# Macrozooplankton from Crozet to Kerguelen and subtropical Southern Indian Ocean

## Identifying key prey species assemblages linked to environmental structures


N/O *Marion Dusfrene*, ©Daniel Delille

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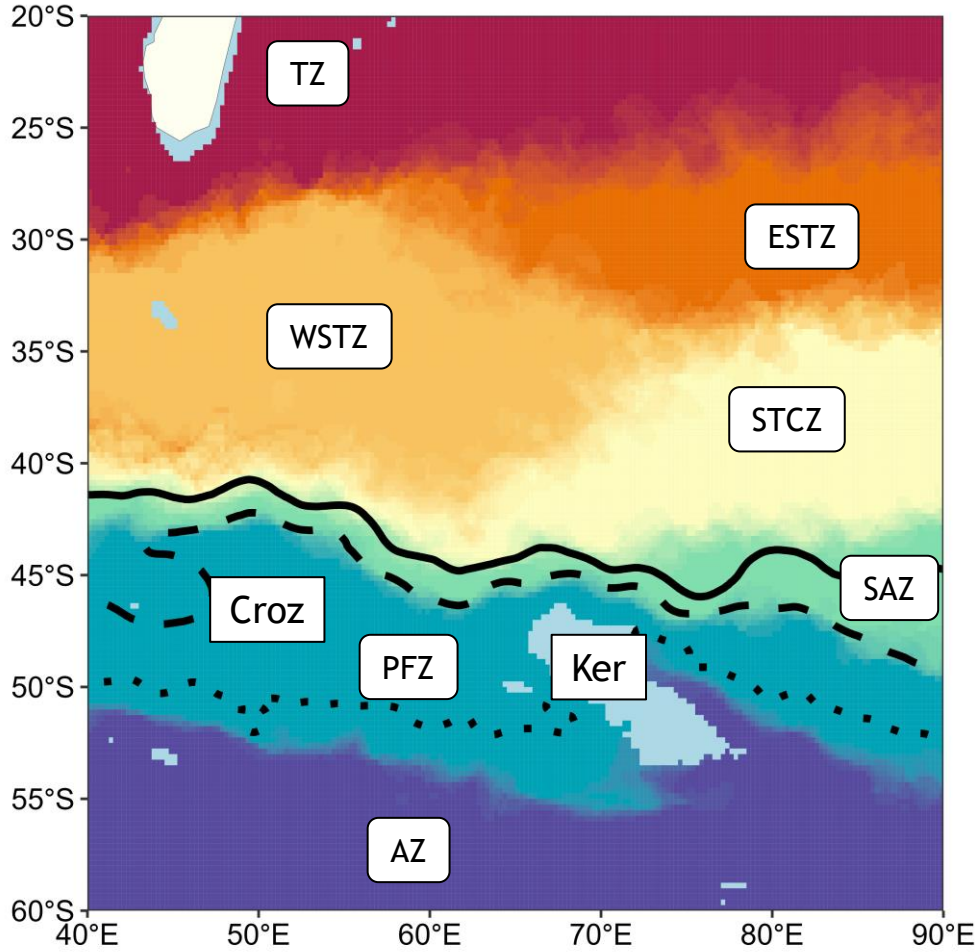
Djian, V., C. Merland, M. Thellier, B. Leroy, C. Cotte, P. Koubbi, 2023. *Macrozooplankton from Crozet to Kerguelen and subtropical southern Indian Ocean*. CCAMLR WG-EMM-2023/21

# Hydrologic zonation

Hydrologic regionalisation by functional PCA on 3D hydrology

- Strong latitudinal zonation defined by hydrologic fronts and sharp environmental gradients

Frontal structures influence biogeography




Djian, V., Cotté, C., Koubbi, P. *Hydrologic regionalisation from Crozet to Kerguelen and subtropical southern Indian Ocean*. CCAMLR WG-EMM-2023/17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# Importance of macrozooplankton

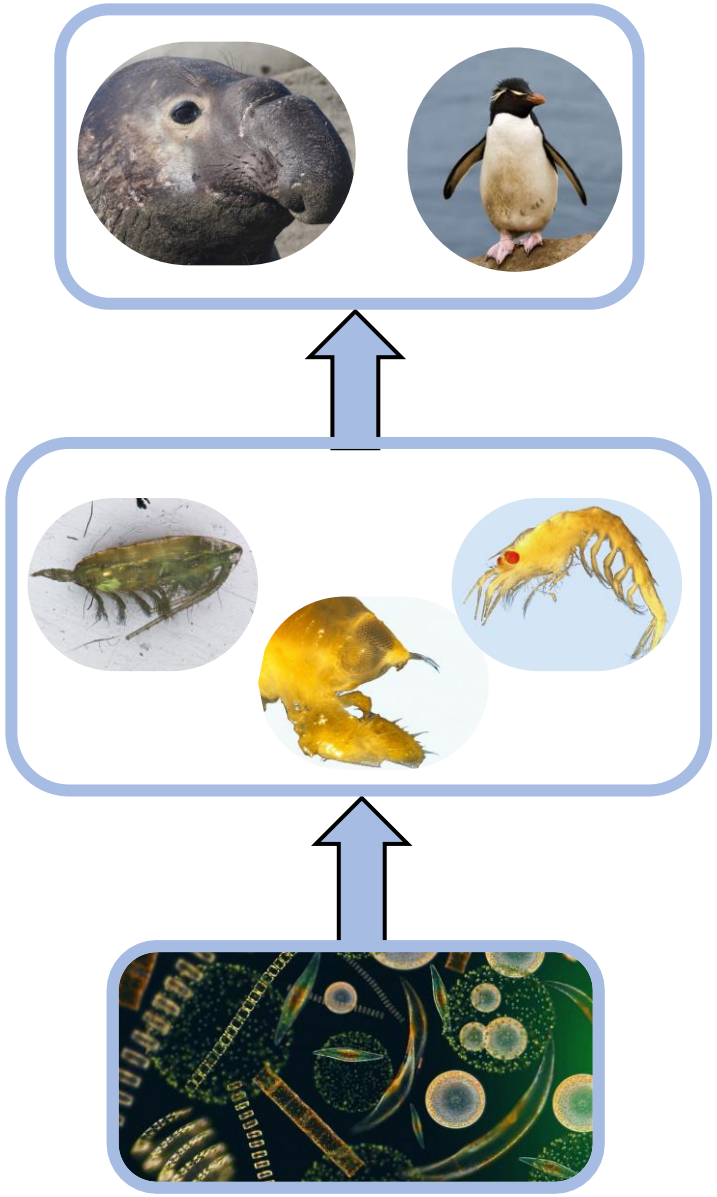
Hydrologic regionalisation by functional PCA on 3D hydrology

- Strong latitudinal zonation defined by hydrologic fronts and sharp environmental gradients

Frontal structures influence biogeography

Particular interest in macrozooplankton

- Key role in energy transfer
- Carbon transport and storage

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# What did we asked ourselves?

***How is macrozooplankton diversity structured in the Southern Indian Ocean and Southern Ocean?***


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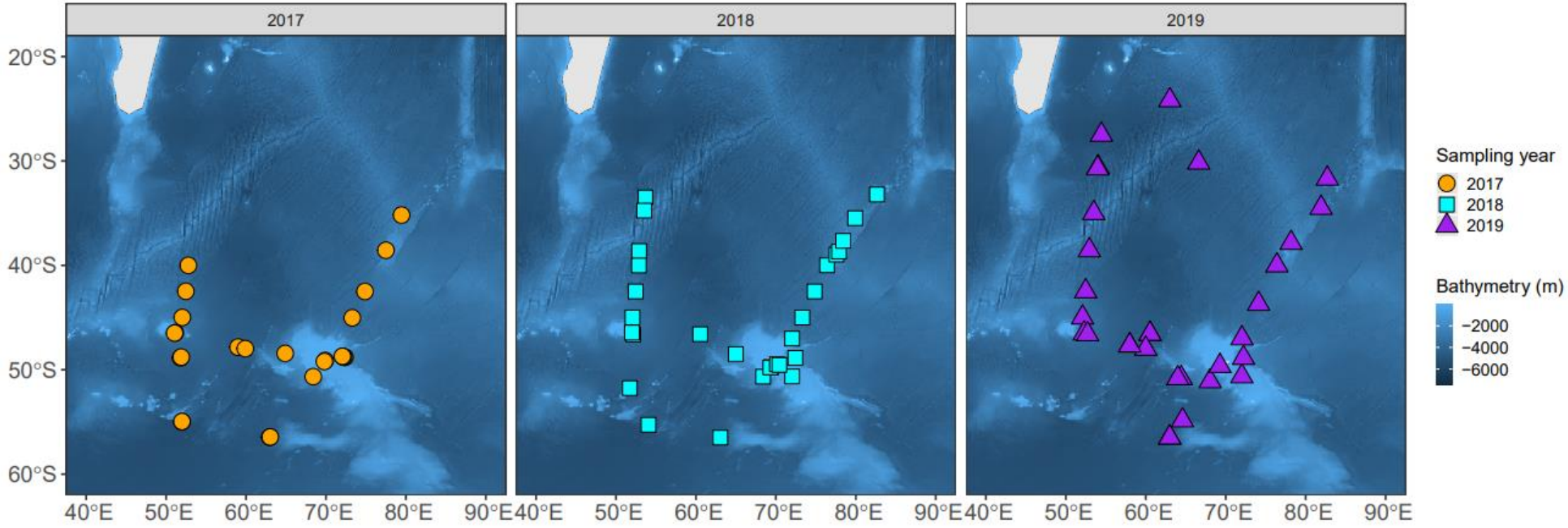
# Sampling

Samples from summer 2017 to 2019

Collected between 0 and 1000m using IKMT trawl

248 species recorded from 20 orders (Djian et al., 2023)

