

Analysis of seasonal variability of the functional diversity and dynamics of trophic activity-linked traits of micromeiofauna in a freshwater biofilm

Julie Neury-Ormanni, Margot Wagner, Jacky Vedrenne, Maud Pierre, Mélissa Eon, Gwilherm Jan, Sylvia Moreira, Soizic Morin



17th INTERNATIONAL MEIOFAUNA CONFERENCE

7-12 th July
University of Evora, Portugal

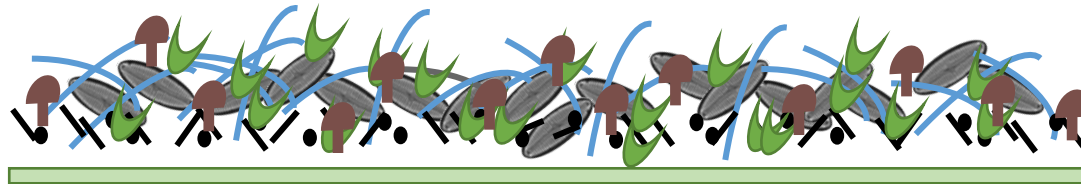
Introduction






Biofilm

Clean substratum



Pioneer species



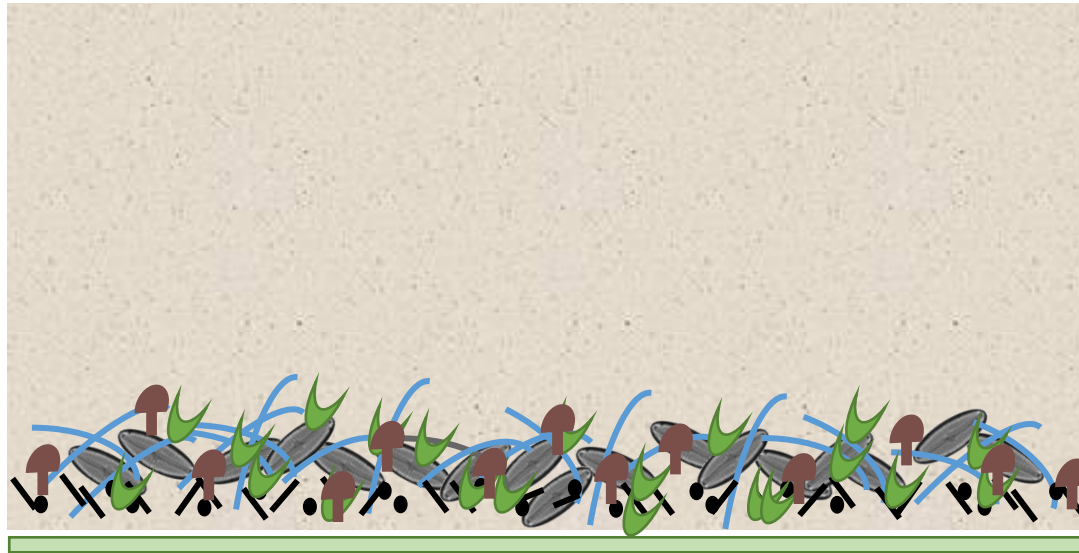
-  Fungi
-  Bacteria
-  Diatoms
-  Cyanobacteria
-  Chlorophytes






Introduction

Biofilm

Extracellular matrix

Pioneer species

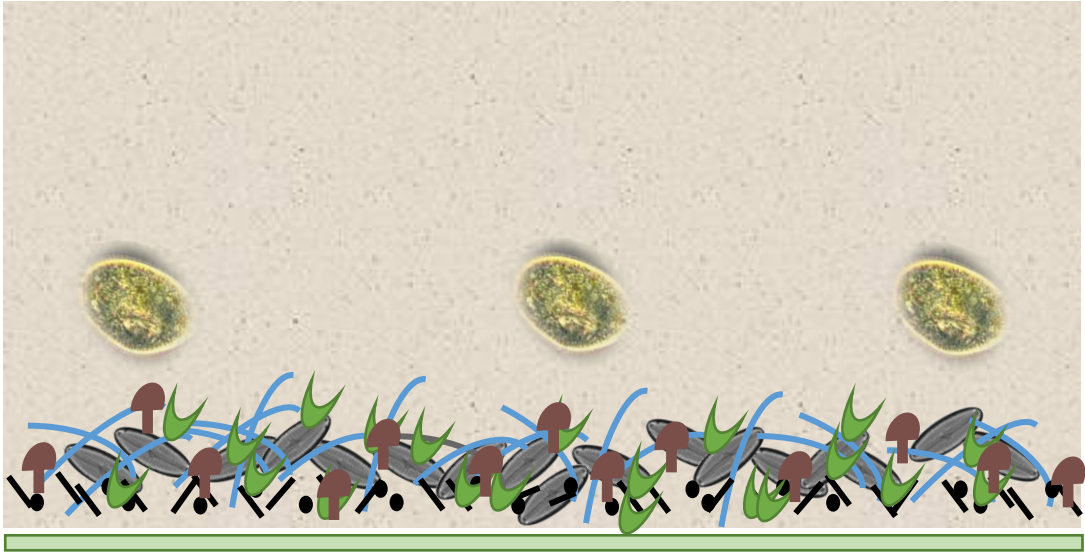


-  Fungi
-  Bacteria
-  Diatoms
-  Cyanobacteria
-  Chlorophytes

Introduction

Biofilm

Extracellular matrix



Pioneer species

-  Fungi
 -  Bacteria
 -  Diatoms
 -  Cyanobacteria
 -  Chlorophytes
-  Protozoans
-  Meiofauna
- } Micro-grazers/predators

