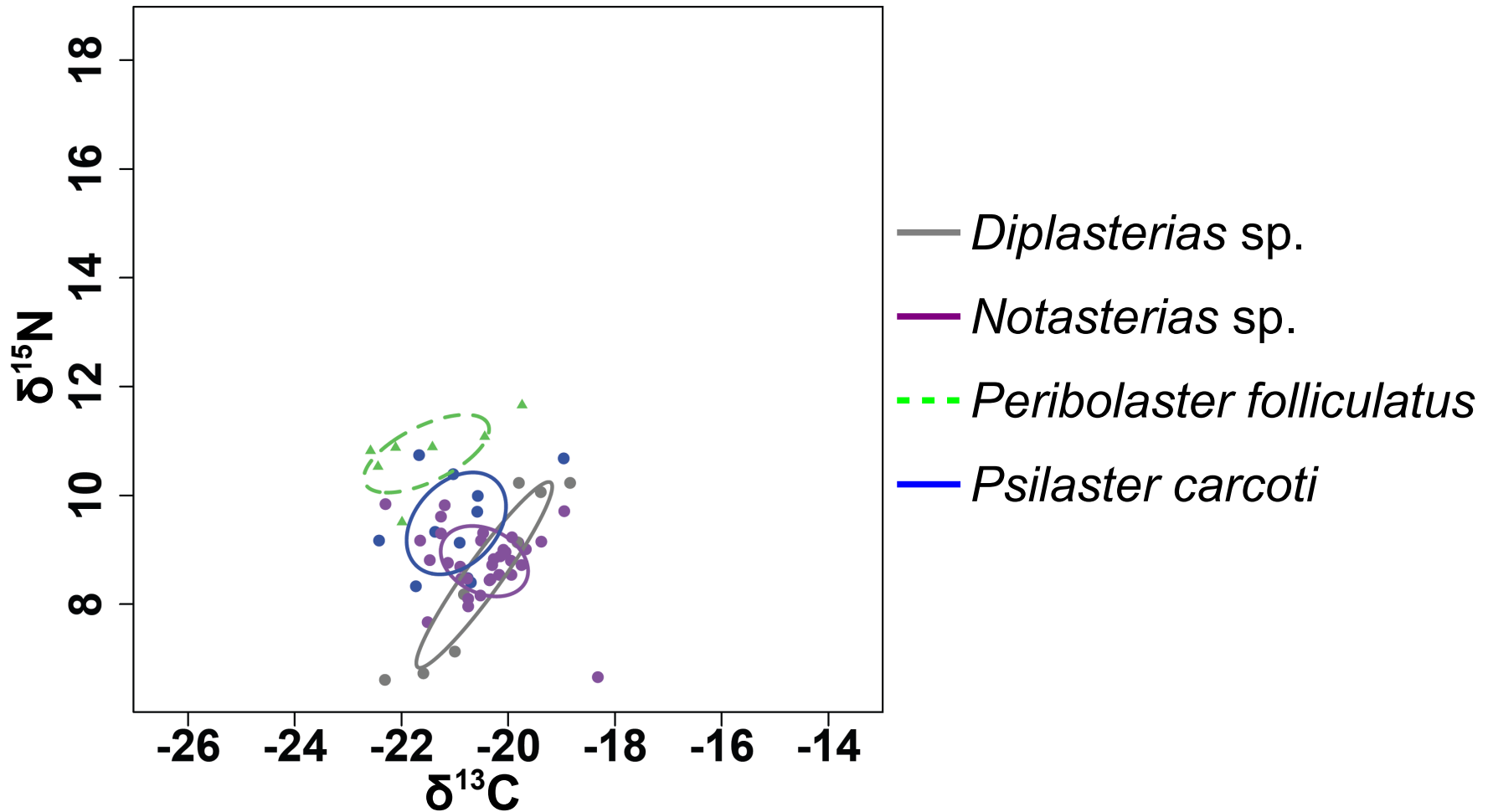
- Low dispersion of stable isotope ratios and high overlap
- Low intraspecific variability