- 49 amphipod species
- 44 euphausiid species





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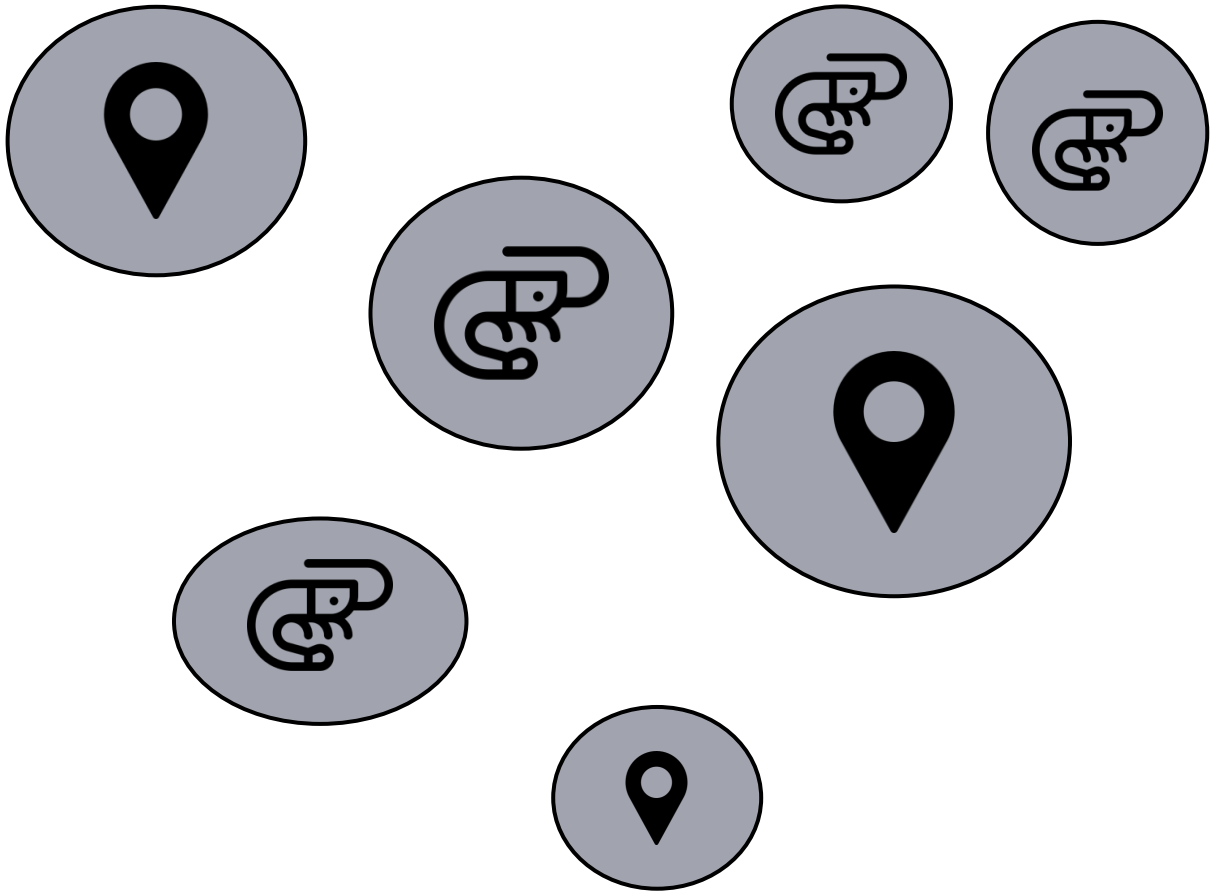
# How to identify assemblages?

Assemblages defined using biogeographic network analysis (Rosvall et al., 2009) on:

1. Euphausiids
2. Amphipods

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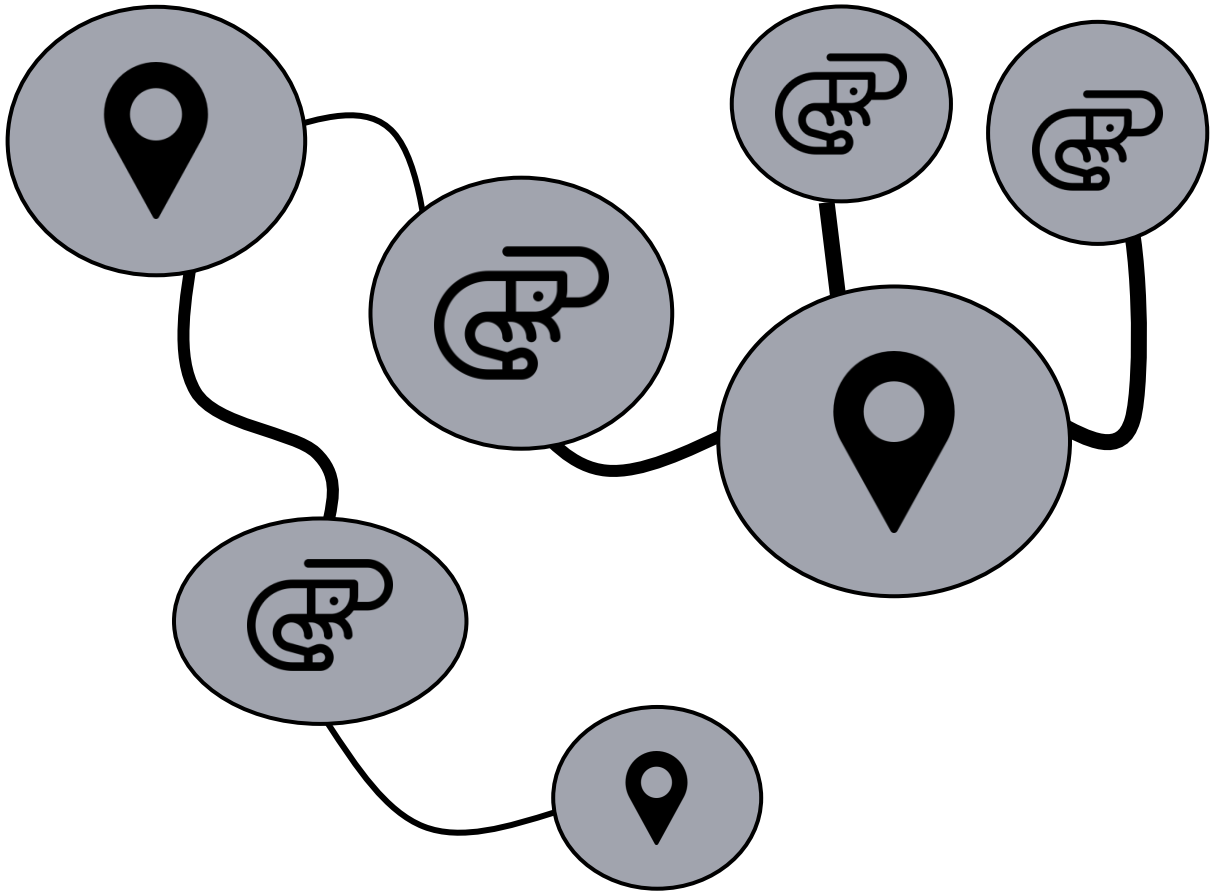


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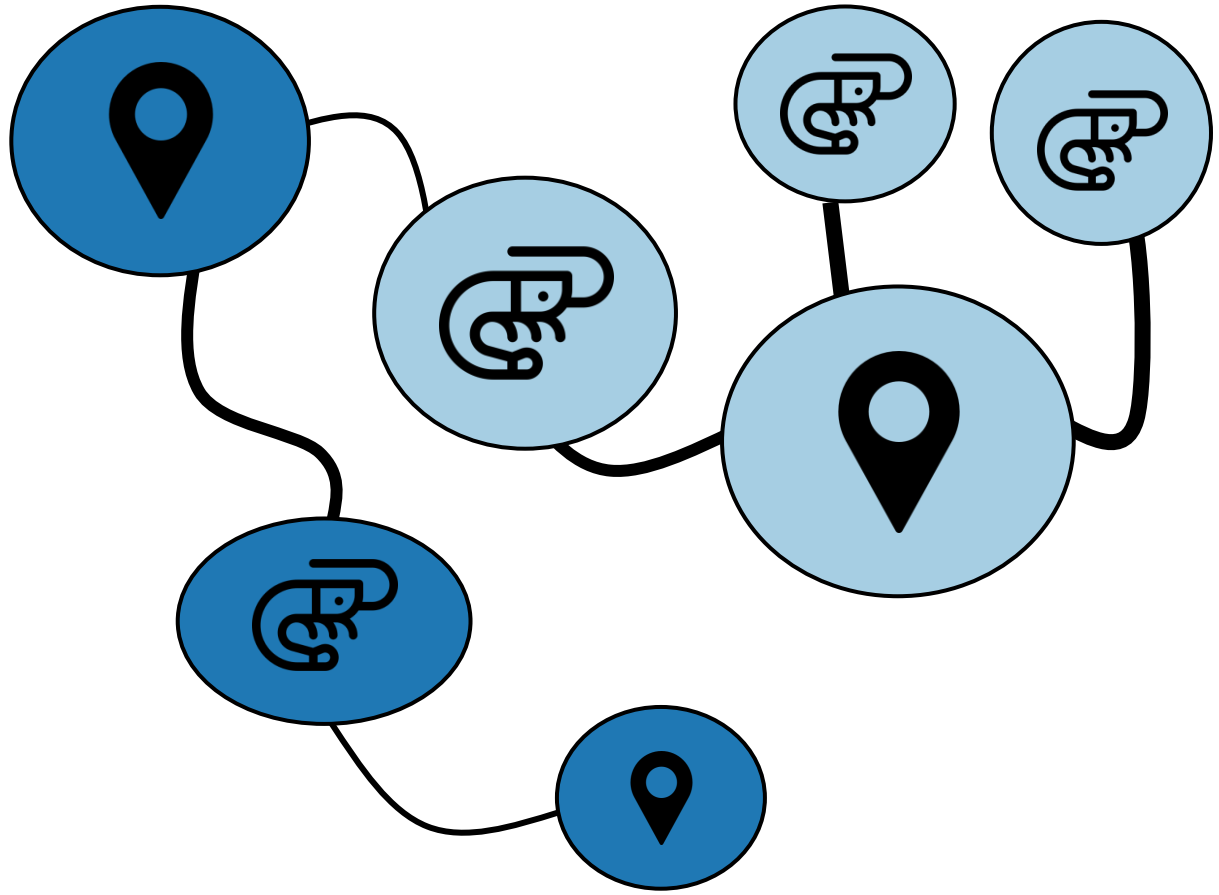
Species assemblages mapped on hydroregions defined by Djian et al. (2023)

