

What do grazers really graze on?

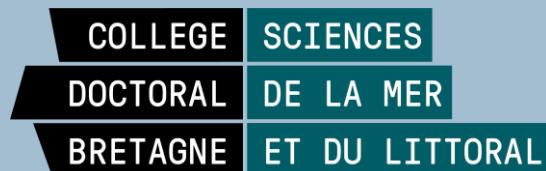
Anthony Voisin^{1;2}

Martin Dogniez, Camille Moreau, Julien Thébault,
Gauthier Schaal, Loïc N. Michel and Gilles Lepoint

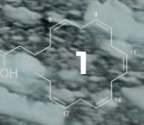


¹ Laboratoire des sciences de l'Environnement Marin, UBO, France

² Laboratoire d'Ecologie Trophique et Isotopique, ULiège, Belgique



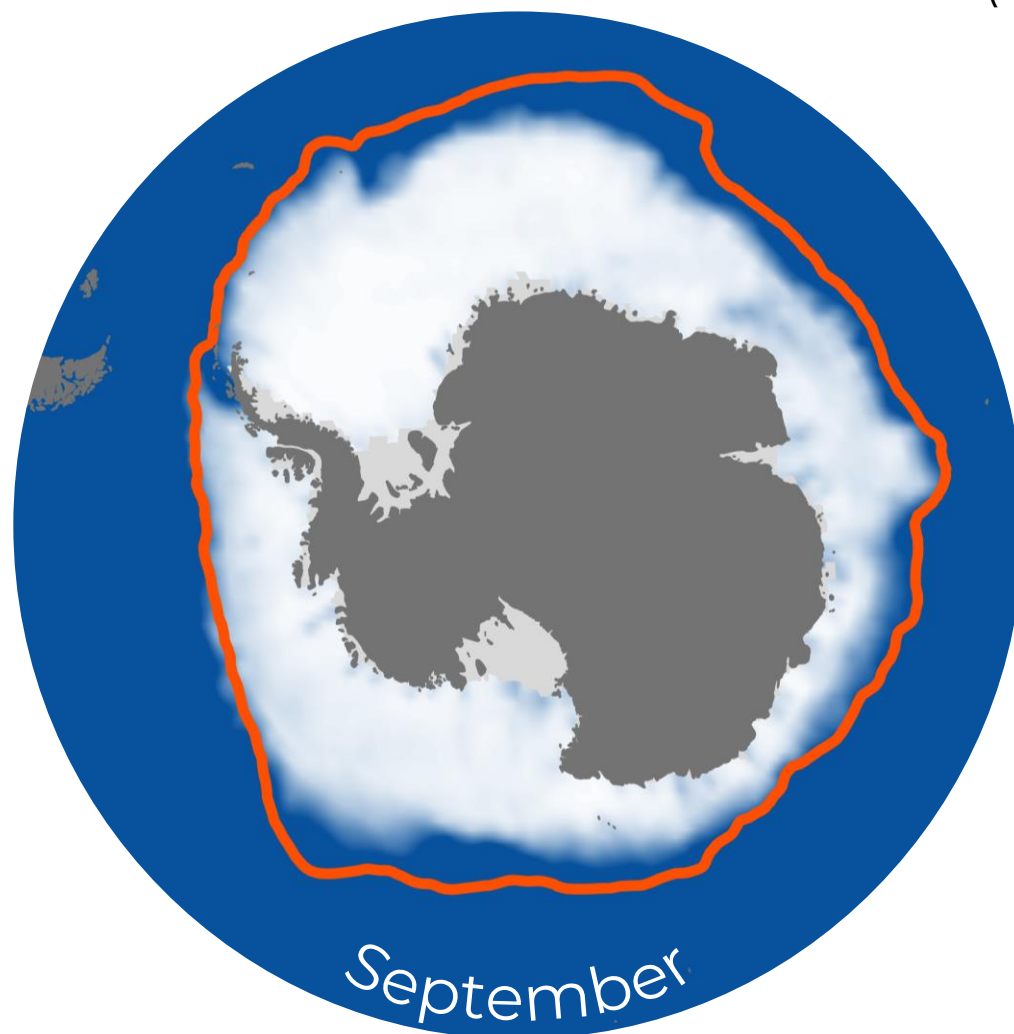
Context



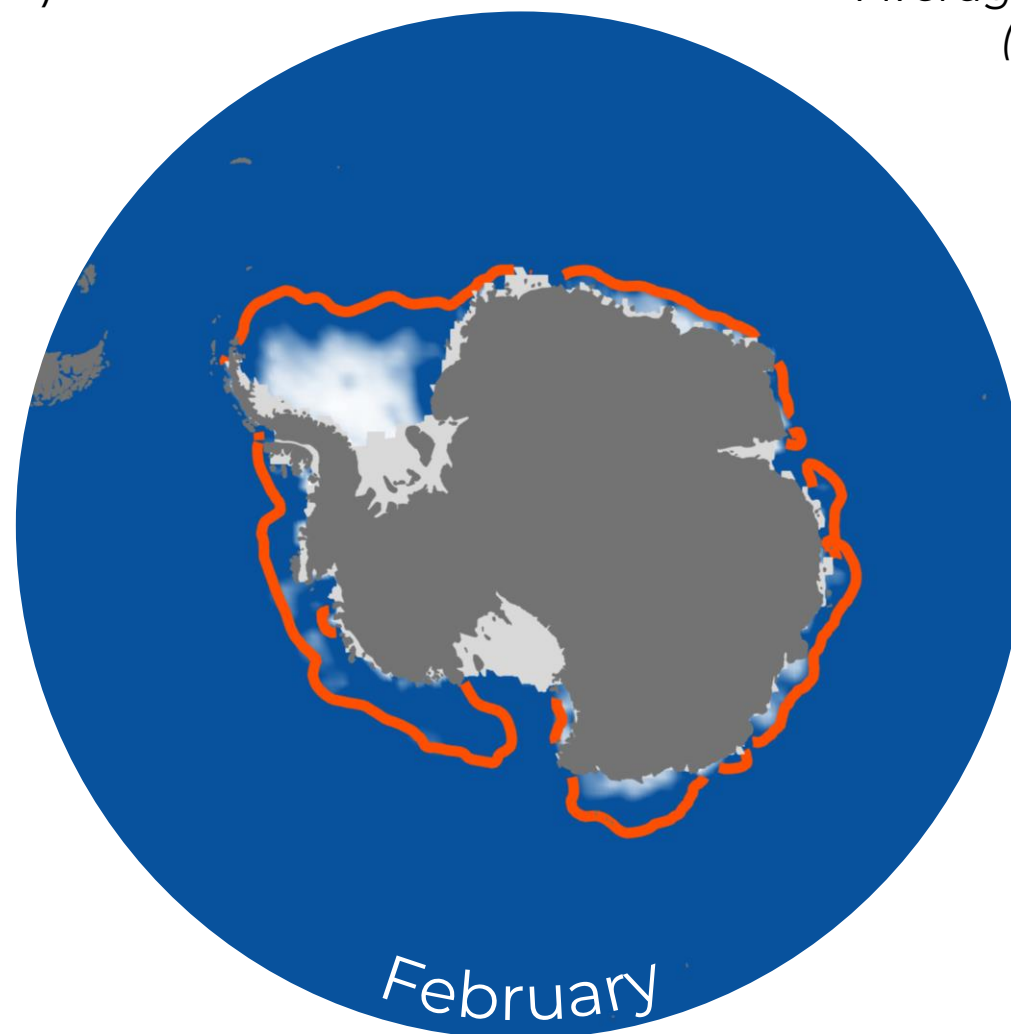
Context

Antarctic sea ice cover (2023)

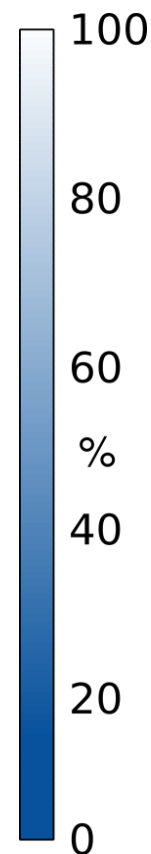
— Average ice edge
(1991-2020)



Austral winter



Austral summer

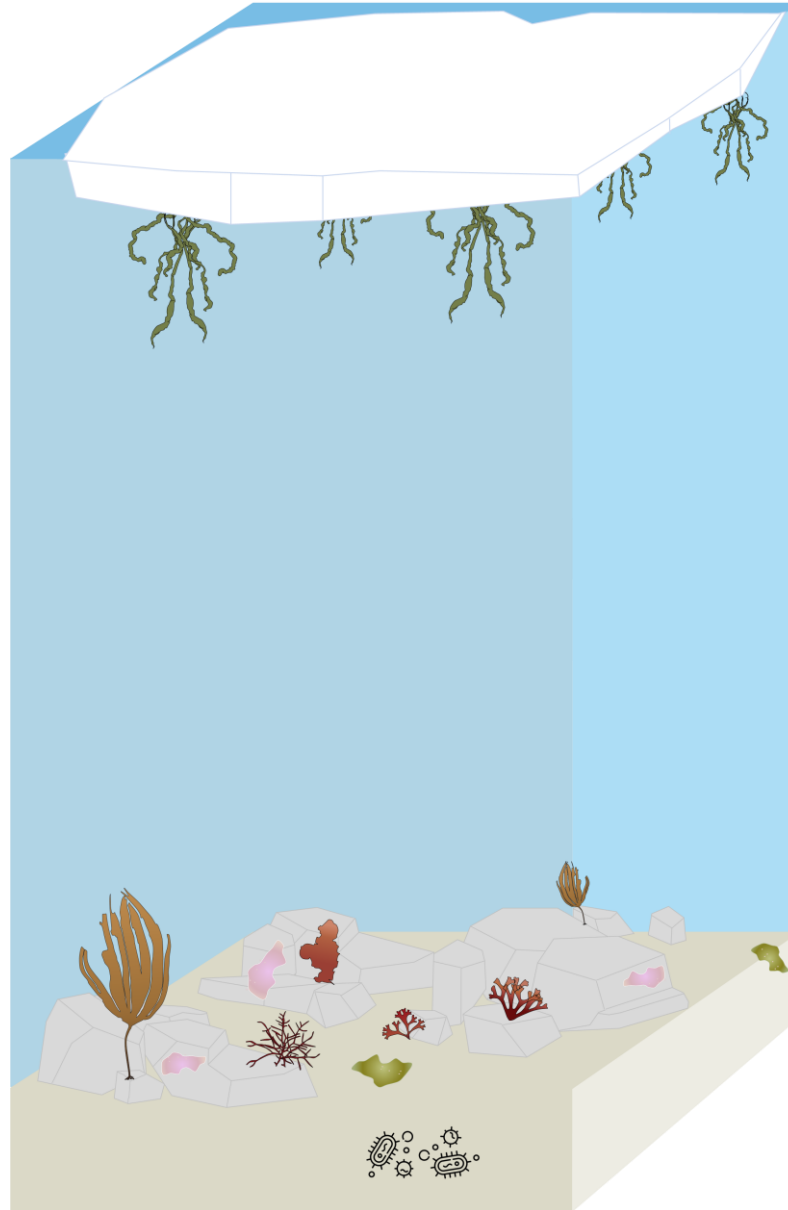


Context



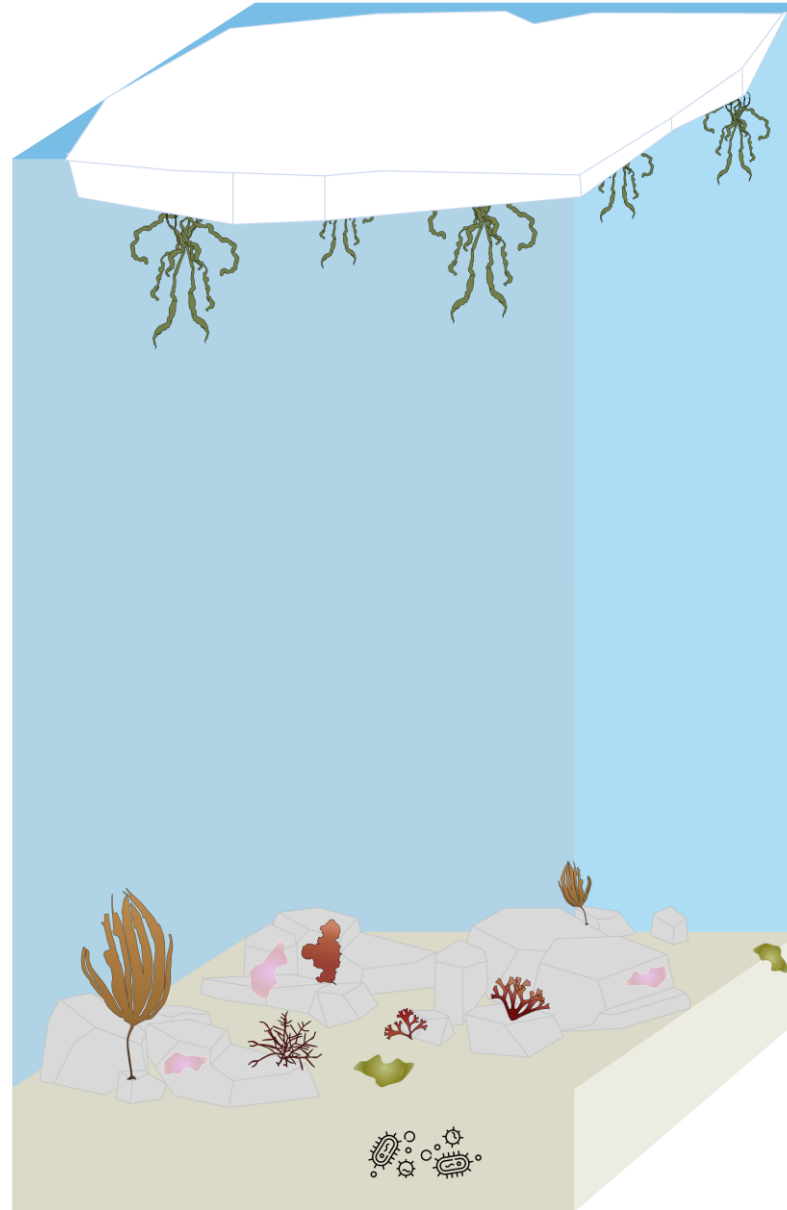
Context

Austral winter

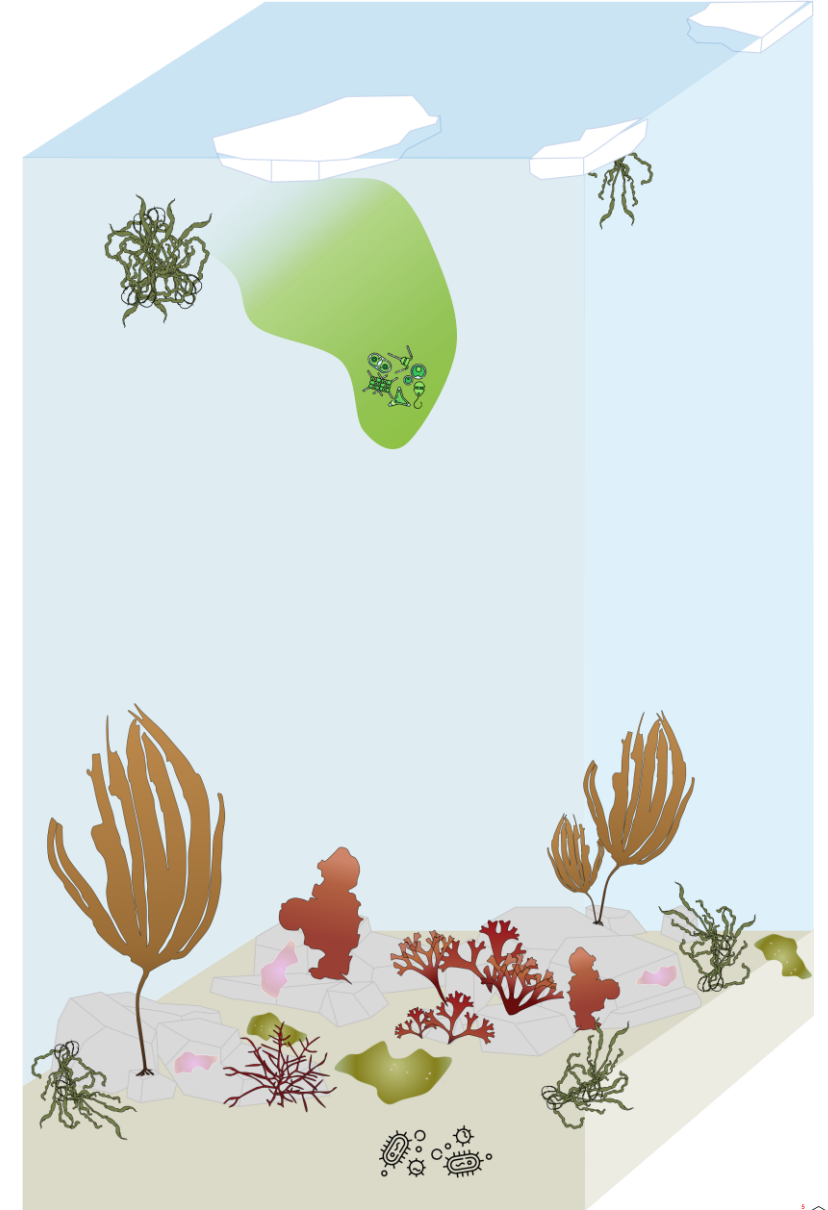


Context

Austral winter



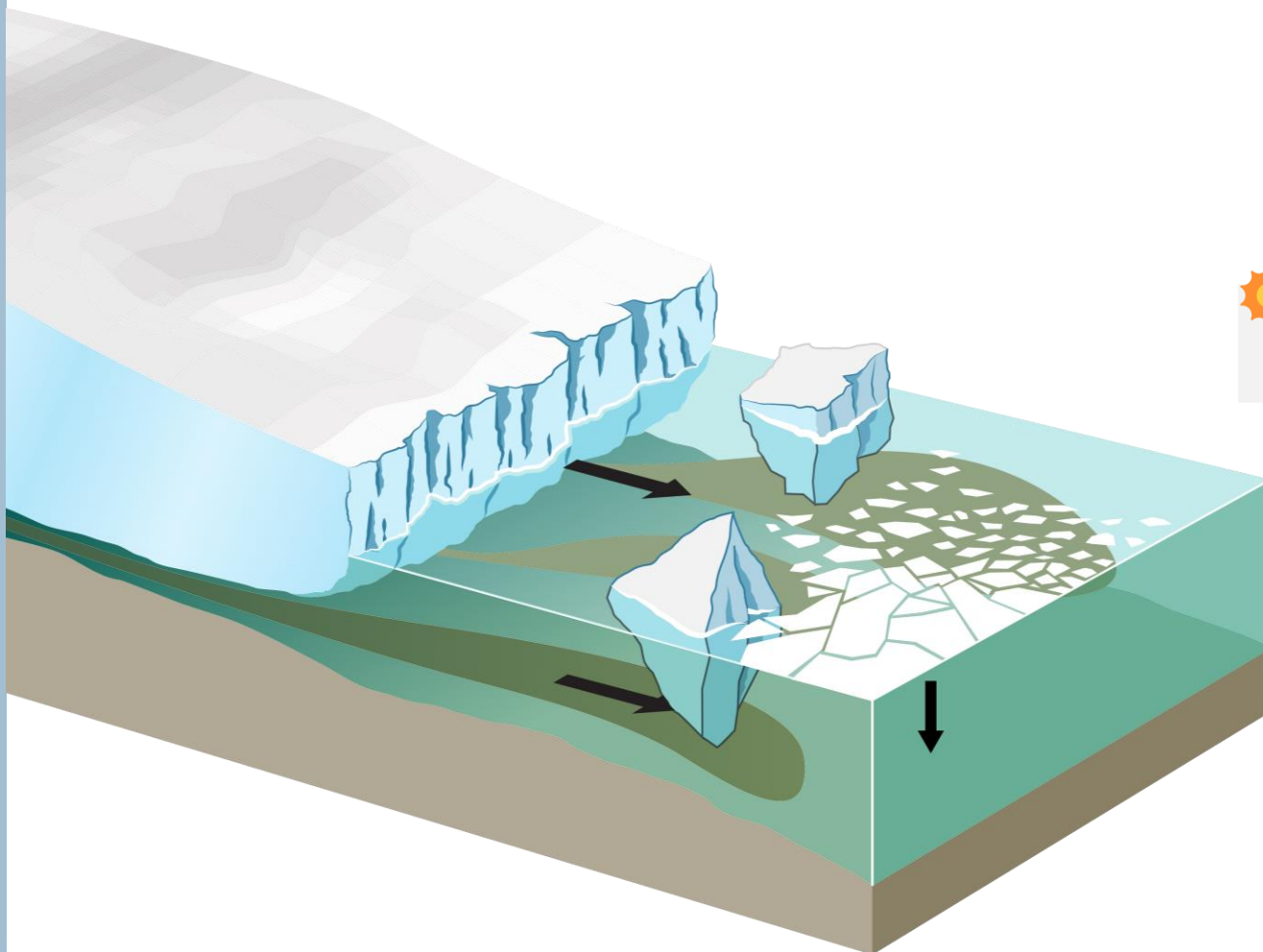
Austral summer



Context

Ice disturbances

(Meredith et al., 2019)