South Shetland Islands



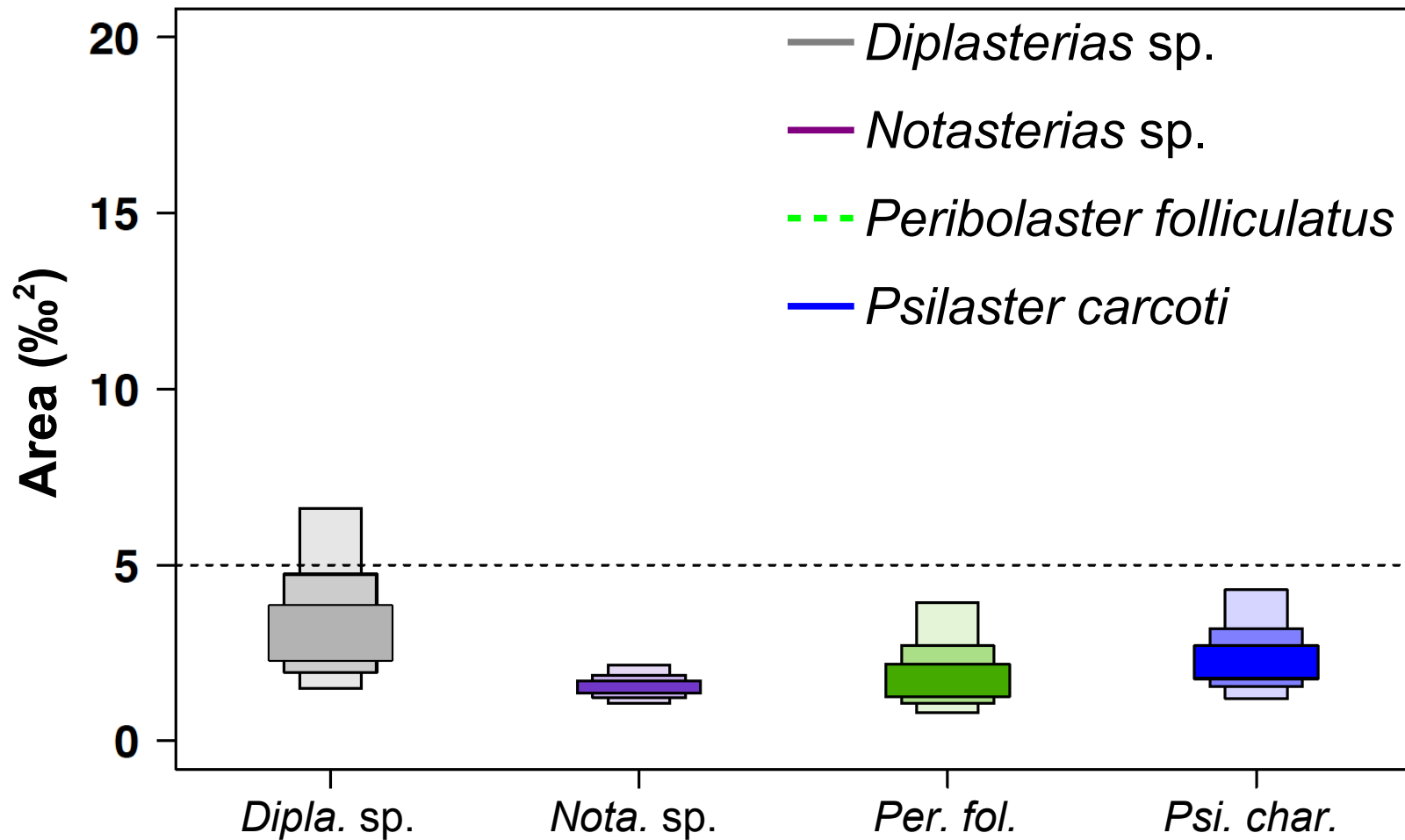
- *Labidiaster annulatus*' niche smaller than that of the four other species