Quantitative structure by plotting abundance boxplots

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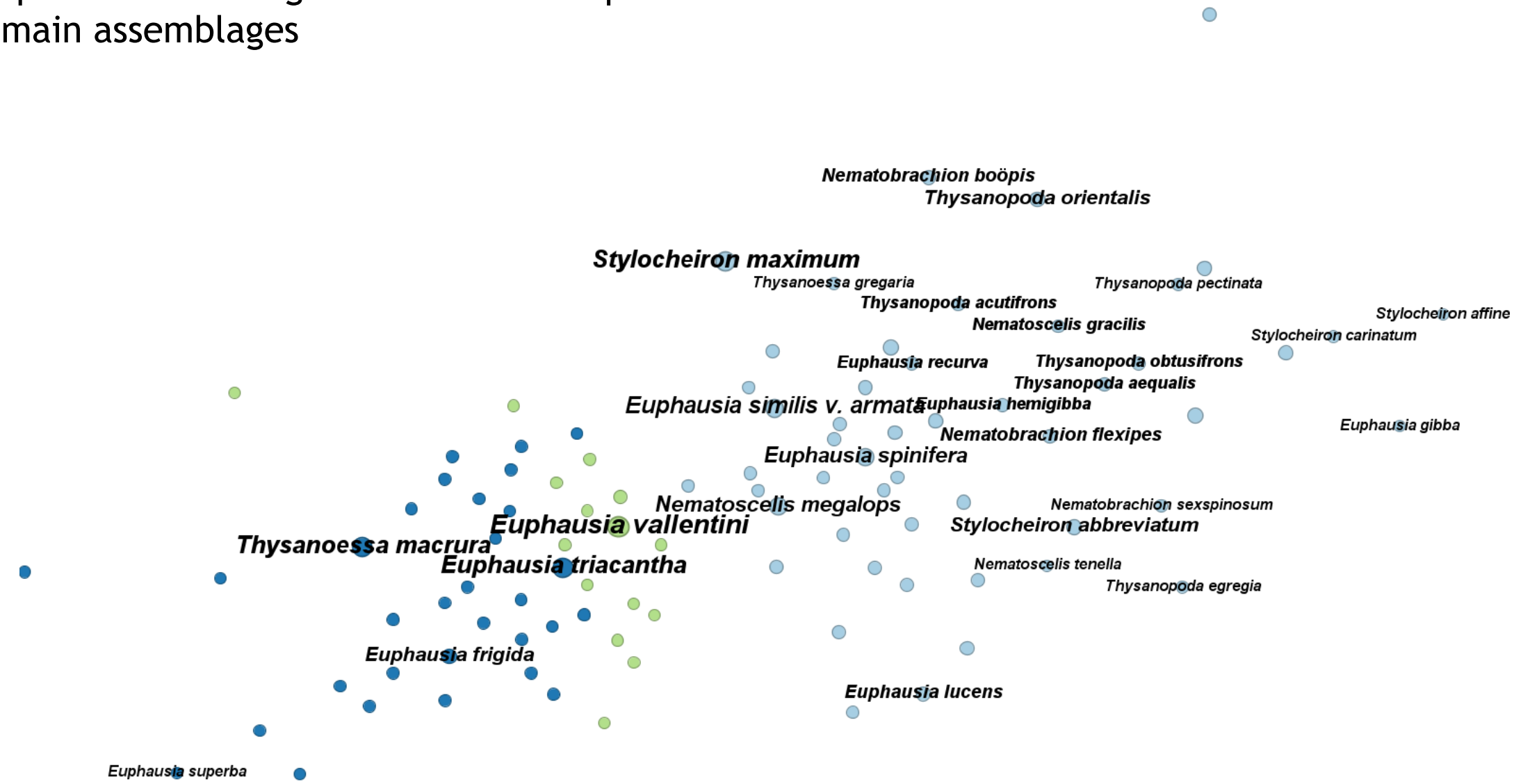
# Euphausiid assemblages identified

- 6 species assemblages identified in euphausiids
- 3 main assemblages





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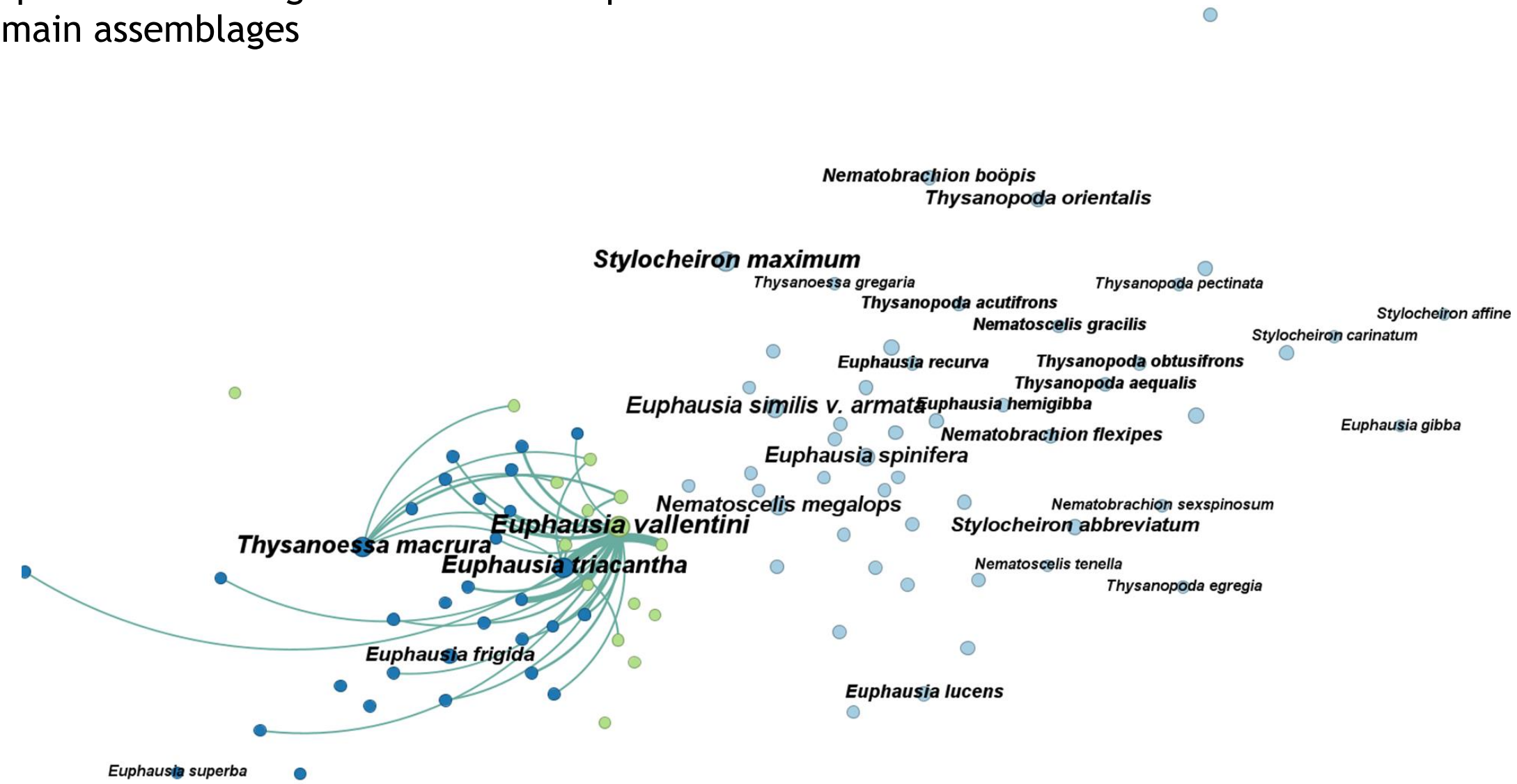



