Biomarkers of change: tracking diets along an environmental gradient in an Antarctic benthic ecosystem.

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14th INTERNATIONAL TEMPERATE REEFS SYMPOSIUM
BREST FRANCE
1›5 JULY 2025

COLLEGE DOCTORAL BRETAGNE SCIENCES DE LA MER ET DU LITTORAL

LEMAR laboratoire des sciences de l'environnement marin UBO | CNRS | IRD | Ifremer

LIÈGE université

[1] Laboratory of Environmental Marine Sciences, UBO, France
[2] Laboratory of Trophic and Isotope Ecology , ULiege, Belgium

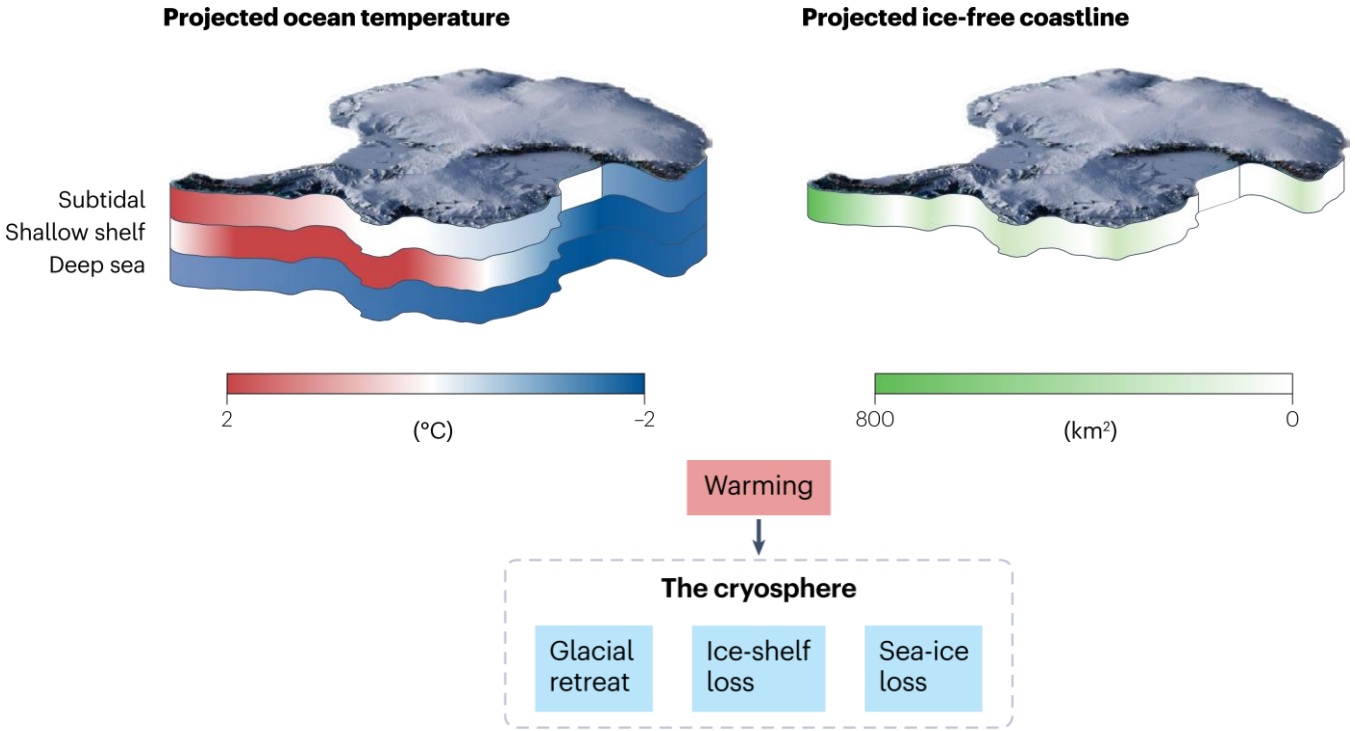
Context

- West Antarctic Peninsula (WAP)

(adapted from Griffiths et al., 2024)

Context

- West Antarctic Peninsula (WAP)
  - Steep environmental changes



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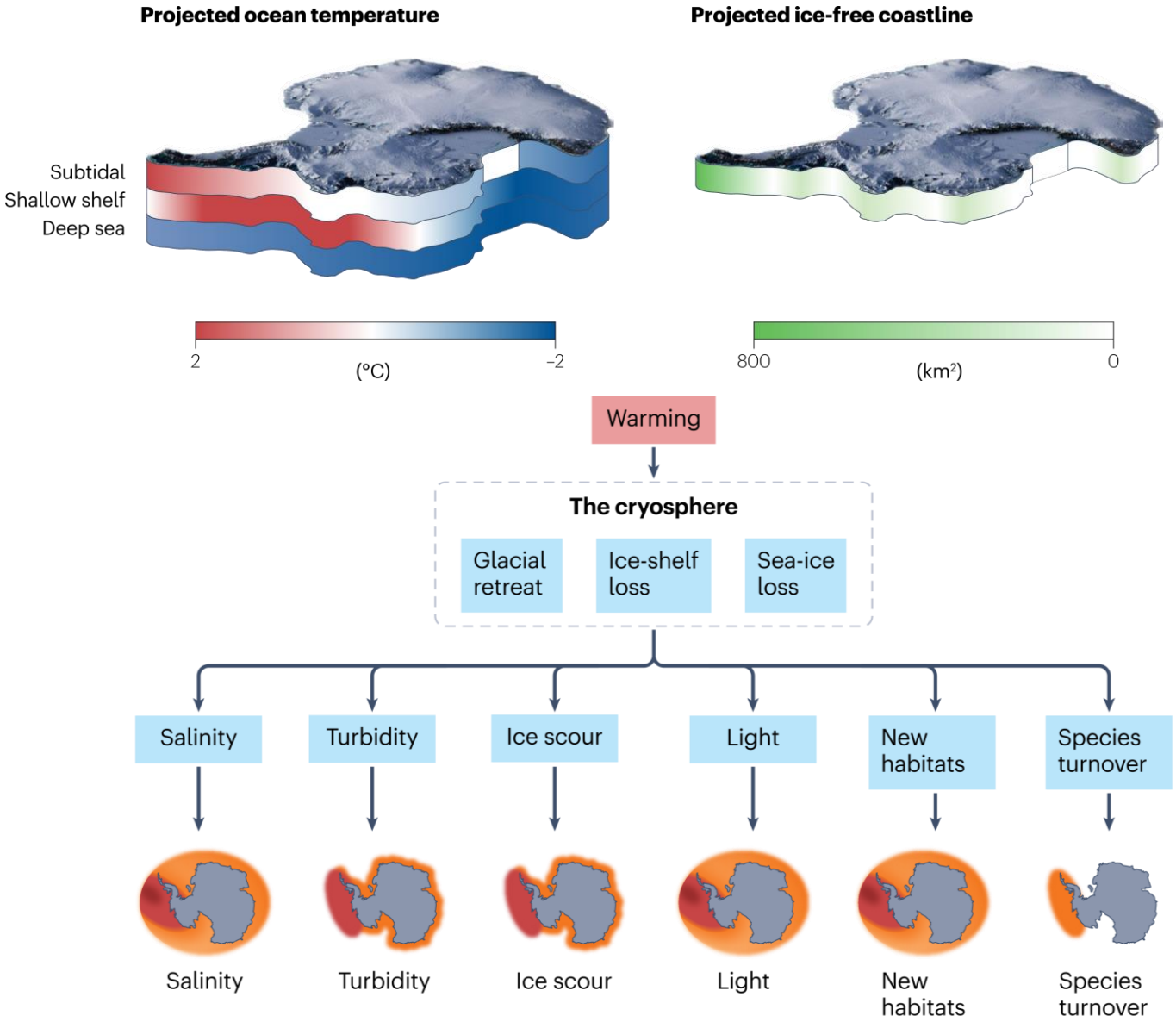
Context

- West Antarctic Peninsula (WAP)
  - Steep environmental changes
  - Benthic ecological changes



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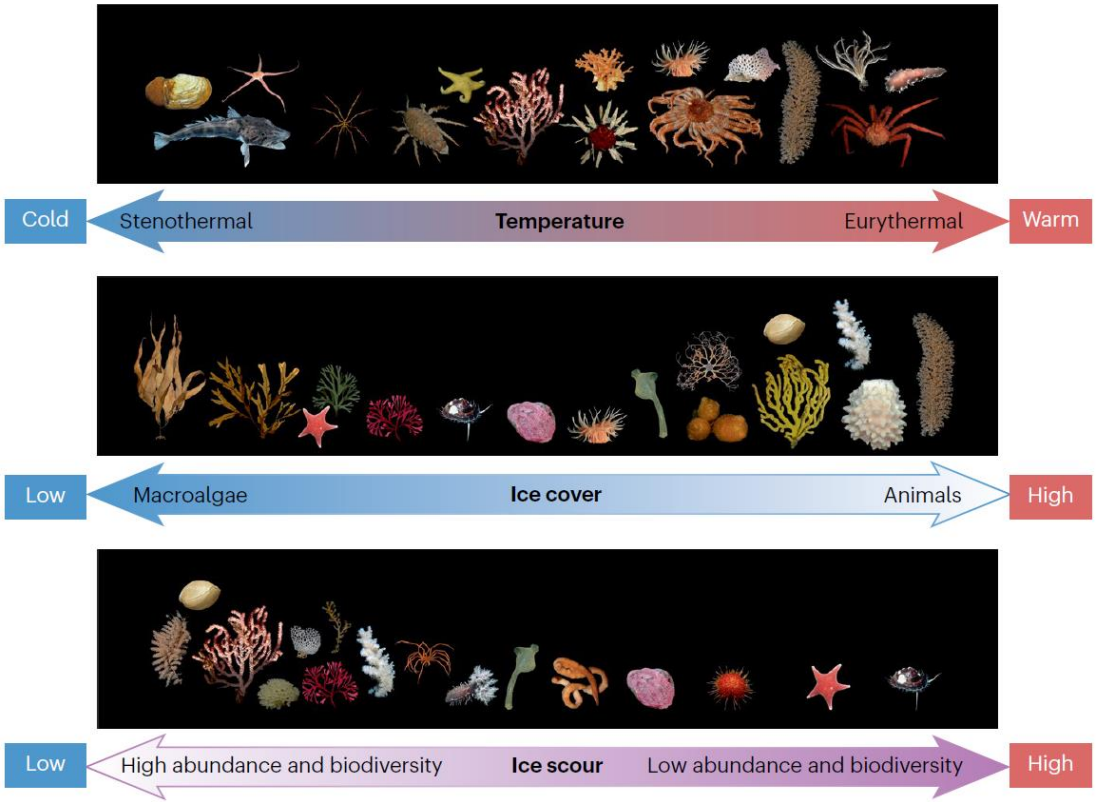

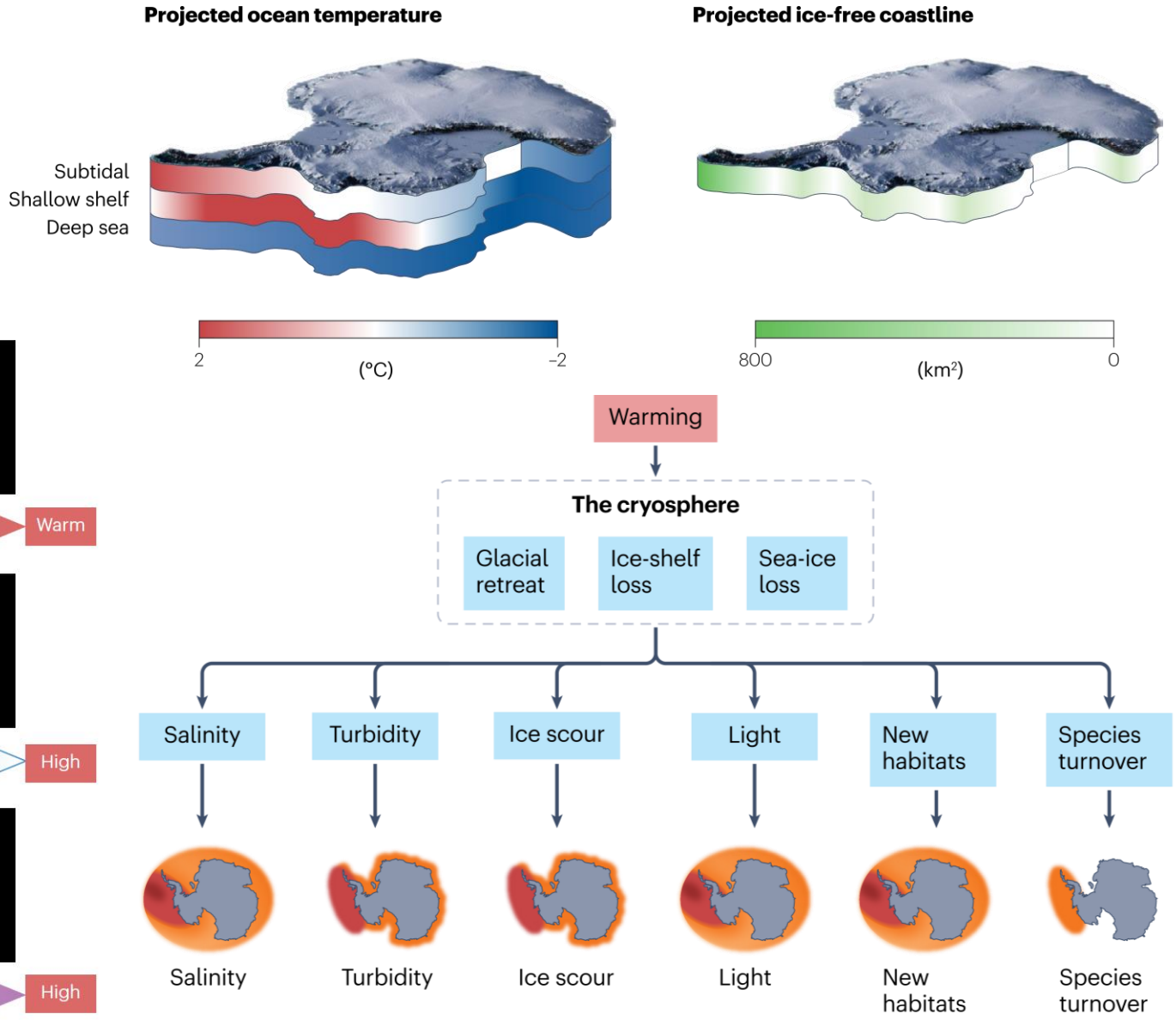

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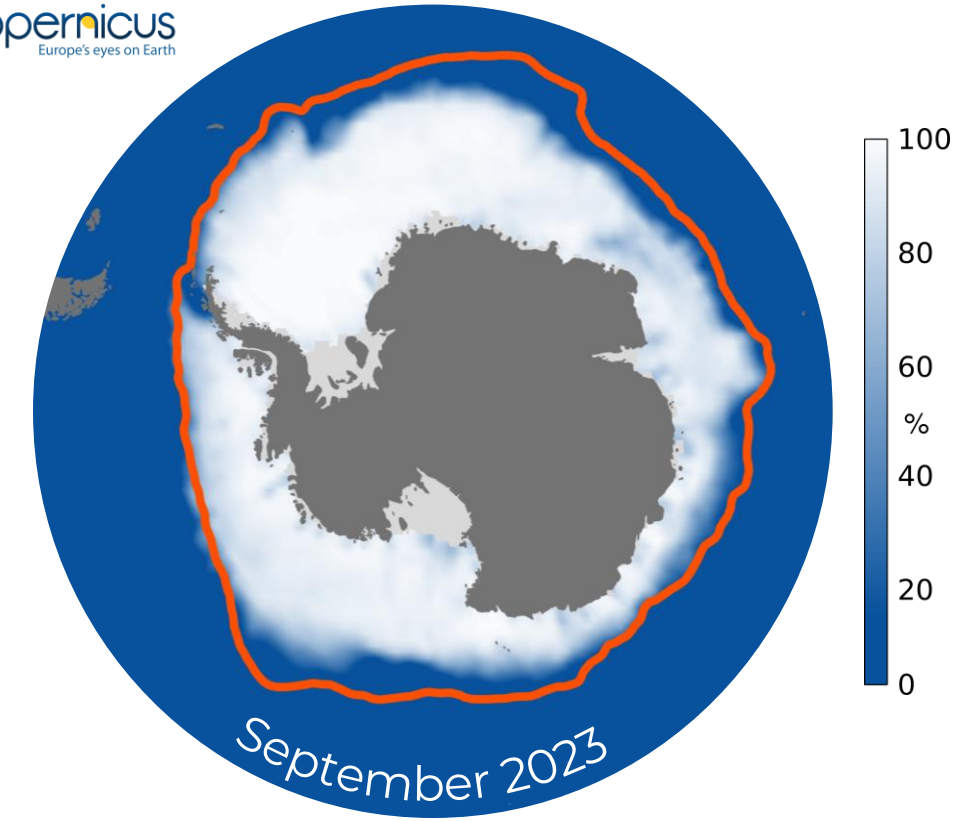
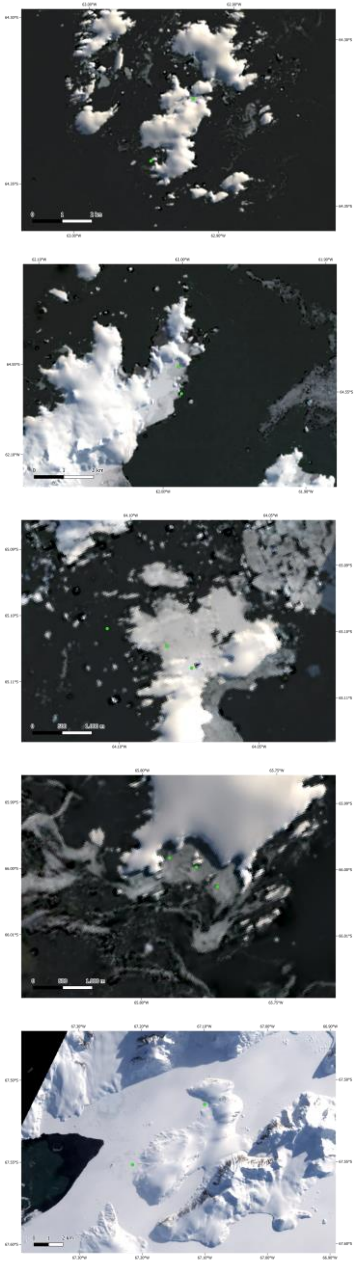
Context