South Orkney Islands



- Low dispersion of stable isotope ratios and low overlap except for *Notasterias* sp.
- Low intraspecific variability

South Orkney Islands



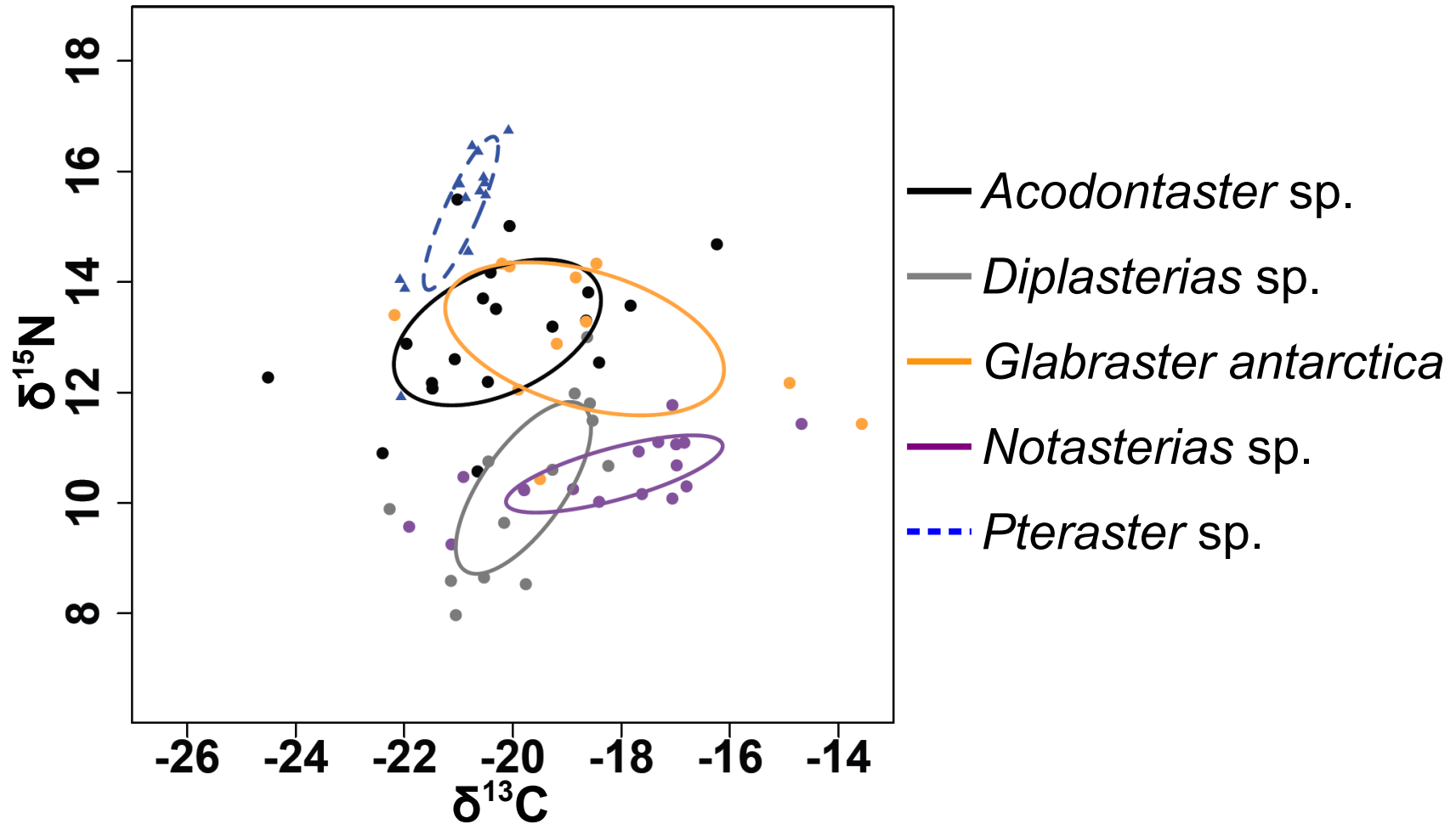
- *Diplasterias sp.*'s niche higher than *Notasterias sp.*'s and *Peribolaster folliculatus*' niches