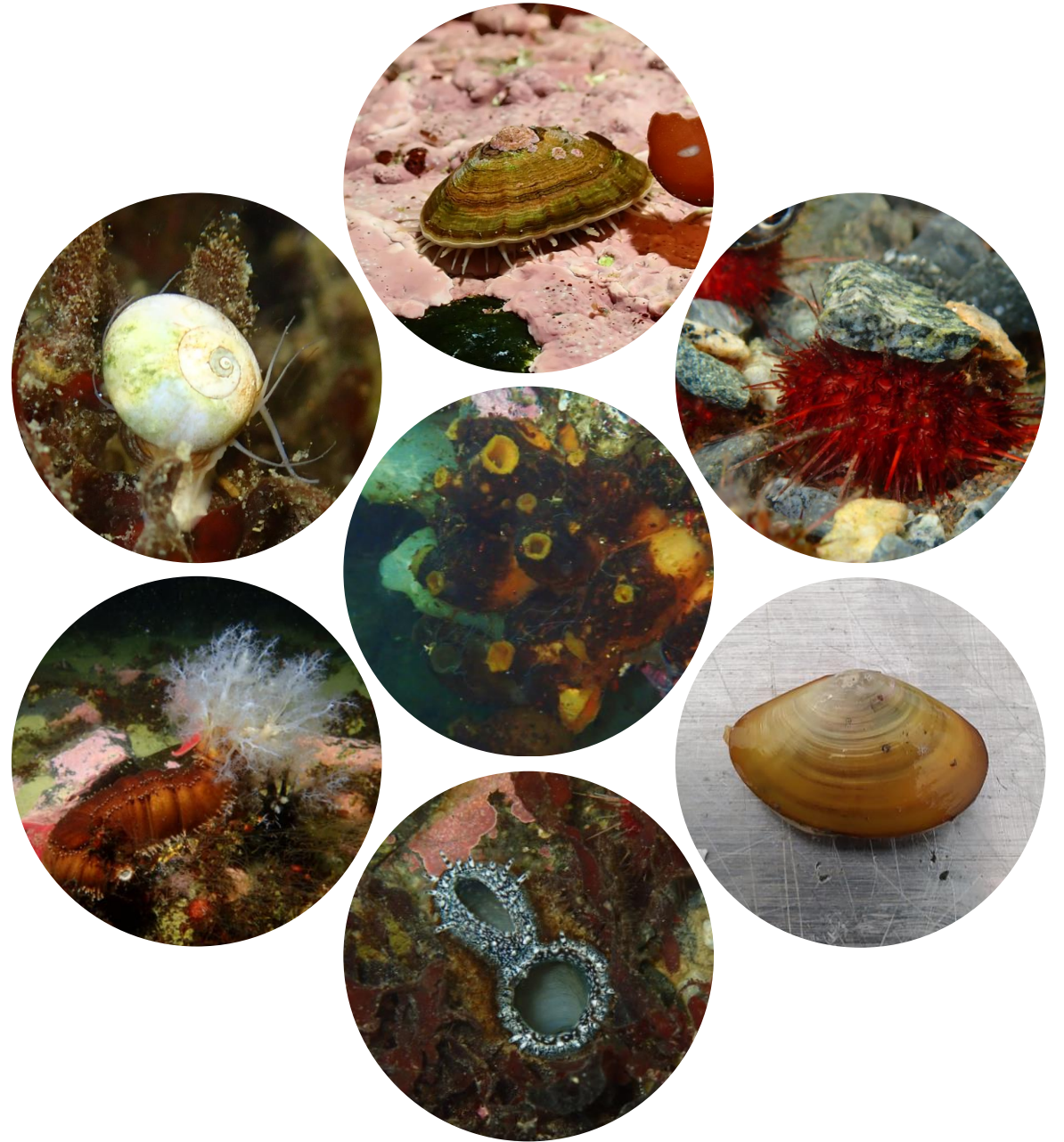
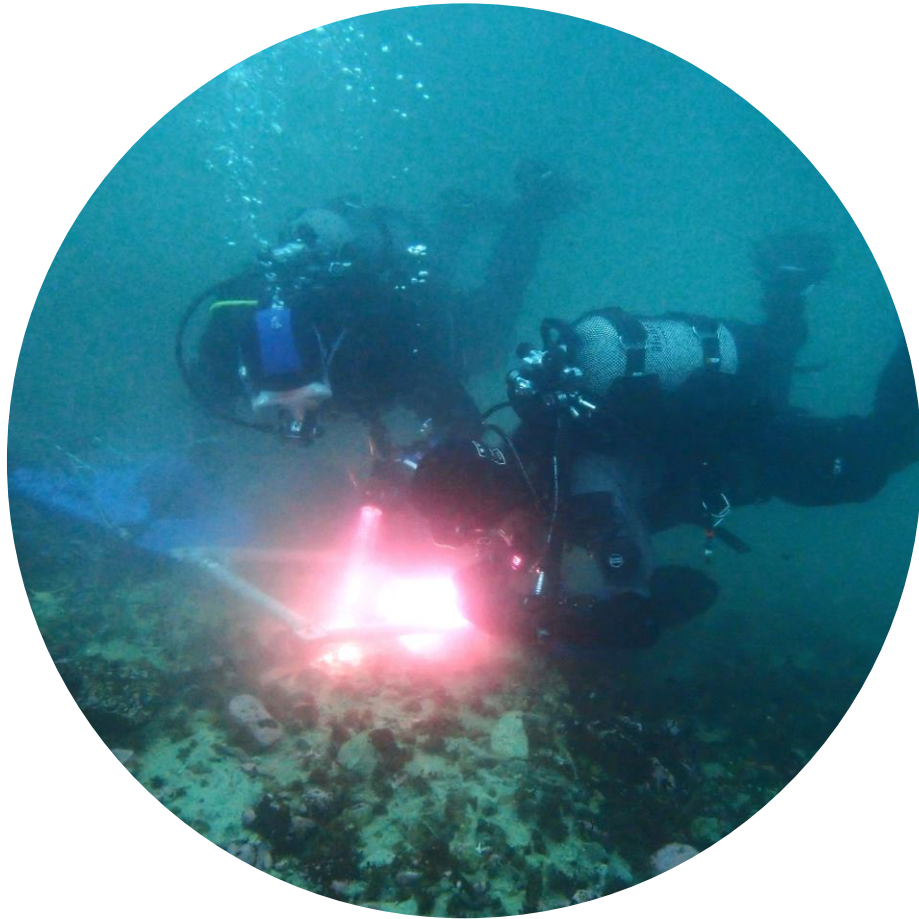


Austral summer



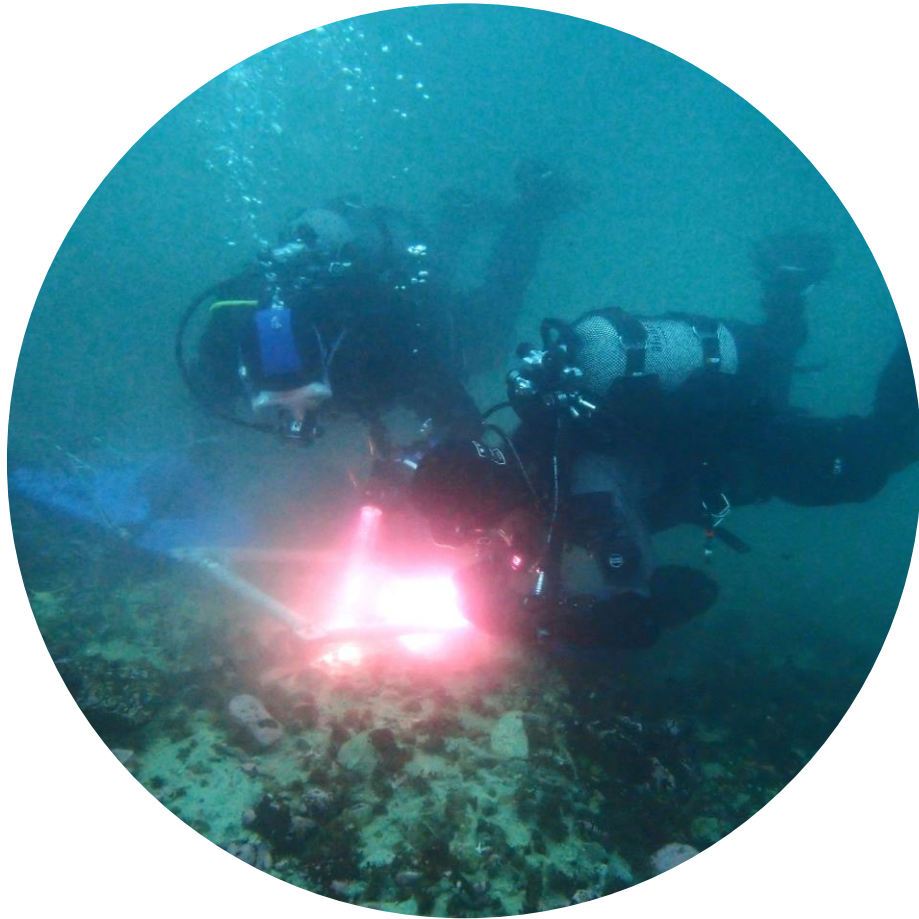
Sampling

Food sources & Consumers



Sampling

Benthic grazers



*Margarella
antarctica*



*Nacella
concinna*



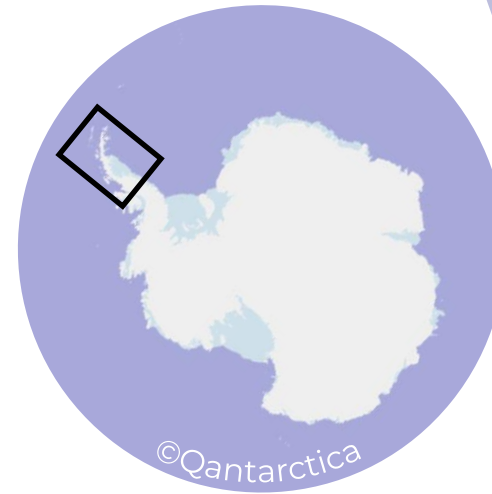
*Sterechinus
neumayeri*

What do grazers really graze on?

Sampling

TANGO project

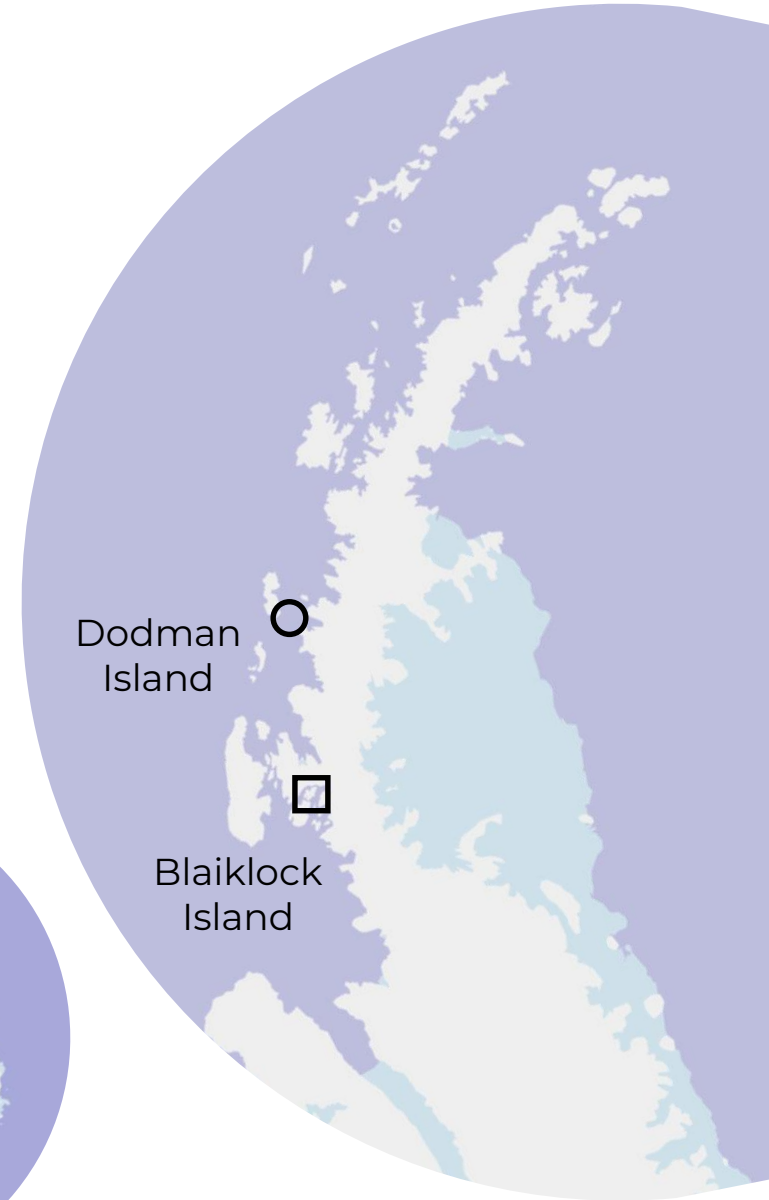
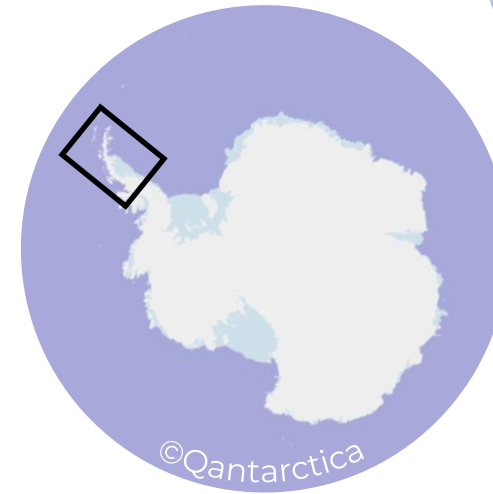
(Danis et al., 2023; 2024)



Sampling

TANGO project

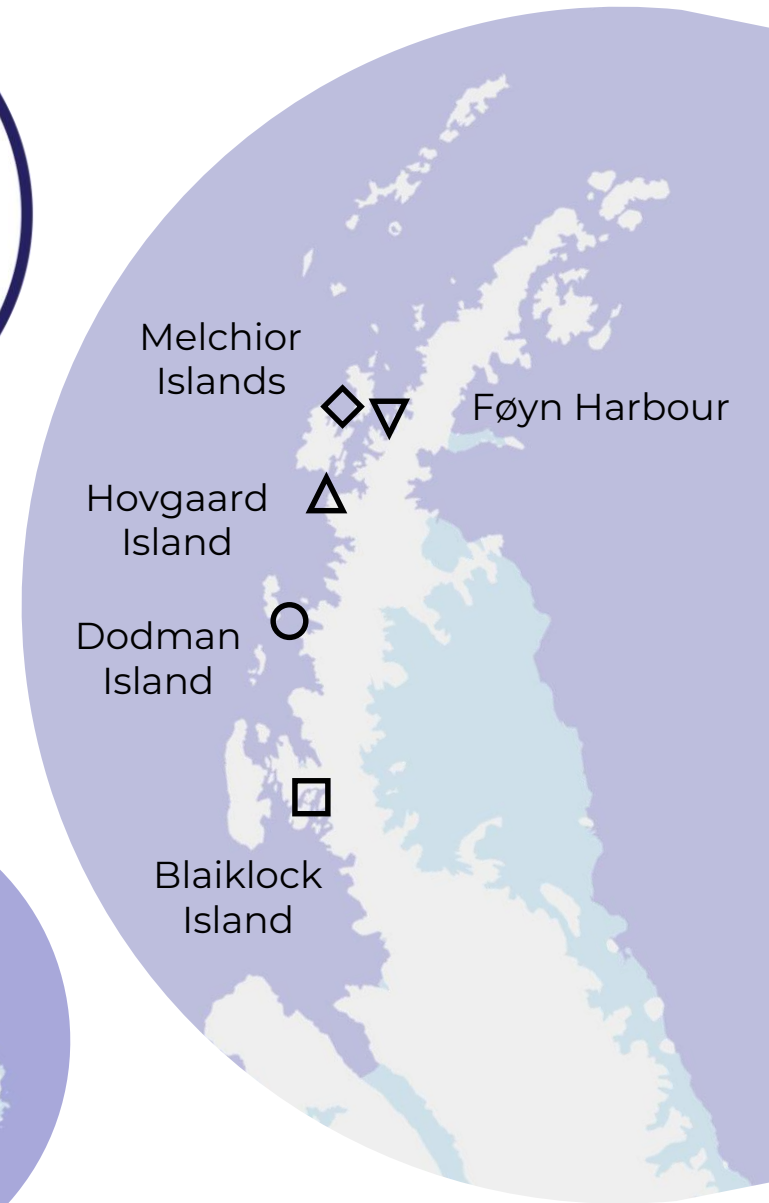
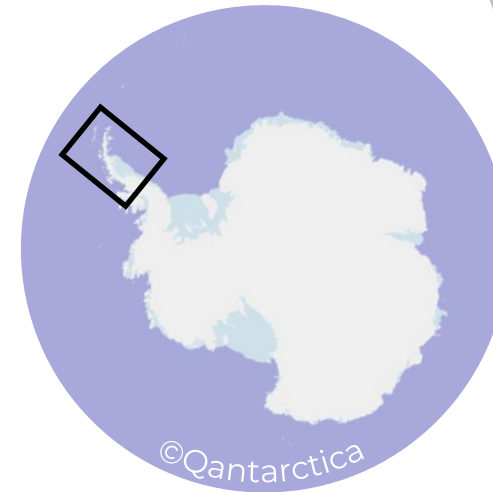
(Danis et al., 2023; 2024)