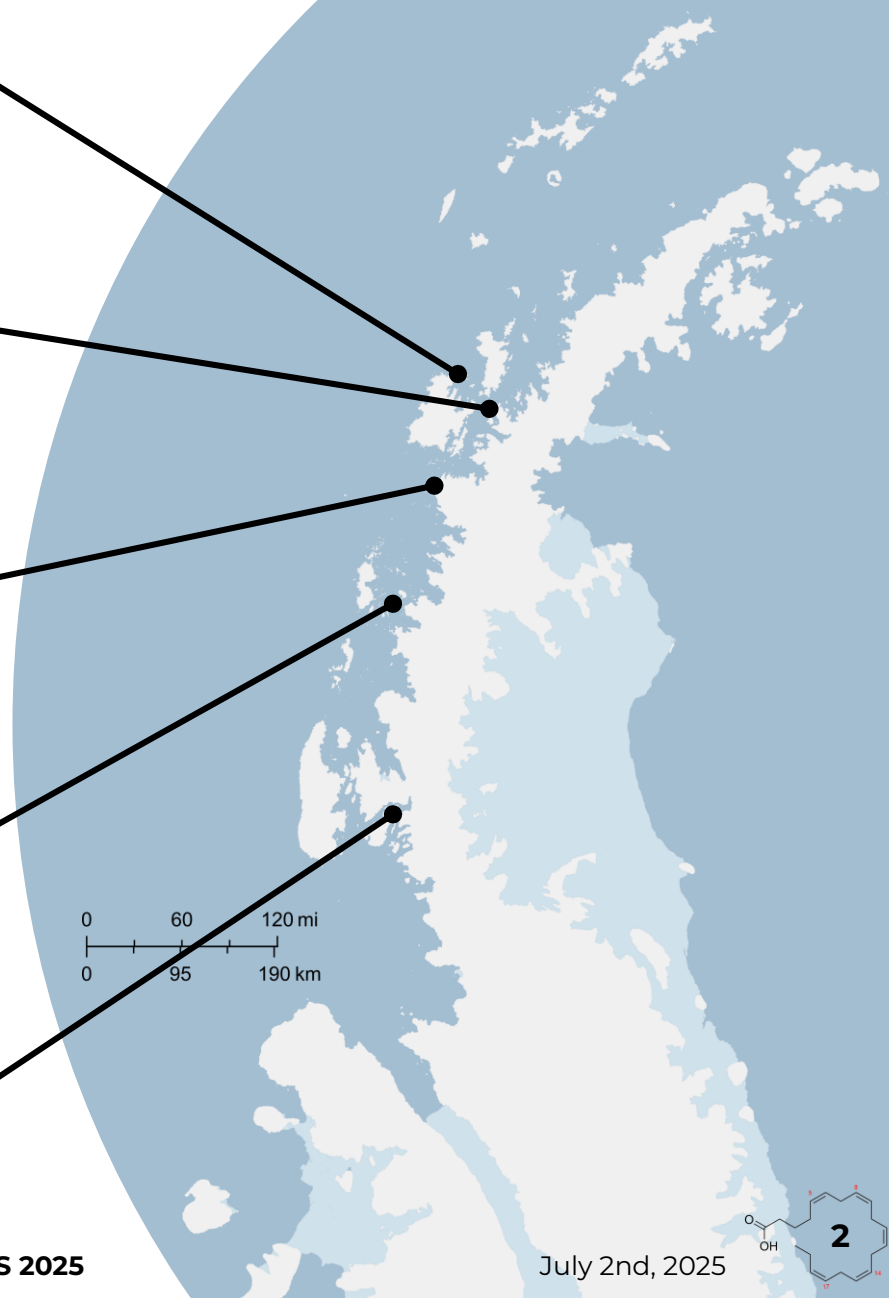
- West Antarctic Peninsula (WAP)
  - Steep environmental changes
  - Small-scale particularities



Austral winter

Satellite view – ©Axelle Brusselman





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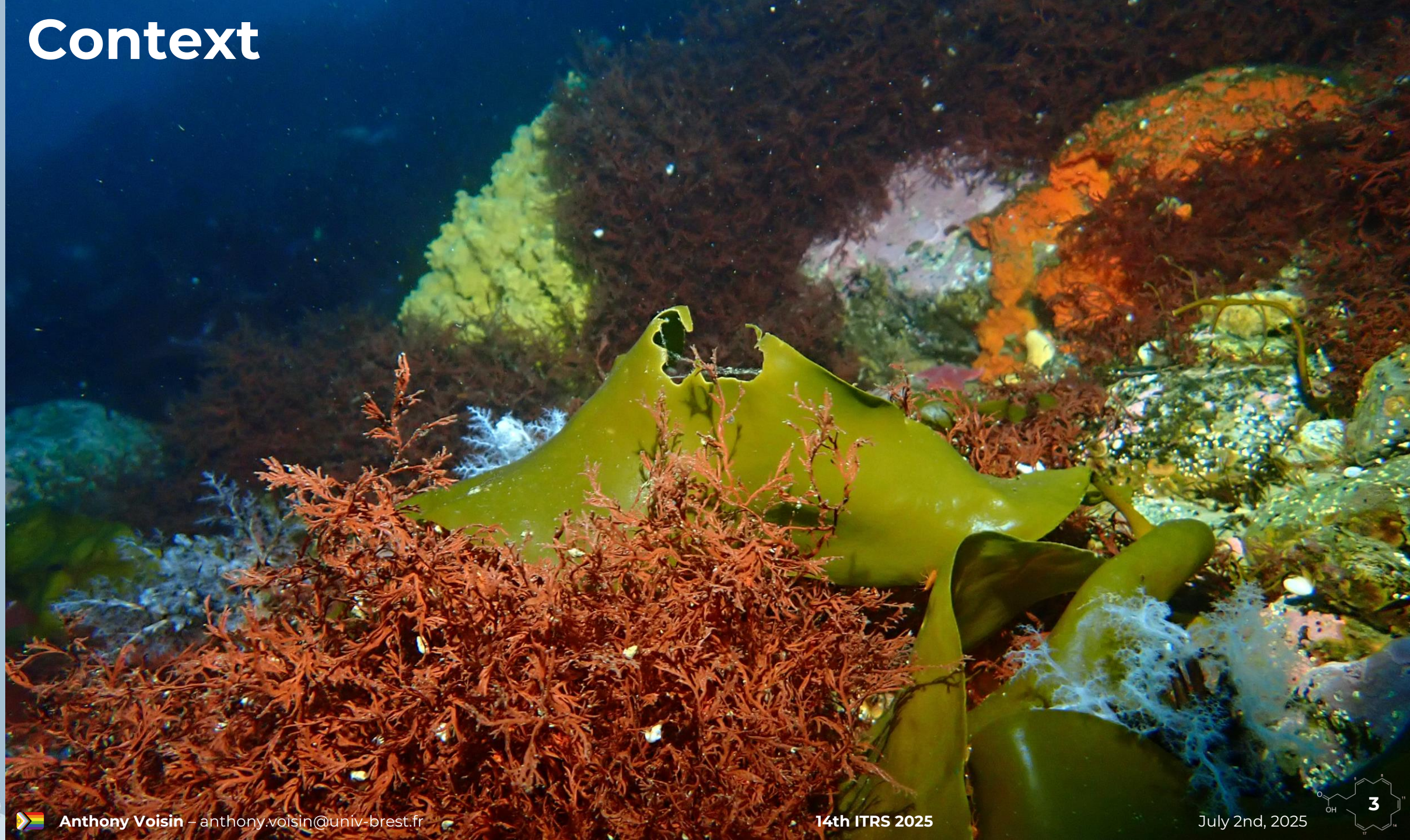
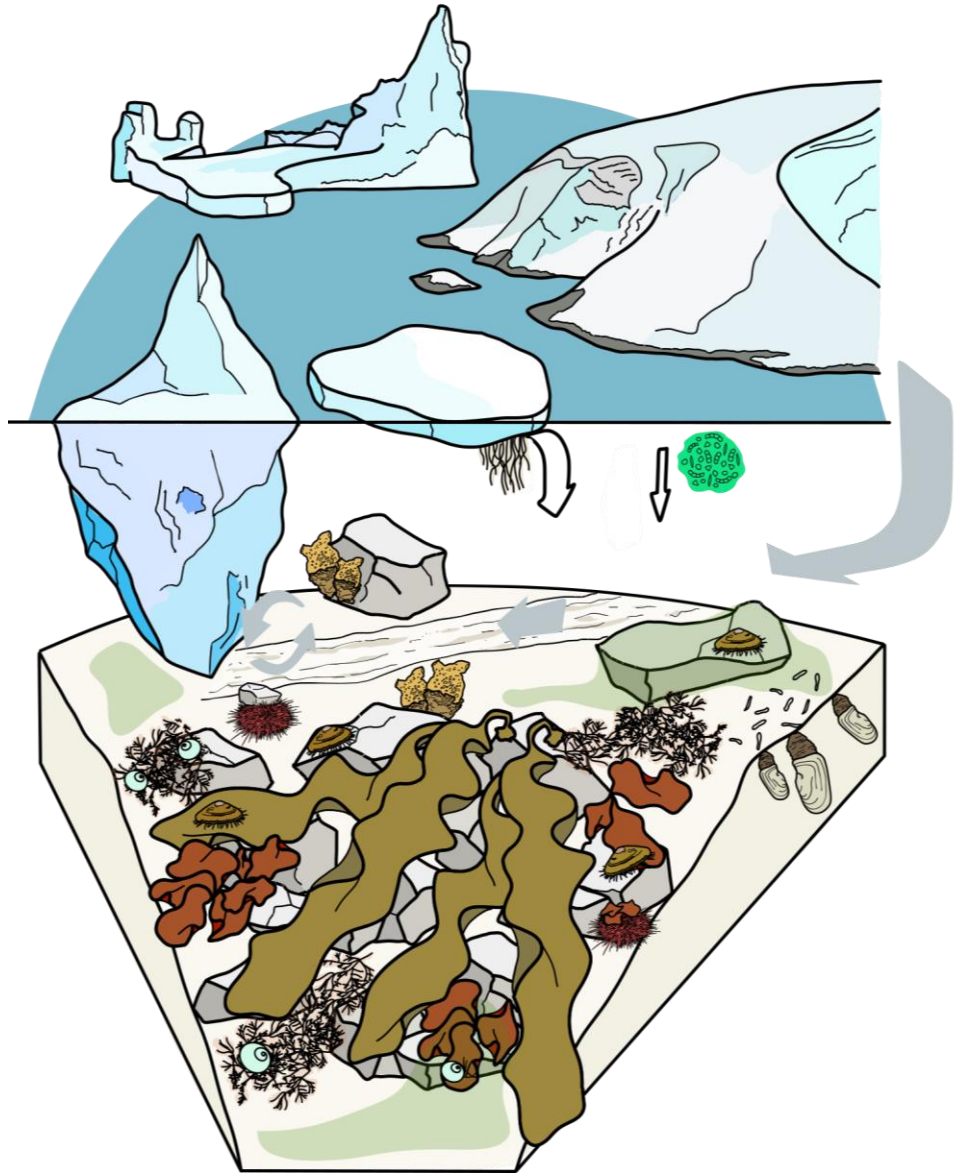


Context

- High environmental variability
  - Ice disturbances
    (i.e., glacier calving, iceberg scouring, nutrient input)
  - Food sources availability



(Ha et al., 2019; Meredith et al., 2019; Ko et al., 2023; Griffith et al., 2024)

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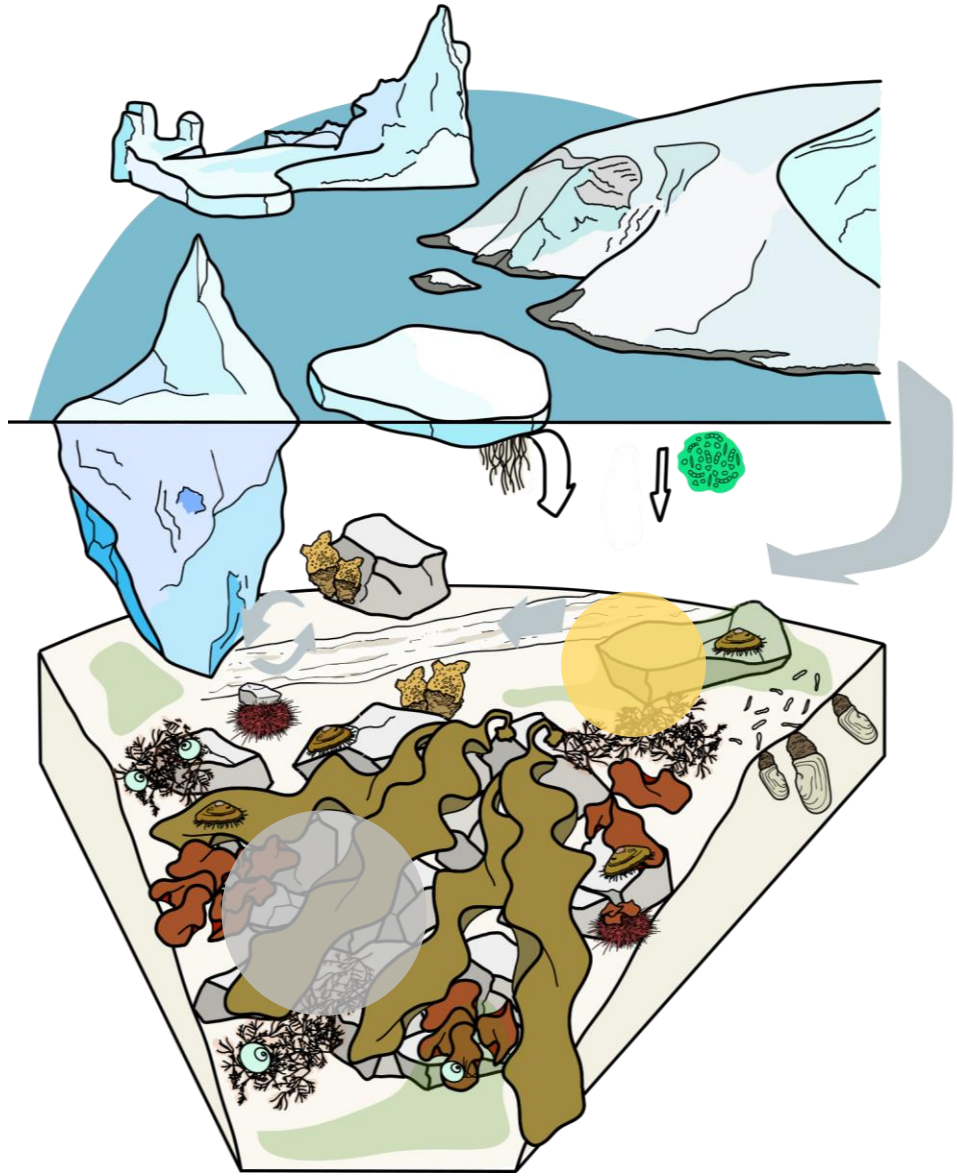
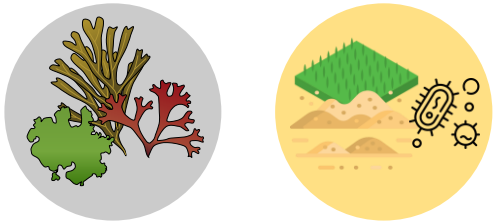