Antarctic regions with ice retreat

- Low interspecific and intraspecific variation of isotopic values
- Small niche areas → specialised diets?
- Low $\delta^{13}\text{C}$

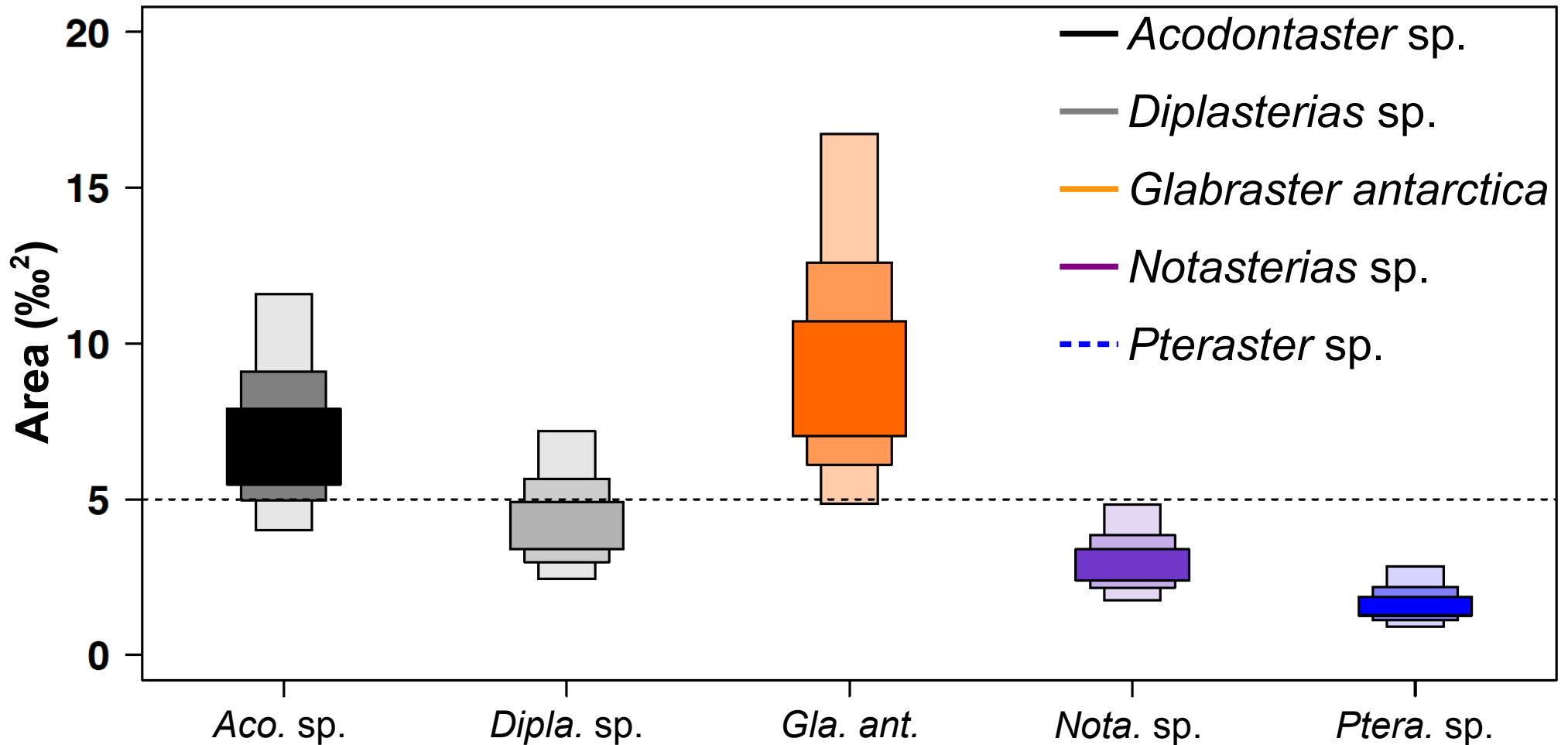
→ **Reliance on one food source at the basis of the food web (likely summer phytoplankton bloom)**