Sampling

TANGO project

(Danis et al., 2023; 2024)



Analyses

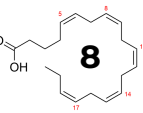
Fatty acids as Trophic biomarkers

(Fry, 2006; Kelly and Scheibling, 2012)

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

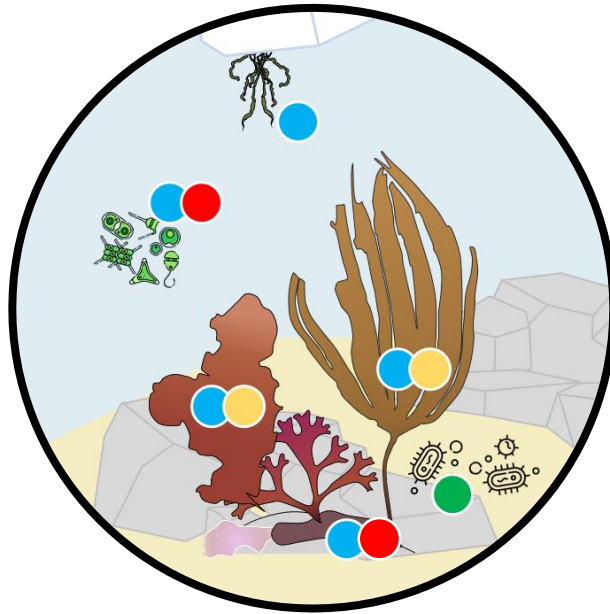
Zoology Congress 2024

December 13th, 2024



Fatty acids as Trophic biomarkers

**Food
sources**



(Fry, 2006; Kelly and Scheibling, 2012)

Analyses

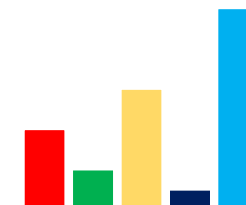
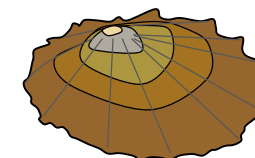
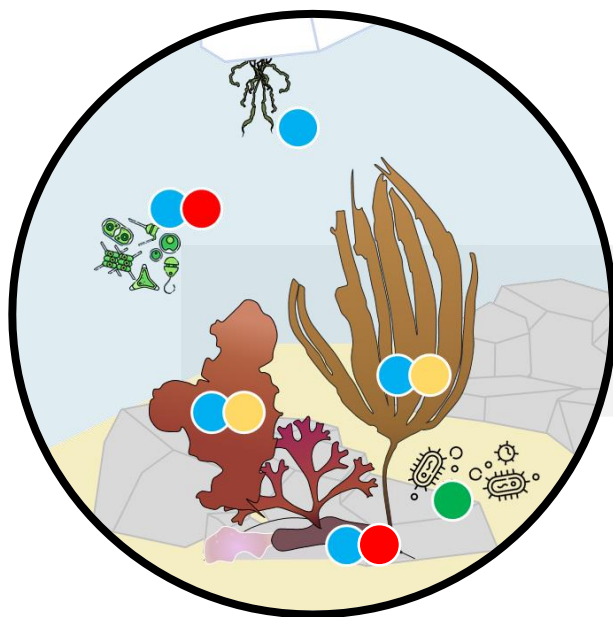
Fatty acids as Trophic biomarkers

●●●● Source synthesized FA
● Consumer modified FA

Consumers

Fatty acid contents

**Food
sources**

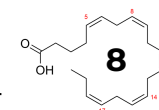


(Fry, 2006; Kelly and Scheibling, 2012)

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Analyses

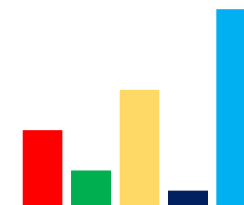
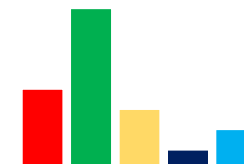
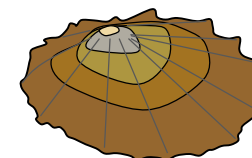
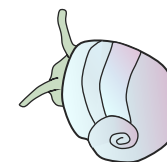
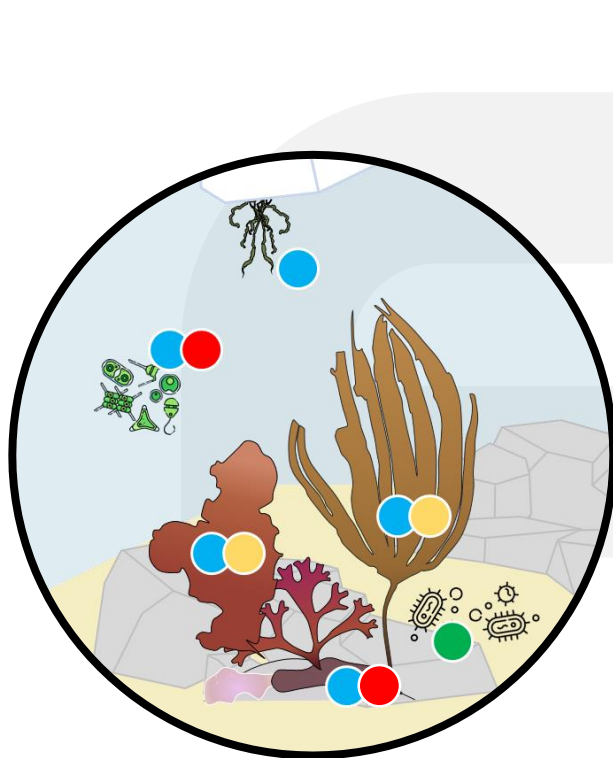
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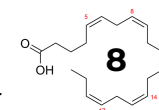


(Fry, 2006; Kelly and Scheibling, 2012)

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Analyses

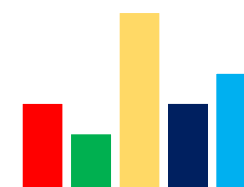
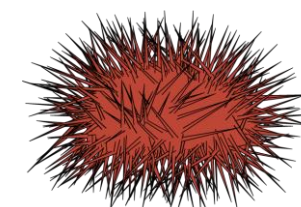
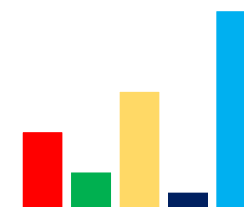
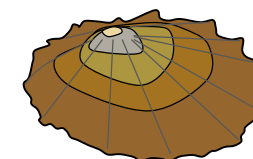
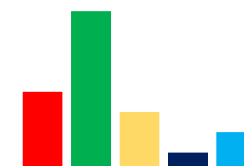
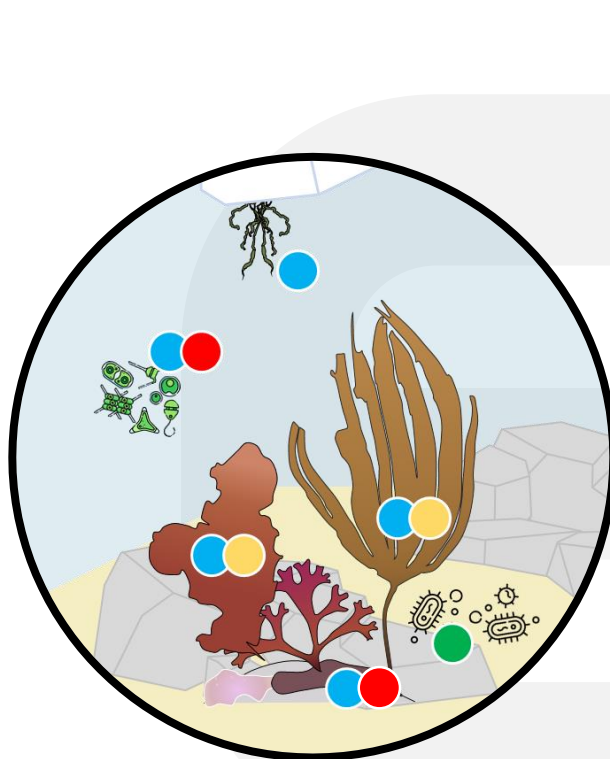
Fatty acids as Trophic biomarkers

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Consumers

Fatty acid contents

**Food
sources**

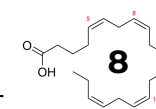


(Fry, 2006; Kelly and Scheibling, 2012)

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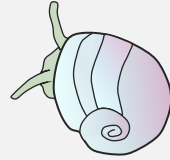
Zoology Congress 2024

December 13th, 2024

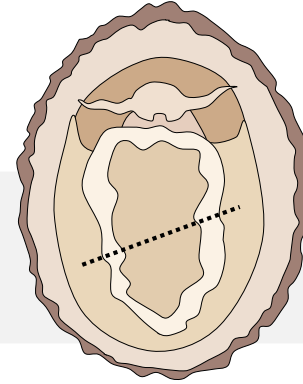


Analyses

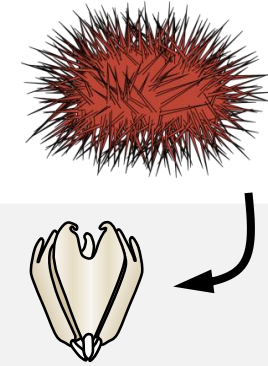
Dissections



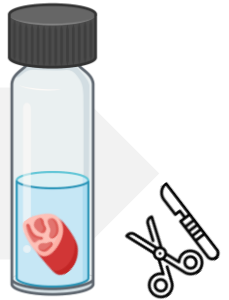
Whole organism



Foot muscle

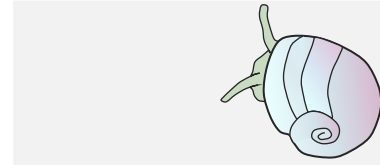


Aristotle lantern

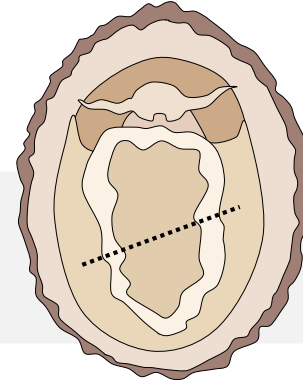


Analyses

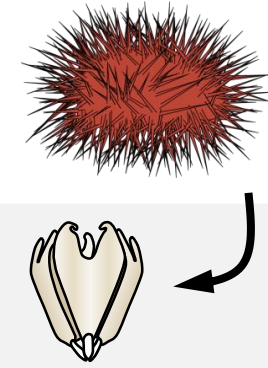
Dissections



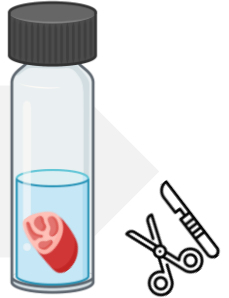
Whole organism



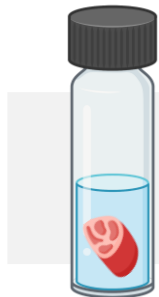
Foot muscle



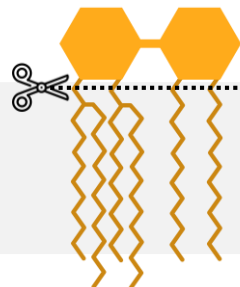
Aristotle lantern



Gas Chromatography Flame Ionization Detector (GC-FID)



$\text{CHCl}_3/\text{MeOH}$
(2:1, v:v)



Saponification & Transmethylation
 KOH-MeOH (0.5M) & $\text{MeOH-H}_2\text{SO}_4$ (3.4%, v:v)

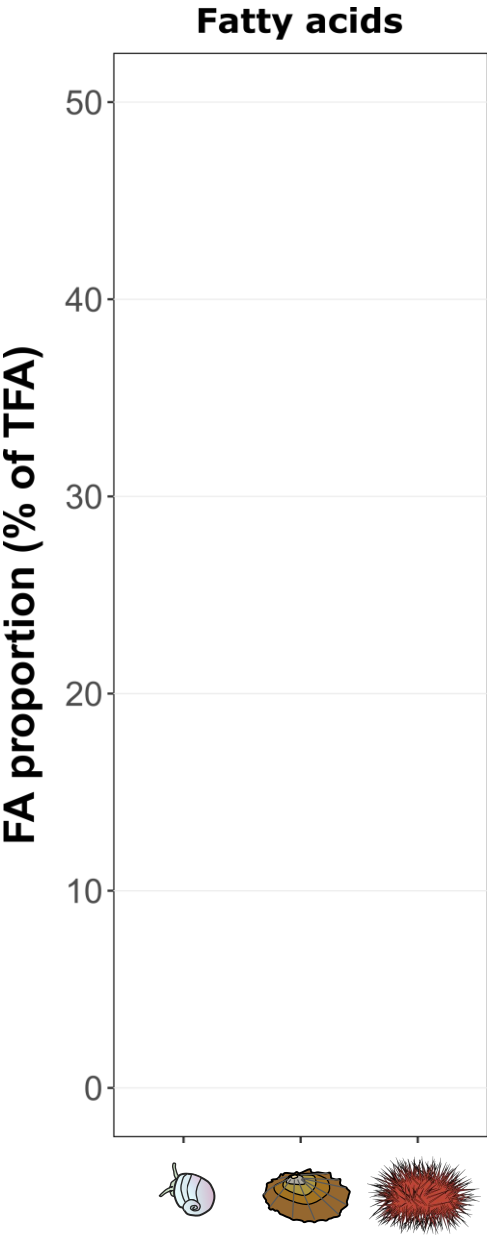


FAME
(Hexane fraction)



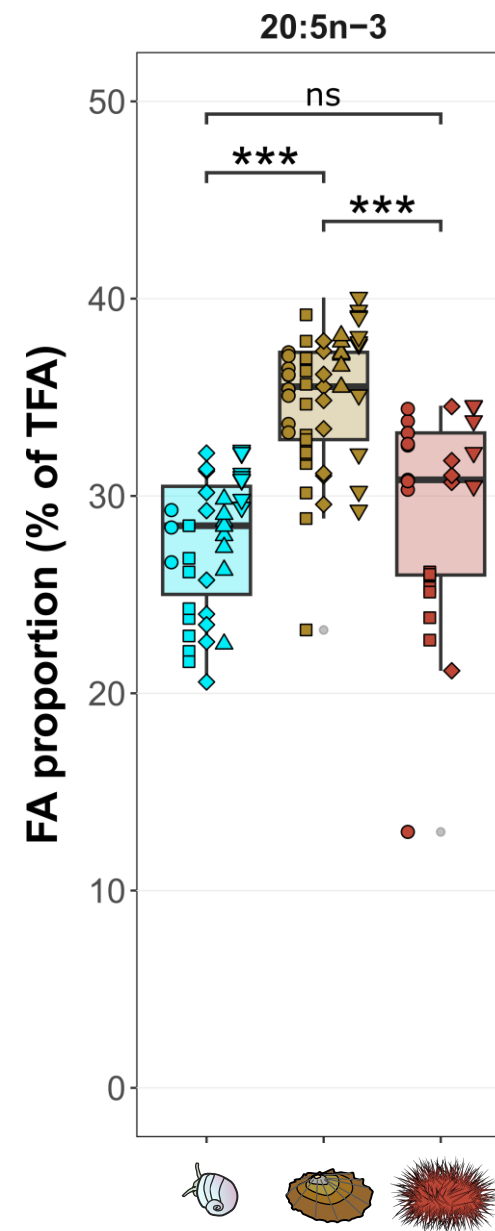
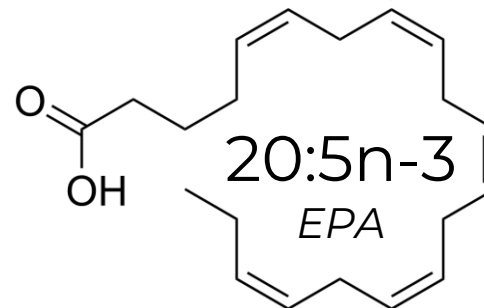
GC-FID

Results

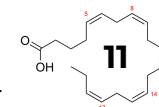


Results

Eicosapentaenoic acid

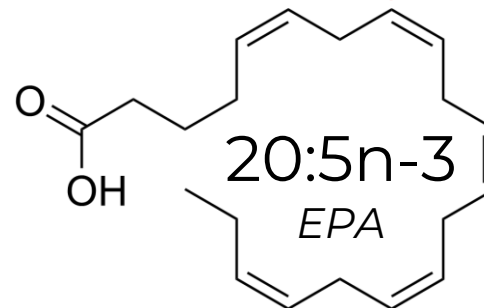


(Fry, 2006; Kelly and Scheibling, 2012)

