Use of stable isotope ratios to delineate coastal benthic food web structure in Adélie Land (East Antarctica)

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Context, objectives & methods

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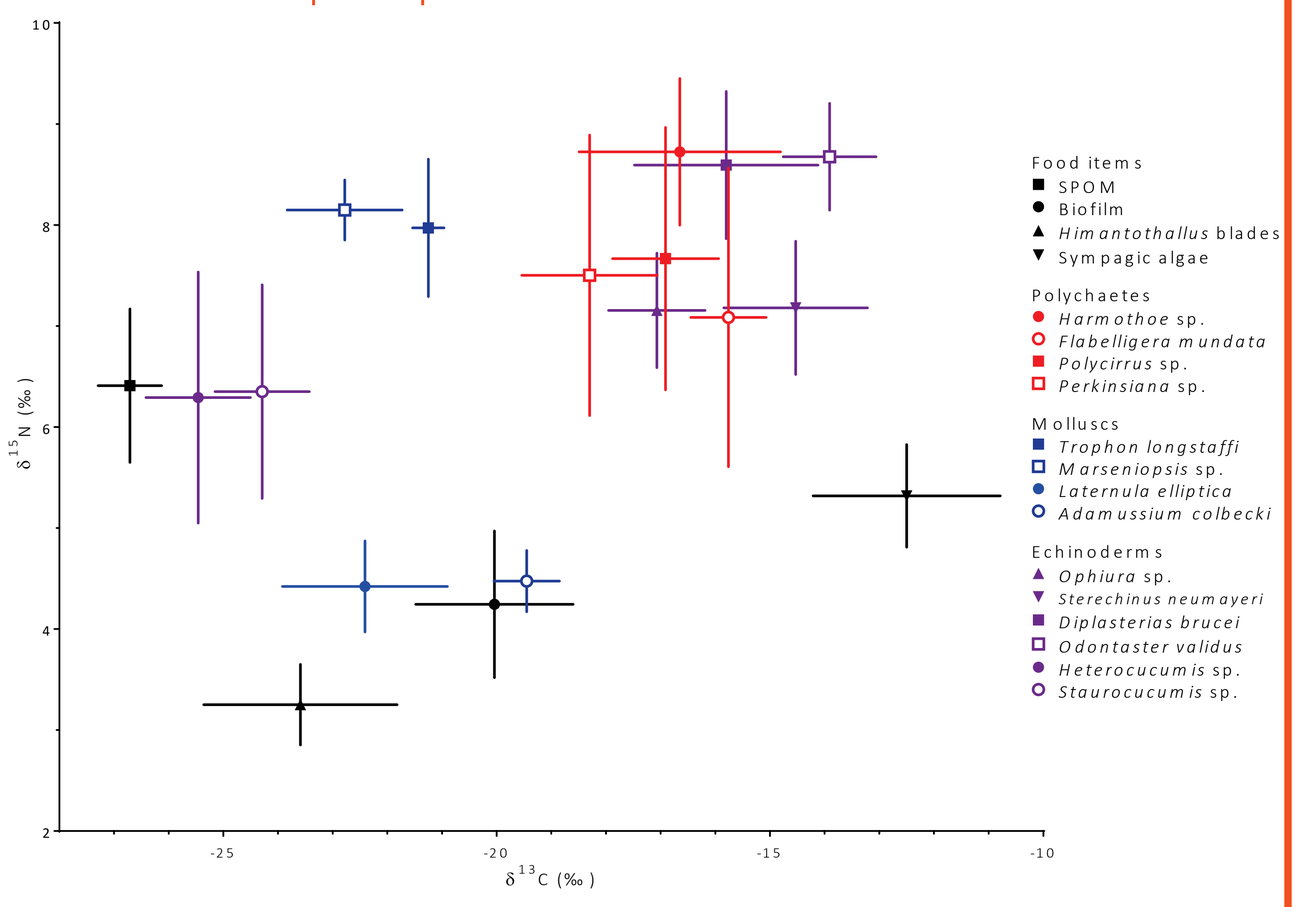
- Climate change has contrasted effects on Antarctica. West Antarctic Peninsula: T° ↗ and sea ice ↘; East Antarctica: T° → ↘ and sea ice cover ↗.
- Dumont-d'Urville station (Adélie Land, East Antarctica) recently underwent an event of high spatial and temporal sea ice coverage (no seasonal breakup during austral summers 2013-2014 and 2014-2015)

▲ Accumulations of benthic biofilm on coastal rocky bottoms near Dumont-d'Urville station at the time of sampling (December 2014).