Microfauna : 20 – 250µm

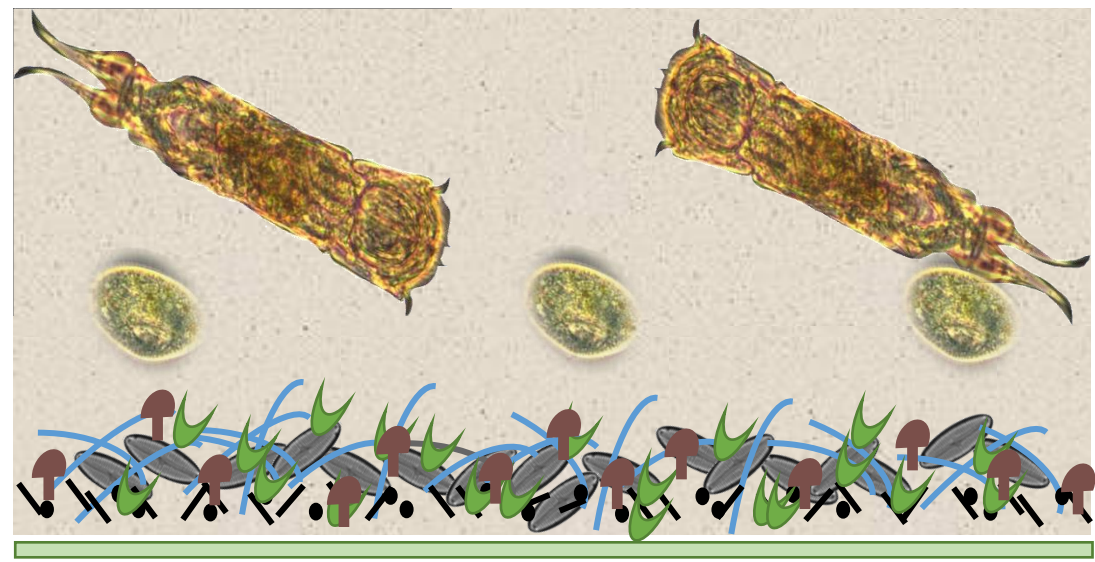
Introduction

Biofilm

Extracellular matrix

Mature community

Pioneer species

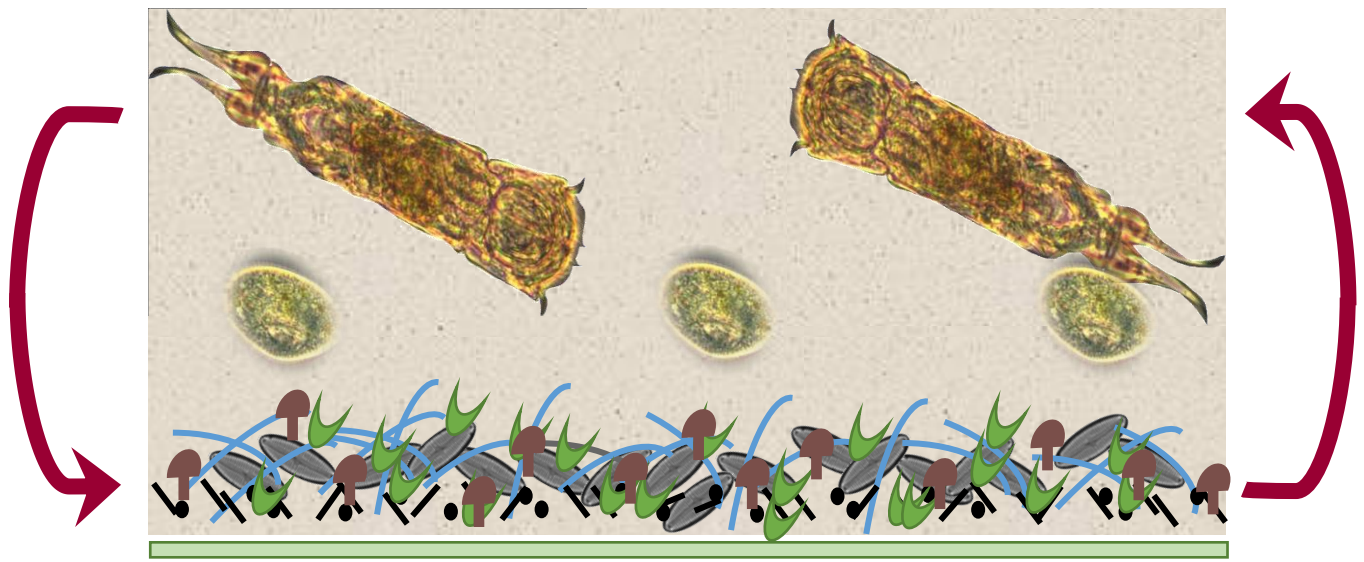


-  Fungi
 -  Bacteria
 -  Diatoms
 -  Cyanobacteria
 -  Chlorophytes
-  Protozoans
-  Meiocytes
- Meiofauna
- Micro-grazers/predators