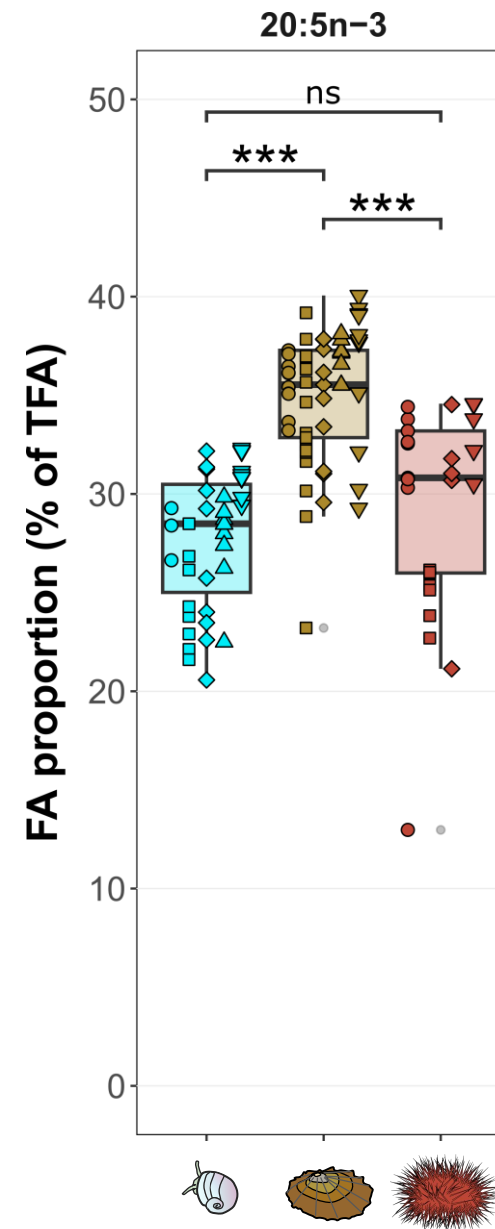
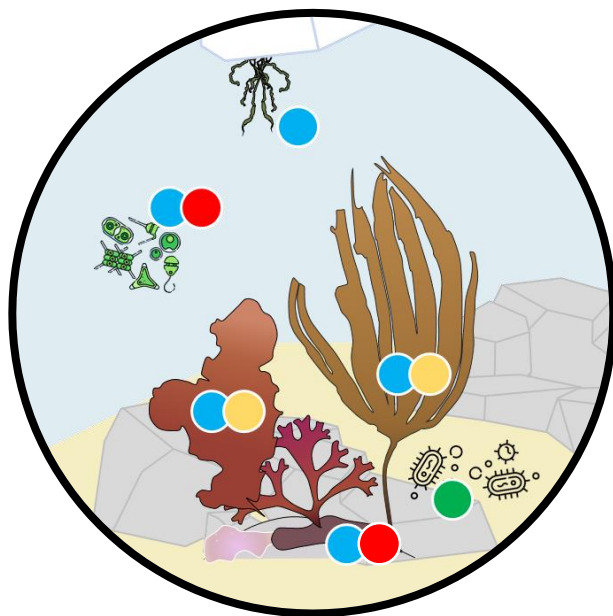


Results

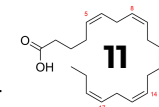
Eicosapentaenoic acid



**Food
sources**

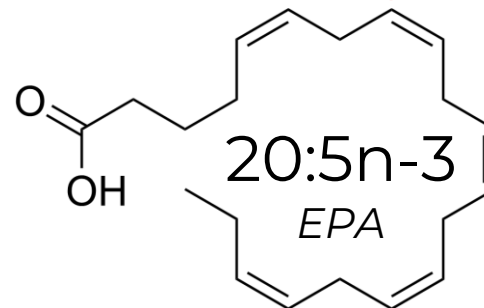


(Fry, 2006; Kelly and Scheibling, 2012)

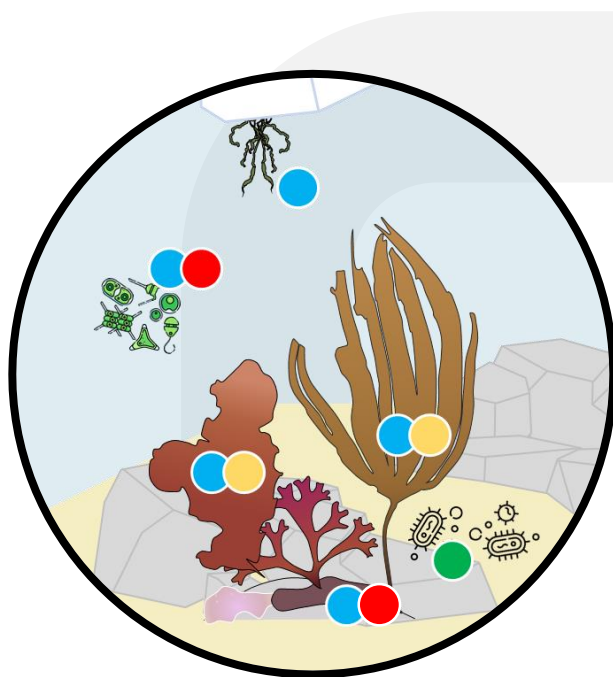


Results

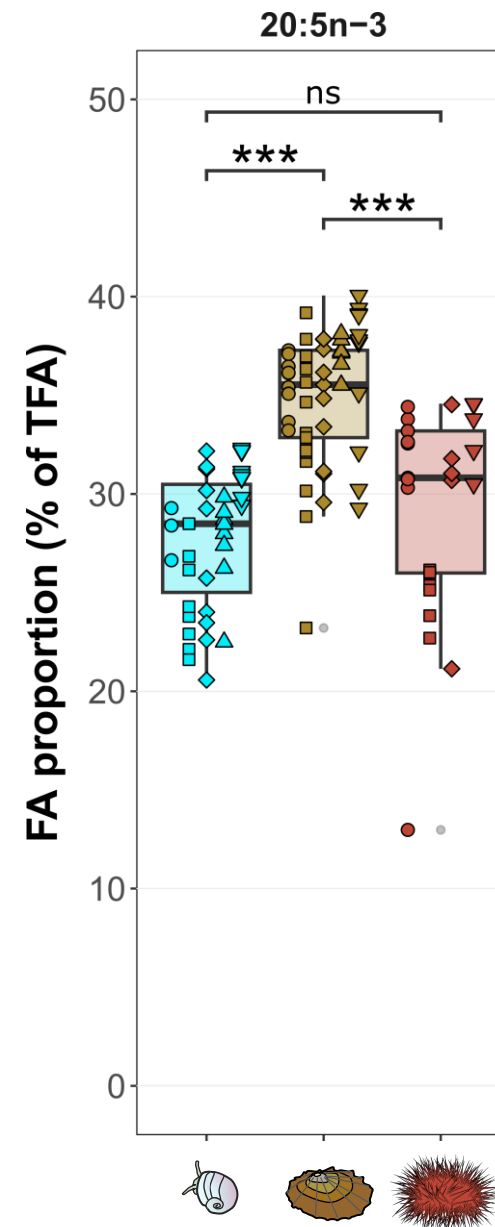
Eicosapentaenoic acid



**Food
sources**



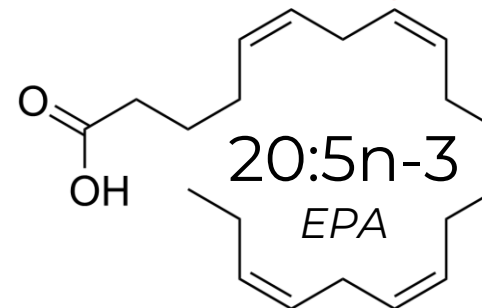
Diatoms
(pelagic vs sea ice)



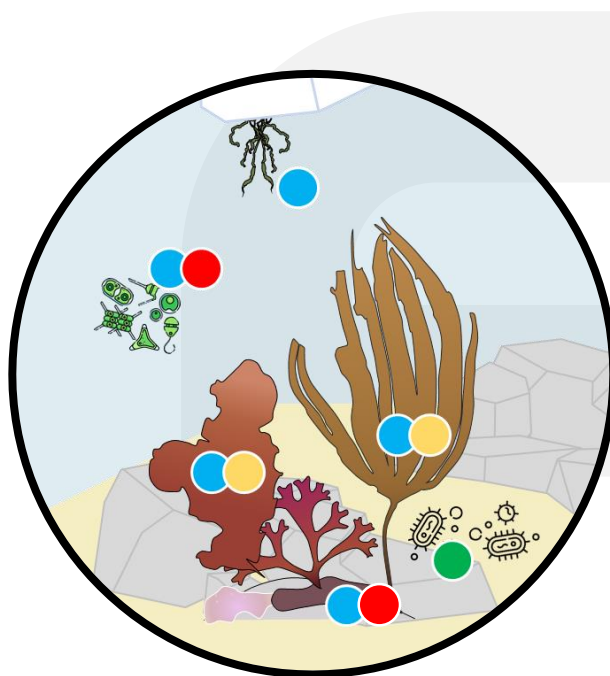
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Results

Eicosapentaenoic acid

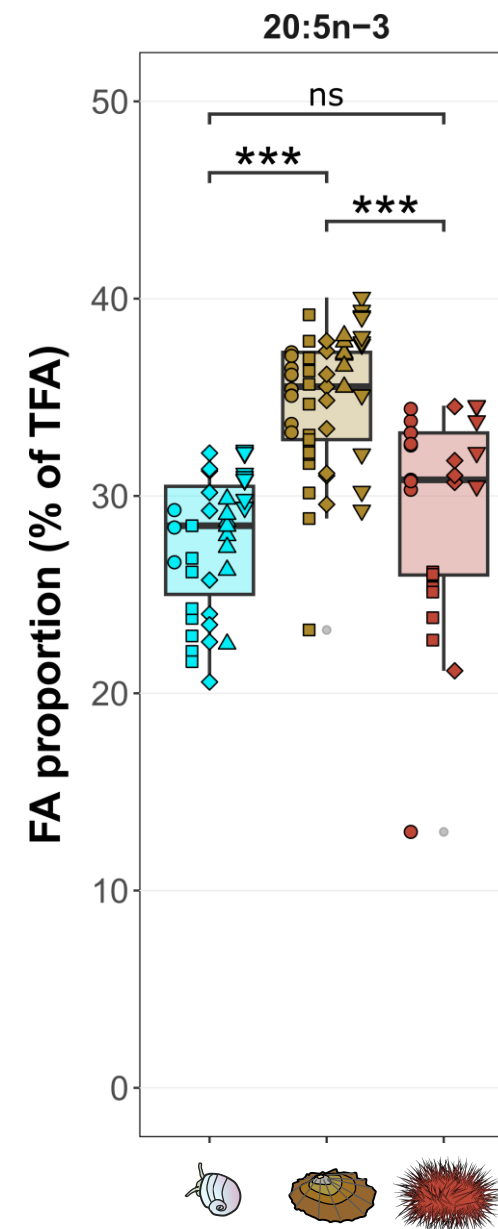


Food sources



Diatoms
(pelagic vs sea ice)

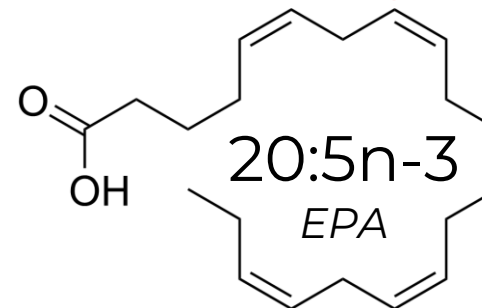
Macroalgae
(brown, red & green)



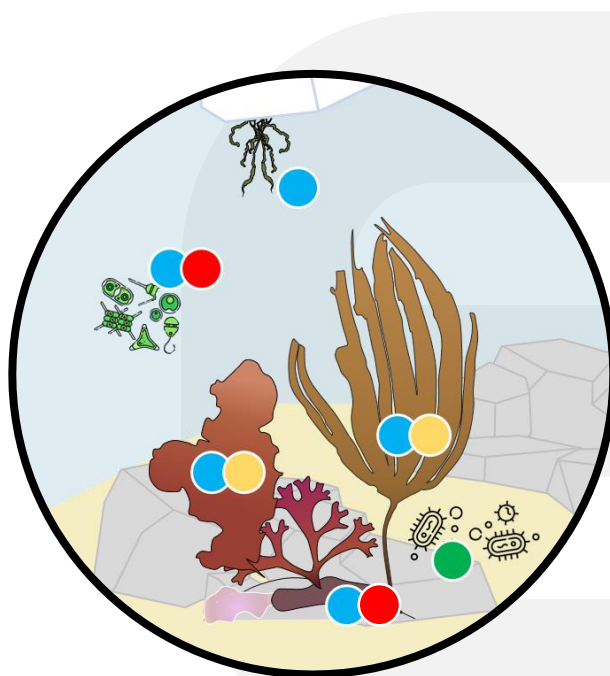
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Eicosapentaenoic acid



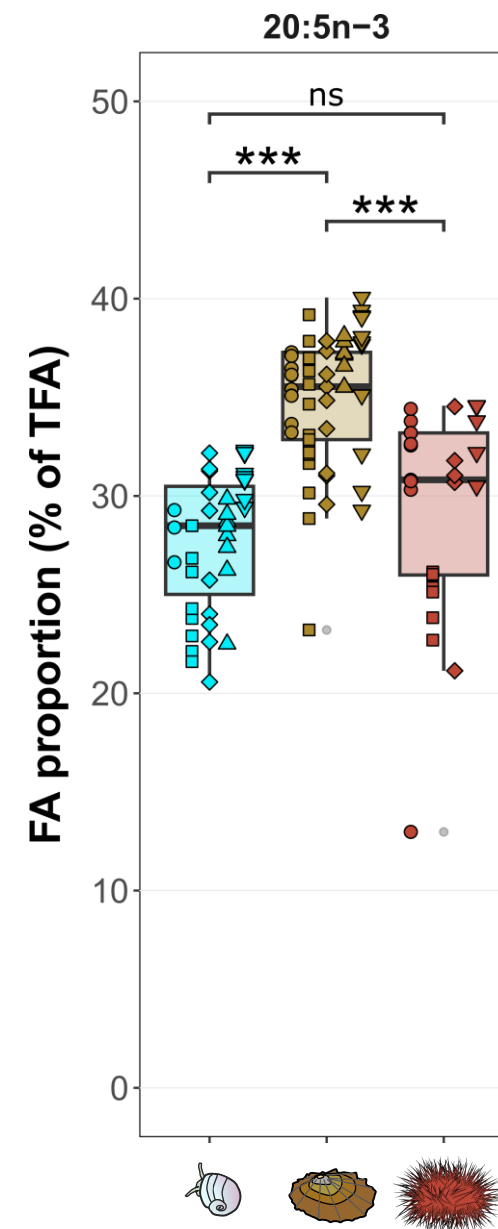
Food sources



Diatoms
(pelagic vs sea ice)

Macroalgae
(brown, red & green)

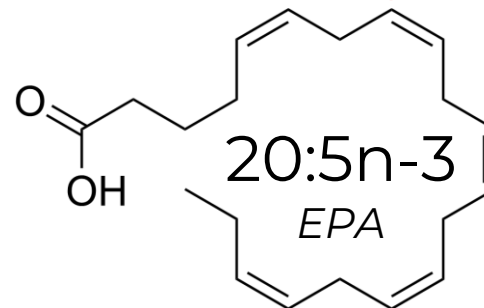
Benthic diatoms



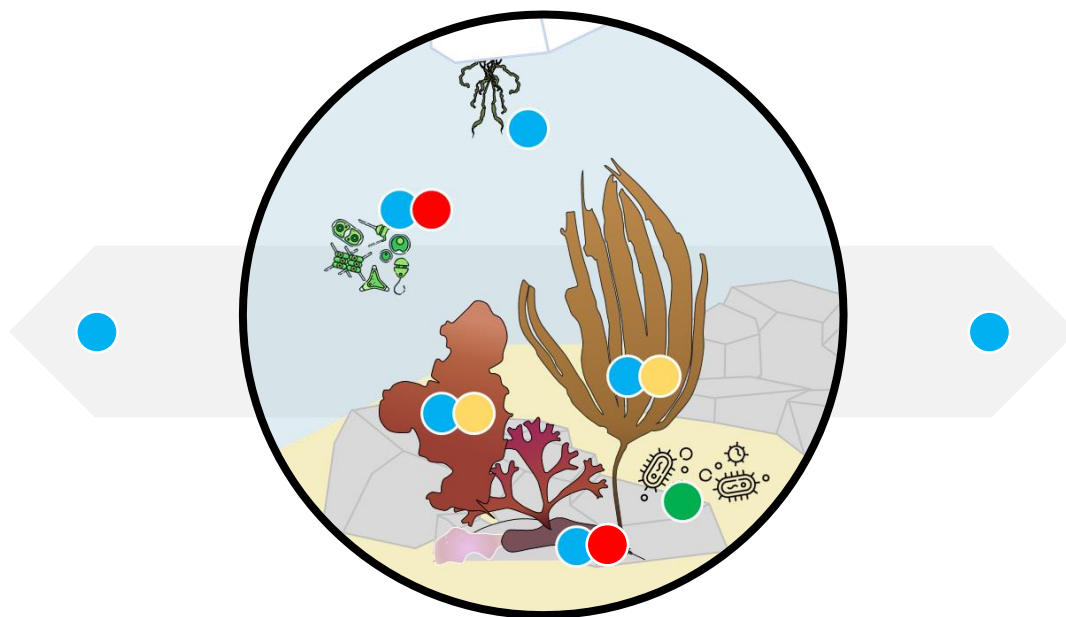
(Fry, 2006; Kelly and Scheibling, 2012)

Results

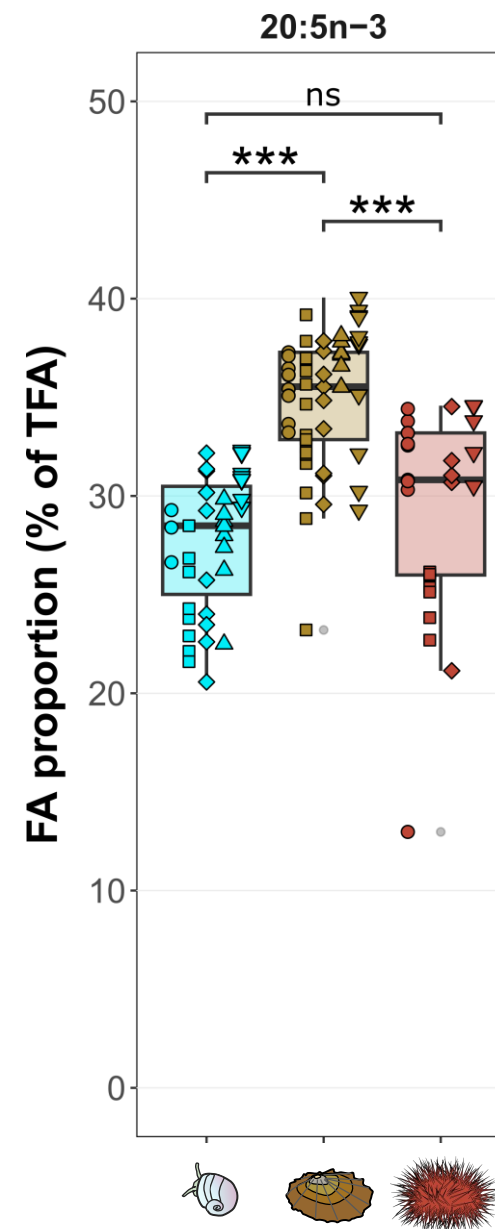
Eicosapentaenoic acid



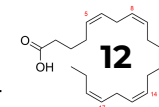
Diatoms



Macroalgae

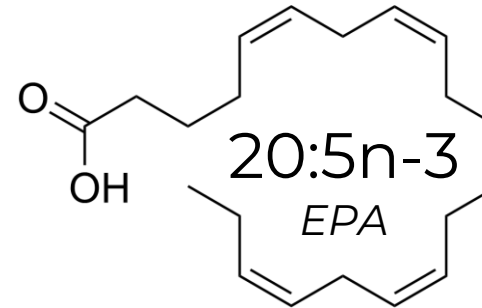


(Fry, 2006; Kelly and Scheibling, 2012)