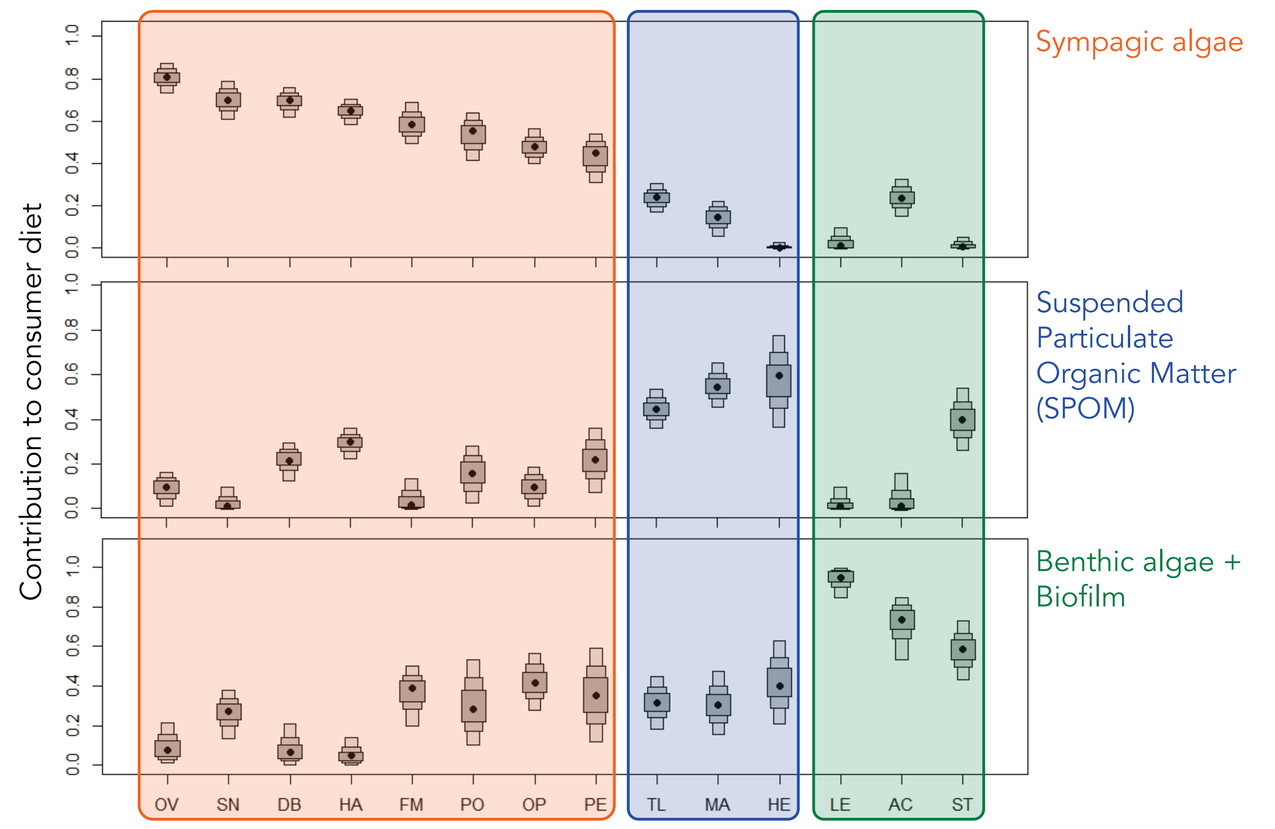
- How will Antarctic communities respond to such environmental changes? How could increased sea ice cover impact benthic food webs?
- Use of stable isotope ratios of C and N (integrative trophic markers, "you are what you eat") to identify resources supporting dominant benthic invertebrates (here: focus on primary consumers and omnivores)
- Use of a mixing model to quantify relative importance of 4 producers / organic matter pools: sympagic algae, suspended particulate organic matter, benthic macroalgae (*Himantothallus grandifolius*) and benthic biofilm (unusually abundant, heterogeneous mix of microalgae, amorphous material and detrital items)