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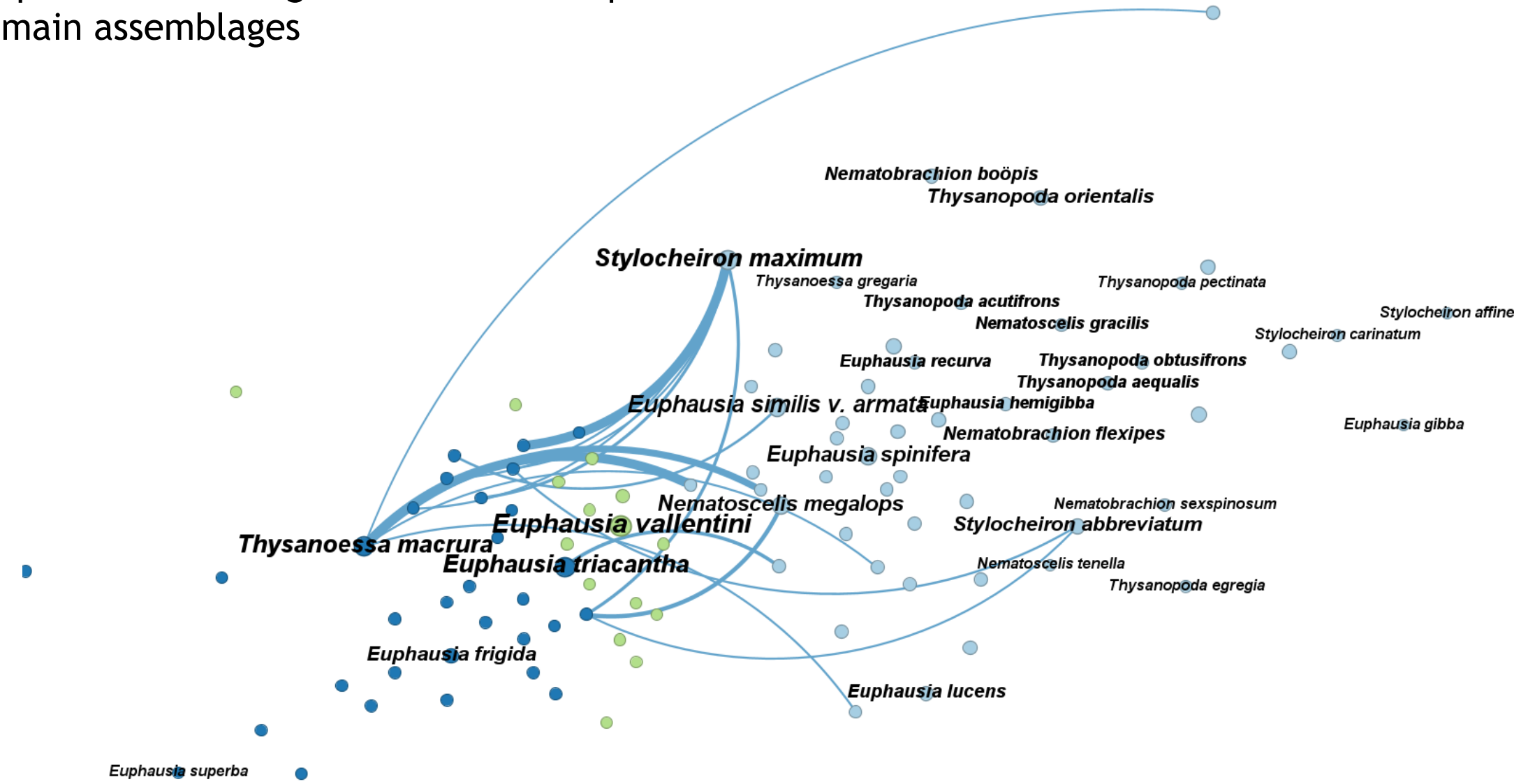



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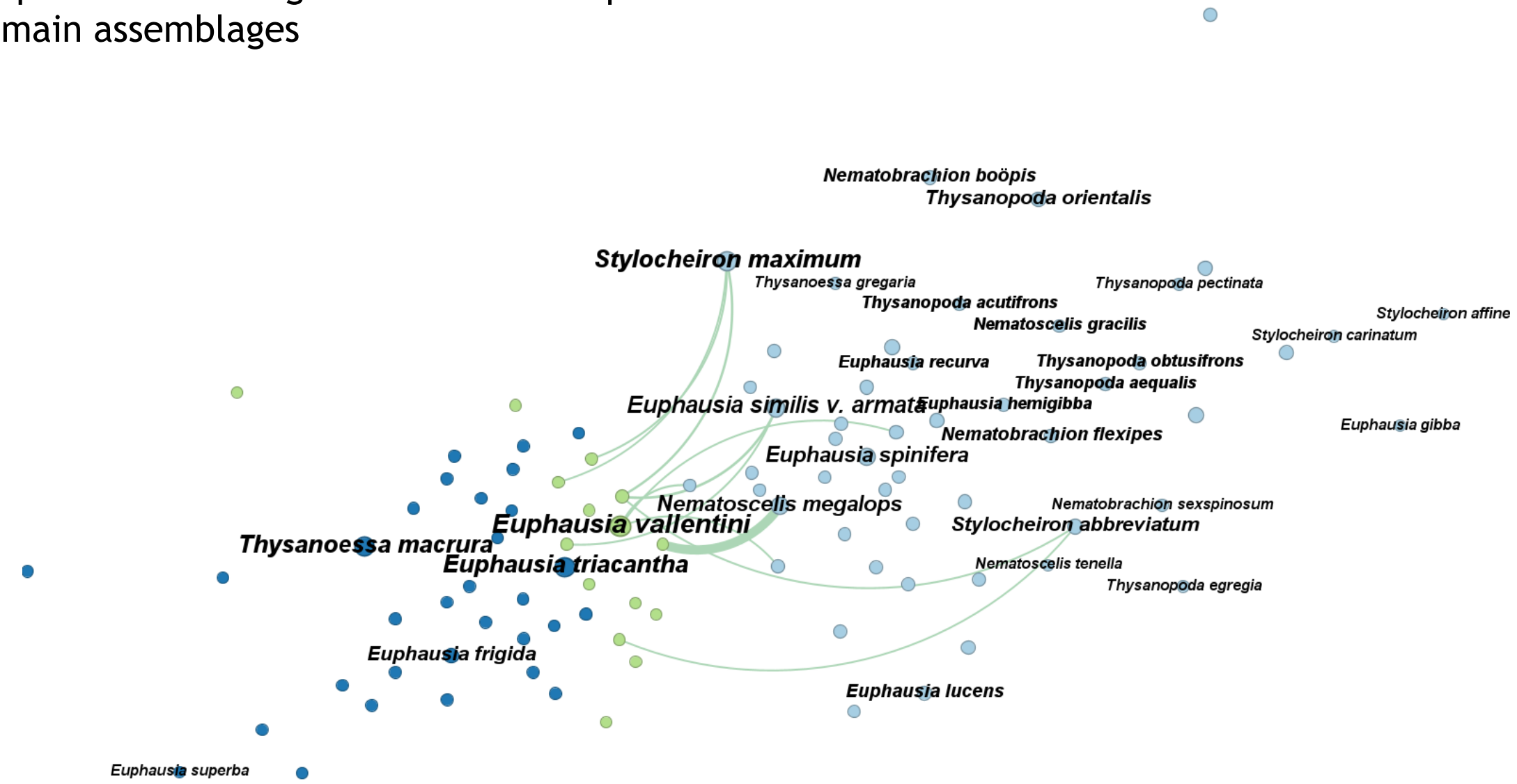



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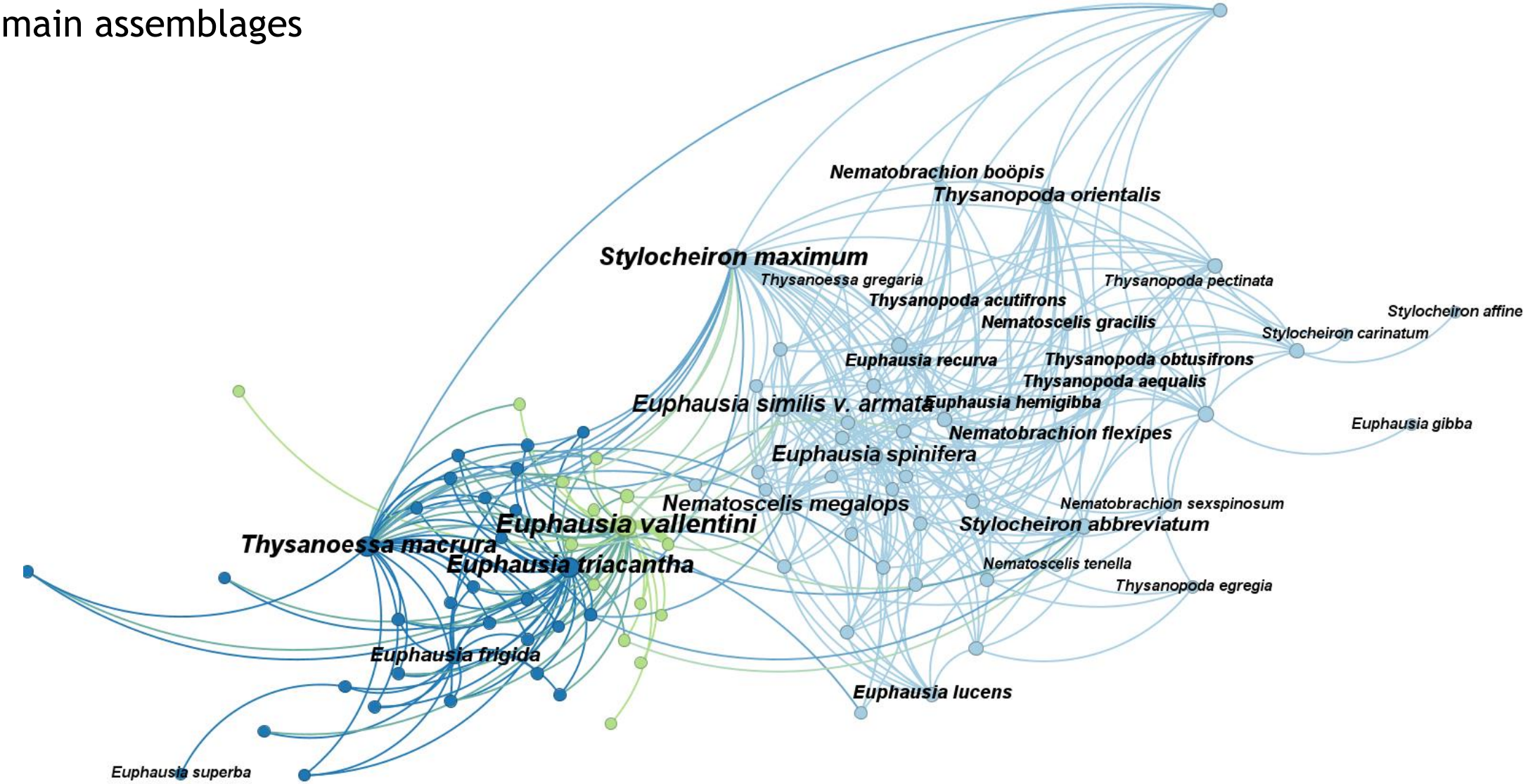