BENTHIC



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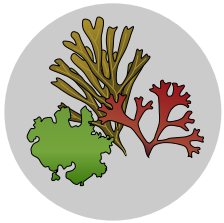
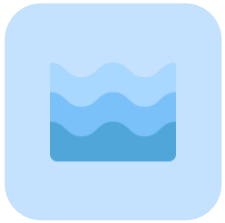
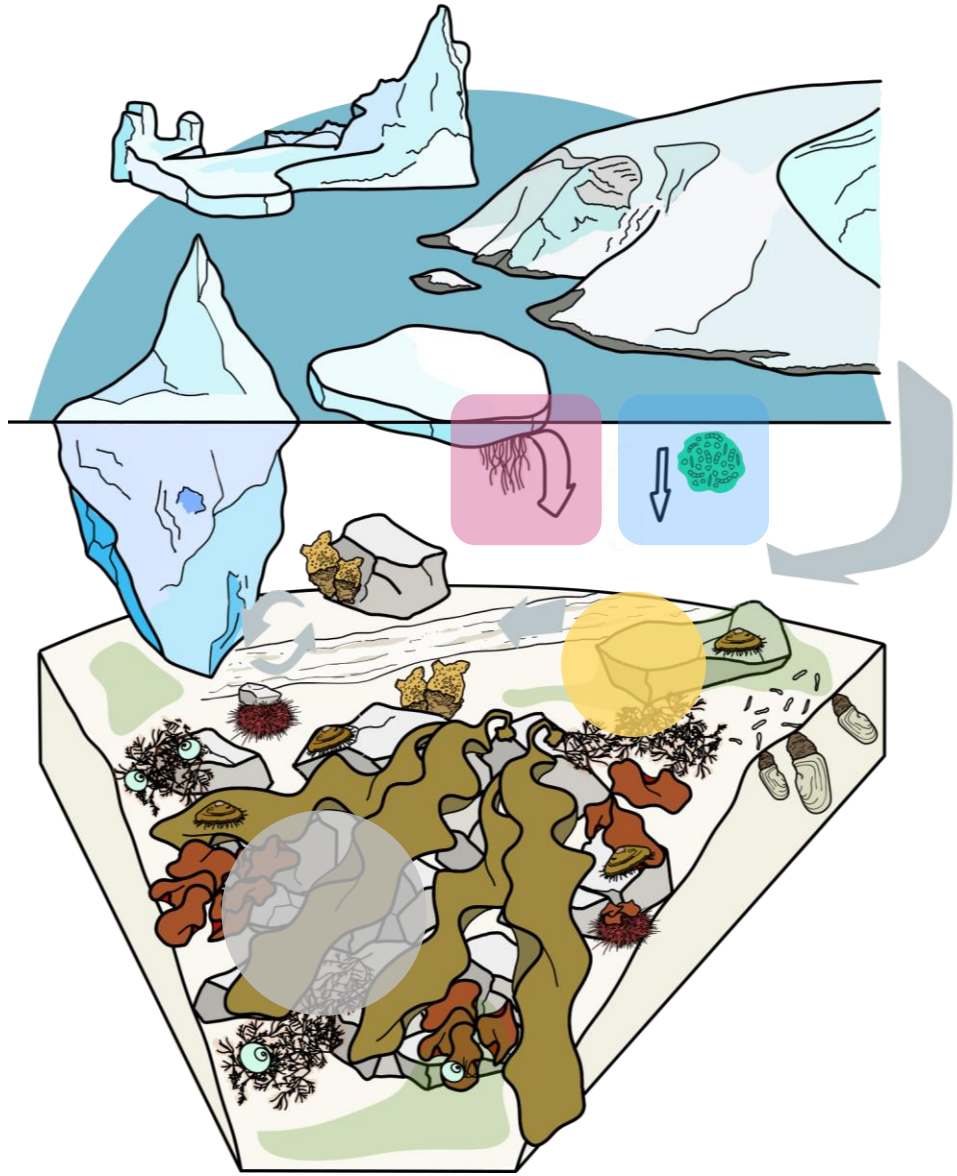


SYMPAGIC

PELAGIC



WEST ANTARCTIC PENINSULA



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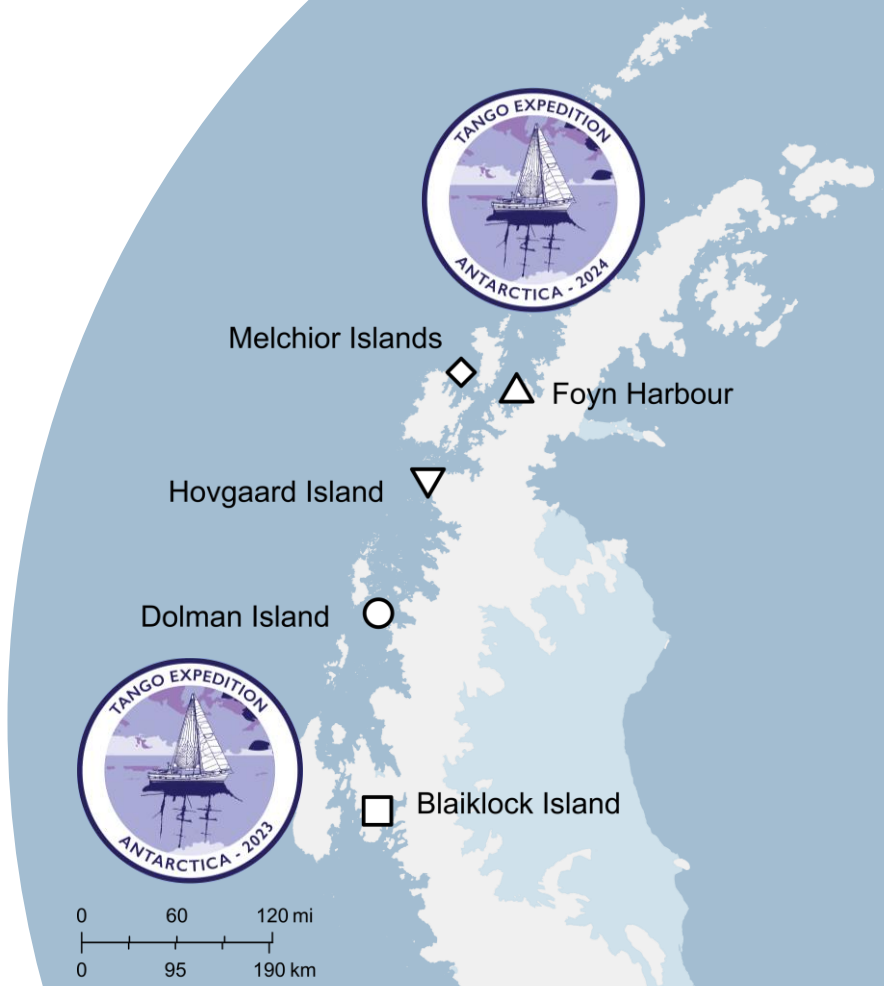
Sampling

TANGO project
(Danis et al., 2023; 2024)

belspo



Sampling

- TANGO project
  (Danis et al., 2023; 2024)

belspo

- Food sources & consumers

Gastropod grazers

Margarella antarctica

Nacella concinna

Filter-feeders

Cnemidocarpa verrucosa

Dendrilla antarctica

Sampling

- TANGO project
  (Danis et al., 2023; 2024)

belspo

- Food sources & consumers

Does combining biomarkers refine the diet of benthic consumers under different environmental conditions?

Gastropod grazers

Margarella antarctica

Nacella concinna

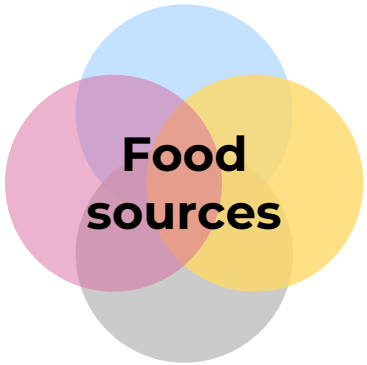
Filter-feeders

Cnemidocarpa verrucosa

Dendrilla antarctica

Biomarkers

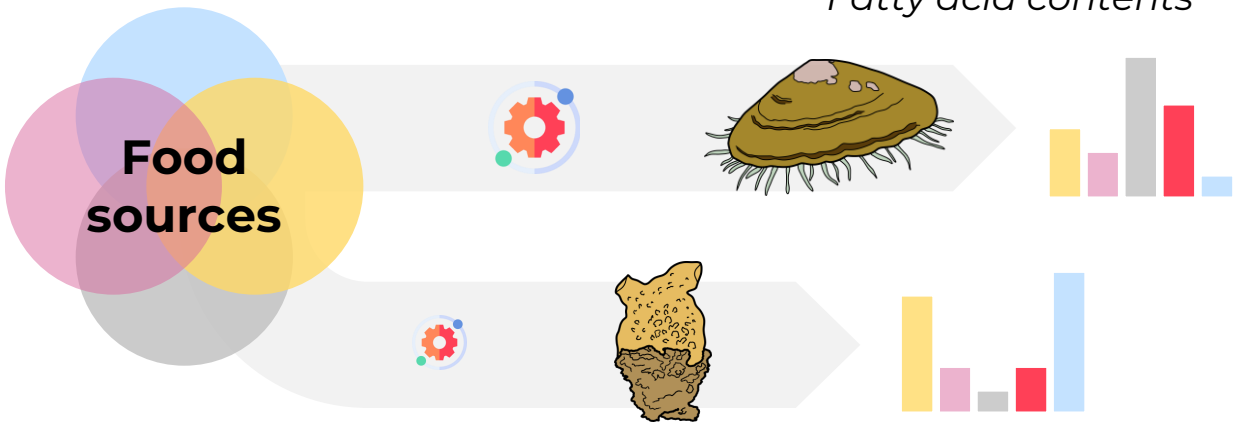
Fatty acids (FA)

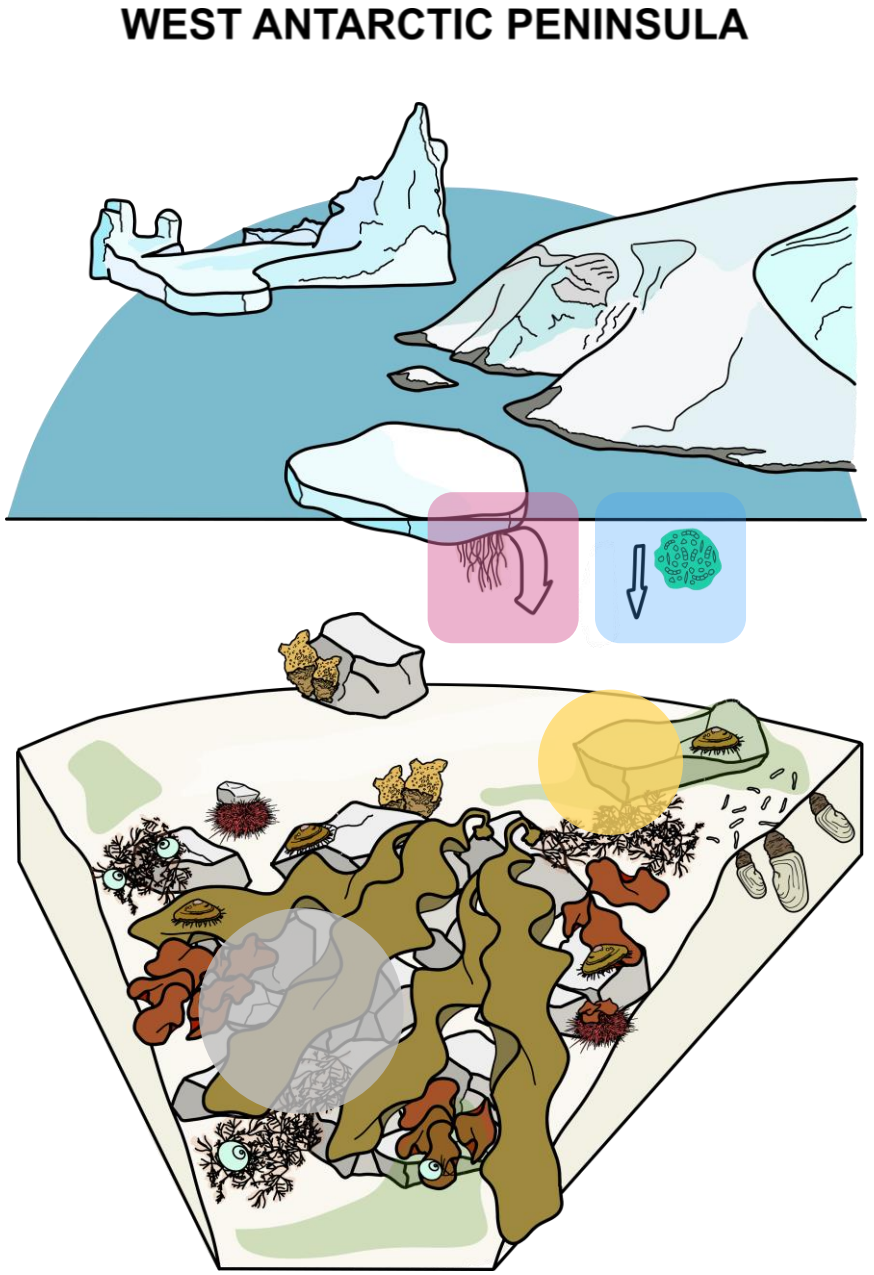


(Kelly and Scheibling, 2012)

Biomarkers

Fatty acids (FA)





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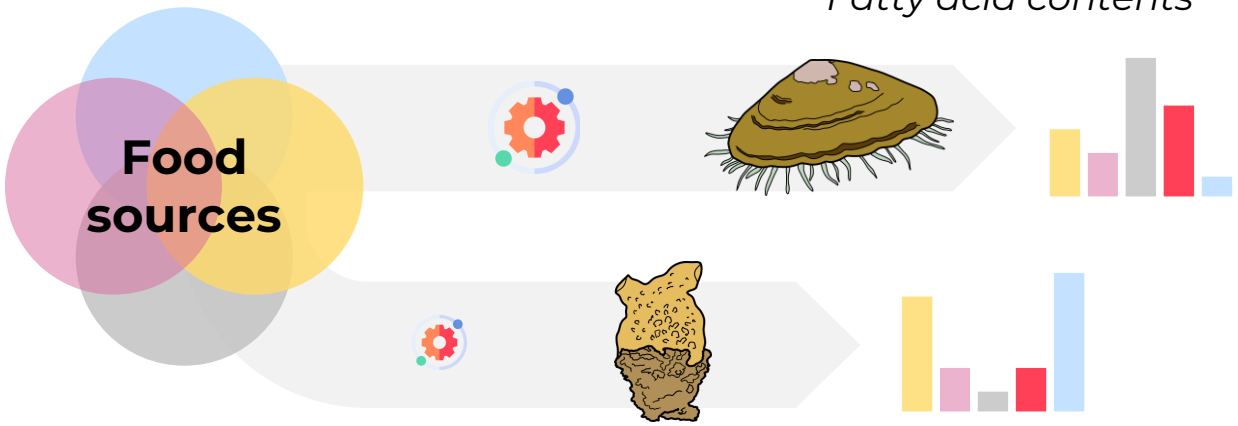
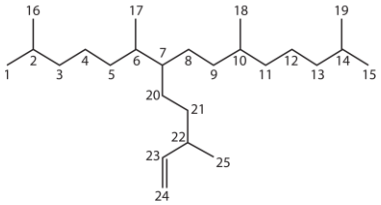


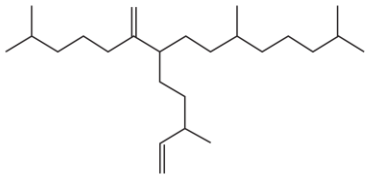
Highly Branched Isoprenoids (HBI)

HBI I
Monoene



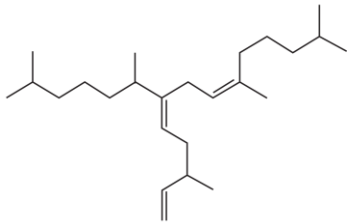
IP25

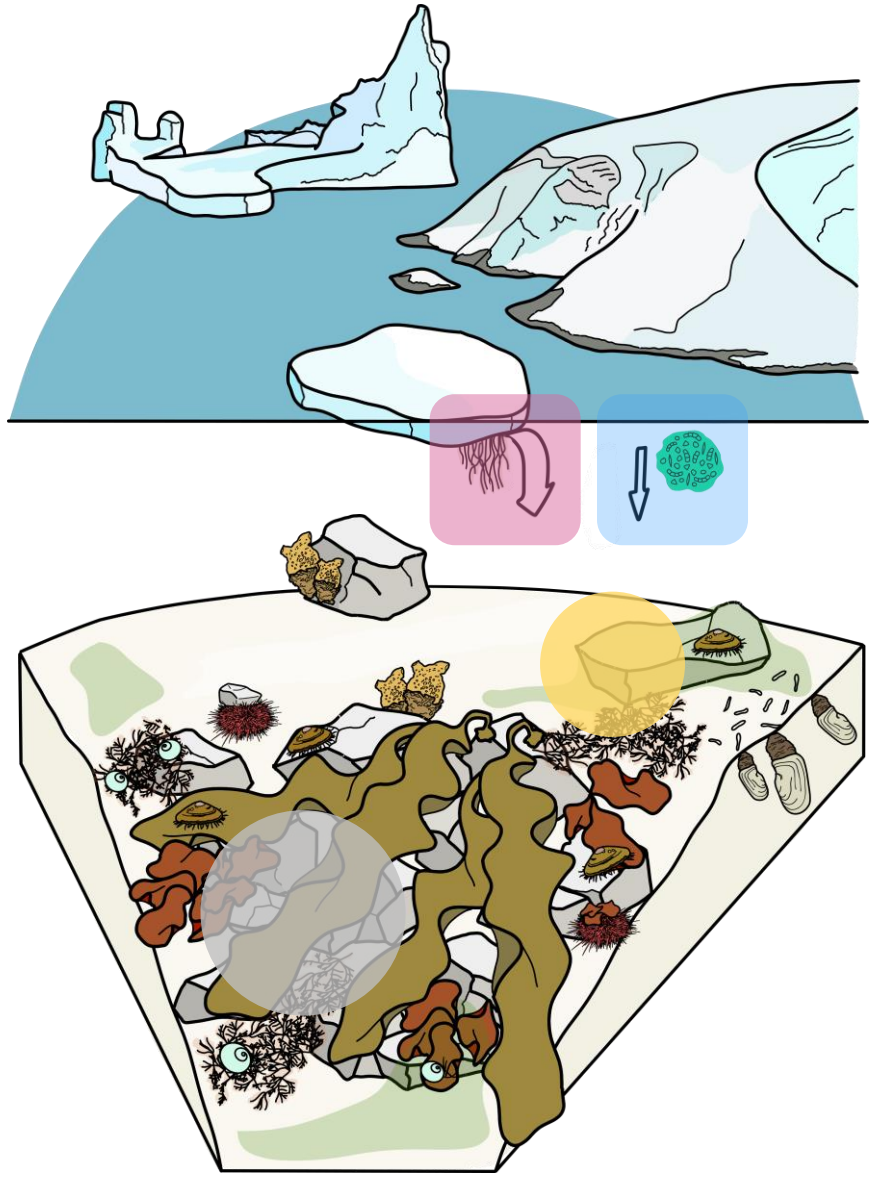
HBI II
Diene



IPSO25

HBI III
Triene

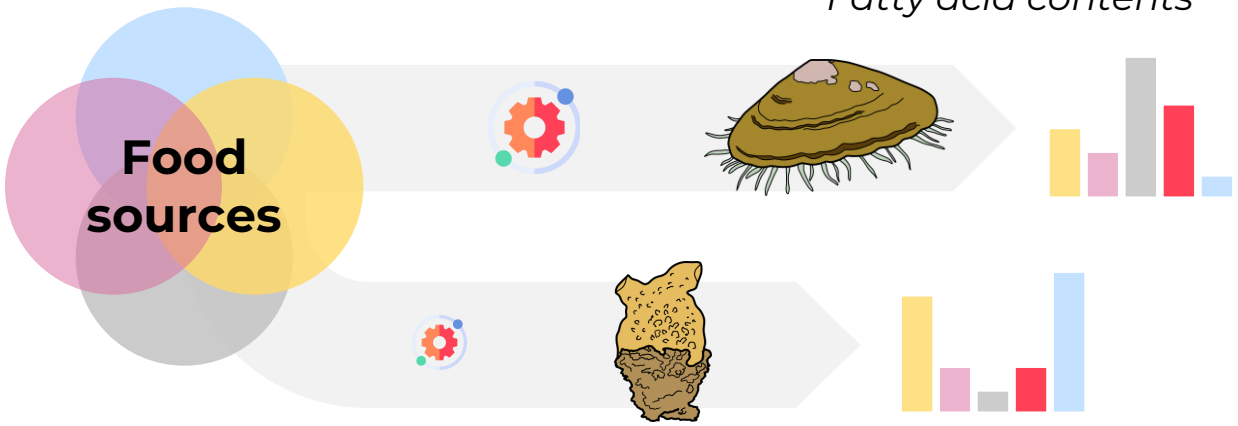




(Kelly and Scheibling, 2012; Belt, 2018; Koch et al., 2023)