Weddell Sea



- Low differences of $\delta^{13}\text{C}$ but well differentiated $\delta^{15}\text{N}$ values
- High intraspecific variability for 4 species

Weddell Sea



- Large niches for *Acodontaster* sp., *Diplasterias* sp., and *Glabraster antarctica*
- *Pteraster* sp.'s niche smaller than that of the four other species

Antarctic regions with ice gain

- High interspecific ($\delta^{15}\text{N}$) and intraspecific ($\delta^{13}\text{C}$) variation of isotopic values
- Large niche areas for some species
- Presence of both generalist and specialist species?
 - **Reliance on more than one food source at the basis of the food web (likely phytoplankton and ice algae)**

General conclusions

Antarctic regions with low ice	Antarctic regions with high ice
Low isotopic diversity	High isotopic diversity
Low isotopic variability	High isotopic variability

How explaining?

General conclusions

Weddell Sea



**Phytoplankton
Ice materials**

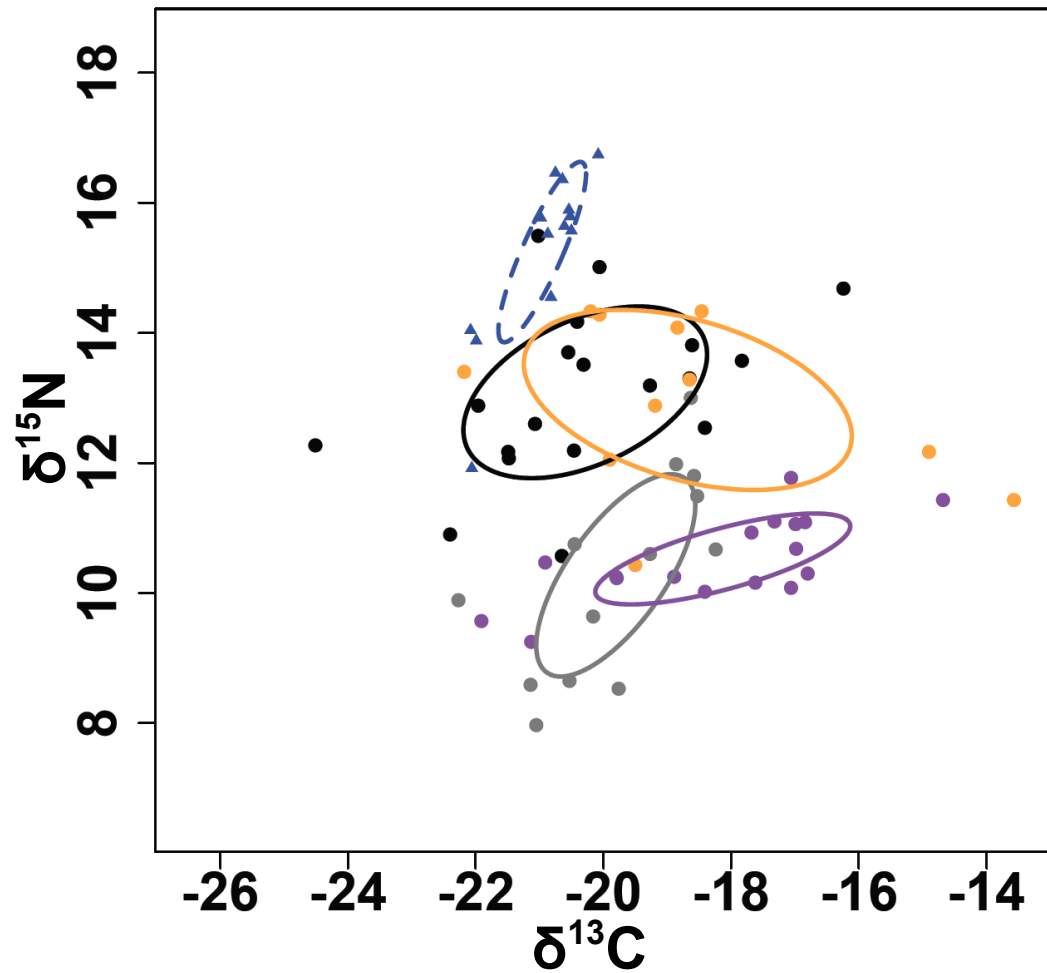
South Shetland Islands
South Orkney Islands