Microfauna : 20 – 250µm
Meiofauna : 250µm – 2mm

Introduction

Biofilm

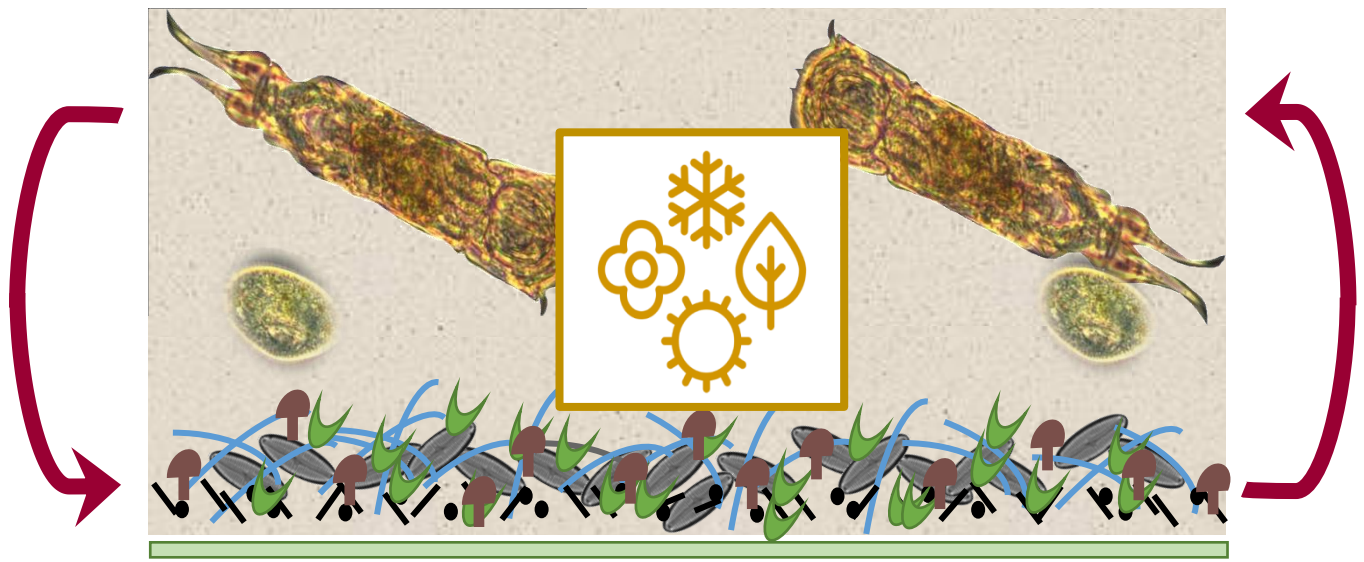


-  Fungi
 -  Bacteria
 -  Diatoms
 -  Cyanobacteria
 -  Chlorophytes
-  Protozoans
-  Meiobenthos
- Micro-grazers/predators

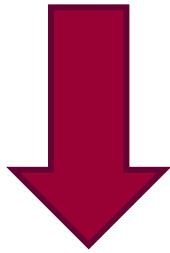
Microfauna : 20 – 250µm
Meiofauna : 250µm – 2mm

Introduction

Biofilm



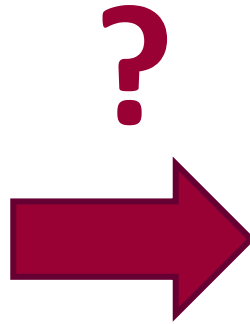
-  Fungi
 -  Bacteria
 -  Diatoms
 -  Cyanobacteria
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 -  Protozoans
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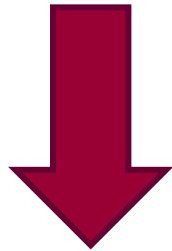
Species diversity



Taxonomy
Classification



Functionnal diversity ??