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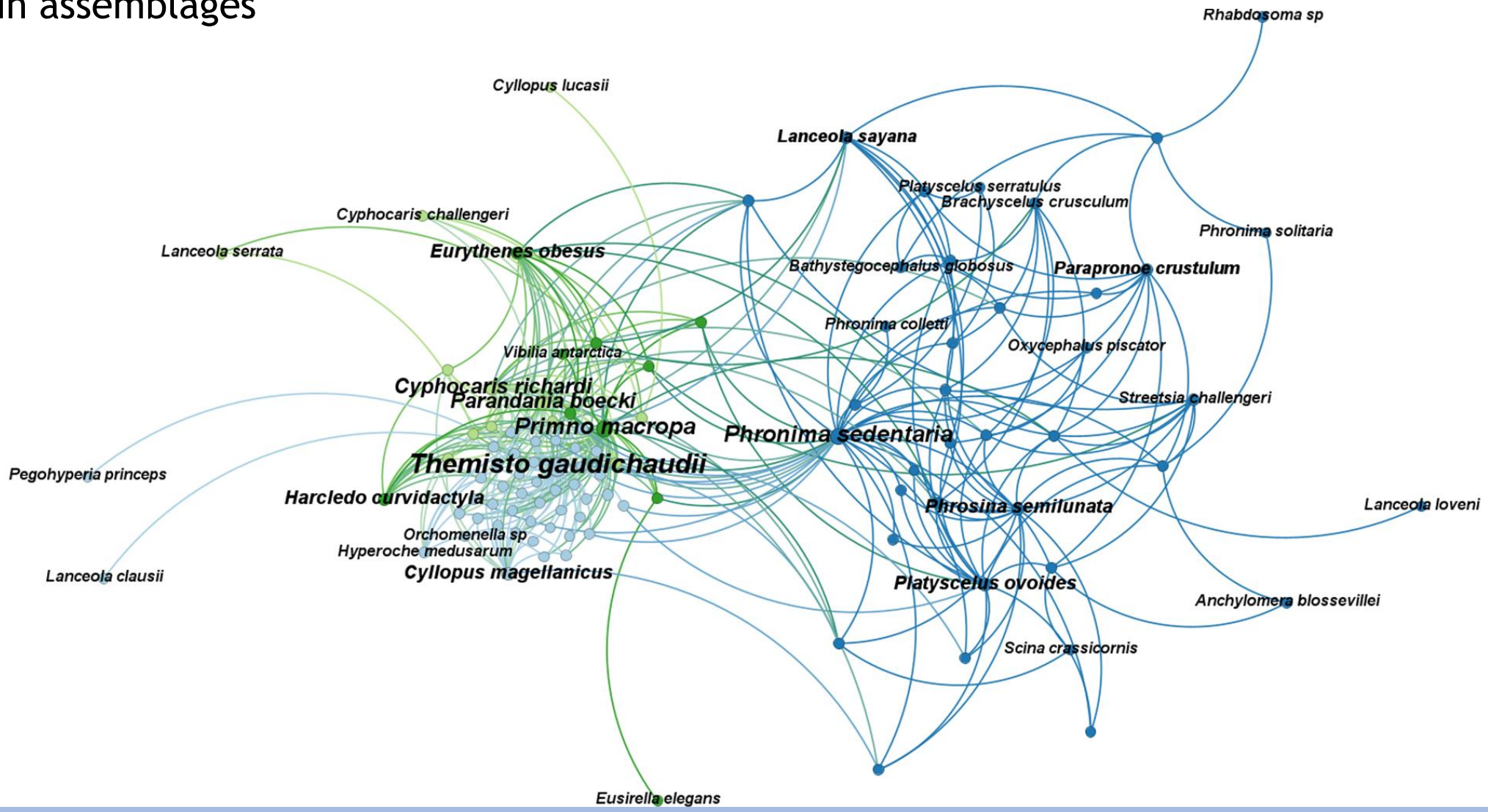
# Amphipod assemblages identified

- 6 species assemblages identified in amphipods
- 4 main assemblages





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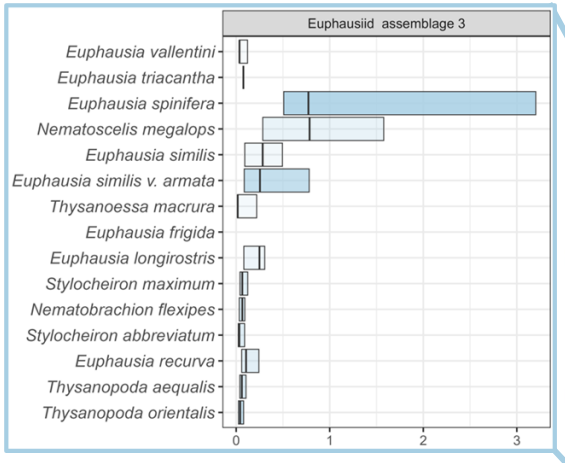
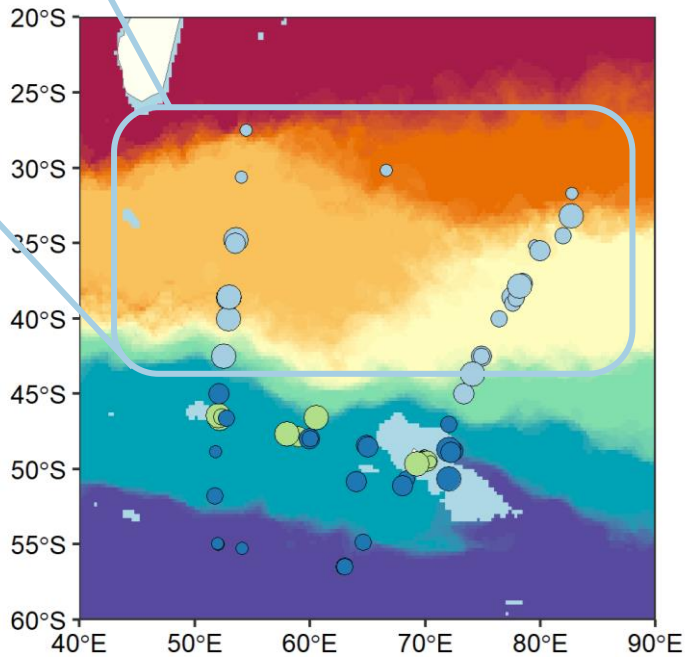
# One to rule them all…

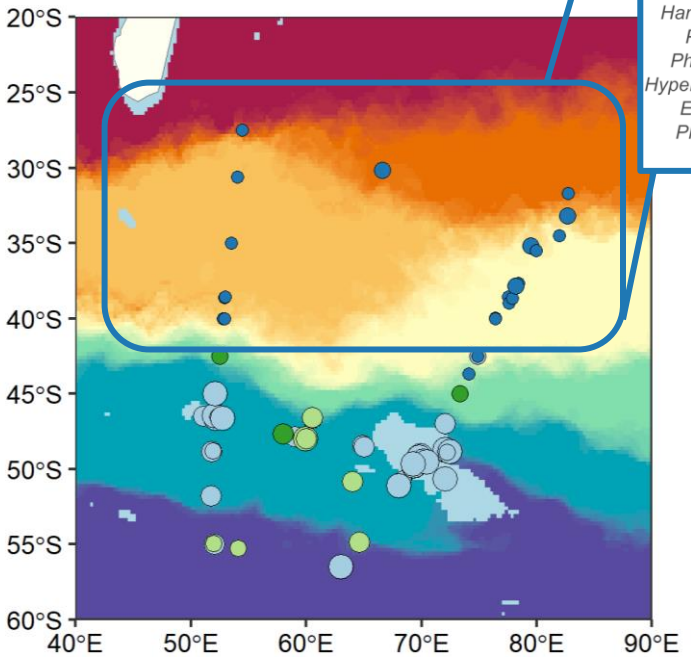
- Subtropical assemblage: all Southern Indian Ocean sites
- Defined by high species richness and diversity