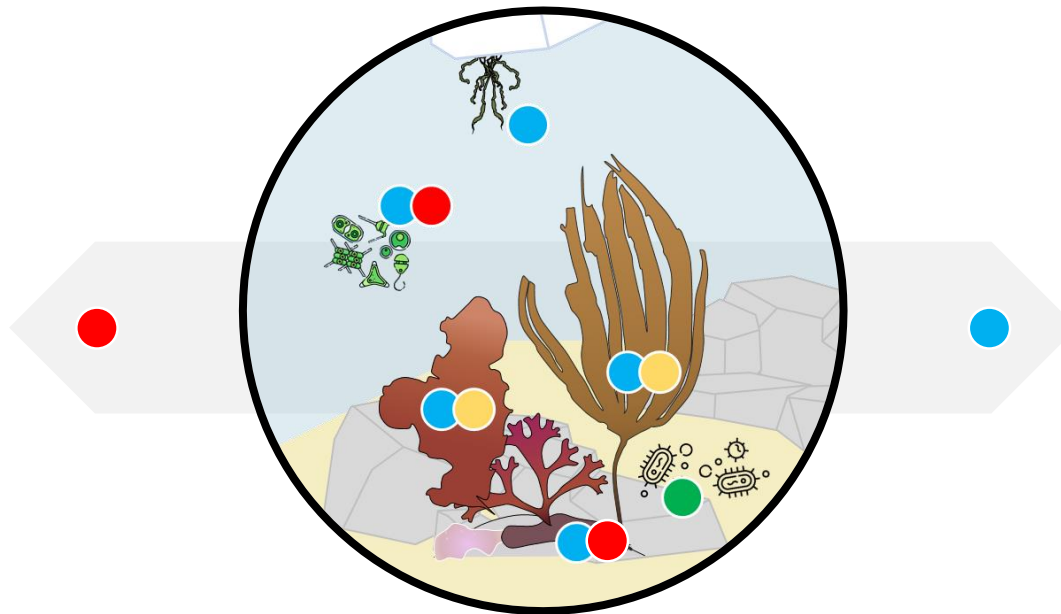
Results

Fatty acids as Trophic biomarkers

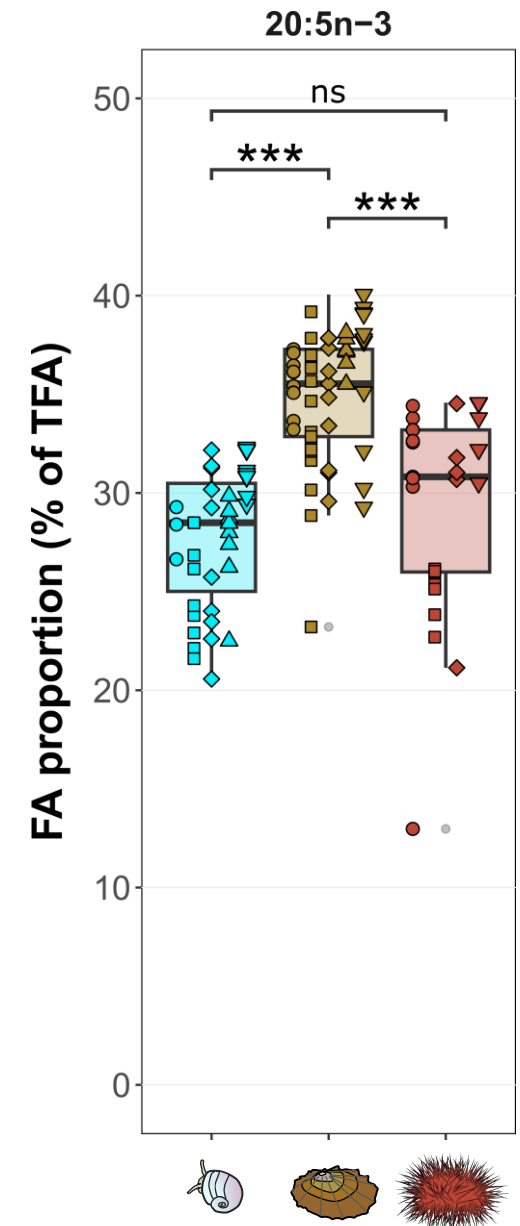


Diatoms

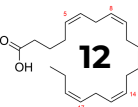
16:1n-7
16:3n-4
& others



Macroalgae

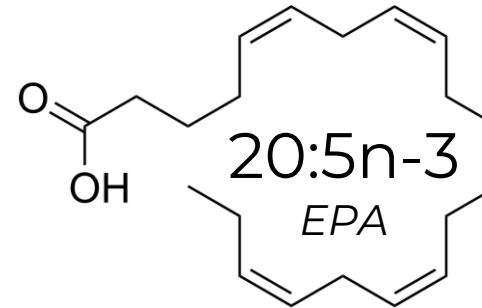


(Fry, 2006; Kelly and Scheibling, 2012)



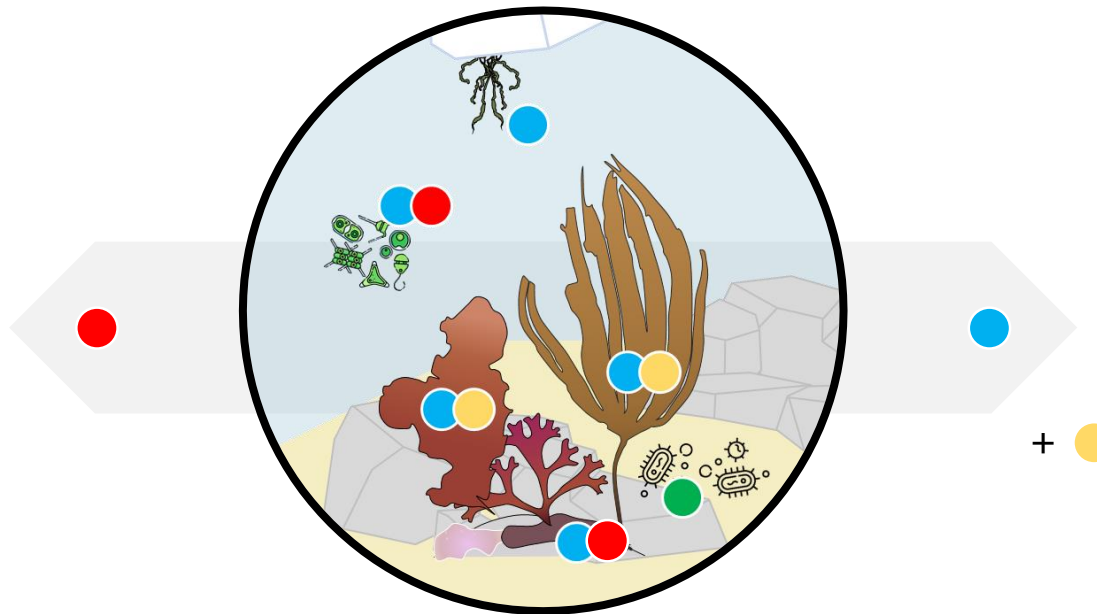
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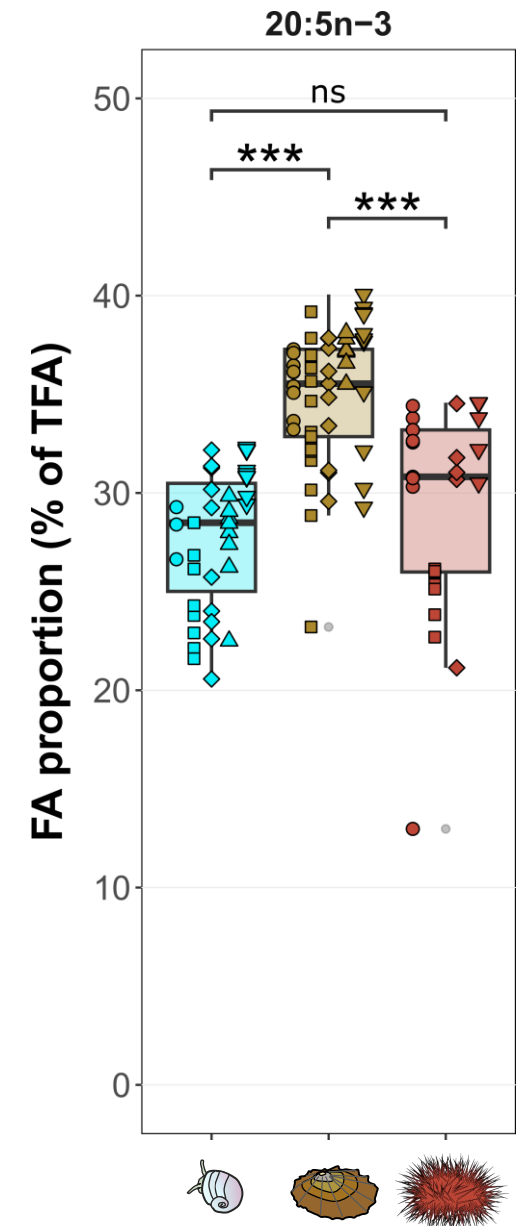
Diatoms

16:1n-7
16:3n-4
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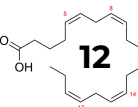


Macroalgae

18:1n-9
18:4n-3
20:4n-6



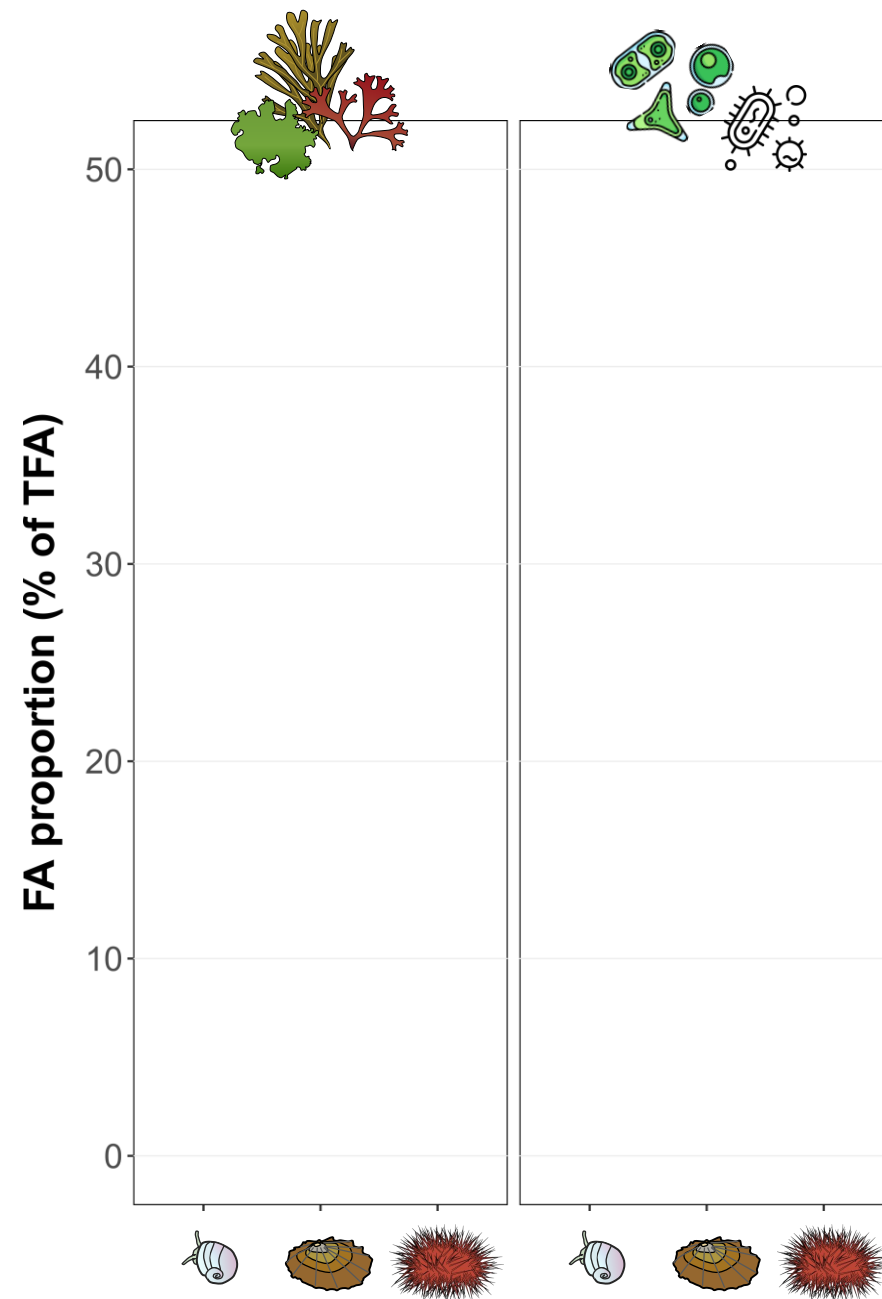
(Fry, 2006; Kelly and Scheibling, 2012)



Results

Each groups are different

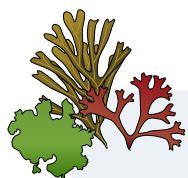
Kruskall and Dunn test pvalue < 0.001



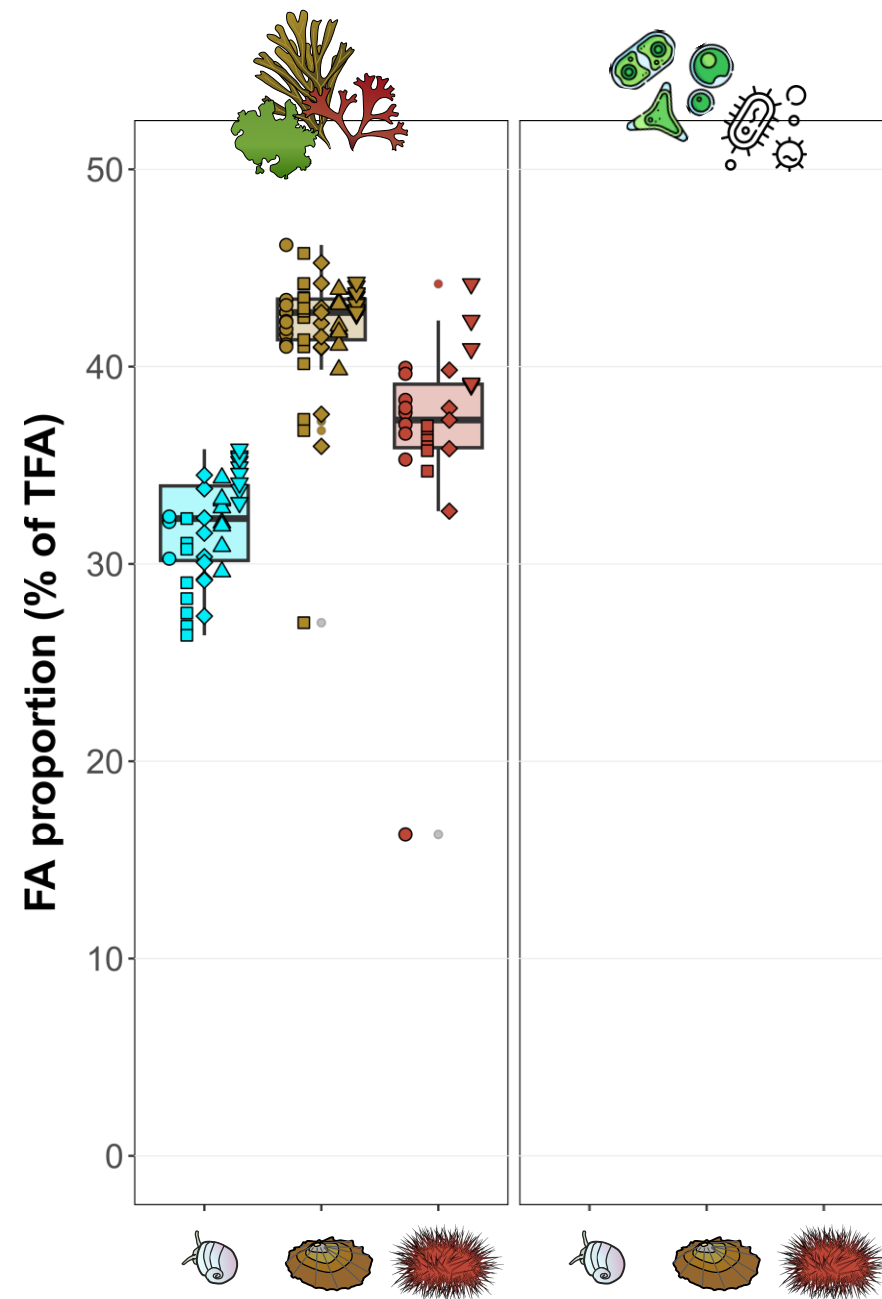
(Fry, 2006; Kelly and Scheibling, 2012)