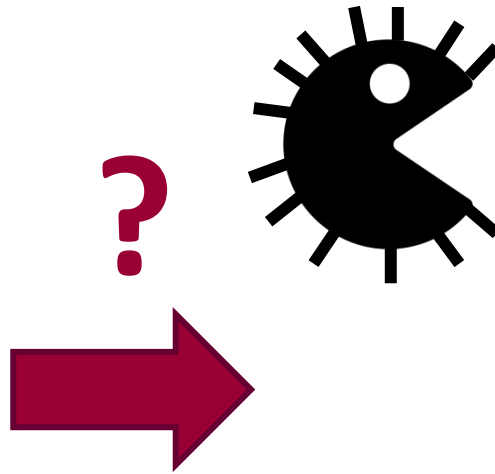
Species diversity



Taxonomy
Classification

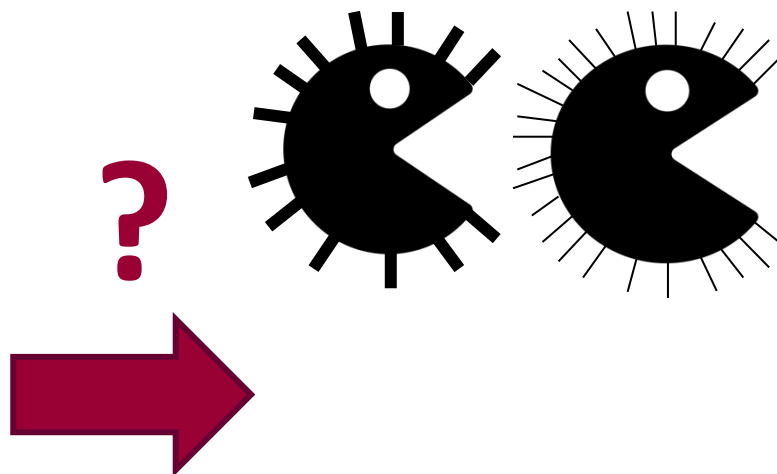
Introduction

Biofilm



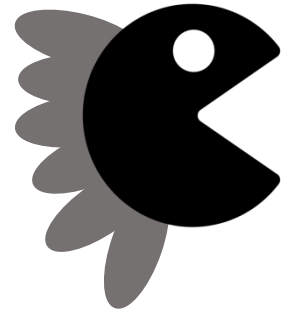
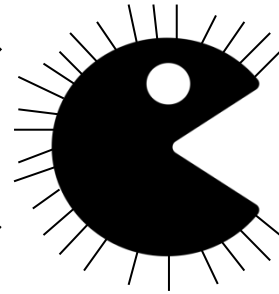
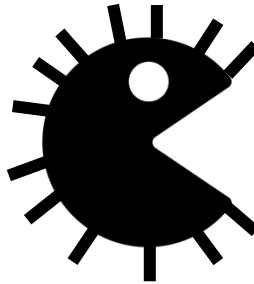
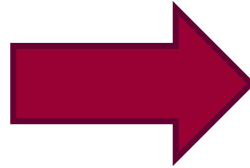
Introduction