Biomarkers

Fatty acids (FA)



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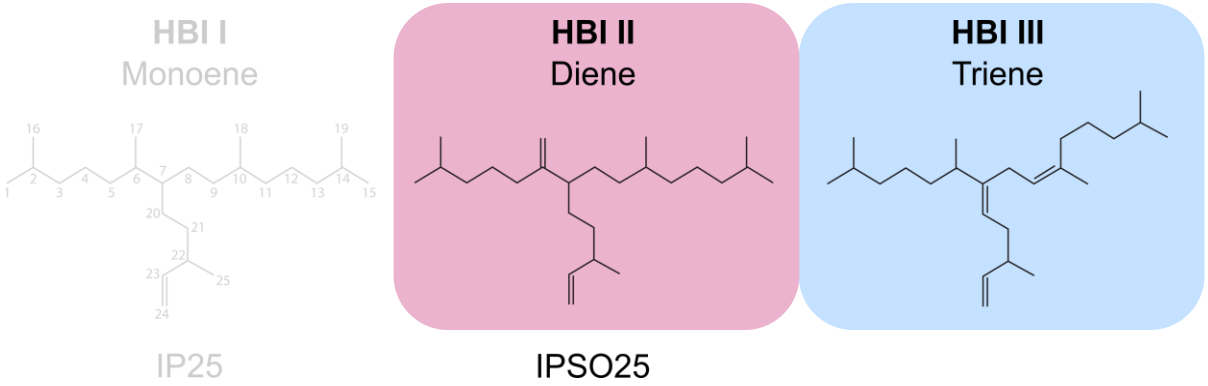

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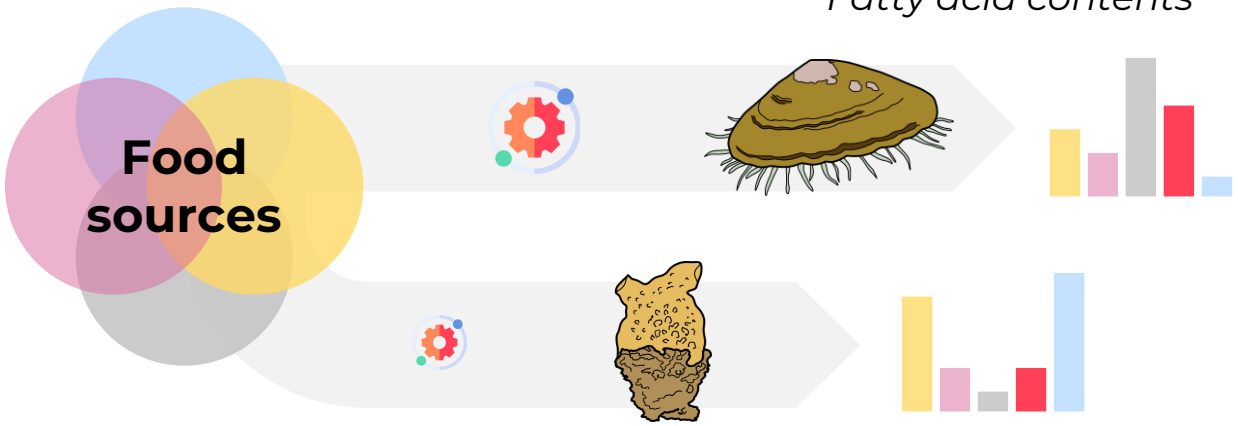

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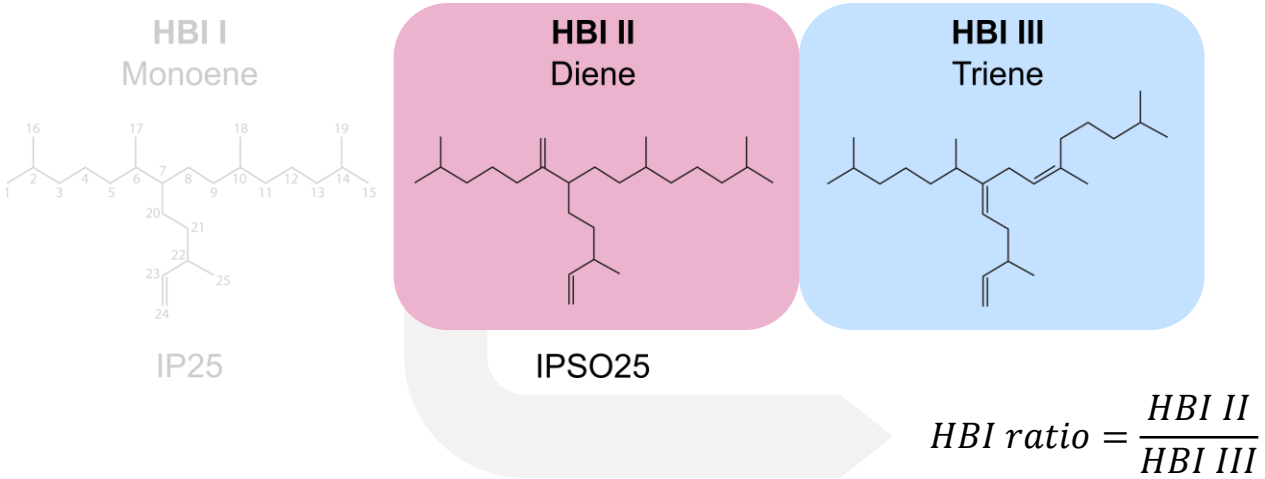

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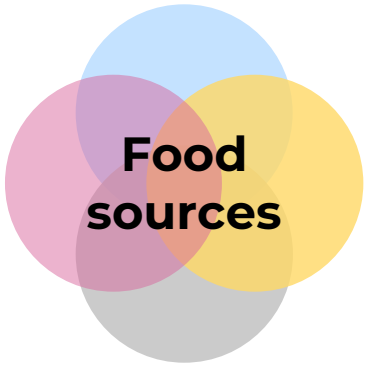
Results & Discussion

Fatty acids (FA)



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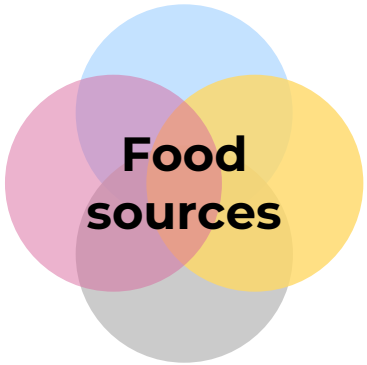

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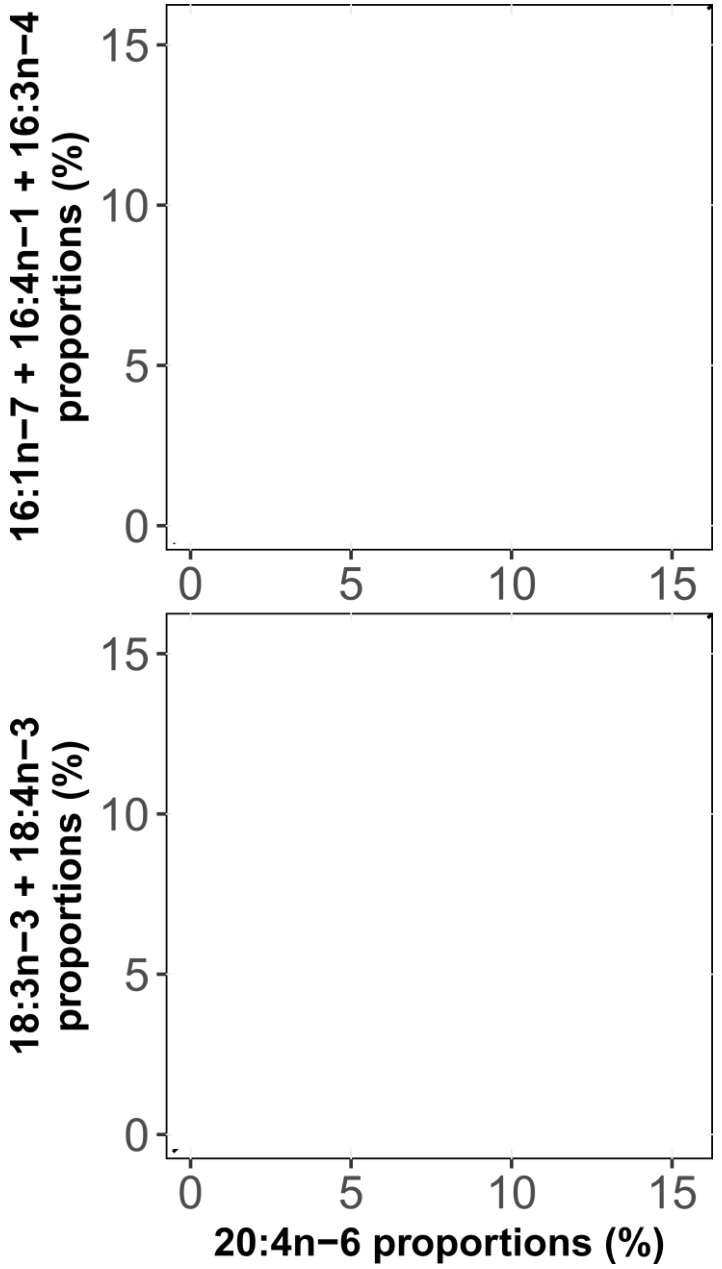

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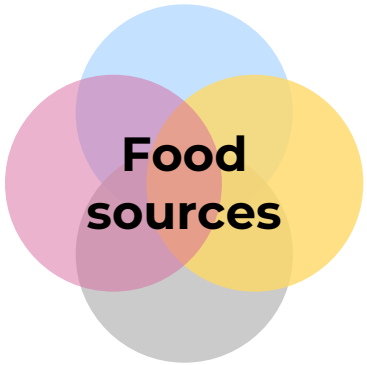

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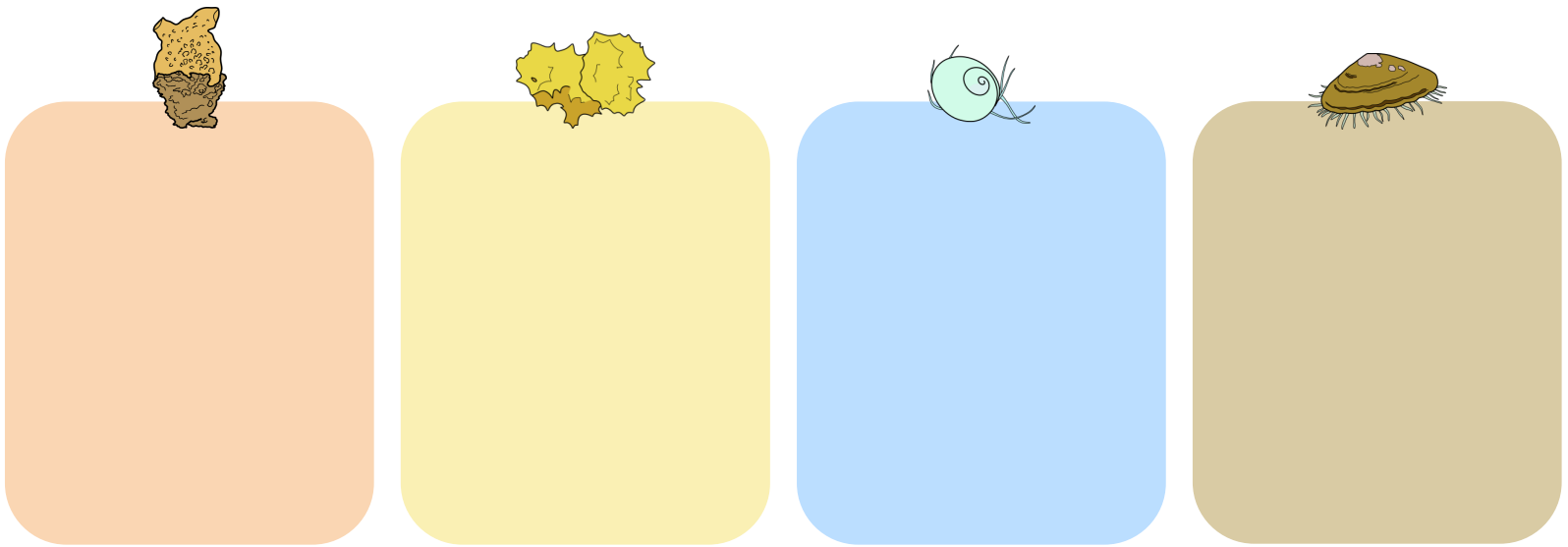

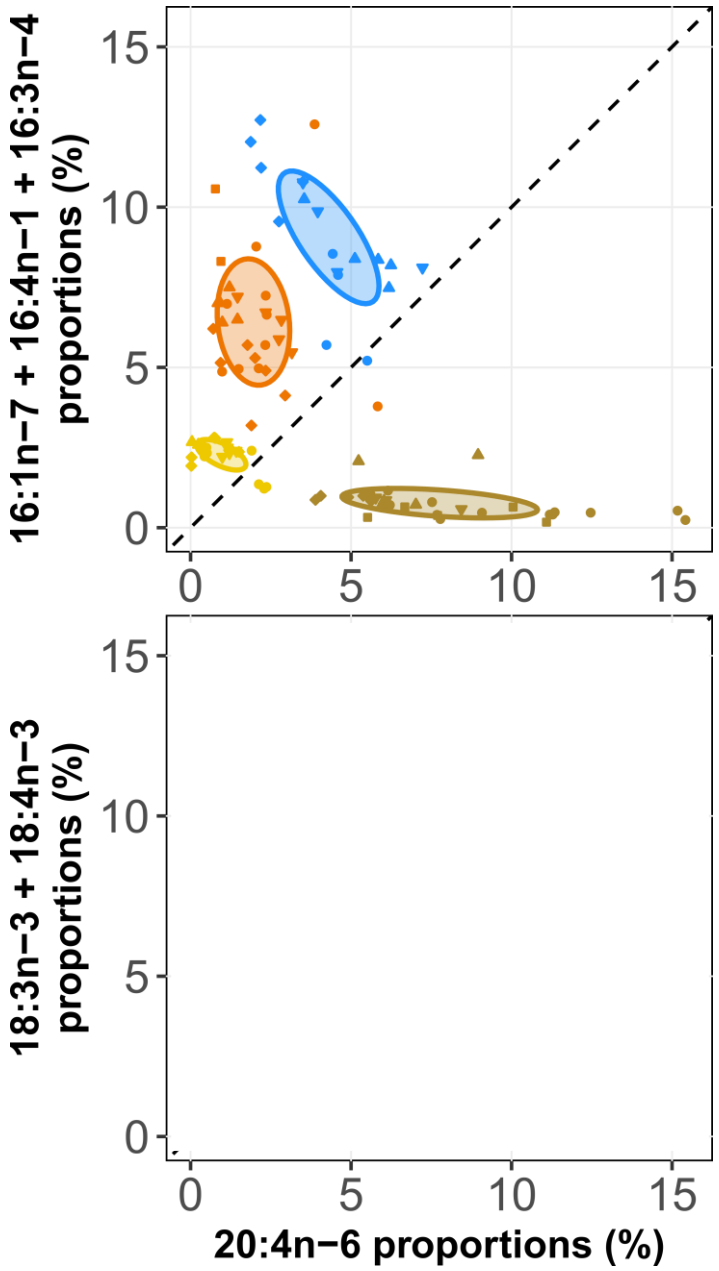

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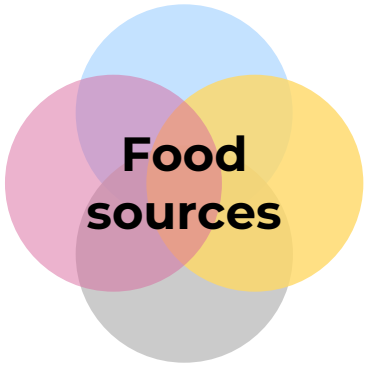