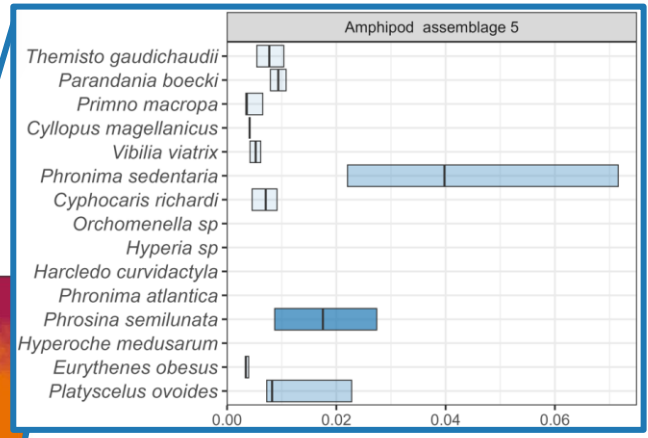



Euphausiid




Amphipod





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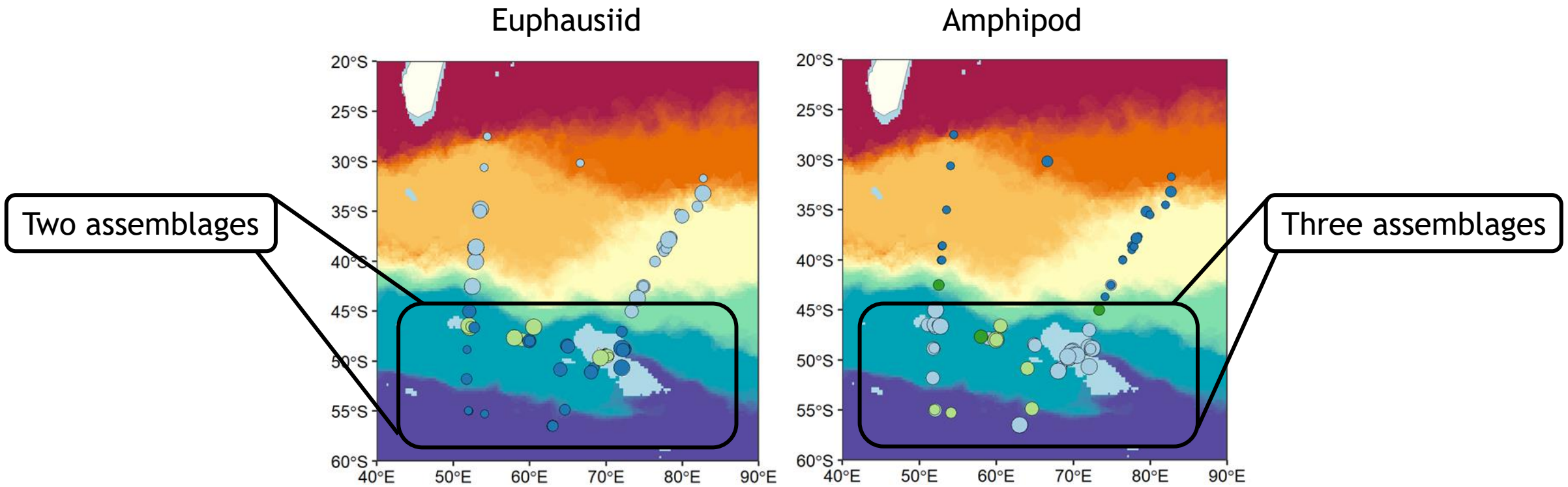
# … Except in the South!

- Several species assemblages in the Southern Ocean





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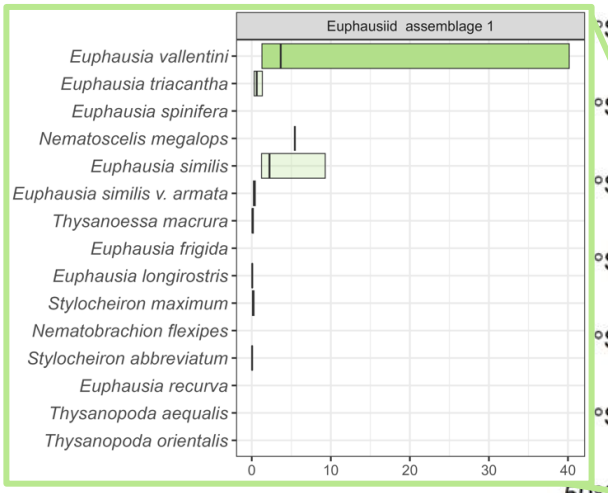
# Island shelf effect

Species assemblage defined by one dominant species

- Euphausiids: island shelves and inter-island area, *Euphausia vallentini*
- Amphipods: island shelves, *Themisto gaudichaudii*

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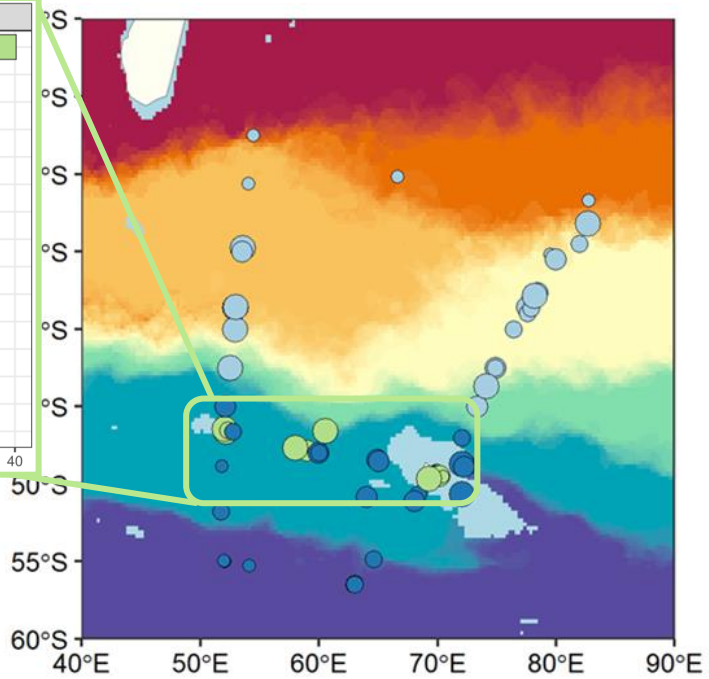
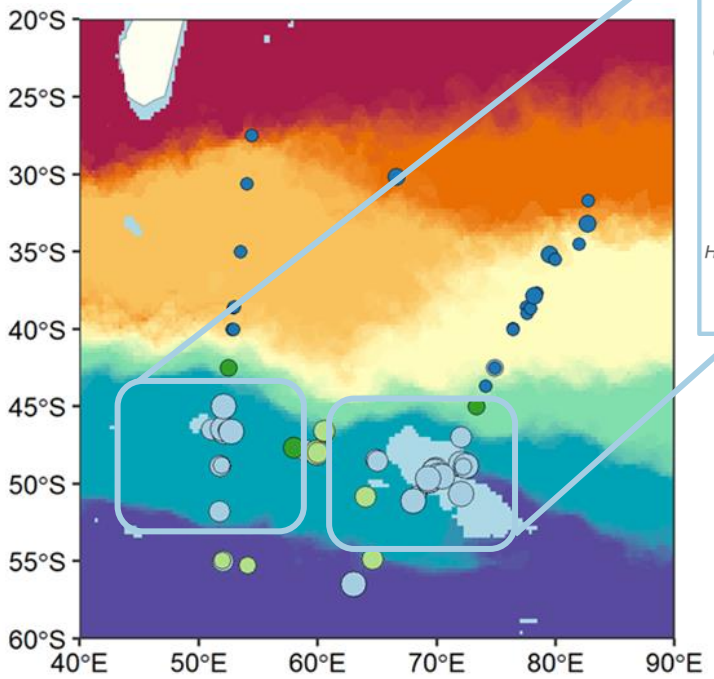
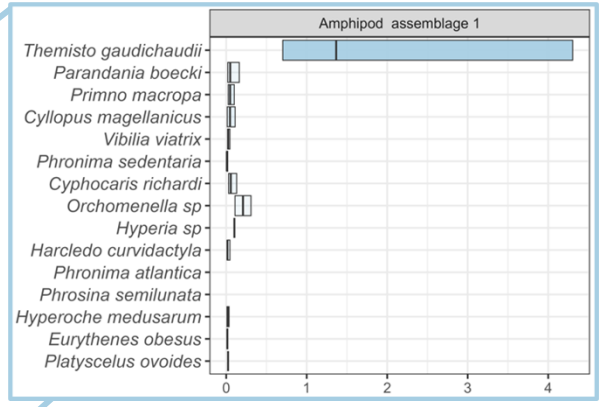



Amphipod





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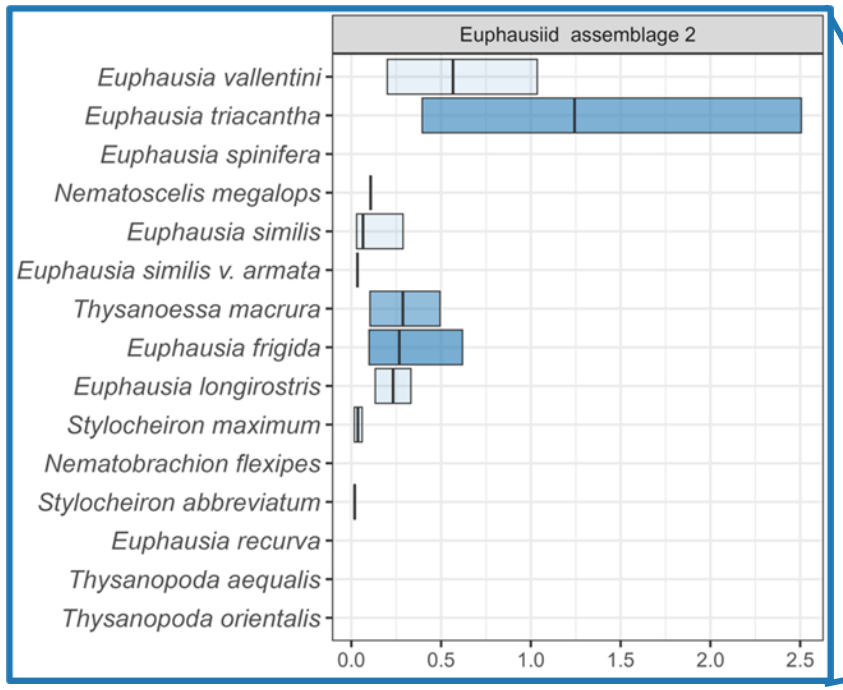
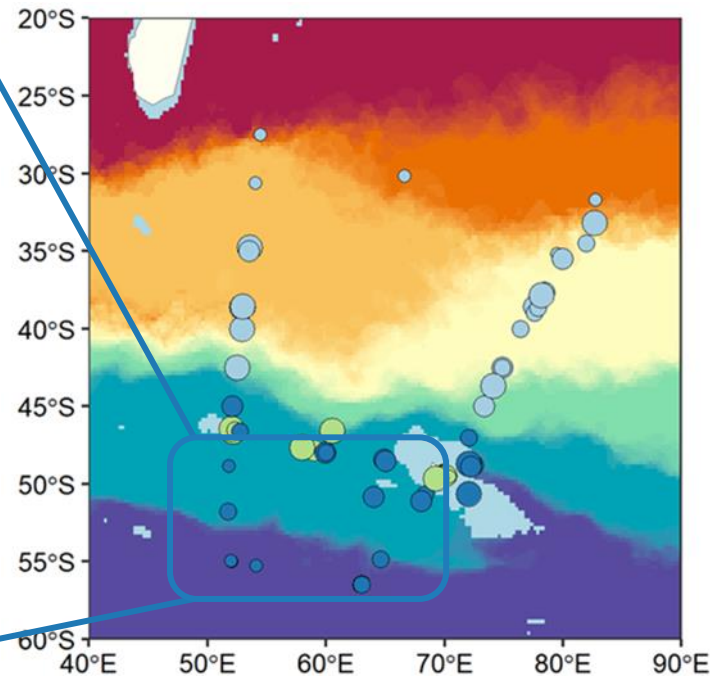
# Diversity in open ocean