Biofilm



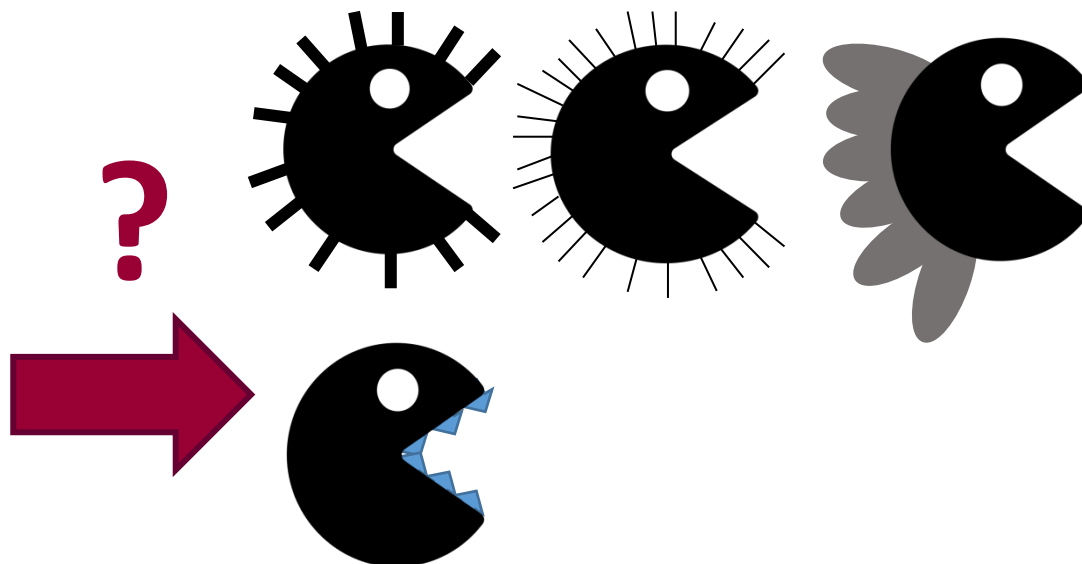
Introduction

Biofilm



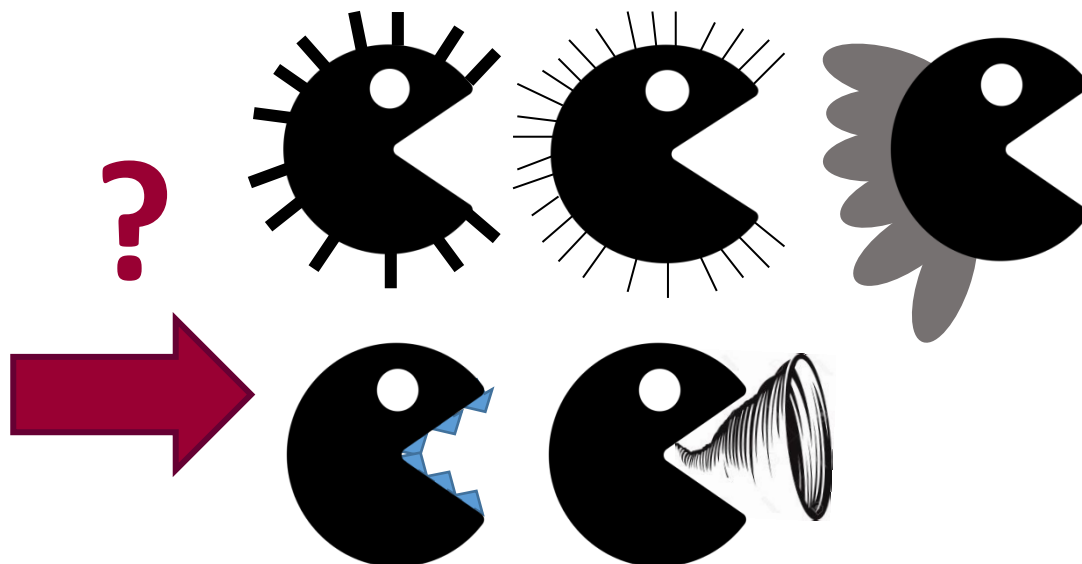
Introduction

Biofilm



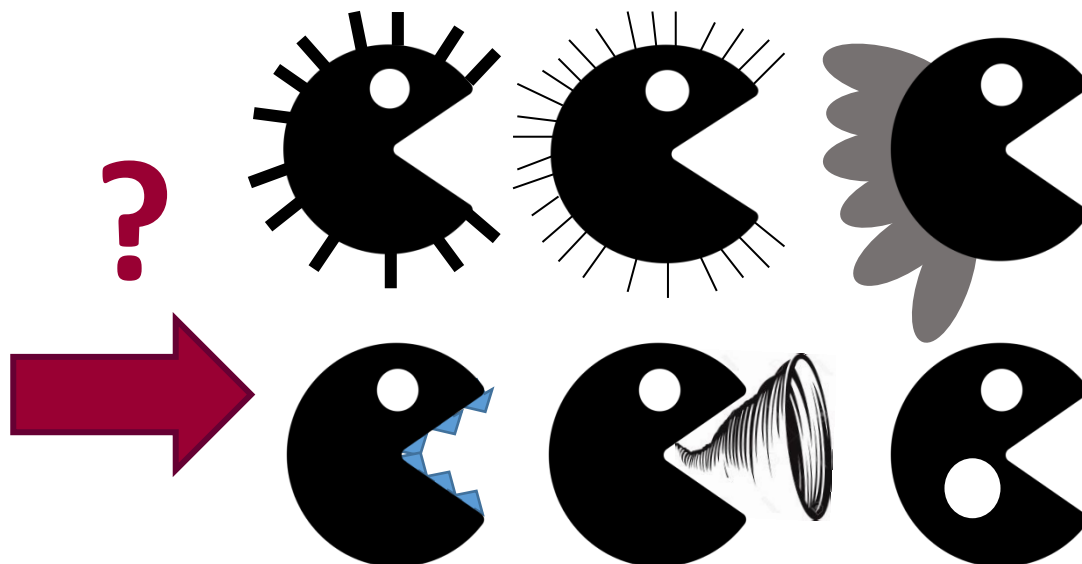
Introduction

Biofilm



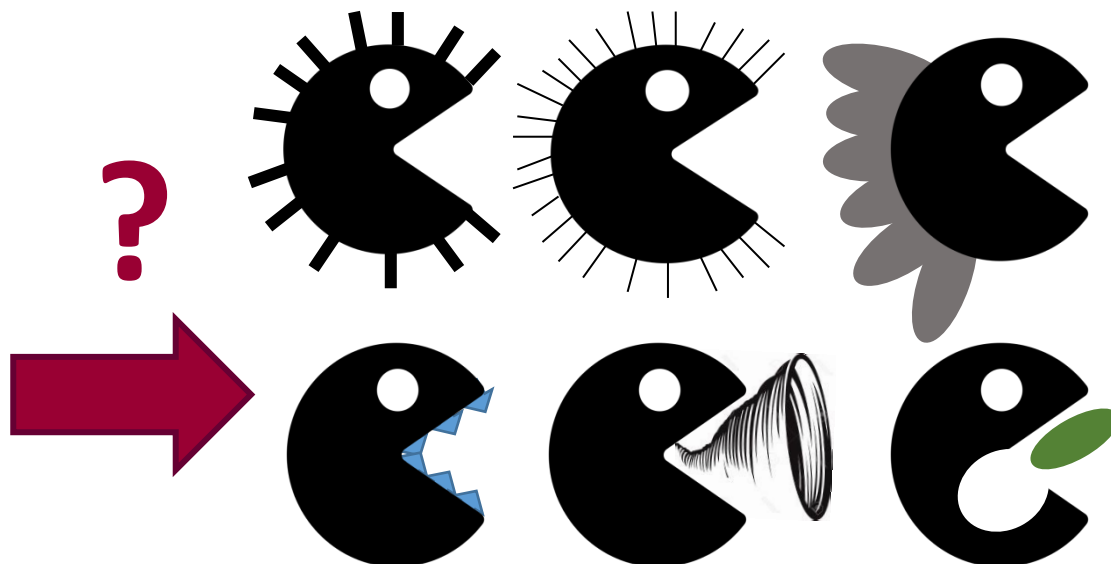
Introduction

Biofilm



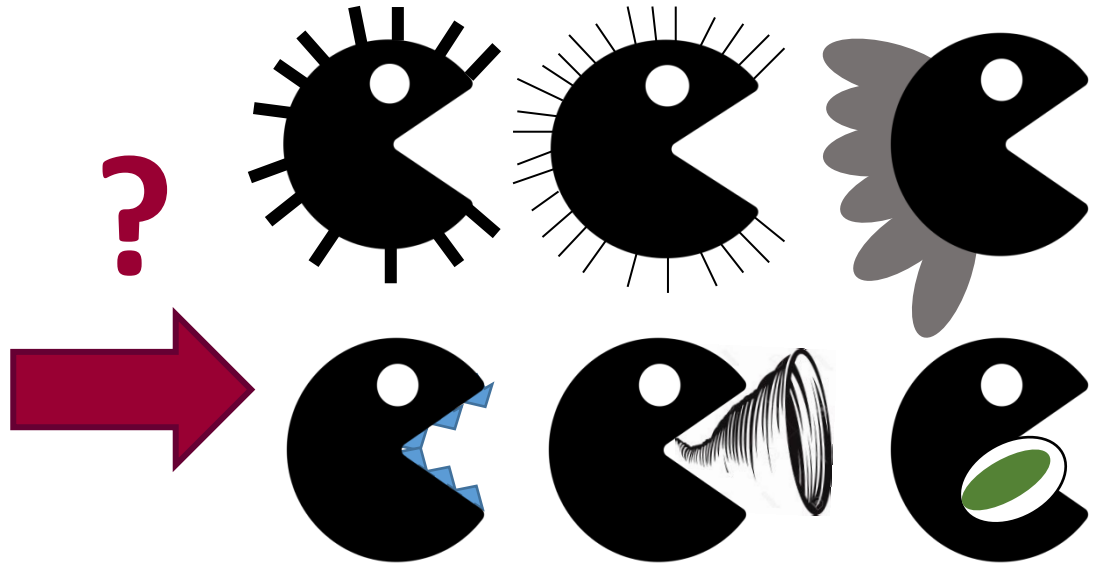
Introduction

Biofilm



Introduction

Biofilm



Are variation of micromeiofauna
functional traits season-dependent?

Materials and methods

Colonisation *in situ*
during 28 days



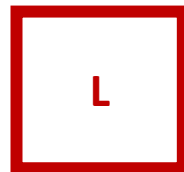
Hypereutrophic lake (OCDE 1982)



d7, d14, d21 and d28
X 3 replicates
X 4 seasons
= 48 samples



32 environmental
variables



43 species
RA: 0.1%



18 functional traits
(Neury-Ormanni
et al., submitted*)

*Neury-Ormanni, J., Vedrenne, J., Wagner, M., Jan, G., Morin, S. (submitted). Micro-meiofauna morphofunctional traits linked to trophic activity. *Hydrobiologia: Meiofauna in freshwater ecosystem*.