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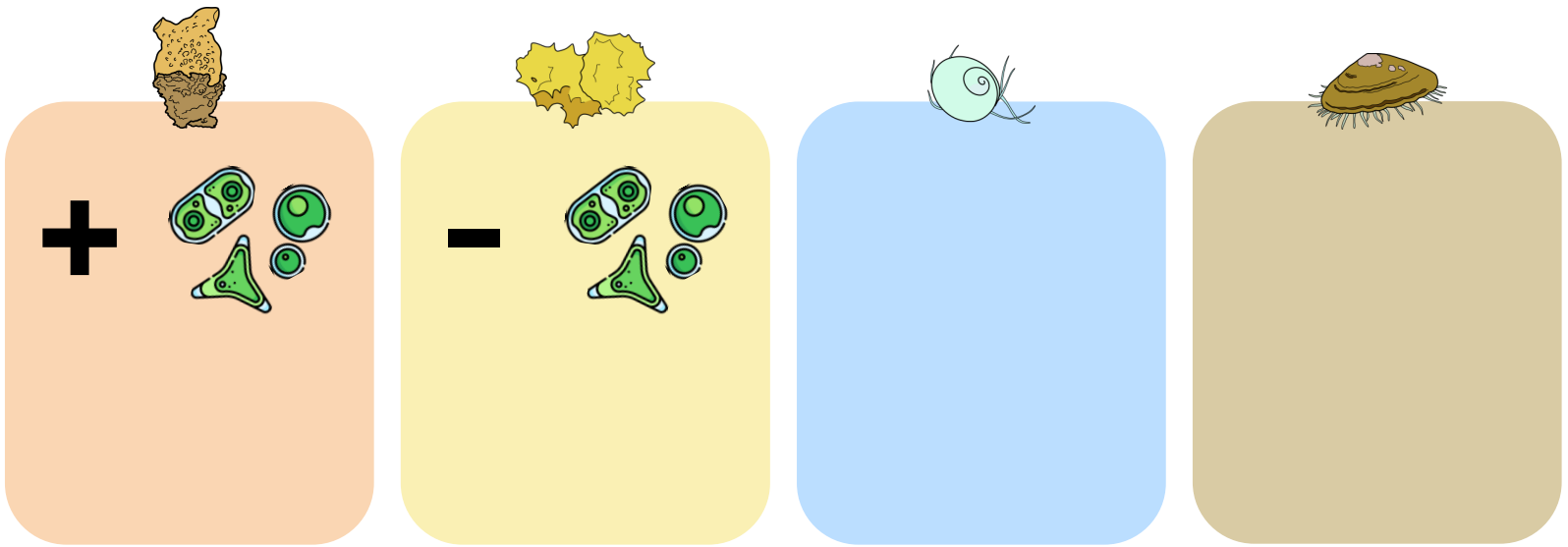

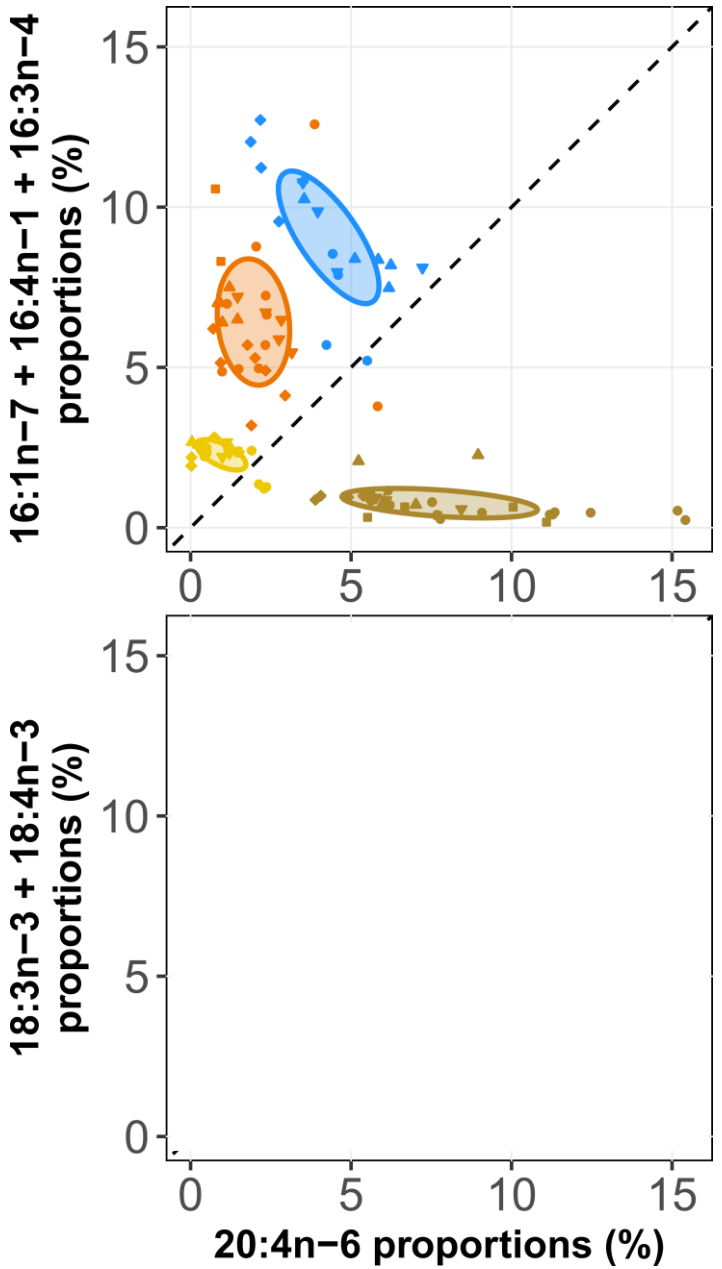

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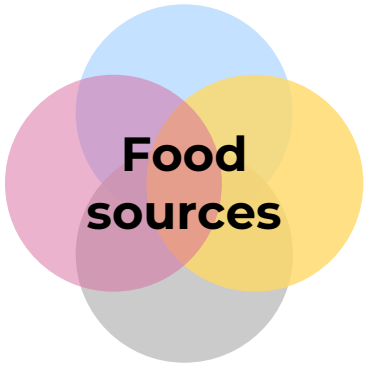

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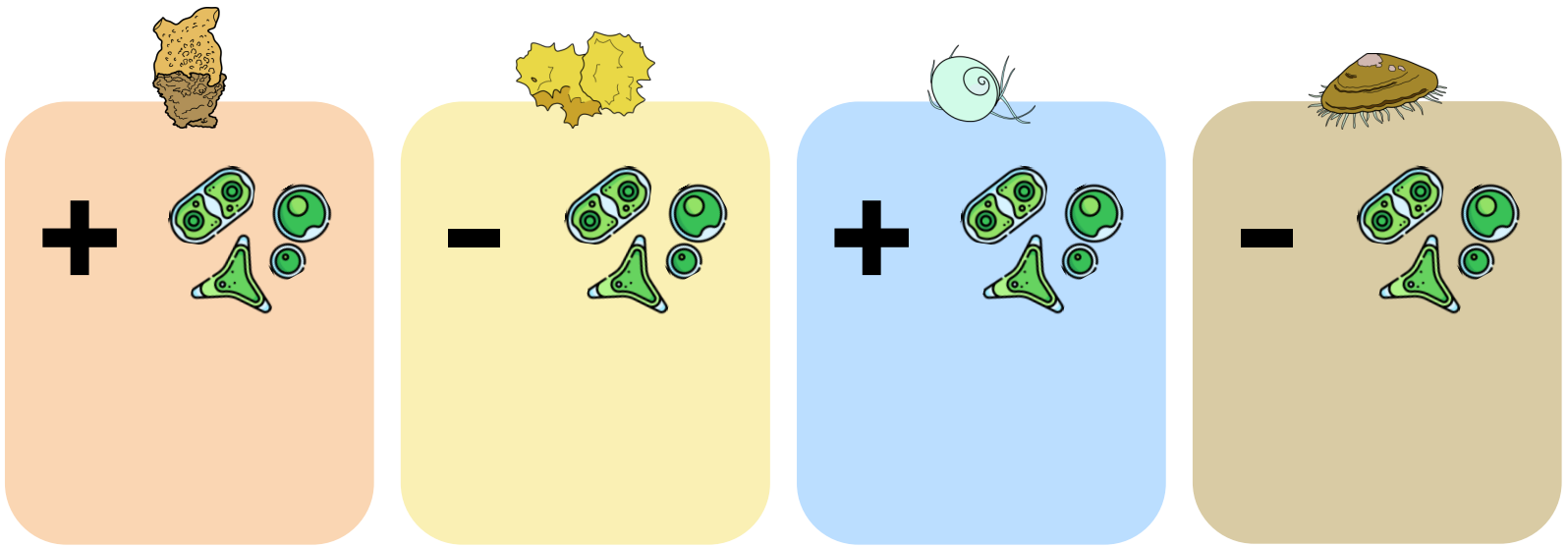

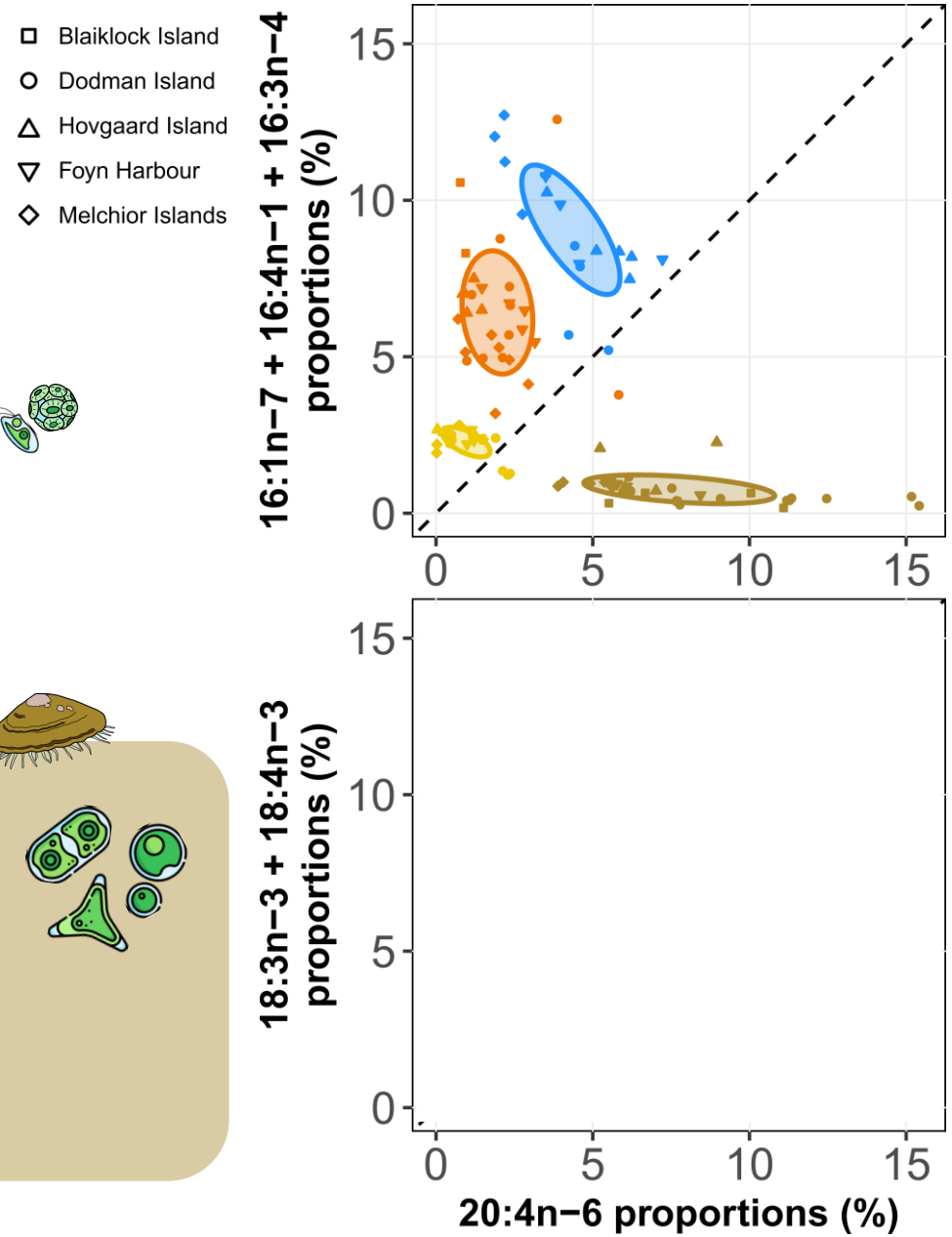

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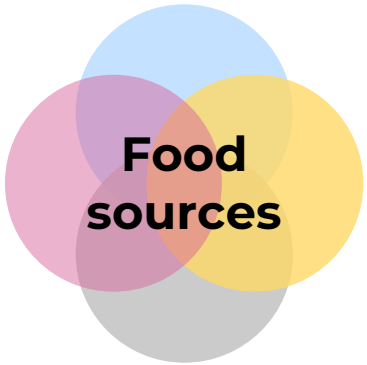

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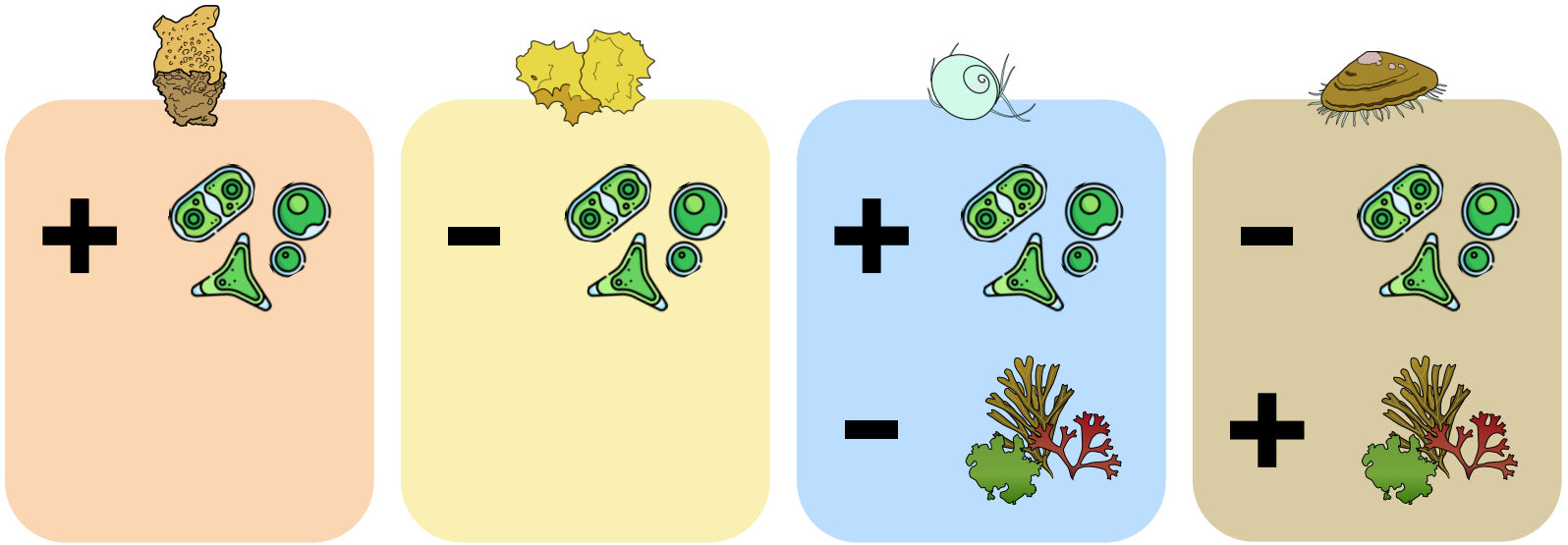

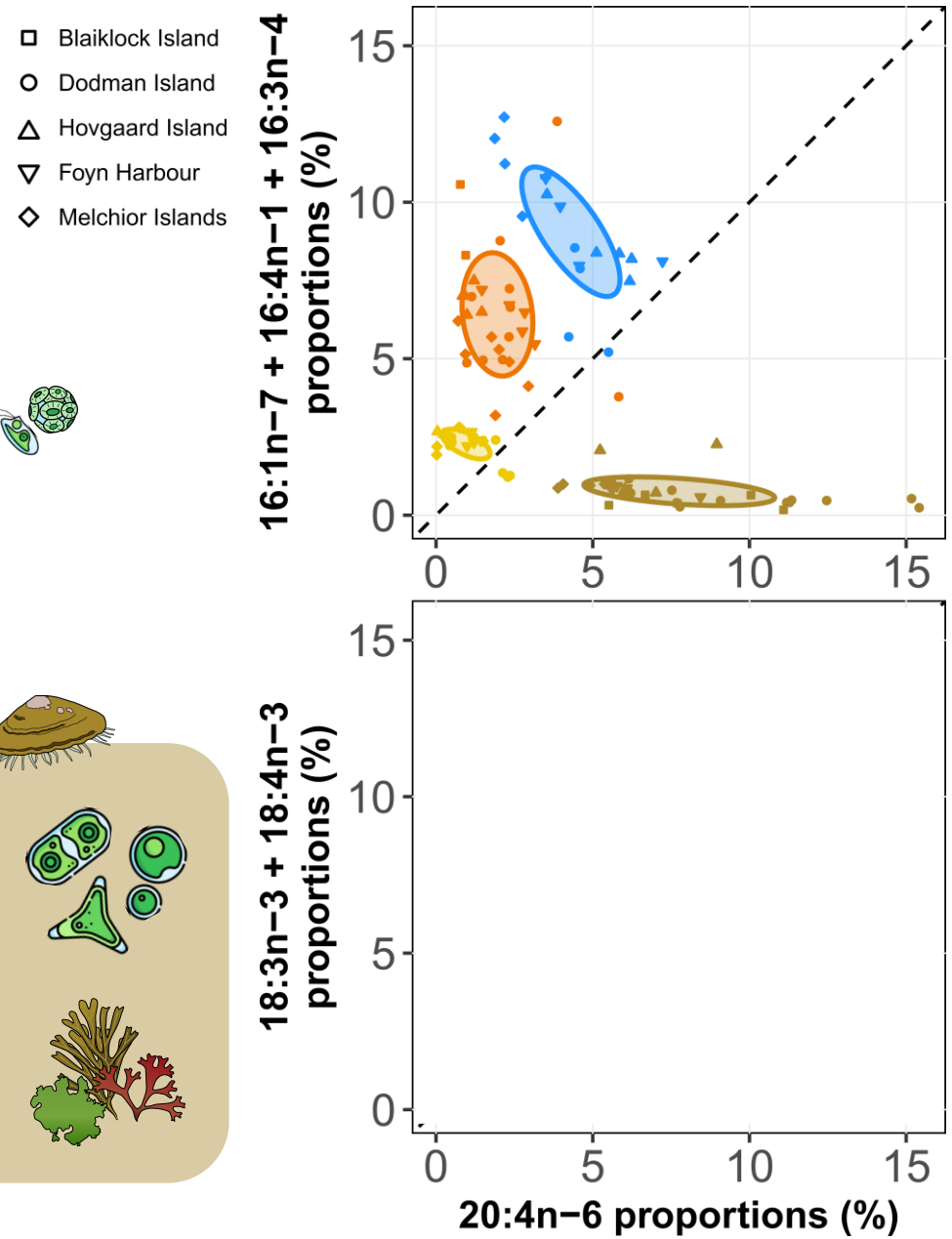

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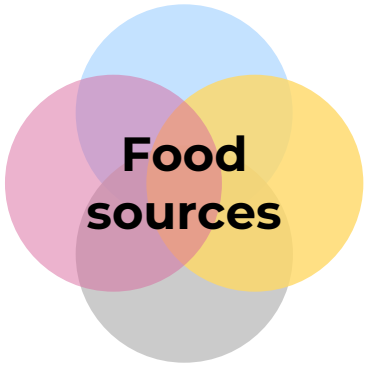