Results

Each groups are different
Kruskall and Dunn test pvalue < 0.001



18:1n-9
18:4n-3
20:4n-6
20:5n-3

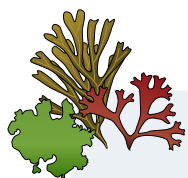


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Results

Each groups are different

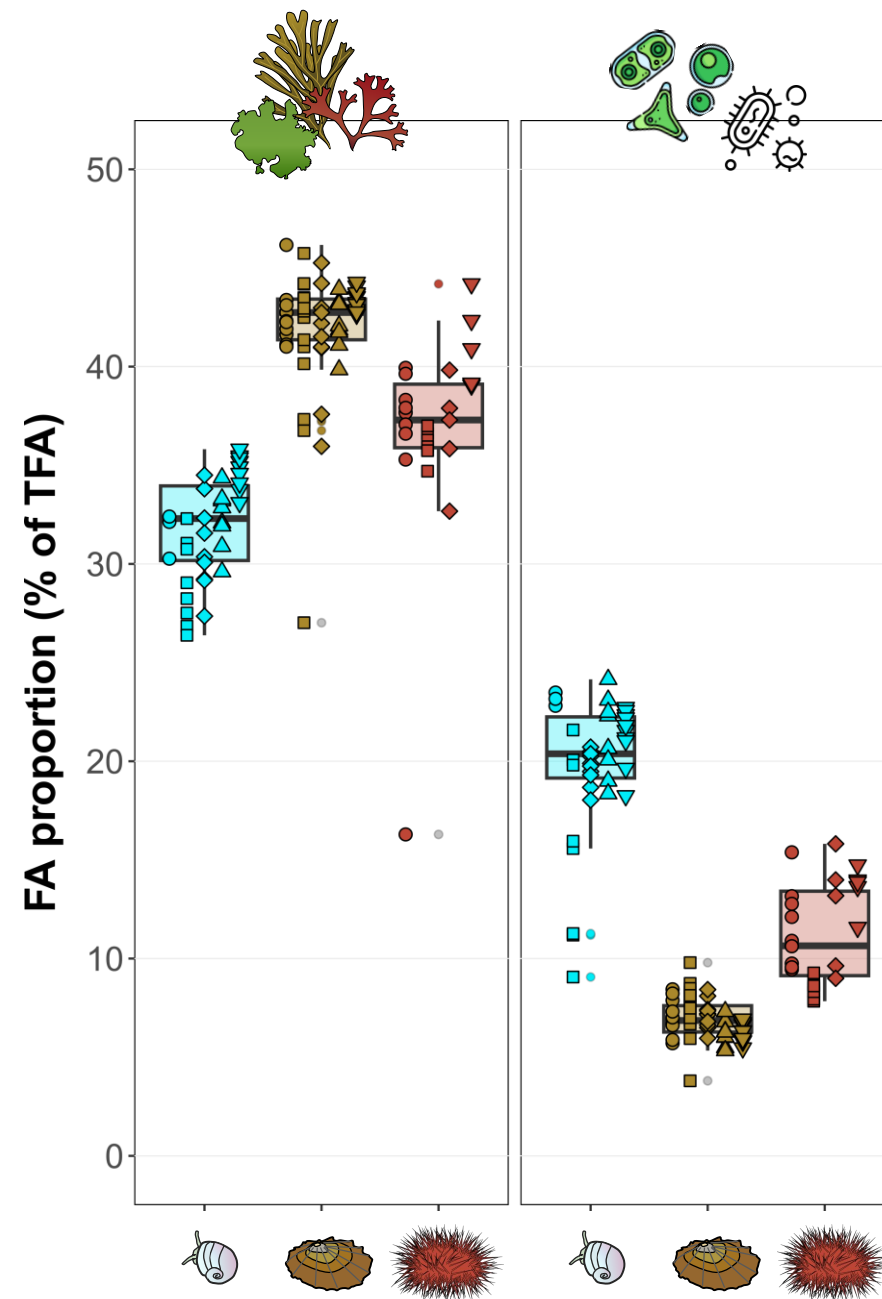
Kruskall and Dunn test pvalue < 0.001



18:1n-9
18:4n-3
20:4n-6
20:5n-3



16:1n-7
 Σ C16+C18 PUFA



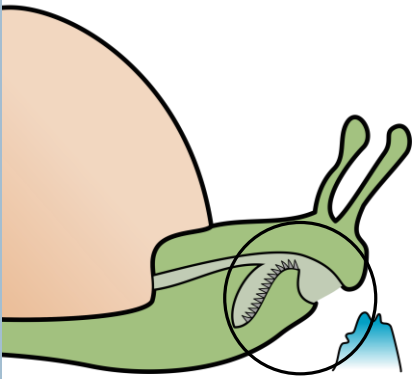
(Fry, 2006; Kelly and Scheibling, 2012)

Discussion

Let's talk about “teeth”

Discussion

Gastropods radula



adapted from ©Debivort
creative commons

(Steneck and Watling, 1982; Vortsepneva et al., 2022)

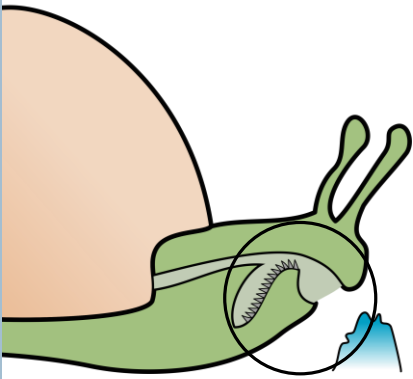
 **Anthony Voisin** – anthony.voisin@univ-brest.fr

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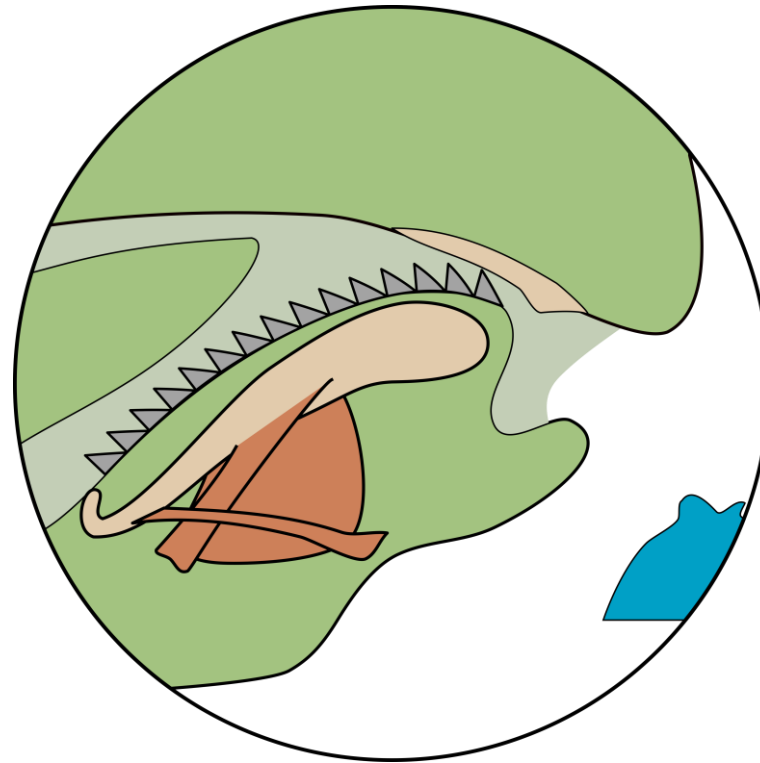
December 13th, 2024

Discussion

Gastropods radula



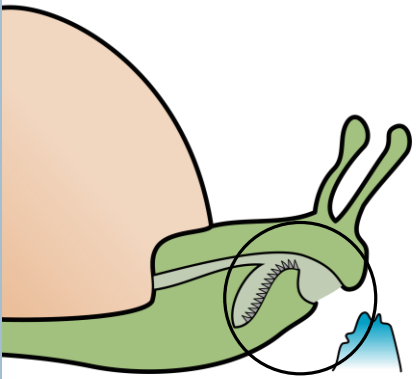
adapted from ©Debivort
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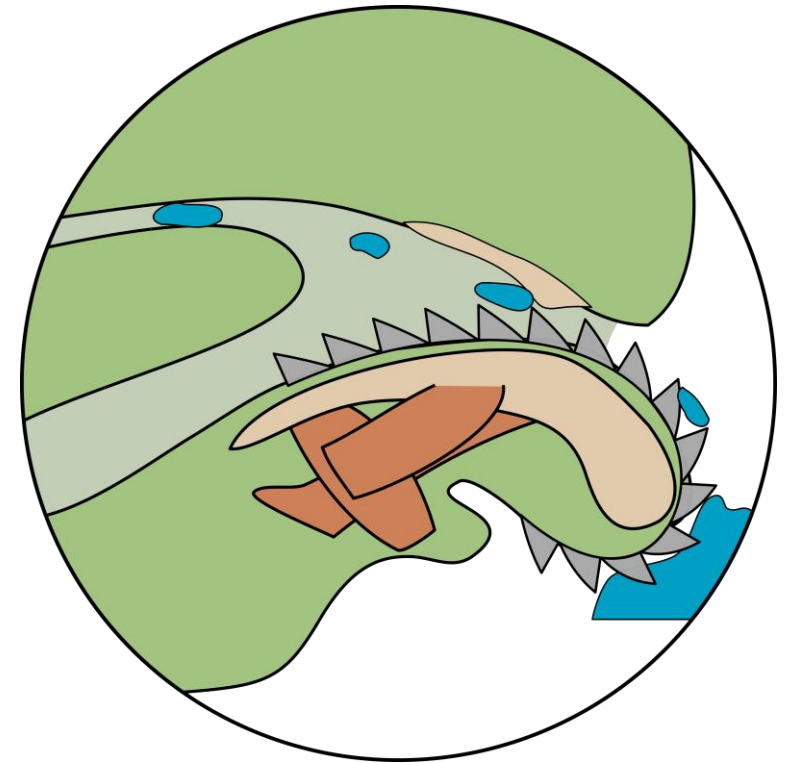
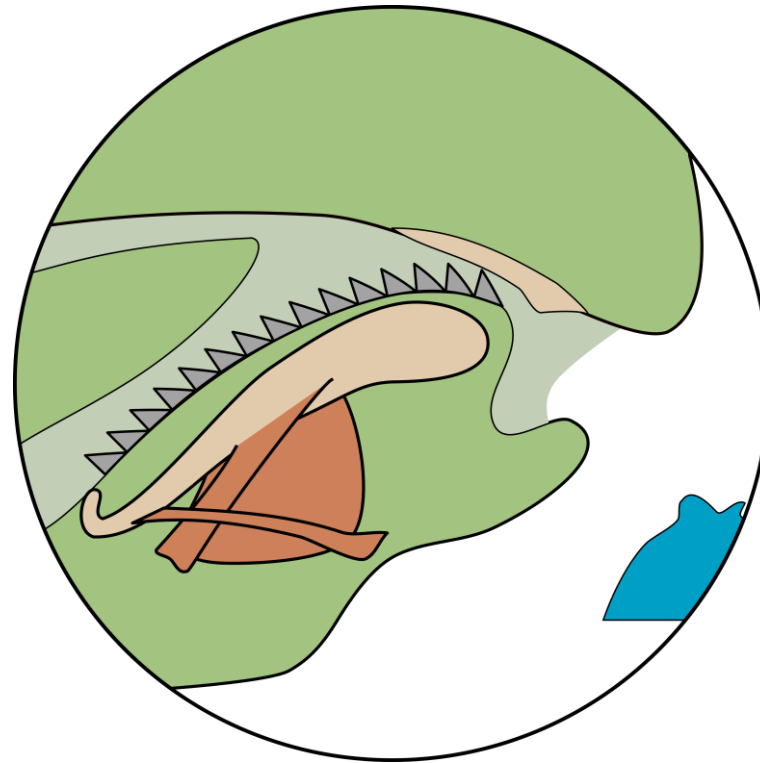
(Steneck and Watling, 1982; Vortsepneva et al., 2022)

Discussion

Gastropods *radula*



adapted from ©Debivort
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(Steneck and Watling, 1982; Vortsepneva et al., 2022)

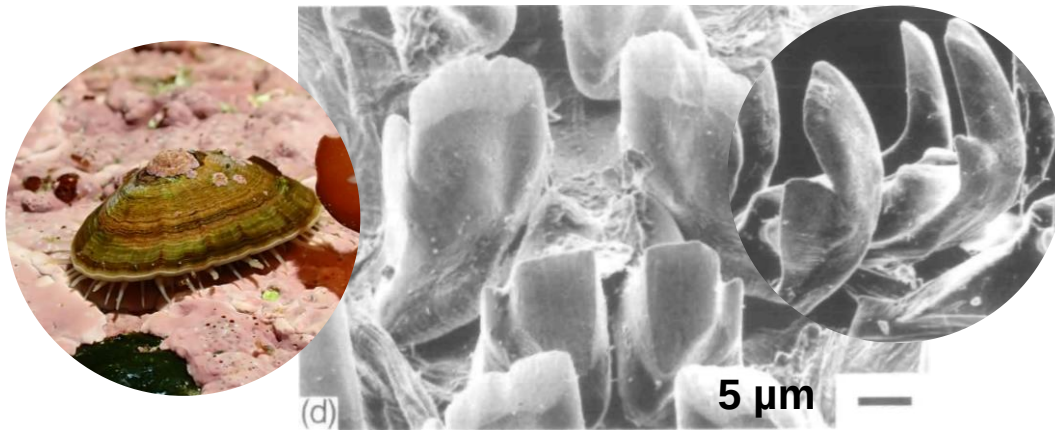
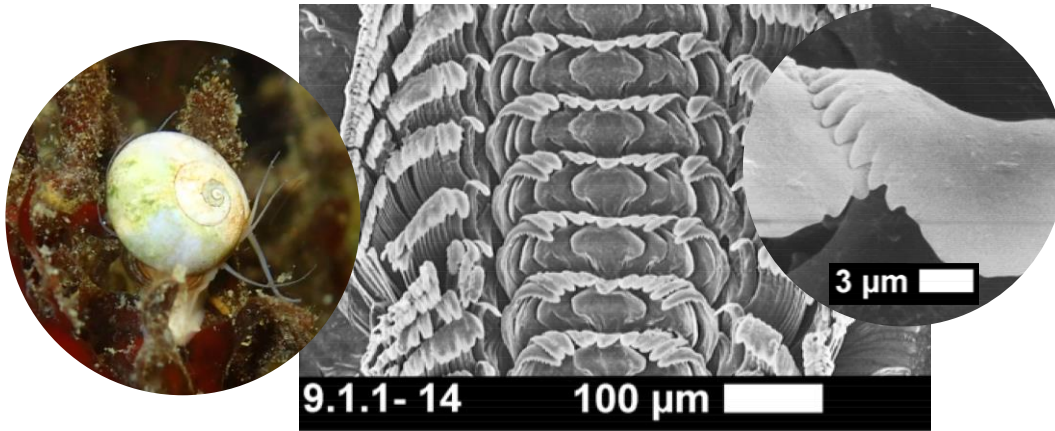
Discussion

Gastropods radula morphology



Discussion

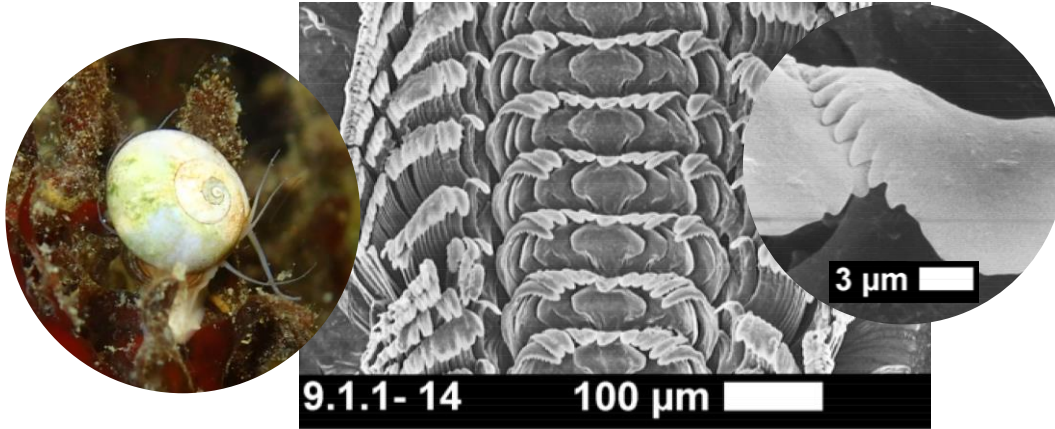
Gastropods radula morphology



(Nolan, 1991; Linse, 2000)

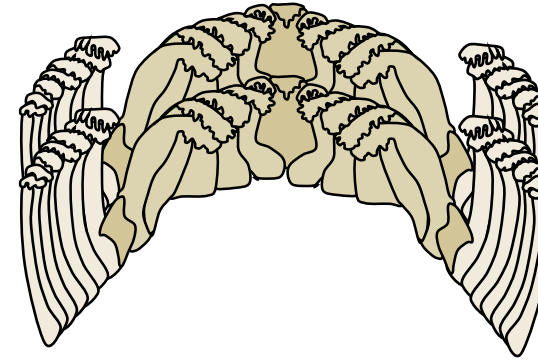
Discussion

Gastropods radula morphology

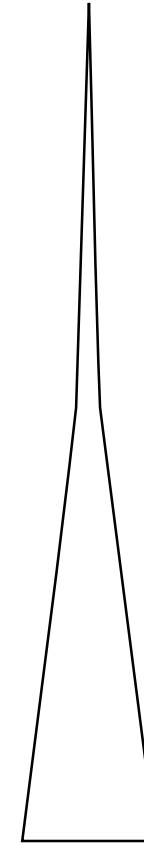
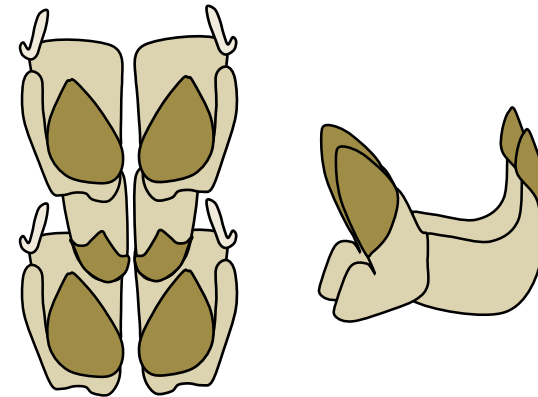
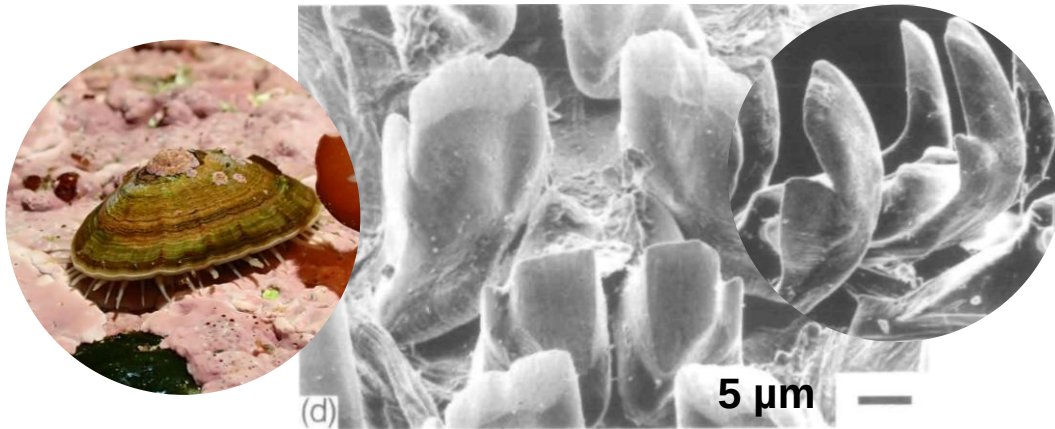