Open ocean assemblages defined by higher diversity

- One for euphausiids




Euphausiid





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# Diversity in open ocean

Open ocean assemblages defined by higher diversity

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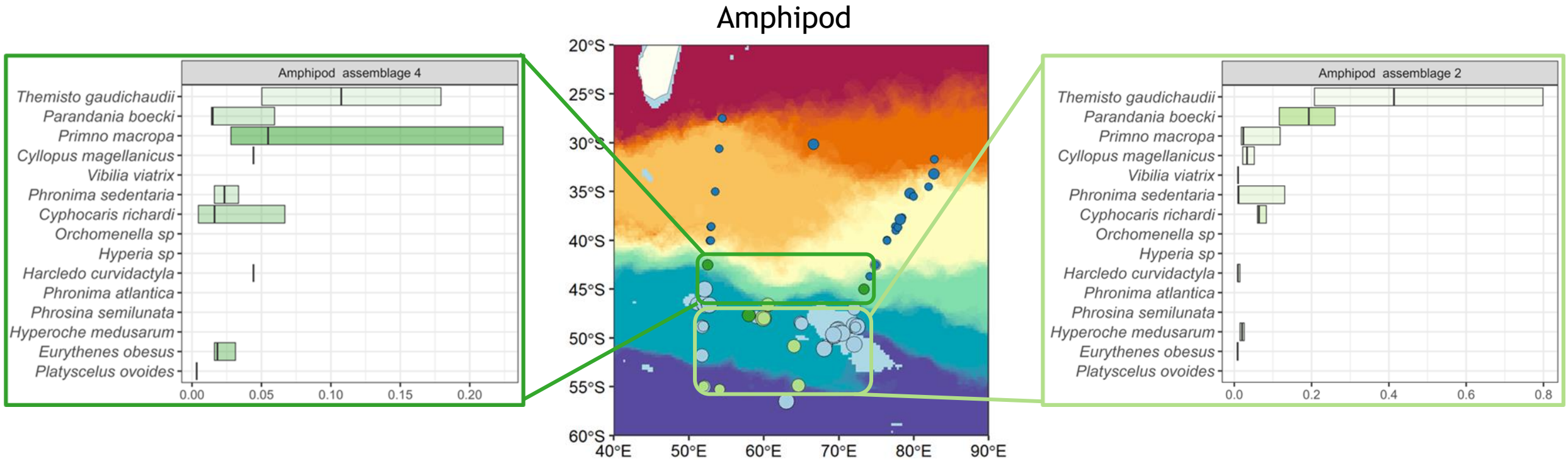
- Two for amphipods





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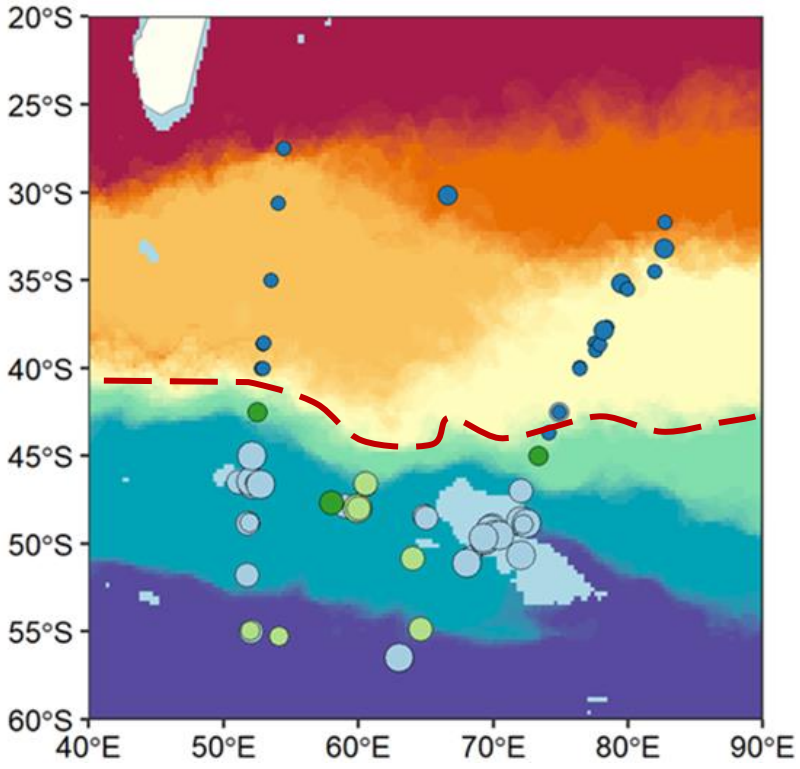
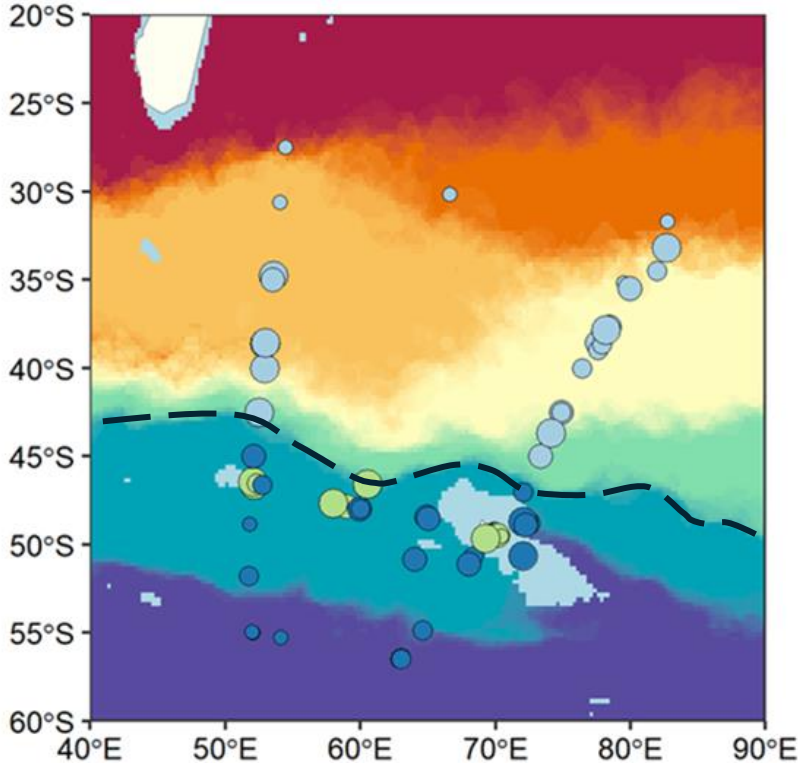
# Indian vs Southern ocean

Biogeographic analyses highlighted the important role of the sub-Antarctic zone as a strong biogeographic barrier