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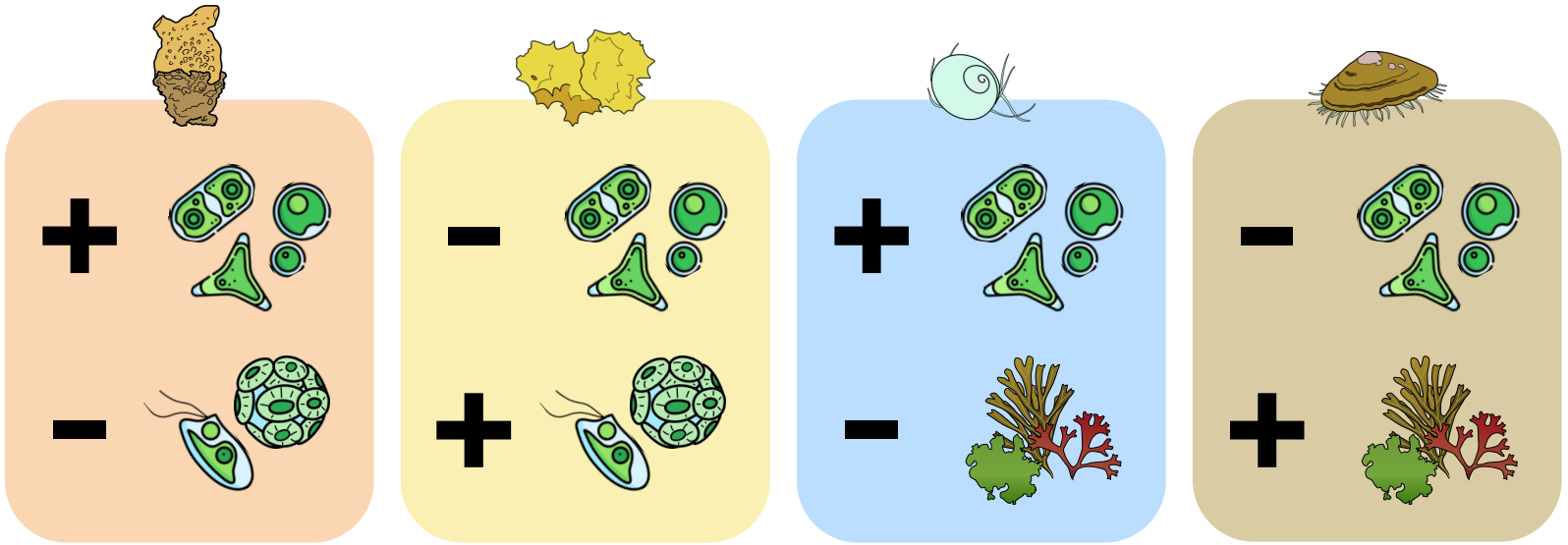

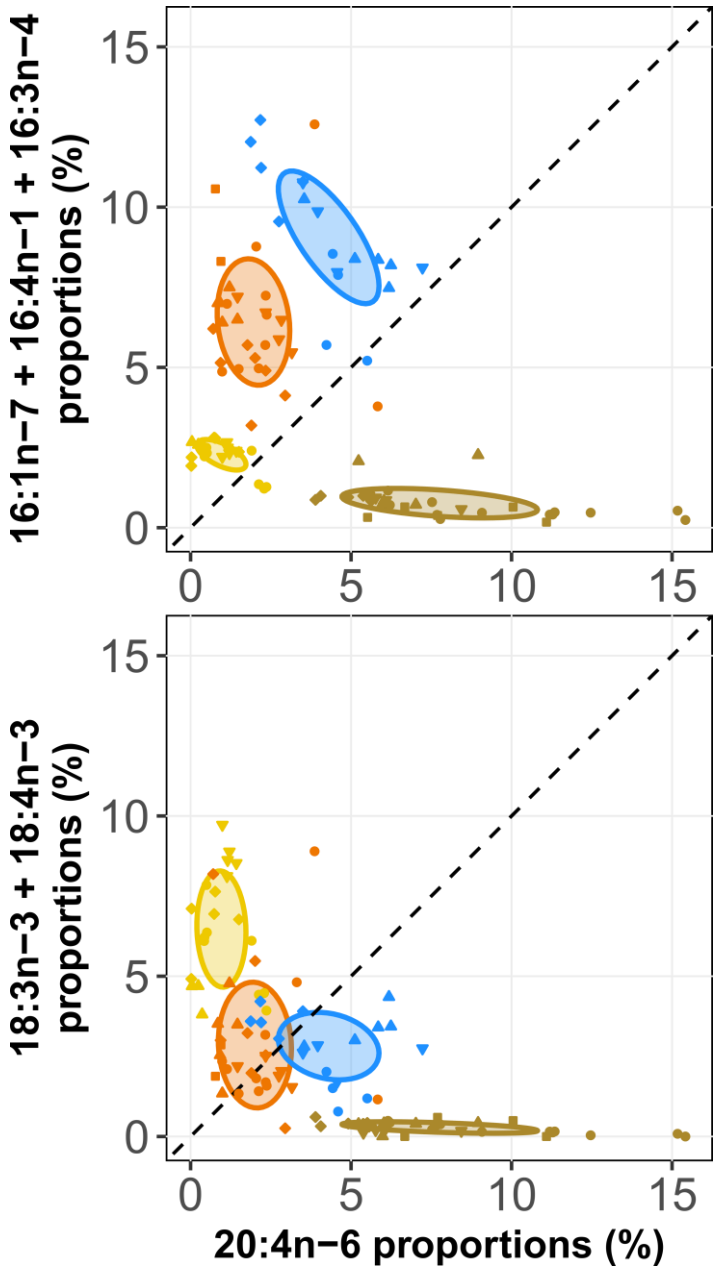

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Results & Discussion

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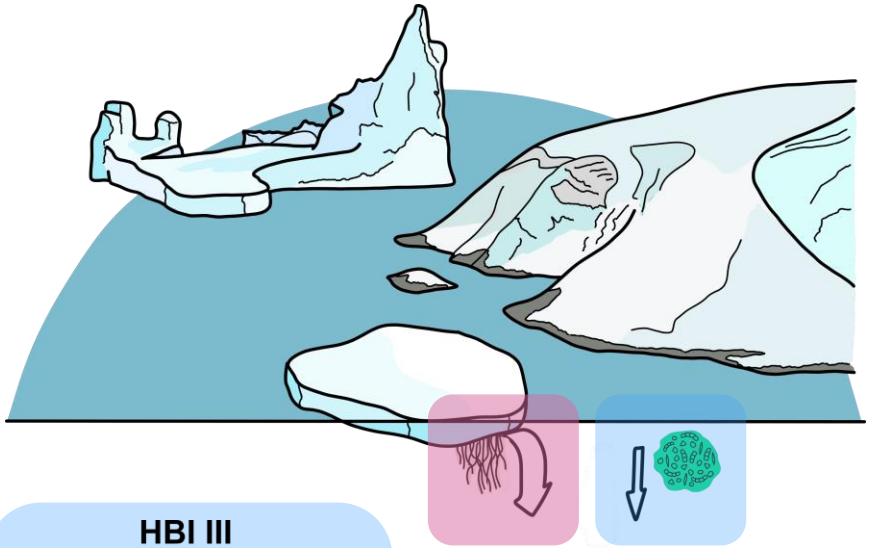
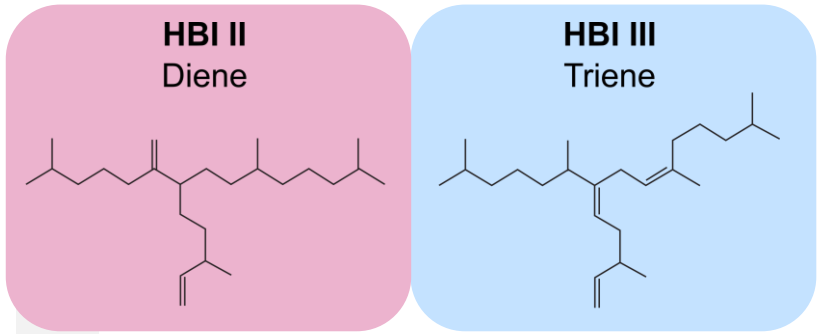
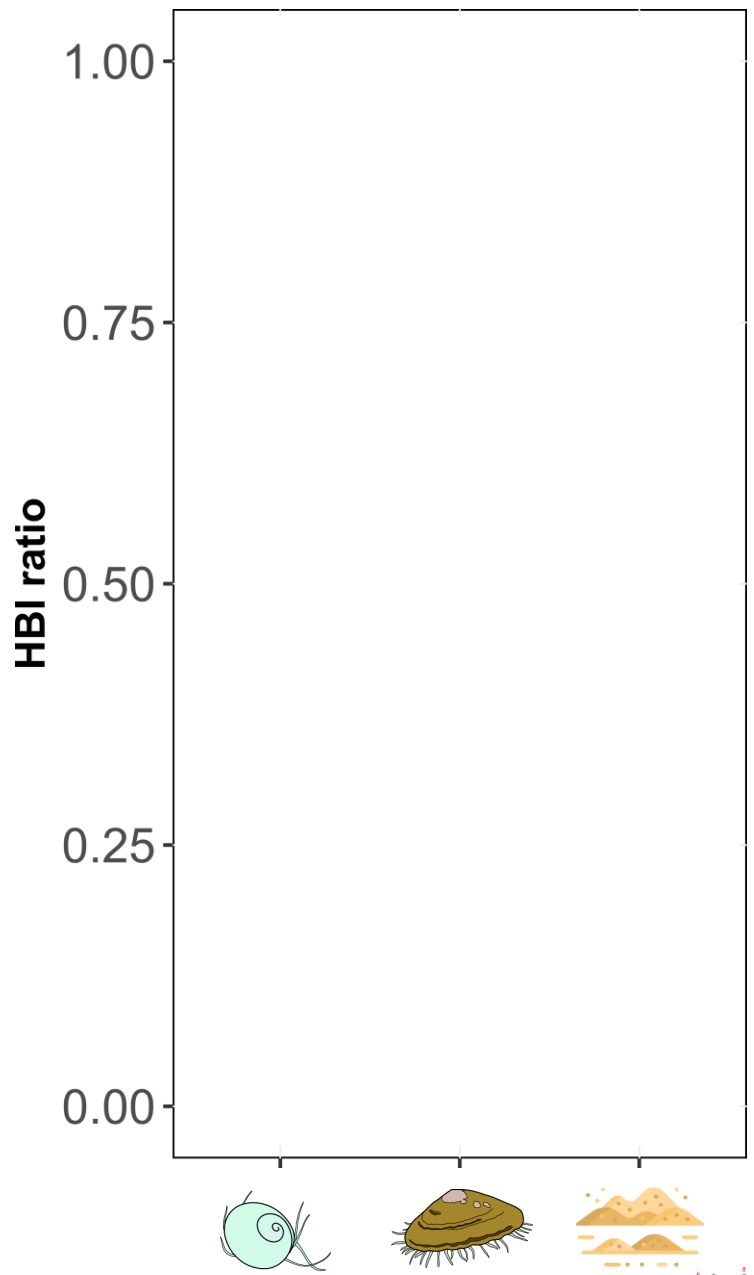




$$HBI\ ratio = \frac{HBI\ II}{HBI\ III}$$



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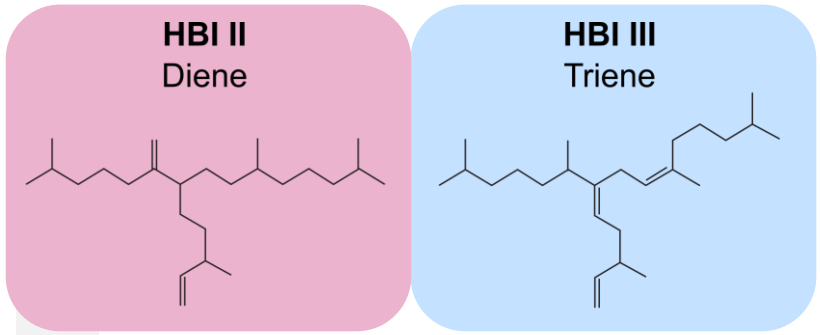
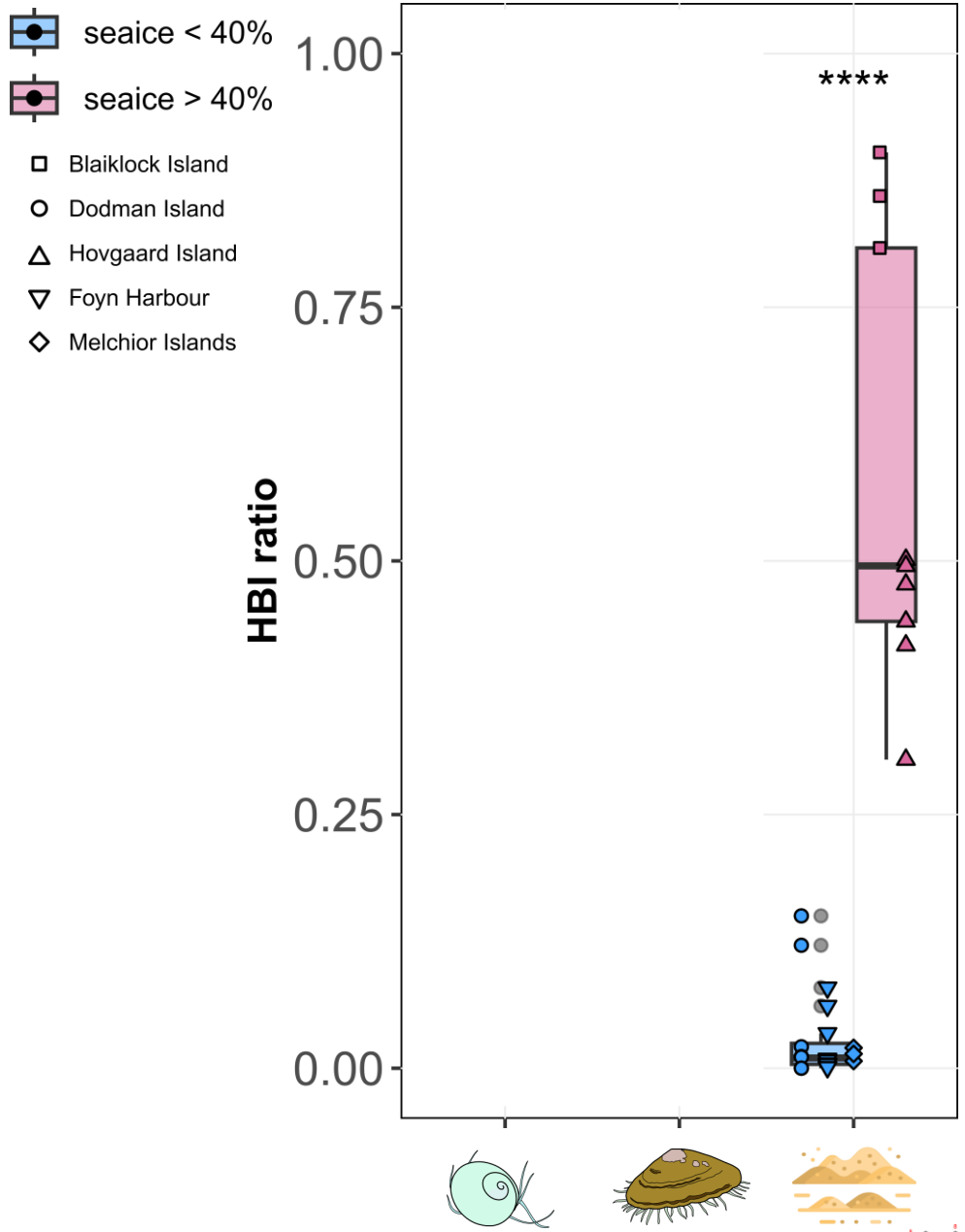


$$HBI\ ratio = \frac{HBI\ II}{HBI\ III}$$

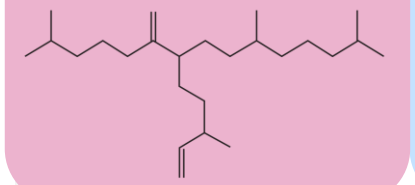


Results & Discussion

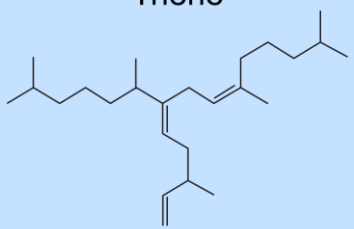
- Highly branched isoprenoïds (HBI)

  - Diatoms? Yes, but from where?