RHIPIDOGLOSSA

Excavation
capability



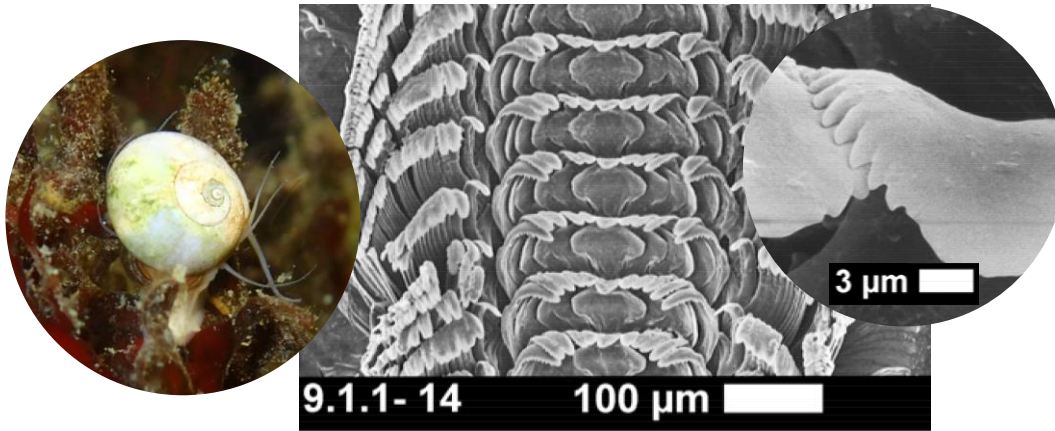
DOCOGLOSSA



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

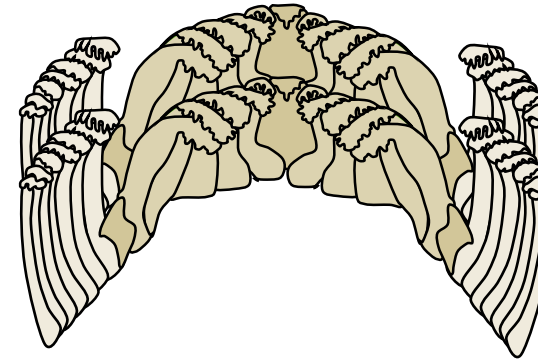
Discussion

Gastropods radula morphology



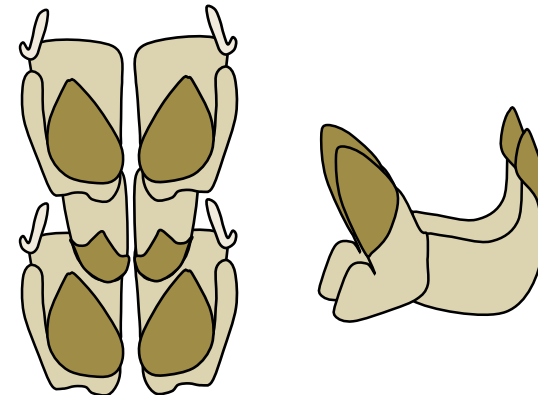
RHIPIDOGLOSSA

Excavation
capability

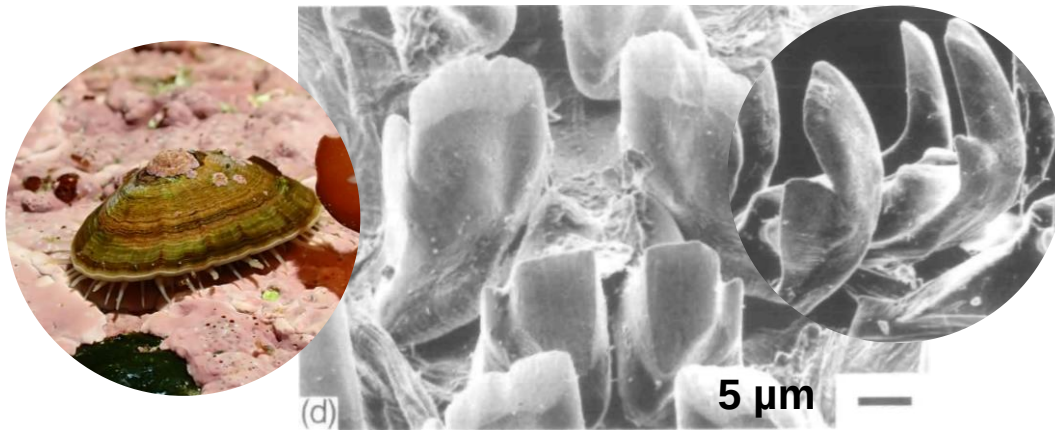


“Broom”

DOCOGLOSSA



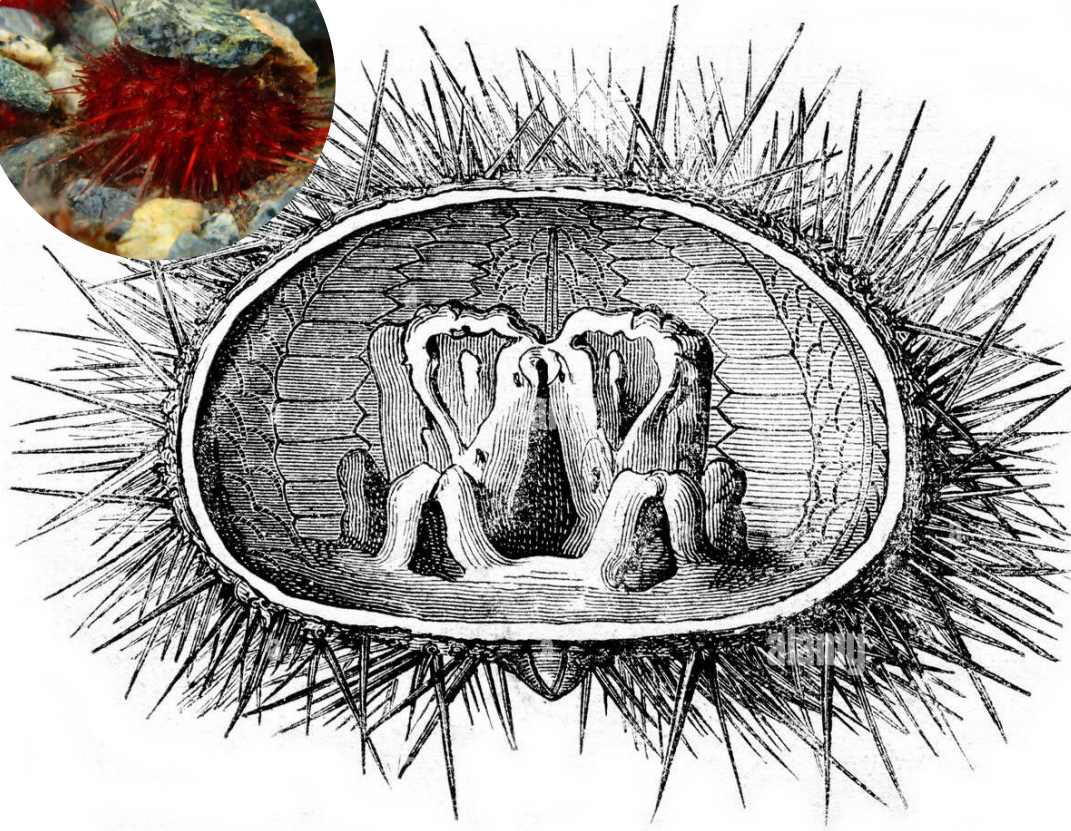
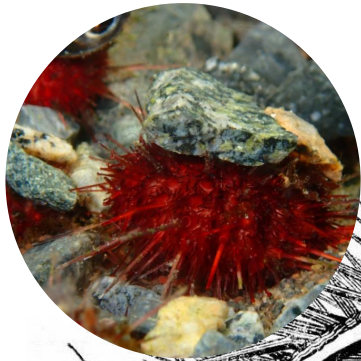
“Shovel”



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

Discussion

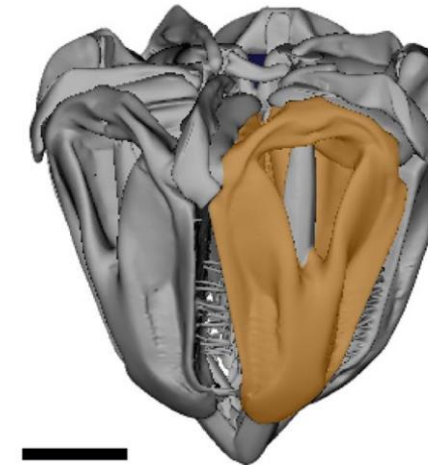
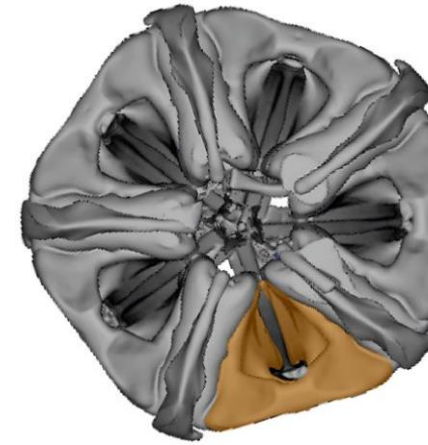
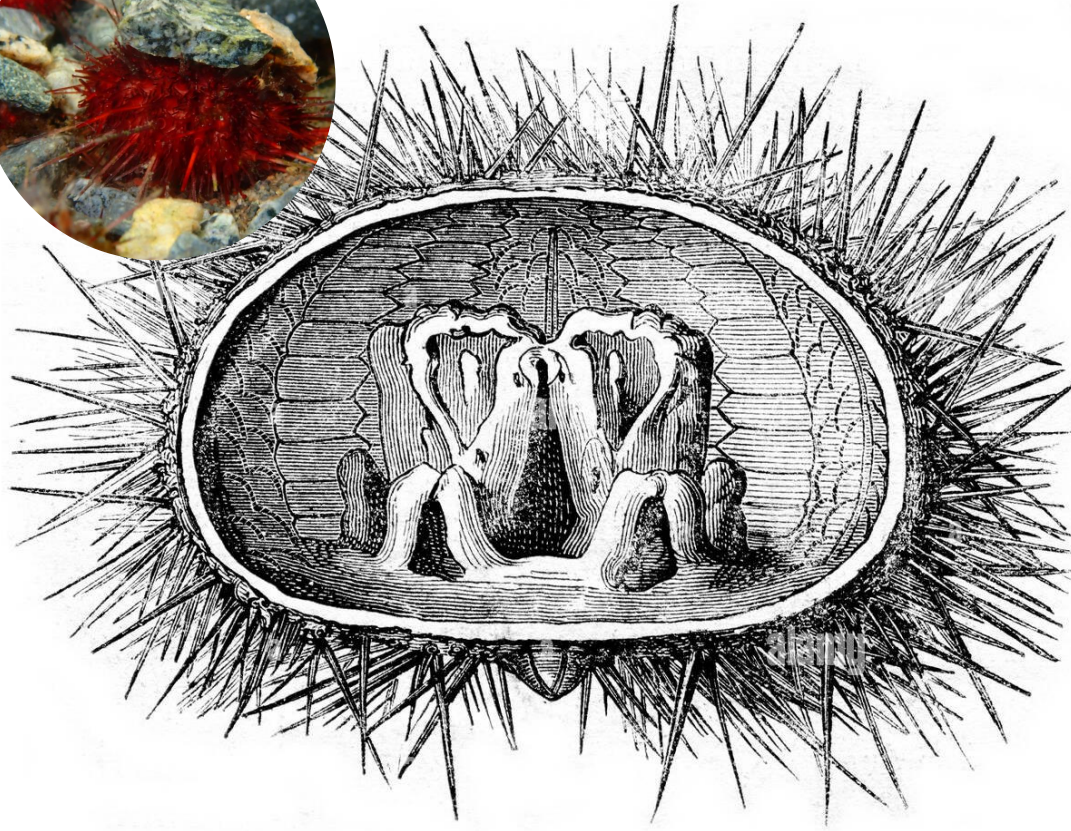
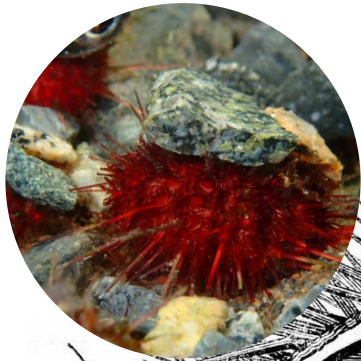
Sea urchin Aristotle lantern



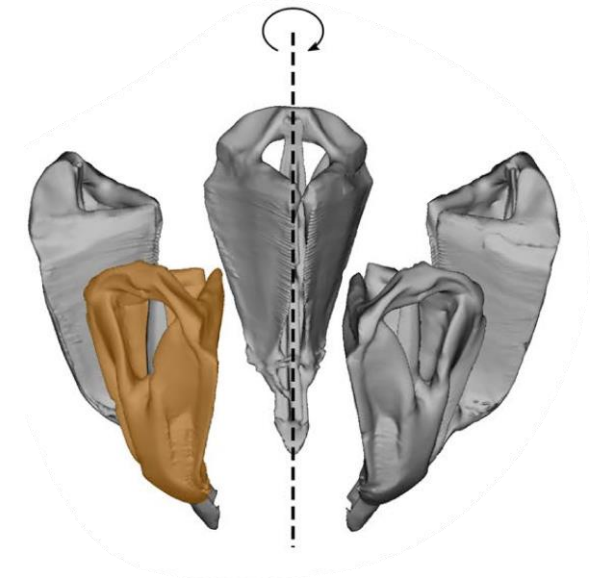
(Savriama and Griebner, 2018)

Discussion

Sea urchin Aristotle lantern



5 mm



(Savriama and Griebner, 2018)

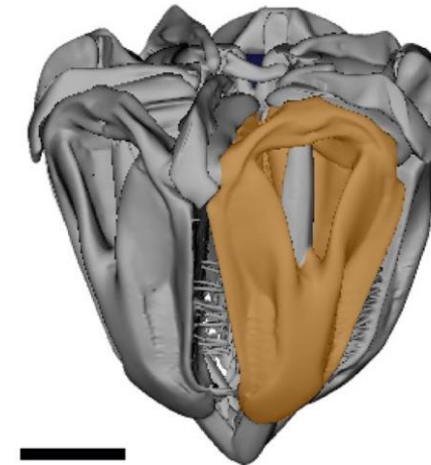
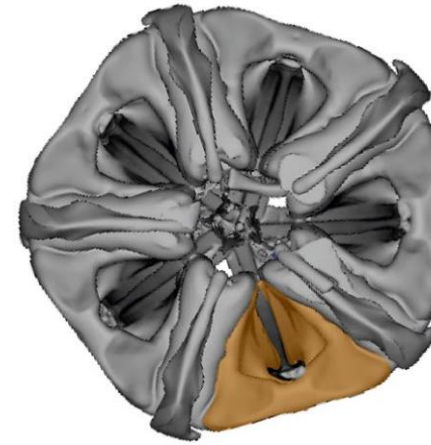
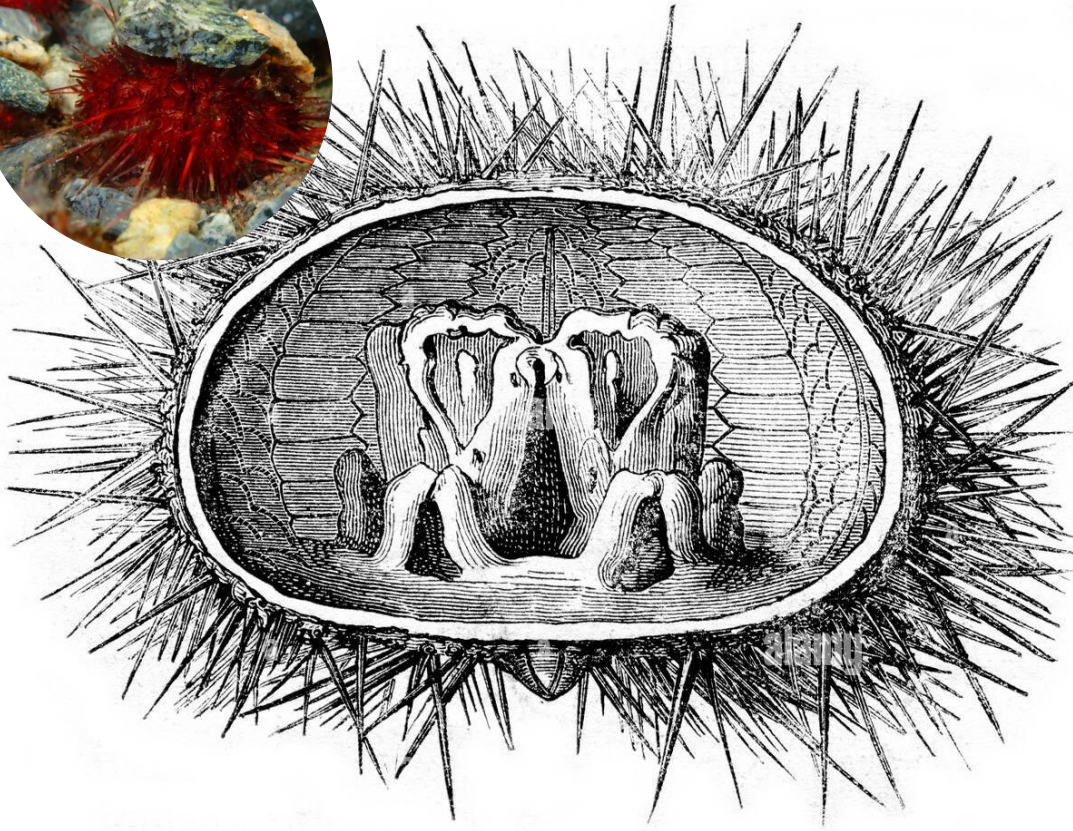
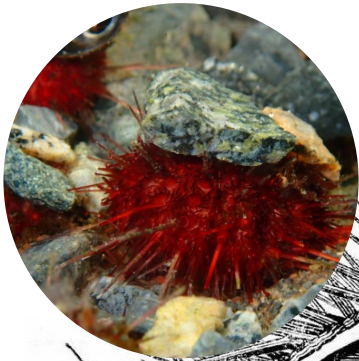
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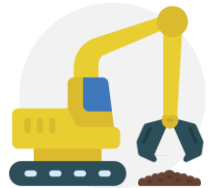
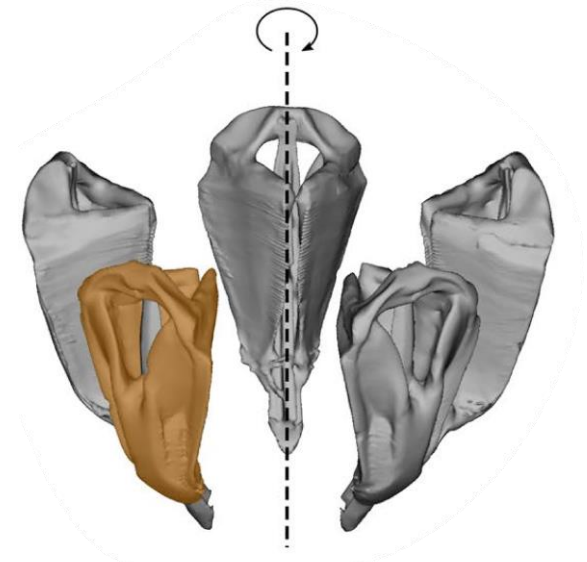
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Discussion