Results & discussion

1) Isotopic biplot of consumers and food sources



2) Main food items according to SIAR mixing model



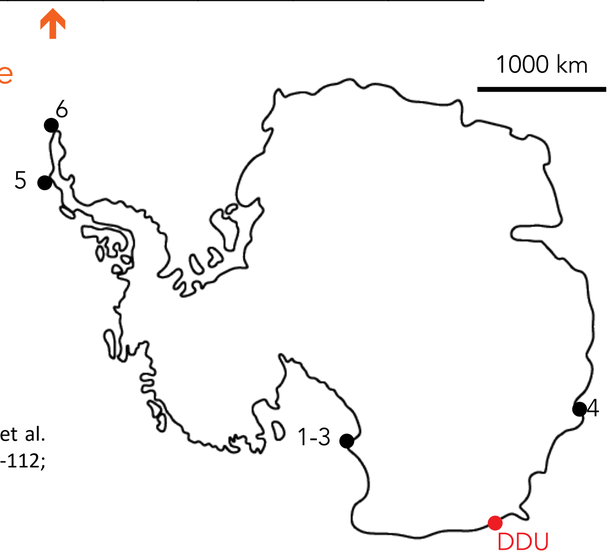
OV: *O. validus*; SN: *S. neumayeri*; DB: *D. brucei*; HA: *Harmothoe* sp.; FM: *F. mundata*; PO: *Polycirrus* sp.; OP: *Ophiura* sp.; PE: *Perkinsiana* sp.; TL: *T. longstaffi*; MA: *Marsienopsis* sp.; HE: *Heterocucumis* sp.; LE: *Laternula elliptica*; AC: *Adamussium colbecki*; ST: *Staurocucumis* sp.

3) Comparison with literature data

Species	DDU	1	2	3	4	5	6
Laternula elliptica							
Adamussium colbecki							
Sterechinus neumayeri							
Odontaster validus							
Staurocucumis sp.							
Harmothoe sp.							

Sea ice

Main food items
- Sympagic algae / Ice POM
- Benthic algae / Biofilm
- Plankton / SPOM
- Sediment POM
- Animal-based diet
- No data



References: 1-3: Norkko et al. 2007 Ecology 88: 2810-2820; 4: Gillies et al. 2012 Estuar Coast Shelf S 97: 44-57; 5: Dunton 2001 Amer Zool 41: 99-112; 6: Corbisier et al. 2004 Polar Biol 27: 75-82

- Main organic matter source of most consumers = sympagic algae (1, 2).
- Important differences in resource use by consumers of Adélie Land and from other locations of coastal Antarctica, including sea ice influenced sites (3).
- Trophic importance of benthic biofilm comparatively limited despite high abundance (2).
- Norkko et al. 07: benthic invertebrates consume more detrital matter in sea ice influenced locations. Our results disagree with this hypothesis (2,3).
- However, no data about dynamics of biofilm accumulation + long-lived consumers with low metabolic rates: low isotopic turnover? Is isotopic equilibrium reached?

Conclusions & perspectives

- Important sea ice cover is linked with high reliance of benthic invertebrates on sympagic algae.
- Important spatial and/or temporal discrepancies in feeding habits and benthic community response to sea ice: high trophic plasticity?
- Interpretation of data is complicated by the lack of background data ("normal" conditions) and by physiological features of studied organisms.

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