HBI II
Diene



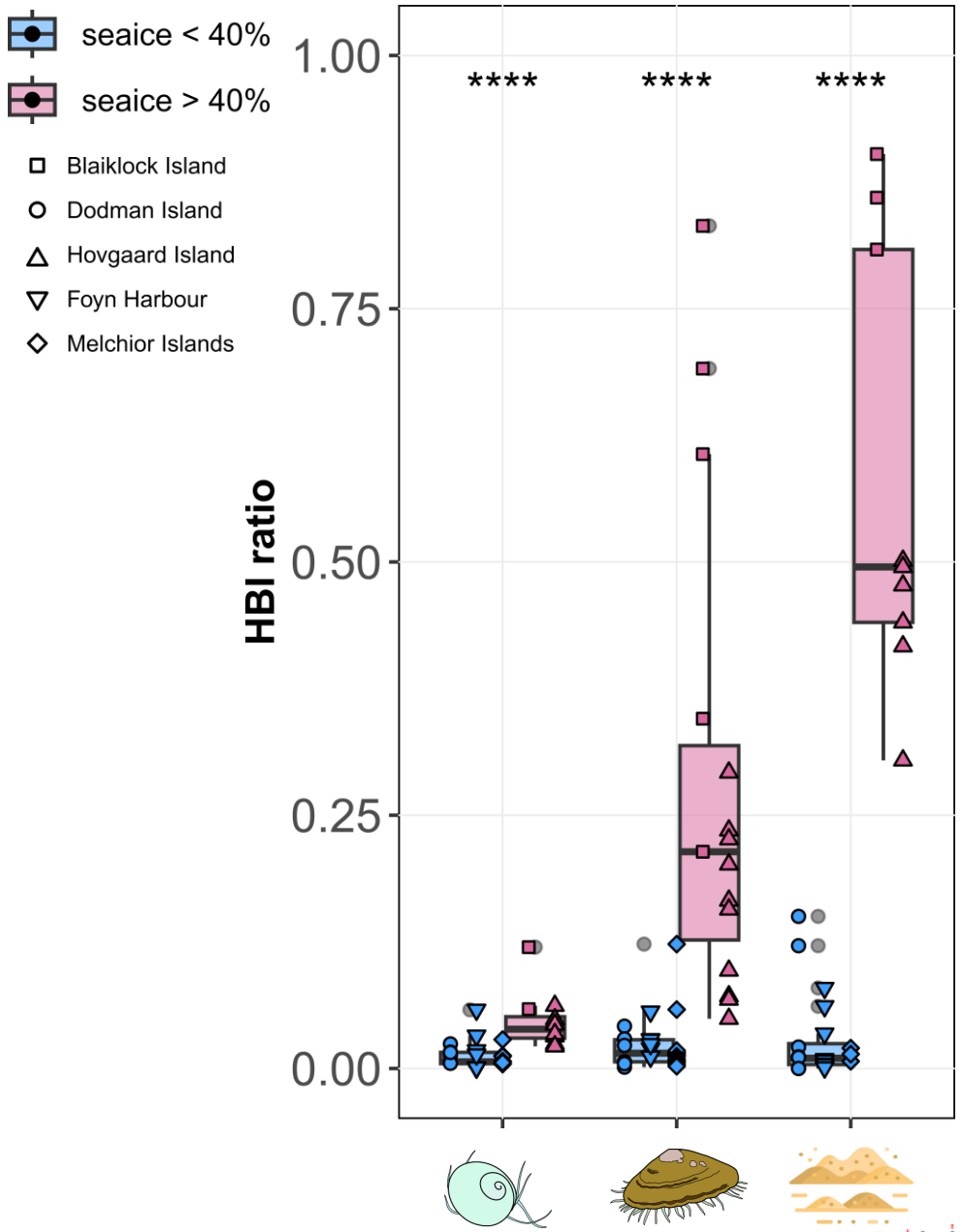
HBI III
Triene



IPSO25

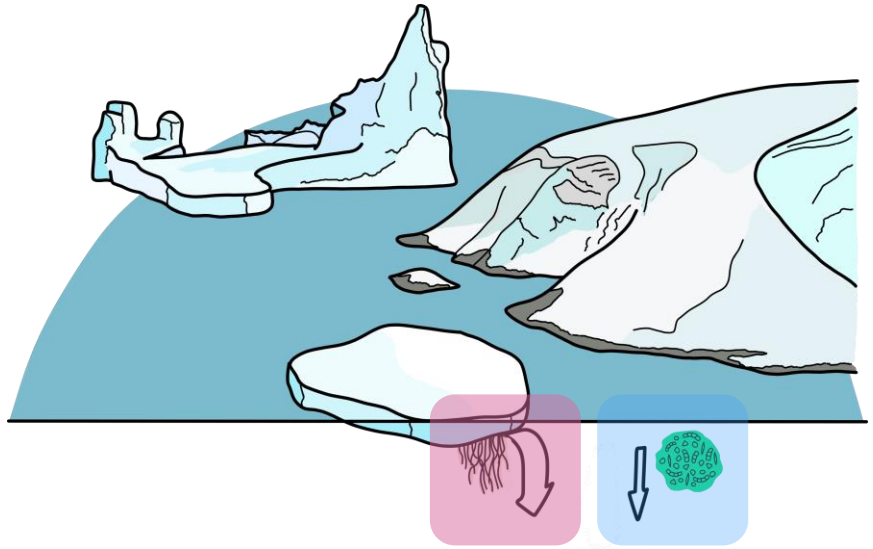
$$HBI\ ratio = \frac{HBI\ II}{HBI\ III}$$

Wilcoxon–Mann–Whitney test



Results & Discussion

- Highly branched isoprenoïds (HBI)
  - Diatoms? Yes, but from where?



16:0 —Δ9 Desat.→ 16:1 n-7 → 18:1 n-7 → 20:1 n-7 —Δ5 Desat.→ 20:2 Δ5,13 → 22:2 Δ7,15

Biochimie 91 (2009) 671–678

Contents lists available at ScienceDirect

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Review

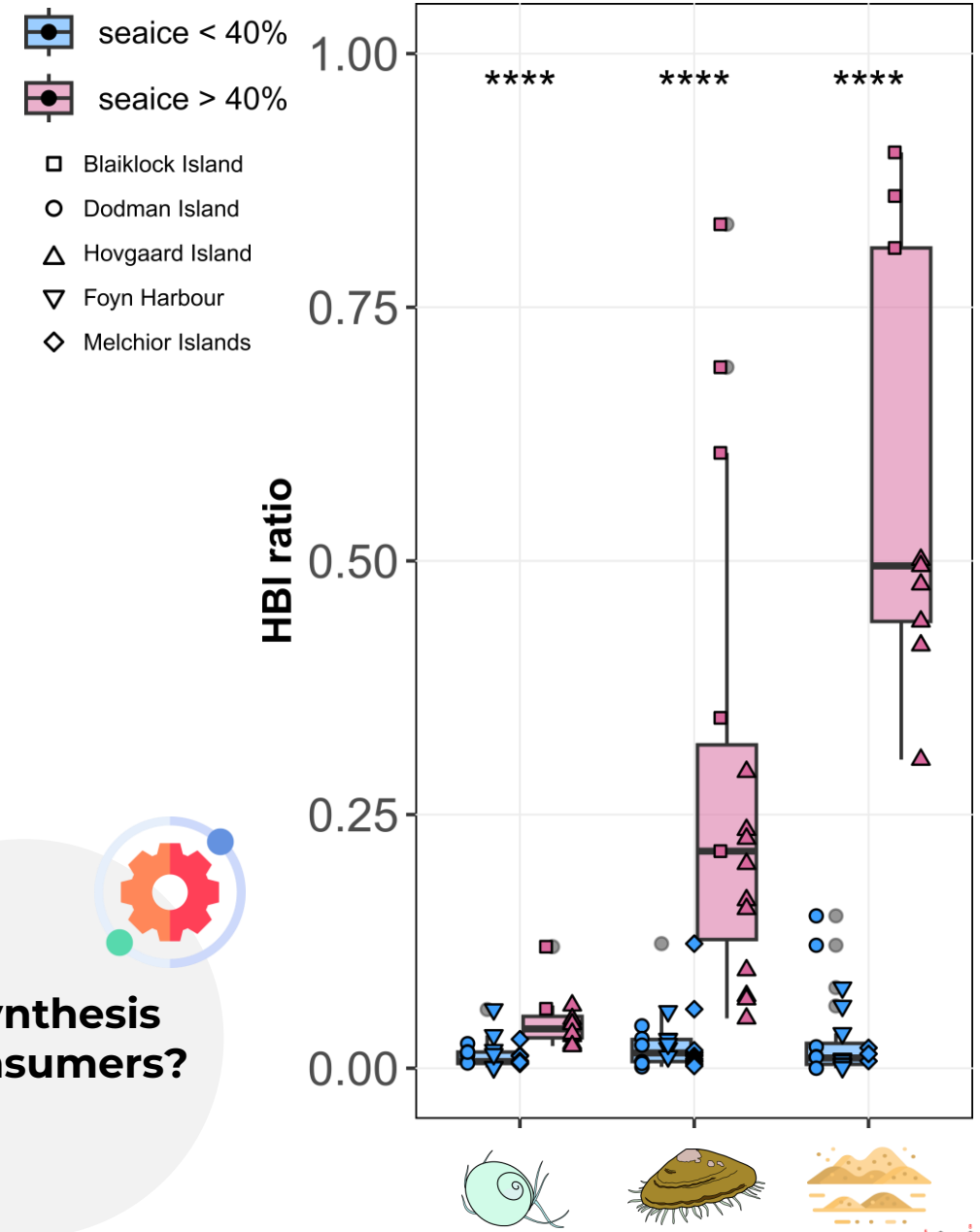
Non-methylene-interrupted fatty acids from marine invertebrates: Occurrence, characterization and biological properties

Gilles Barnathan*

(Barnathan, 2009; Bridier et al., 2023)

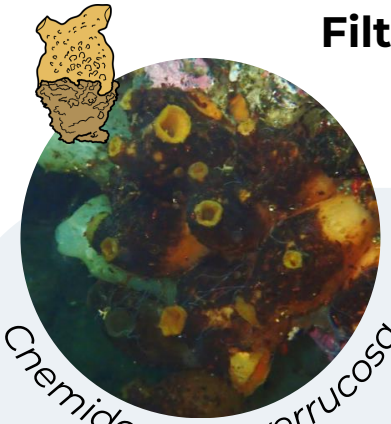
FA synthesis by consumers?

Wilcoxon–Mann–Whitney test



Take home message

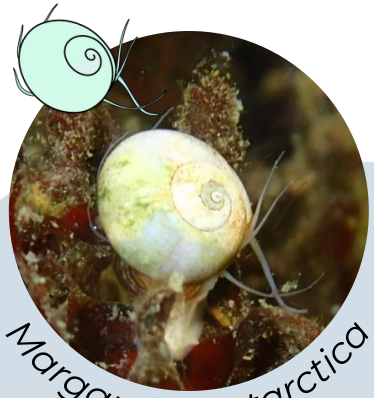
Filter-feeders



Cnemidocarpa verrucosa

Dendrilla antarctica

Grazers

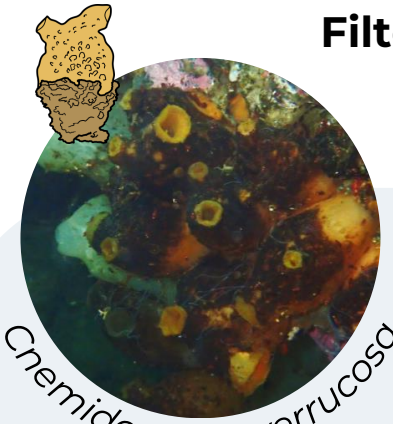


Margarella antarctica

Nacella concinna

Take home message

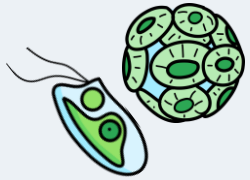
Filter-feeders



Cnemidocarpa verrucosa

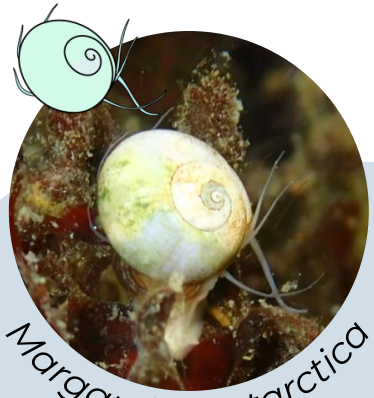
Dendrilla antarctica

Diet relates to filter capability and consumption



FA

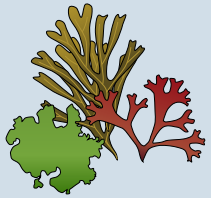
Grazers



Margarella antarctica

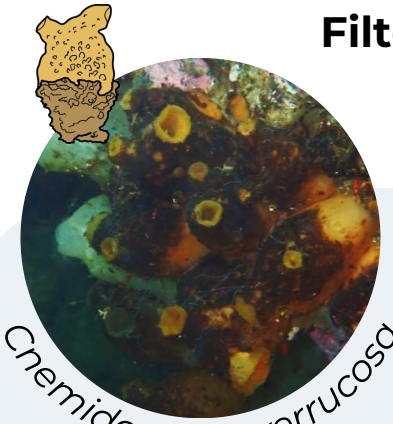
Nacella concinna

Might reflect diet differences



Take home message

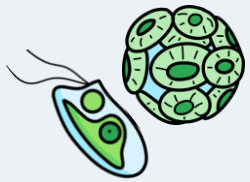
Filter-feeders



Cnemidocarpa verrucosa

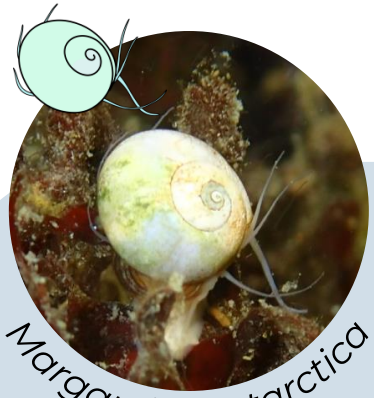
Dendrilla antarctica

Diet relates to filter capability and consumption



Not sufficient exploitable data for further investigation

Grazers

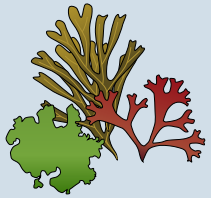


Margarella antarctica

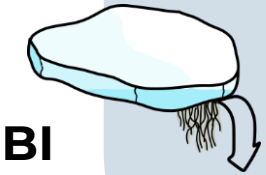
Nacella concinna

Might reflect diet differences

FA



HBI

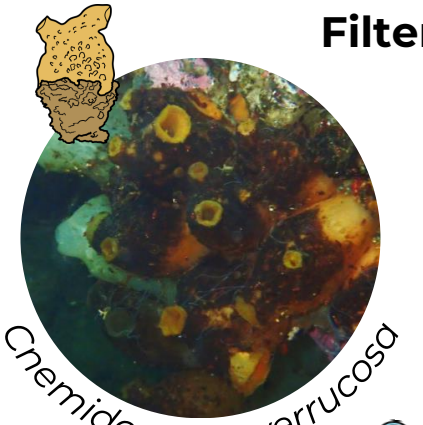


Higher ratio in sites with a higher mean sea ice cover

- ⇨ *Consumption of sea ice diatoms*
- ⇨ *Biosynthesis capabilities*

Take home message

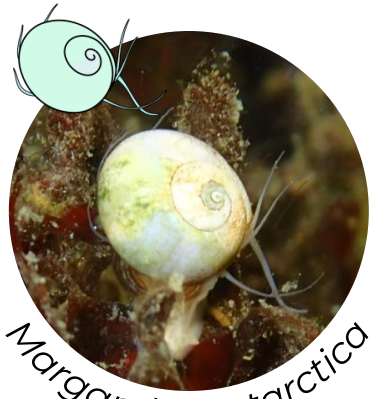
Filter-feeders



Cnemidocarpa verrucosa

Dendrilla antarctica

Grazers



Margarella antarctica

Nacella concinna

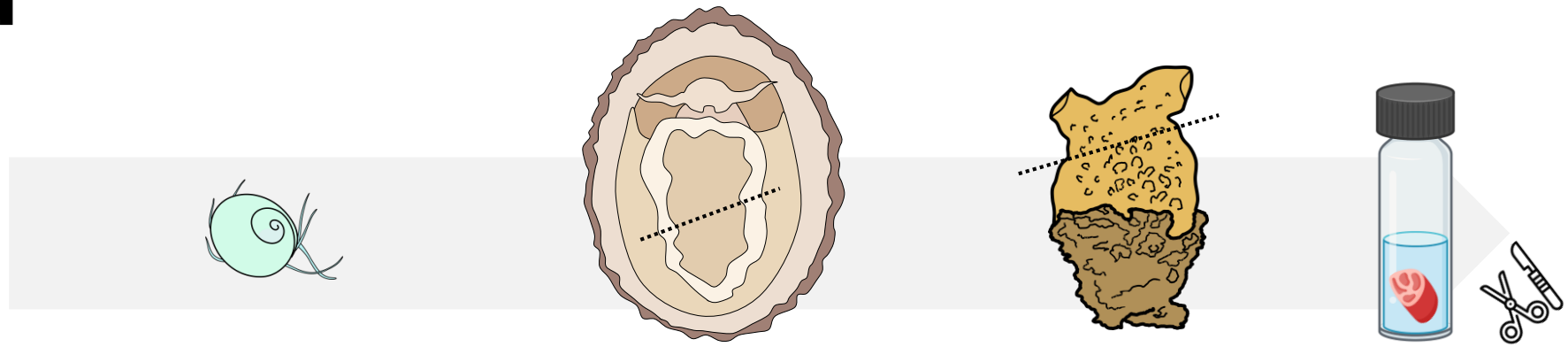
Different influences of environmental changes, according to trophic habits and food sources consumed