Phytoplankton

General conclusions

Weddell Sea



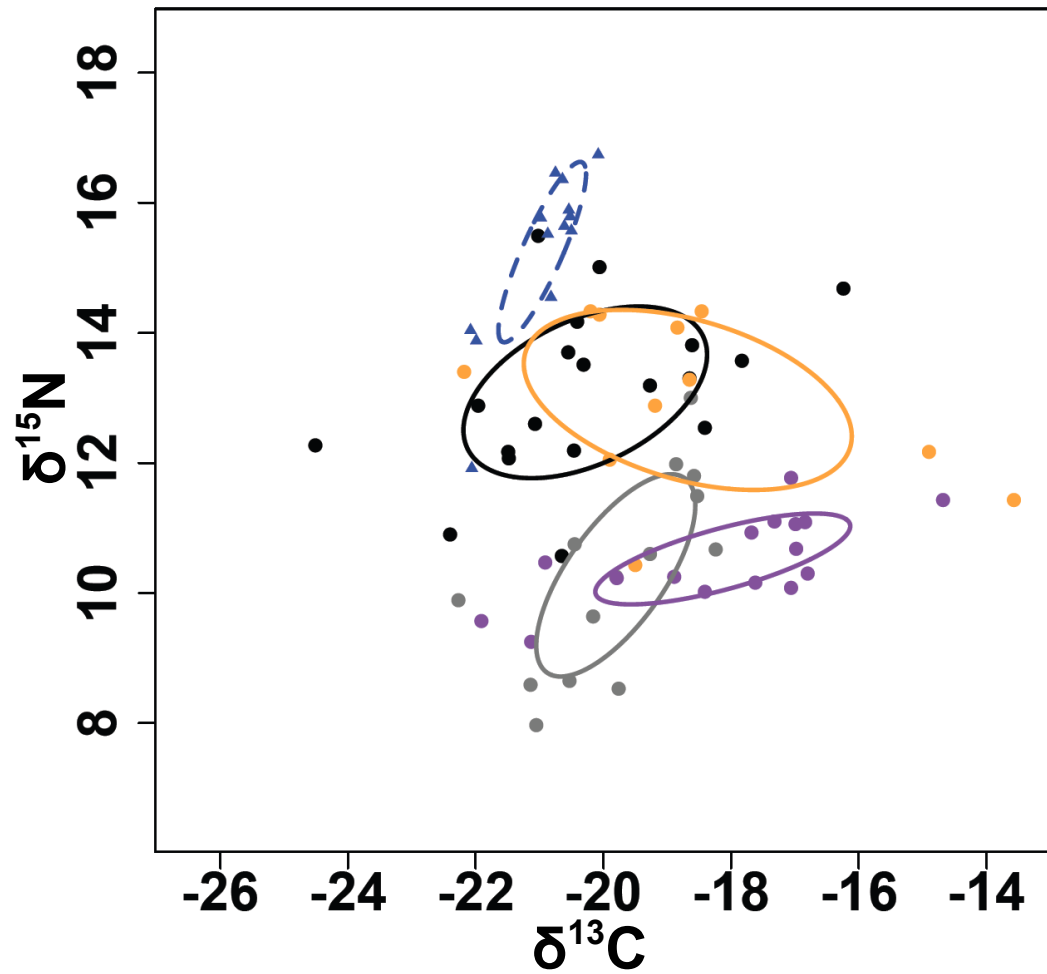
South Shetland Islands
South Orkney Islands