Sea urchin Aristotle lantern



5 mm



(Savriama and Griebner, 2018)

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Take home message



Take home message



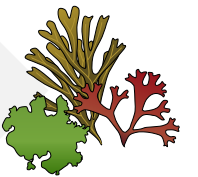
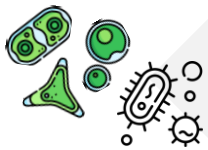
Take home message



Take home message



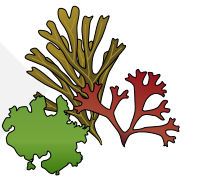
Take home message



Take home message



Feeding structures offering different feeding capacity & trophic habits



Thank you for your attention

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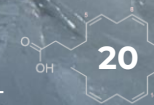


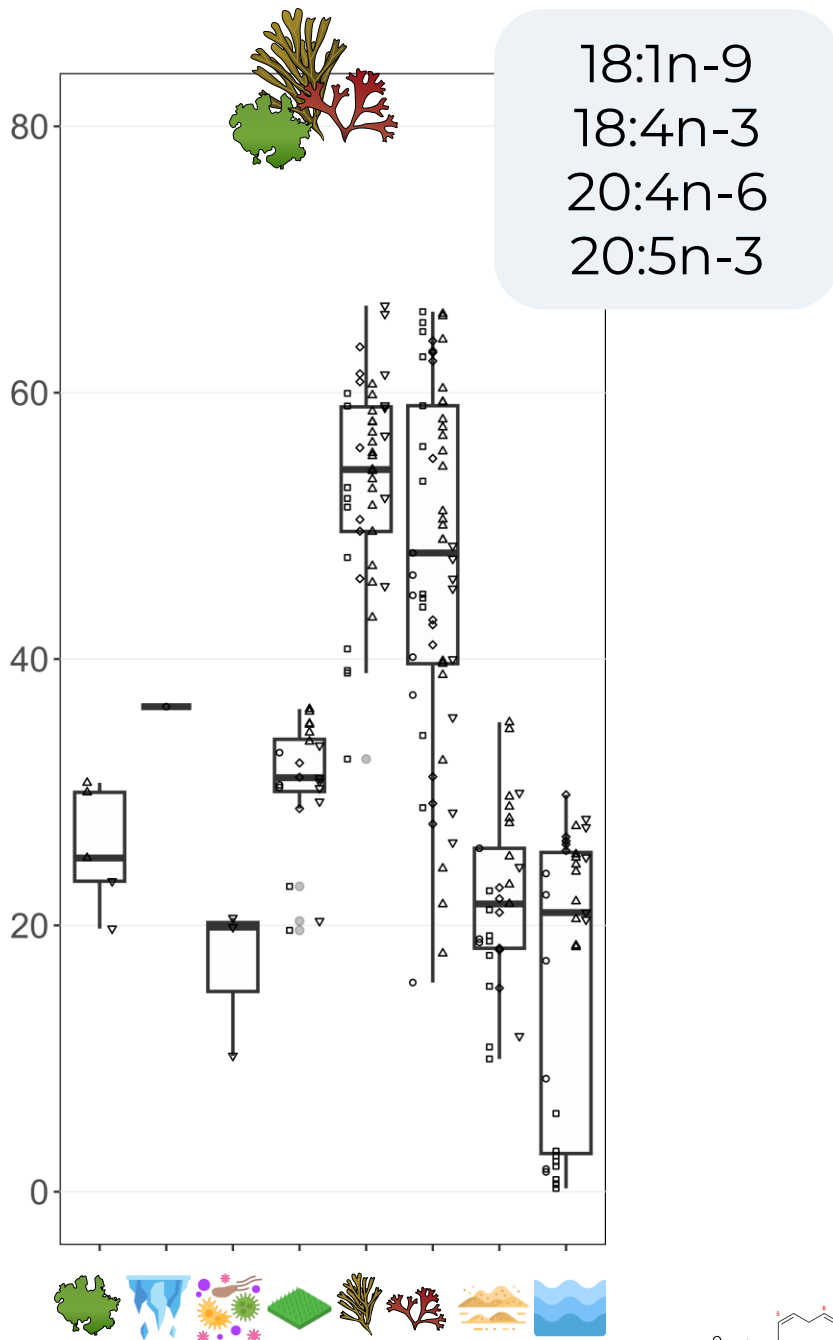
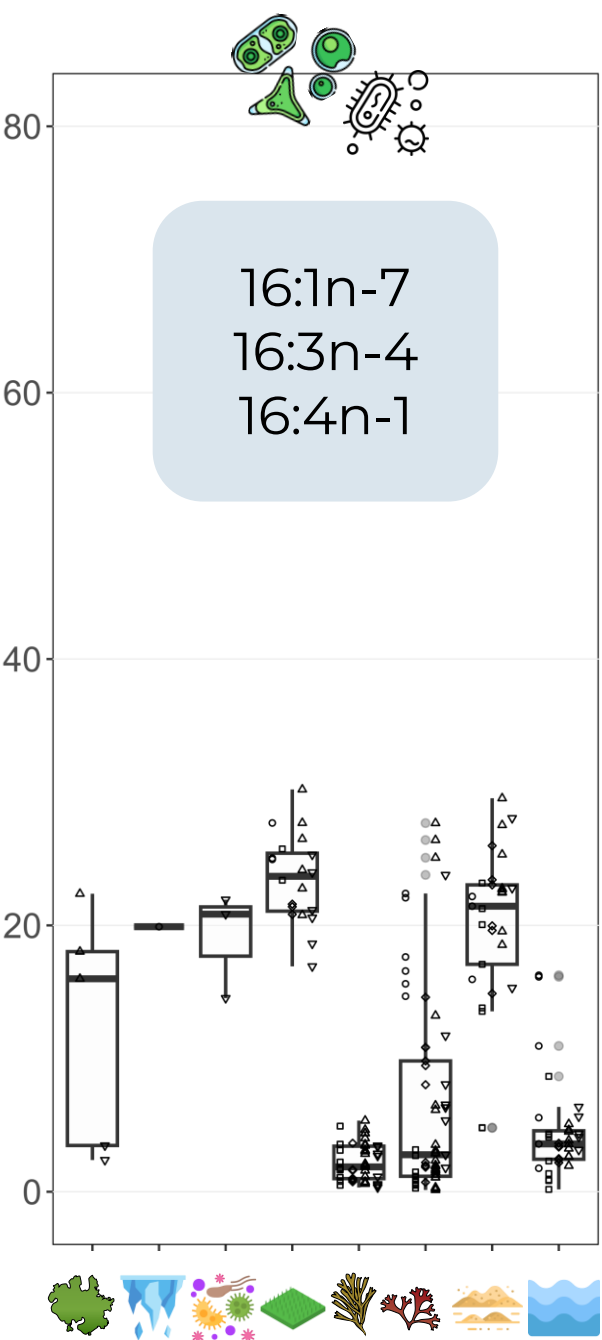
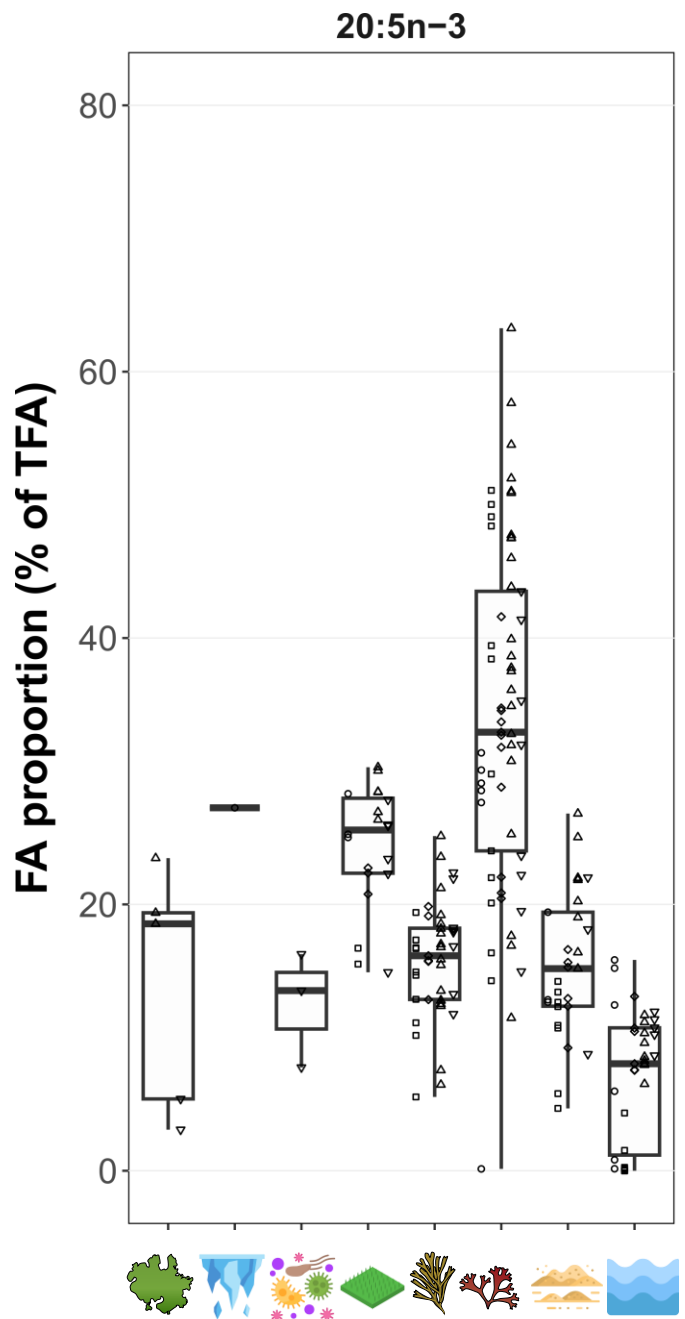
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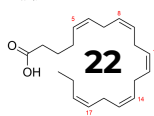
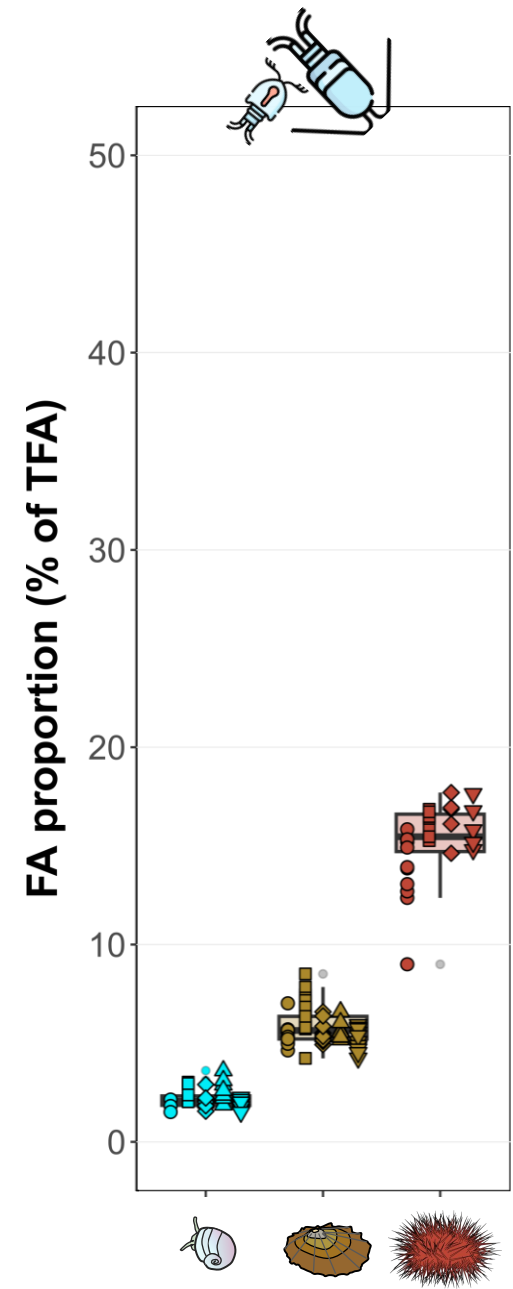




Each groups are different
Kruskall and Dunn test pvalue < 0.001



20:1n-9
20:1n-11
22:1n-9
22:1n-11



Each groups are different
Kruskall and Dunn test pvalue < 0.001

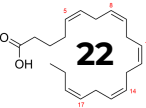
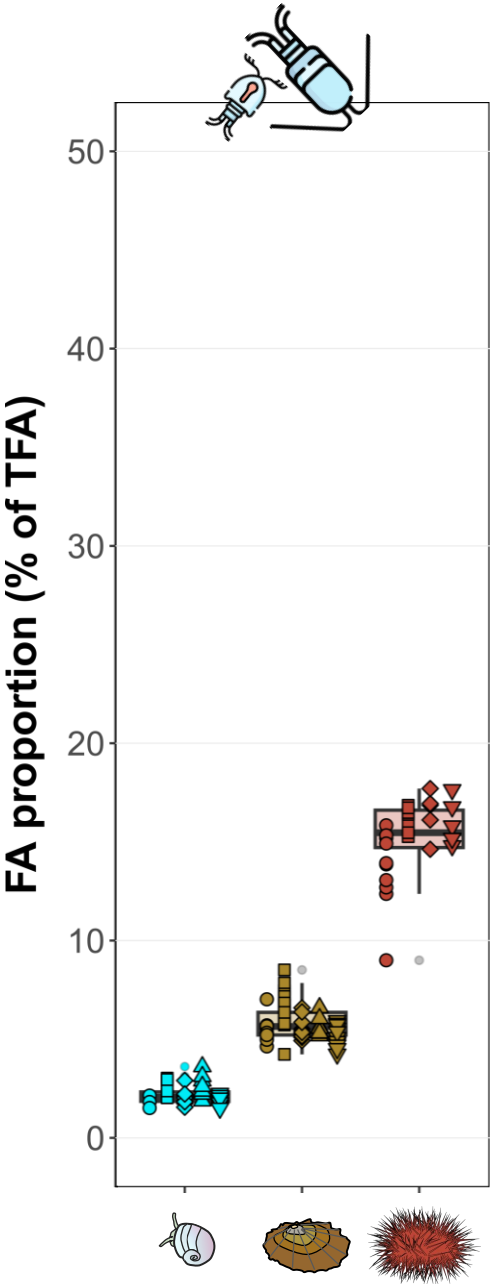
Biosynthesis pathway ?

(Castel et al., 2004; Zarate, 2014)



- 20:1n-9
- 20:1n-11
- 22:1n-9
- 22:1n-11

(Fry, 2006; Kelly and Scheibling, 2012)

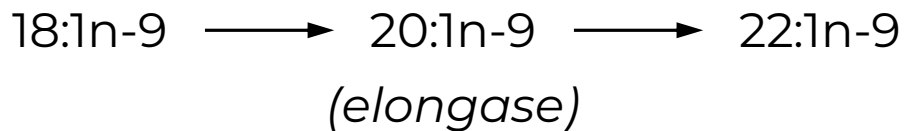


Each groups are different
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Biosynthesis pathway ?
(Castel et al., 2004; Zarate, 2014)



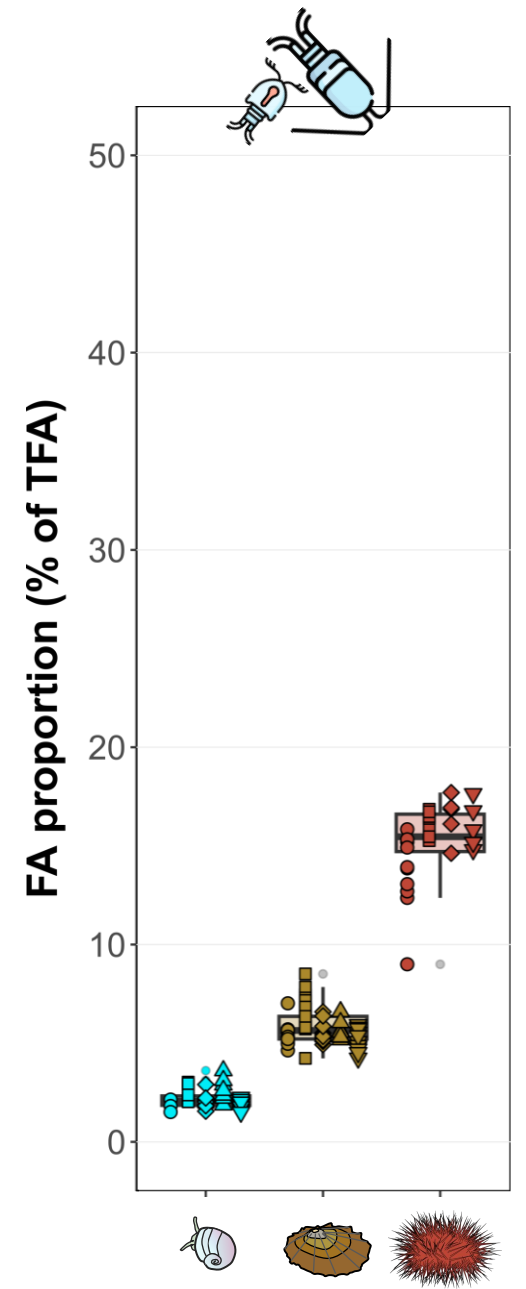
- 20:1n-9
- 20:1n-11
- 22:1n-9
- 22:1n-11



Strongylocentrotus droebachiensis



Evechinus chloroticus



(Fry, 2006; Kelly and Scheibling, 2012)