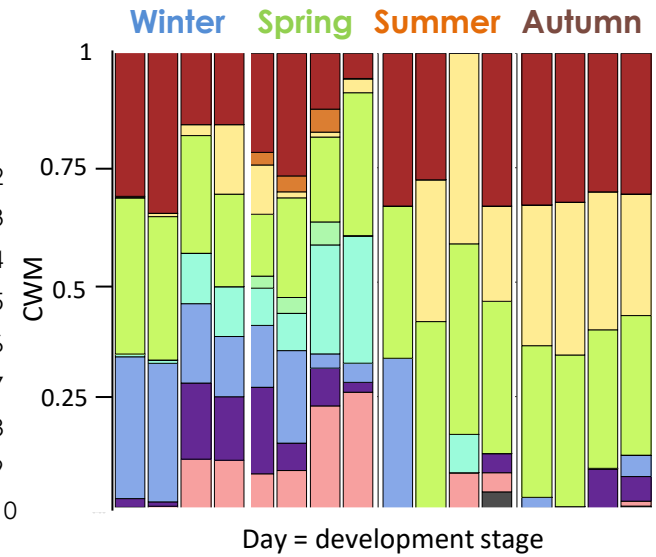
Materials and methods



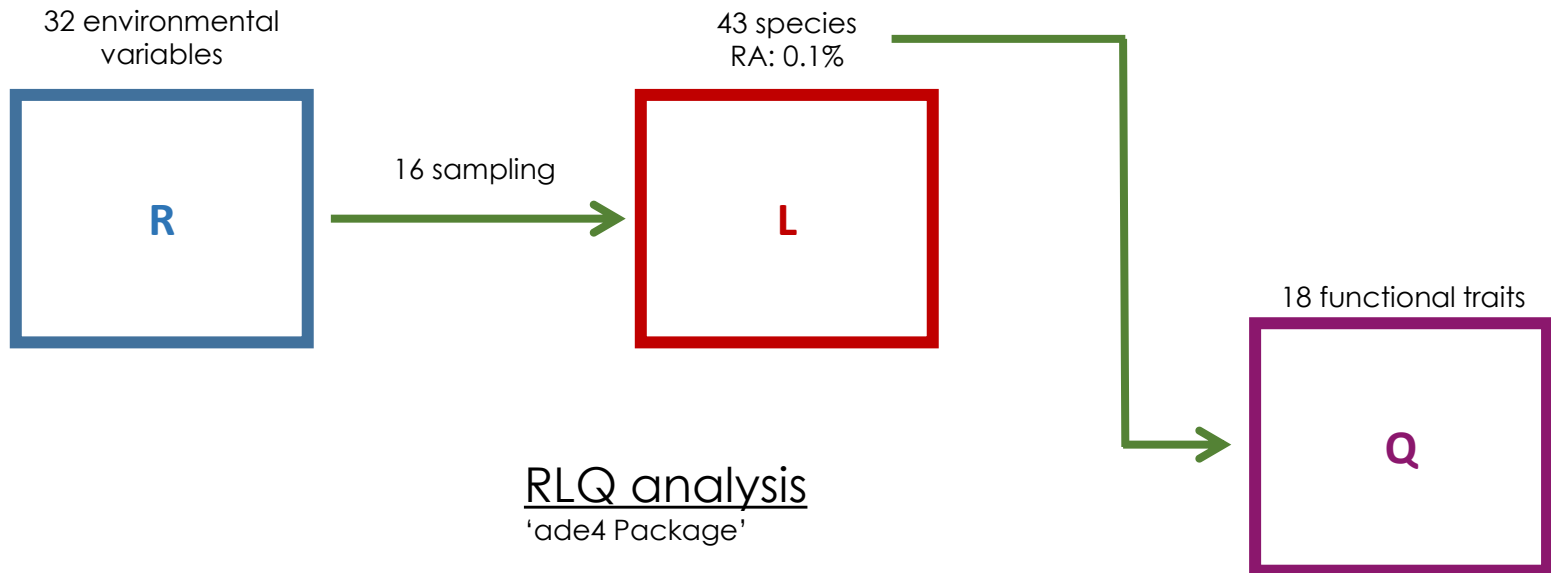
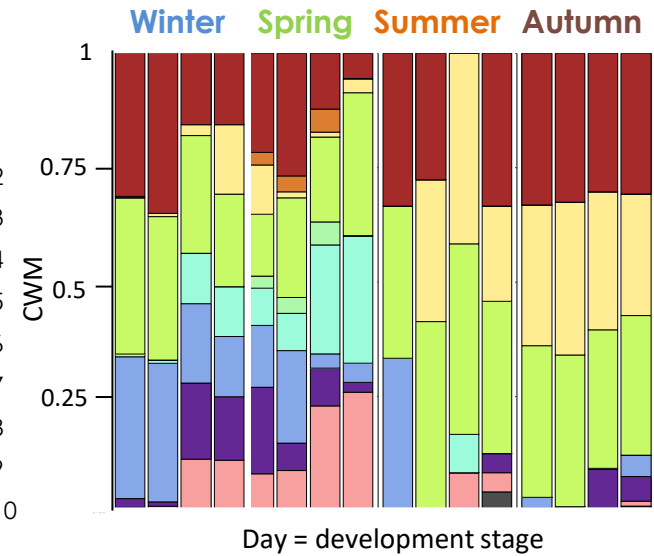
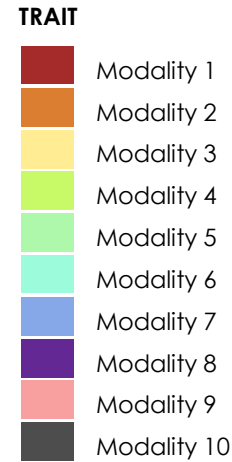
+



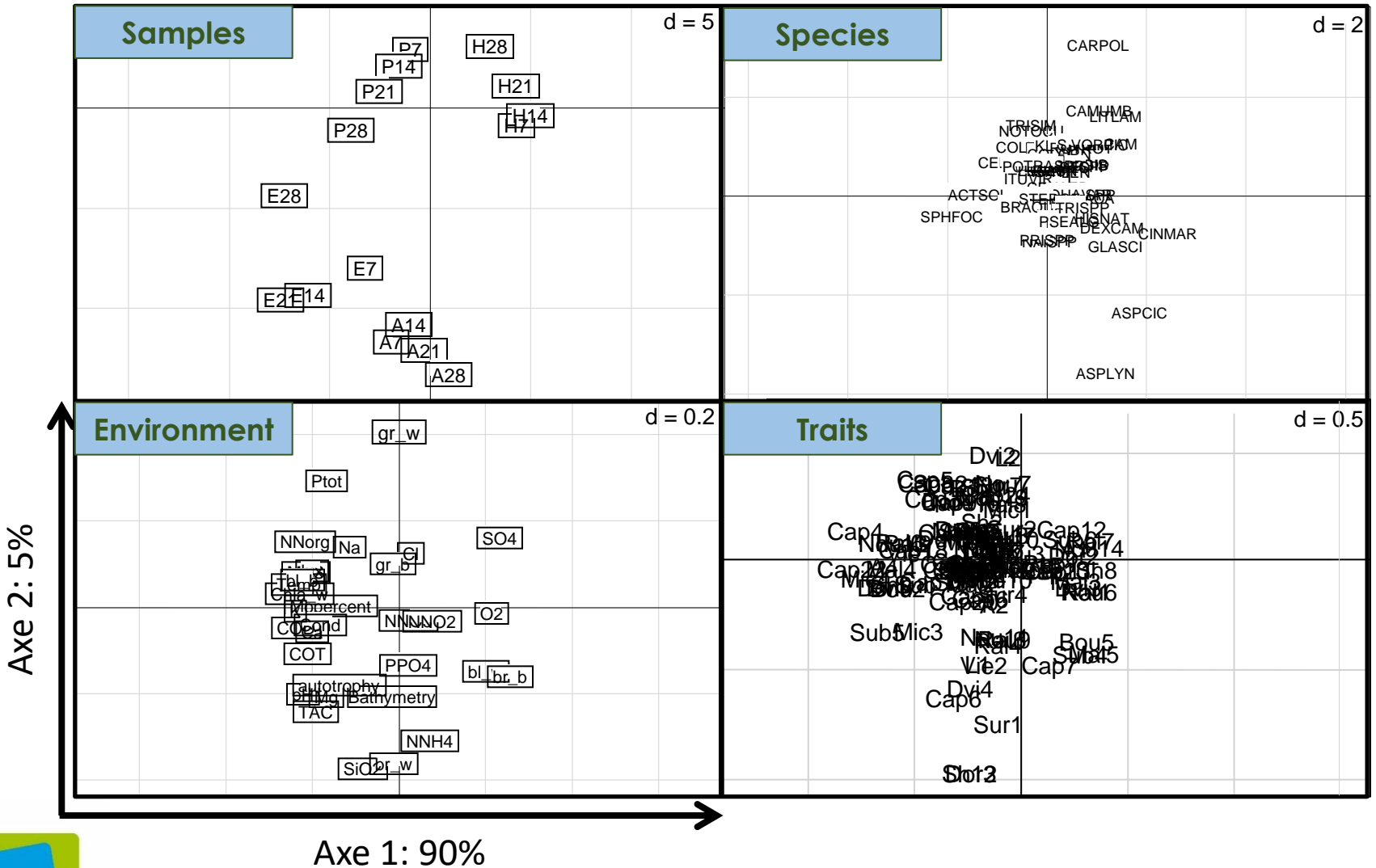
= Community
Weighted
Mean
'FD Package'