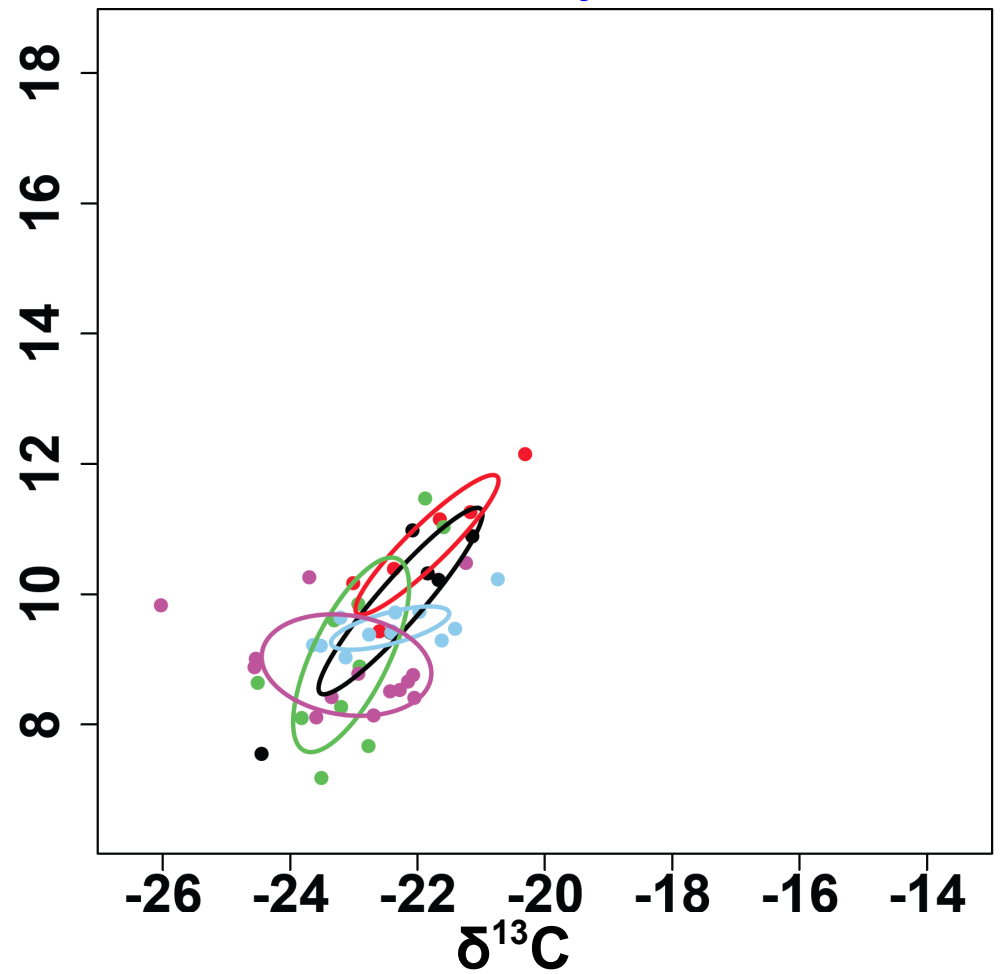
↓
Phytoplankton

General conclusions

Weddell Sea



South Shetland Islands
South Orkney Islands



Thank you for your attention



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NATURAL ENVIRONMENT RESEARCH COUNCIL

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