The barrier front is not the same for each taxa

- **Subtropical Front** for amphipods
- **Subantarctic Front** for euphausiids





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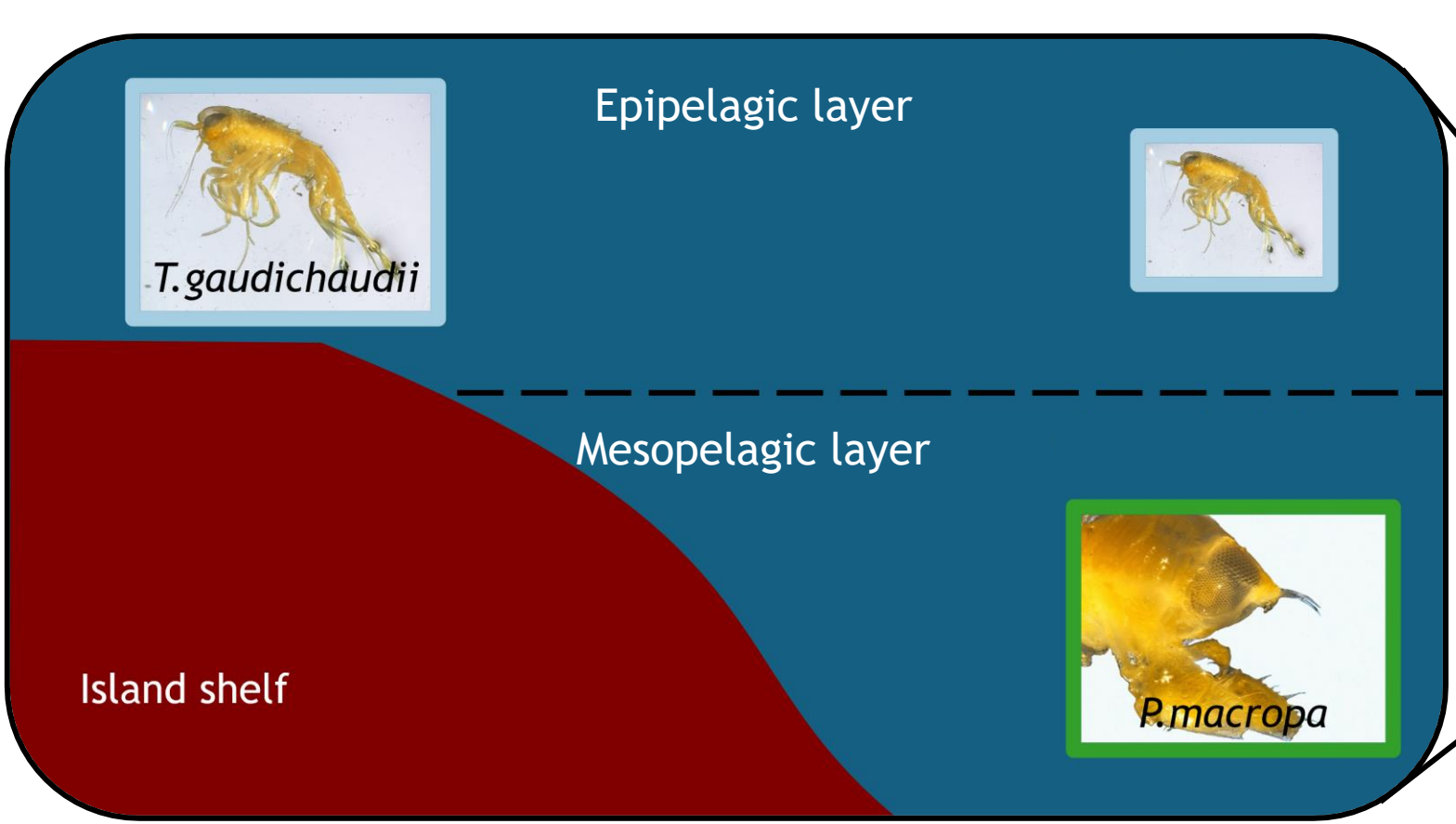
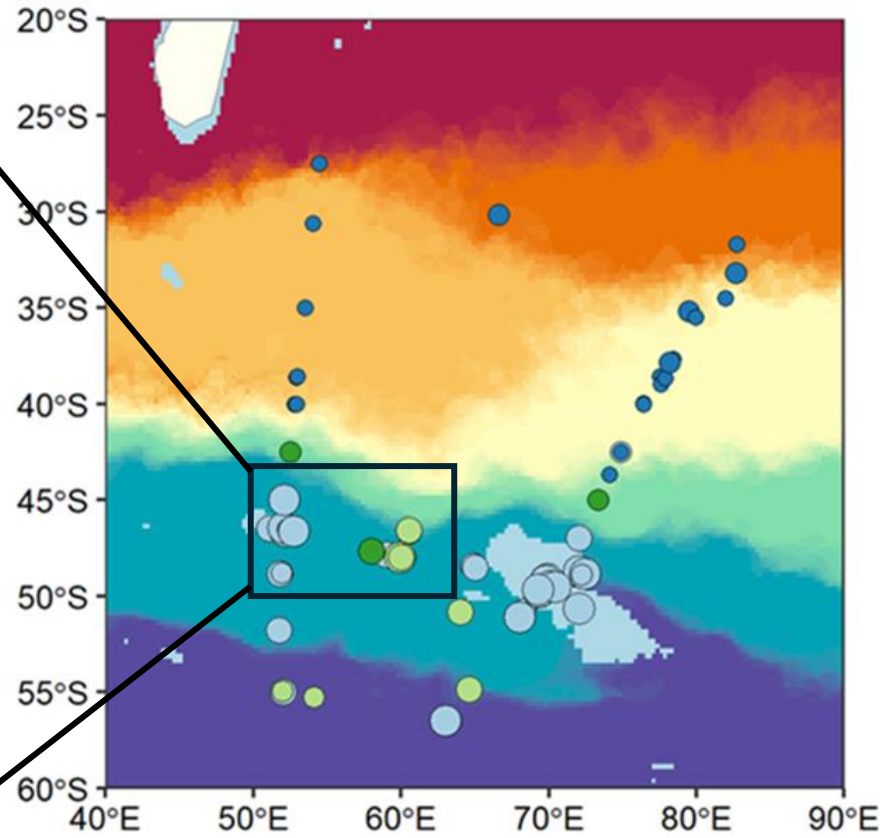
# Does traits influence biogeographic patterns?

Species assemblages identified for both taxa show subdivision of the Southern Ocean

Amphipod assemblages show the effect of bathymetry: epipelagic vs mesopelagic species





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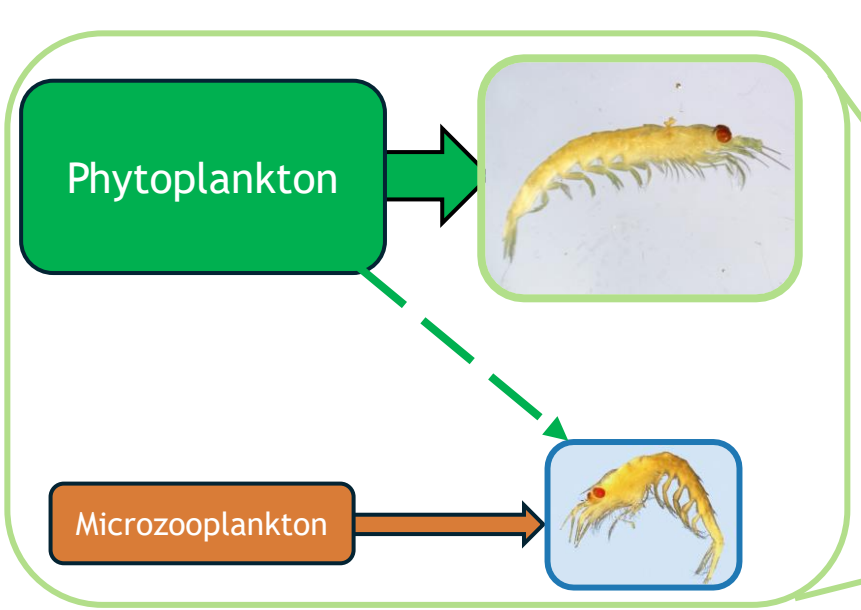
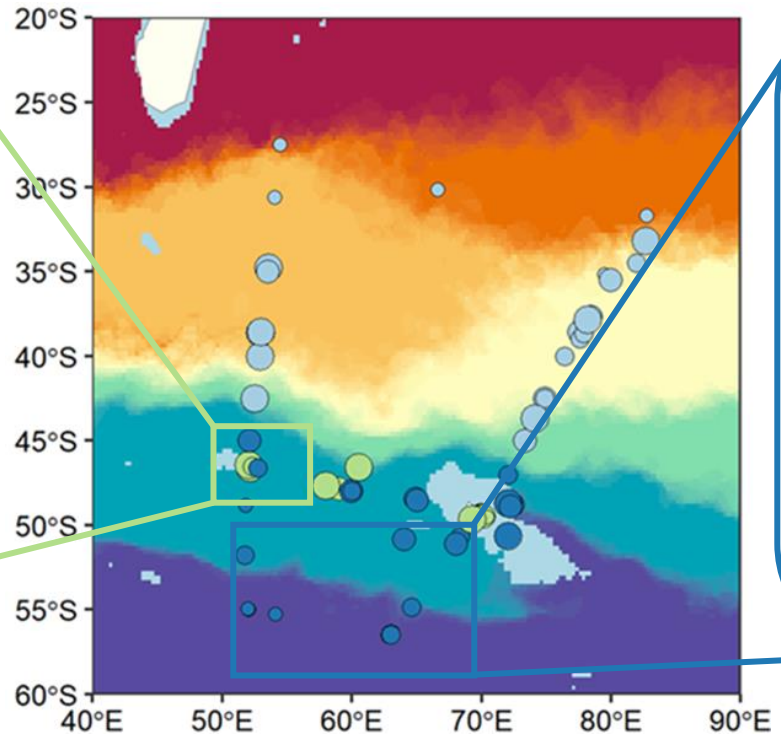
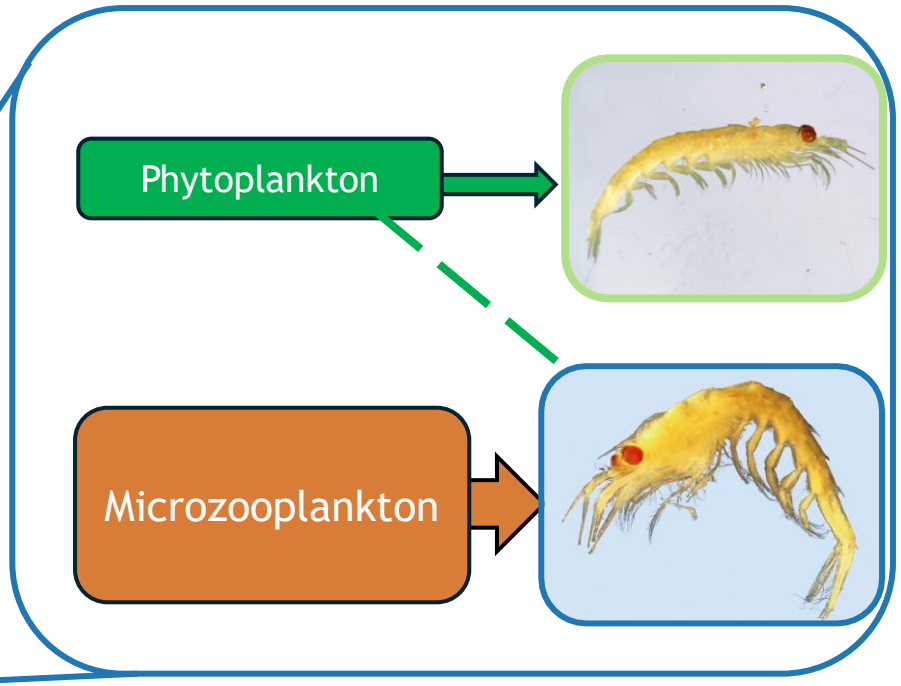
Euphausiid assemblages show the effect of primary production: herbivorous vs carnivorous species





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# Take-home messages

Subantarctic zone drives changes between southern indian ocean and southern ocean assemblages

Main differences in species assemblages are found in the Southern Ocean:

- Amphipod species assemblages' quantitative structure is explained by topography
- Euphausiid species assemblages' quantitative structure may be explained by traits


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Thank you! Any questions?


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