Thank you for your attention

Anthony Voisin – anthony.voisin@univ-brest.fr

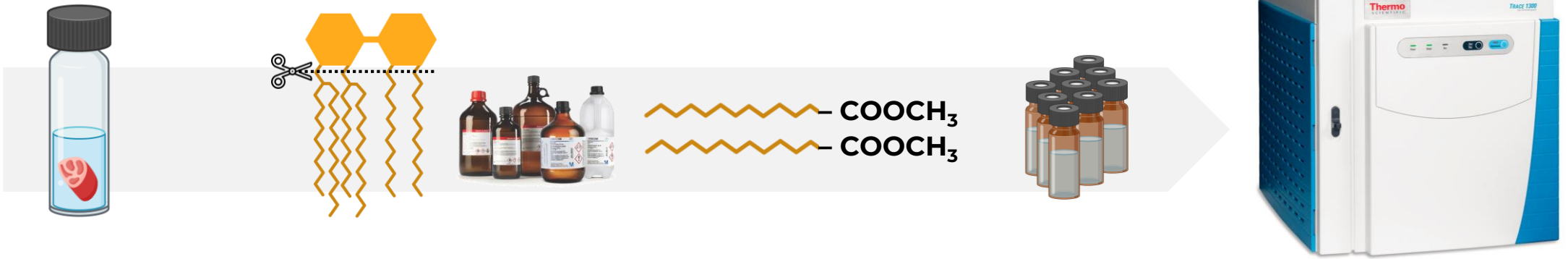
FA method

Dissections



Whole organism | Foot muscle | Mantle

Gas Chromatography
Flame Ionization Detector (GC-FID)



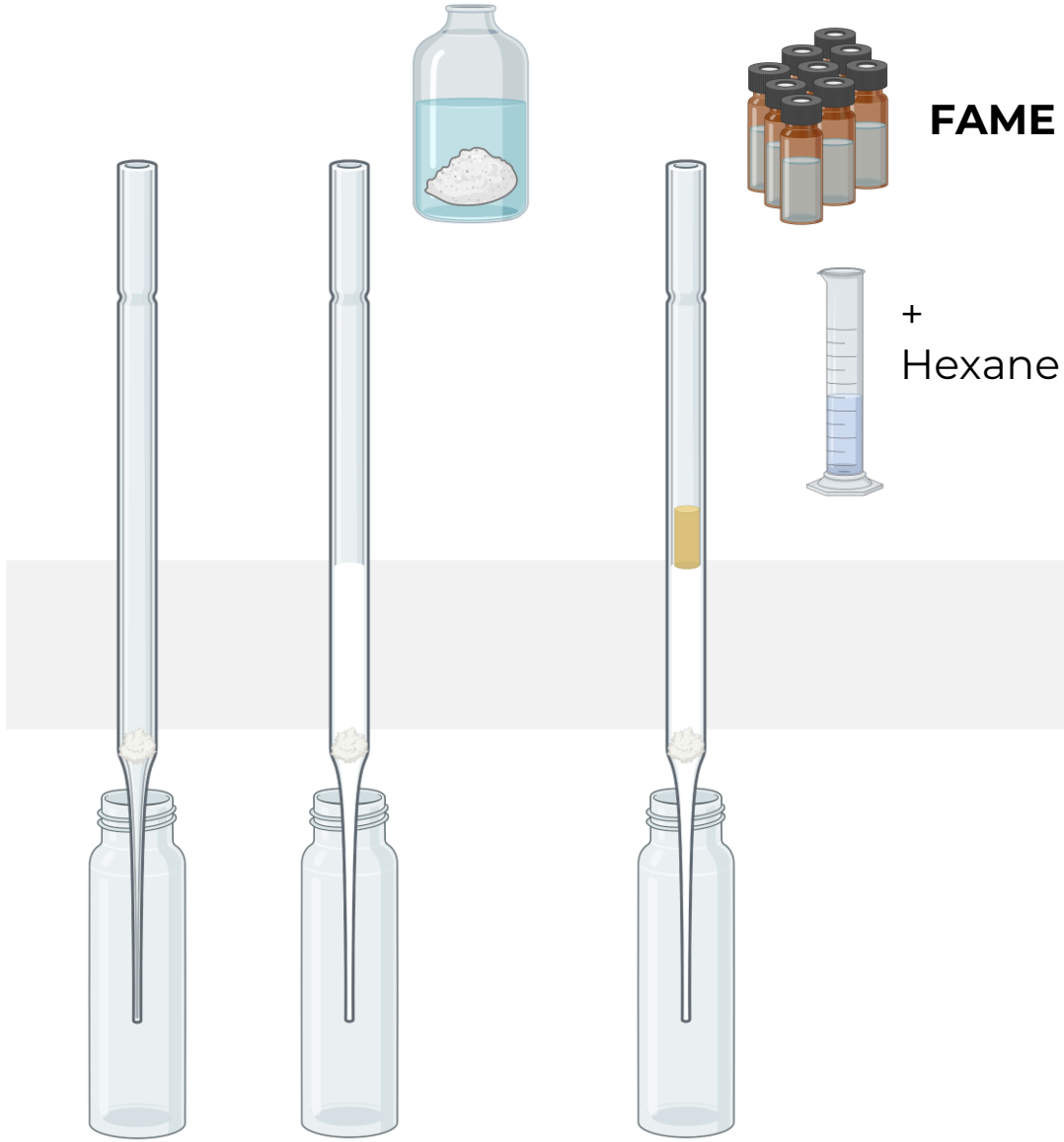
$CHCl_3$/MeOH
(2:1, v:v)

Saponification & Transmethylation
KOH-MeOH (0.5M) & MeOH-H_2SO_4 (3.4%, v:v)

FAME
(Hexane fraction)

GC-FID + MS

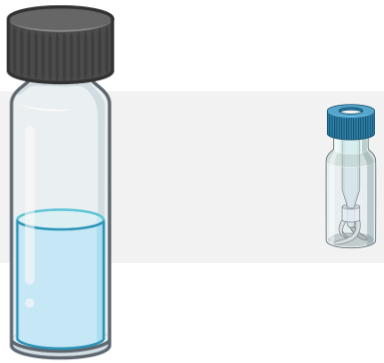
HBI method



FAME

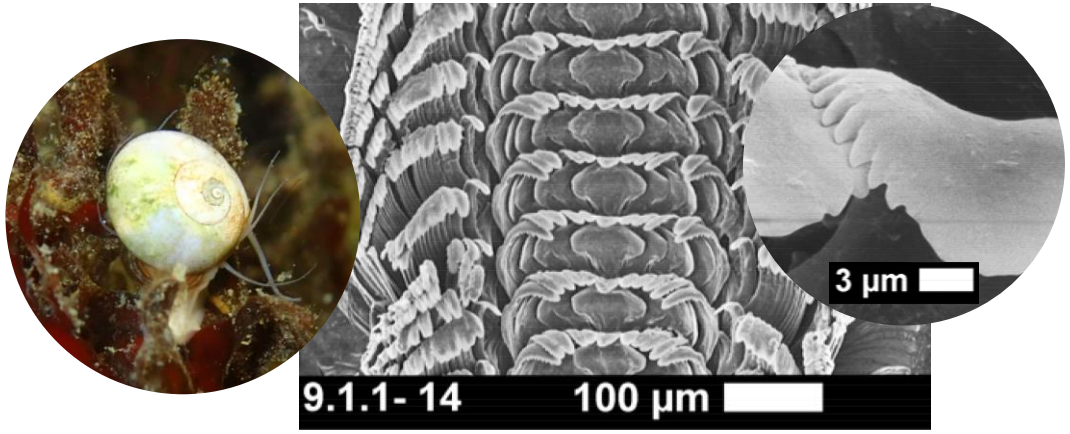
\+
Hexane

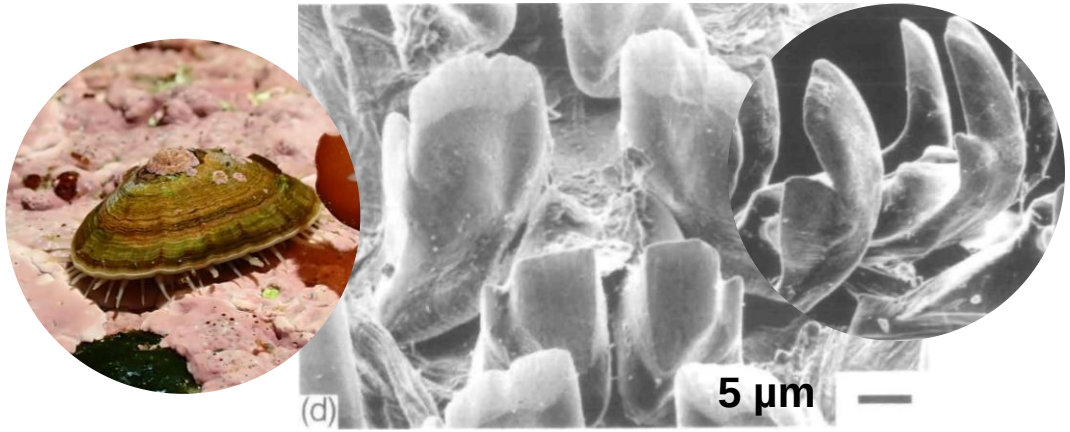
Evaporation & transfert



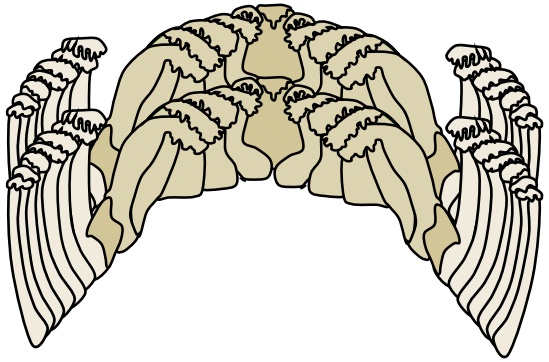
GC-MS
SIM analysis

Gastropods radula morphology

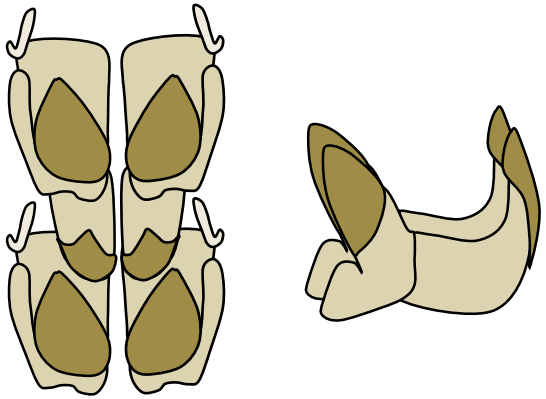




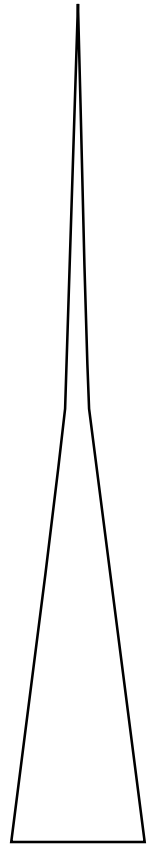
RHIPIDOGLOSSA



DOCOGLOSSA



Excavation capability



“Broom”

“Shovel”

(Steneck and Watling, 1982; Nolan, 1991; Linse, 2000; Vortsepneva et al., 2022)

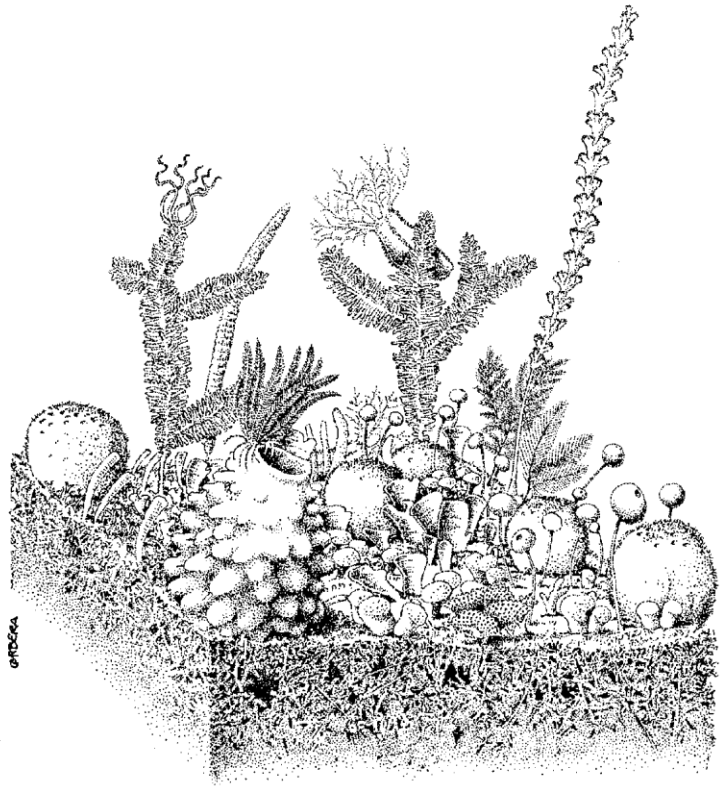
Filter feeding

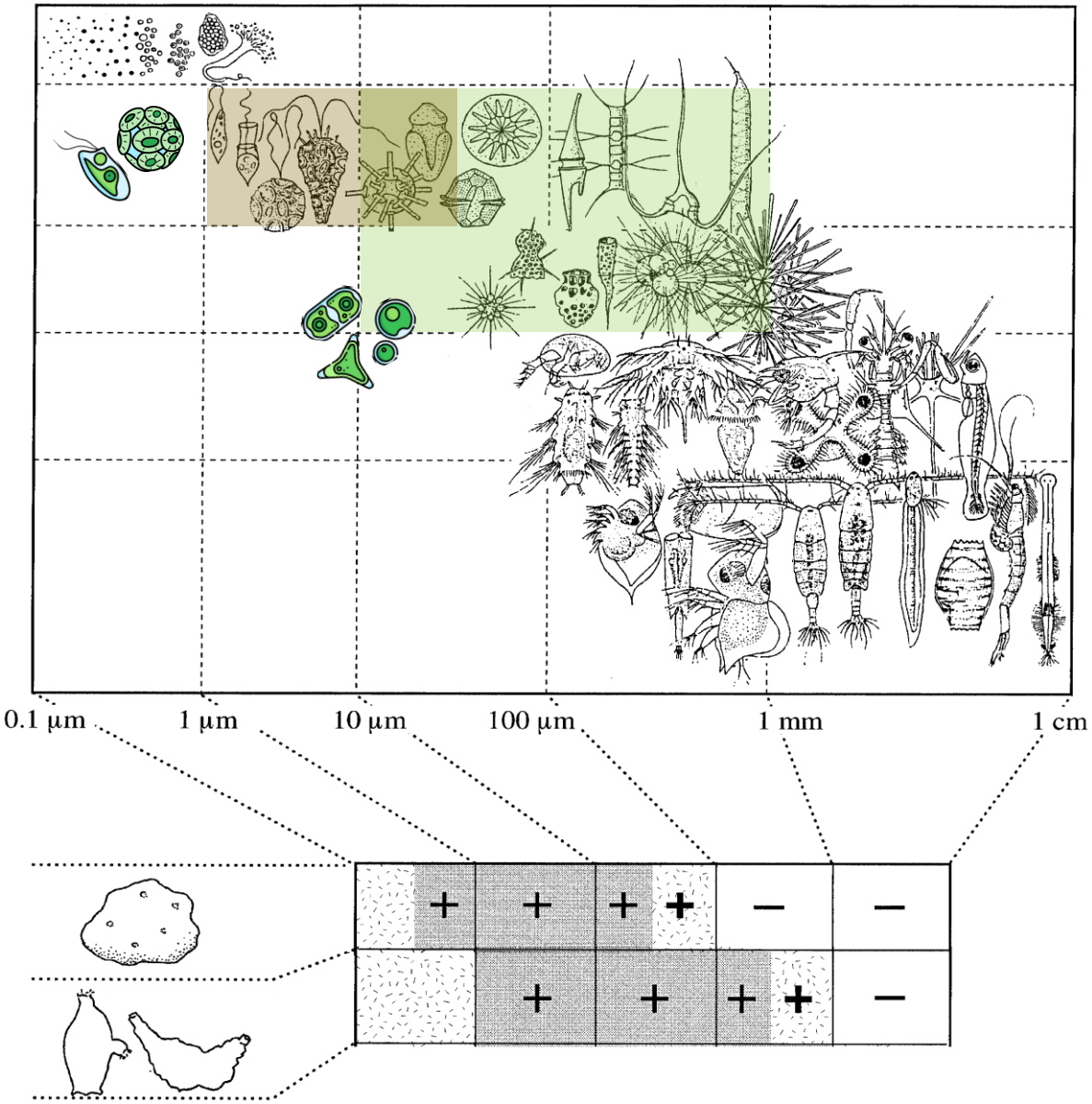
Polar Biol (2001) 24: 473–485
DOI 10.1007/s003000100257

REVIEW

Josep-Maria Gili · Rafel Coma · Covadonga Orejas
Pablo J. López-González · Mikel Zabala

Are Antarctic suspension-feeding communities different from those elsewhere in the world?





(adapted from Gili et al., 2001)