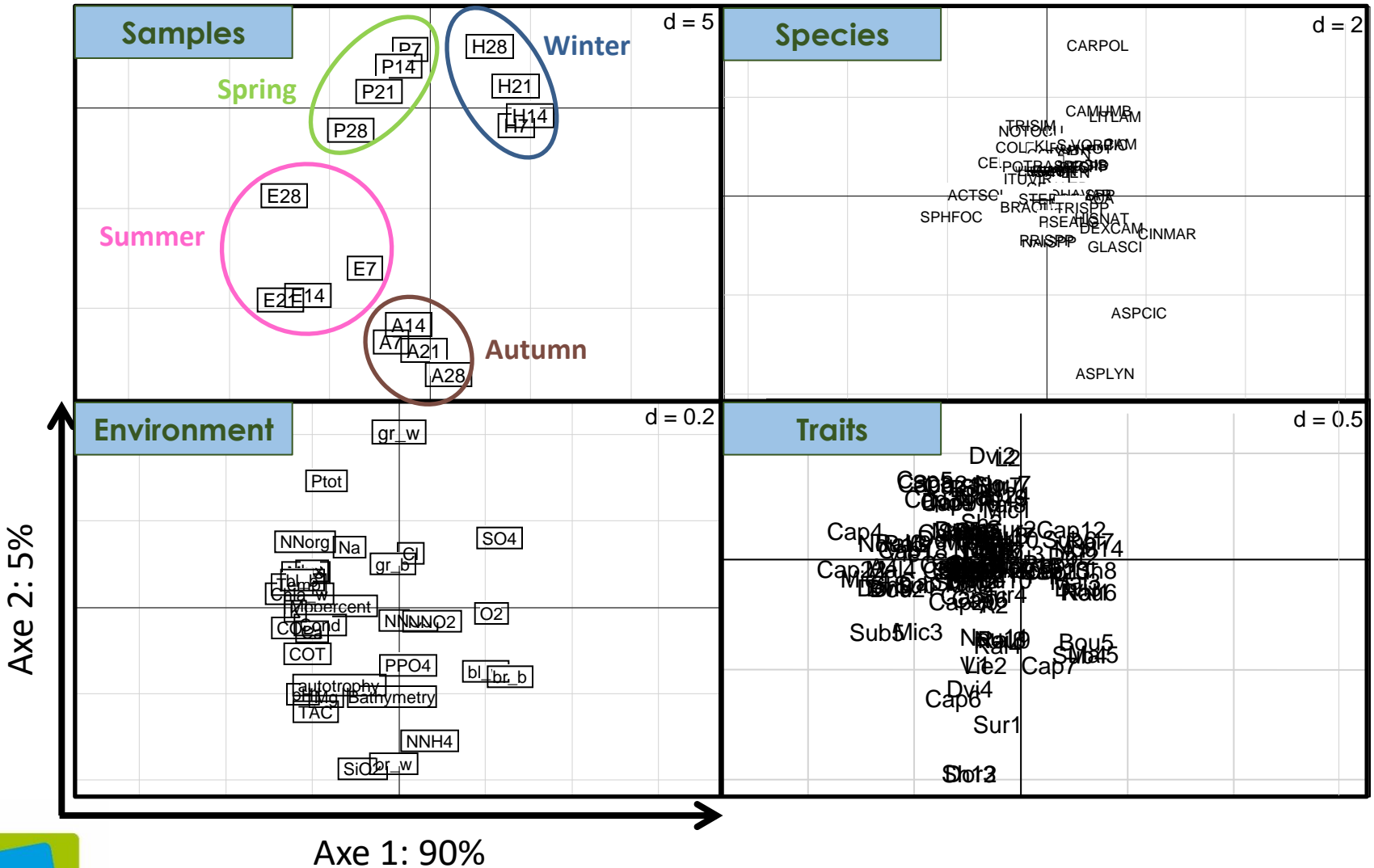
Materials and methods



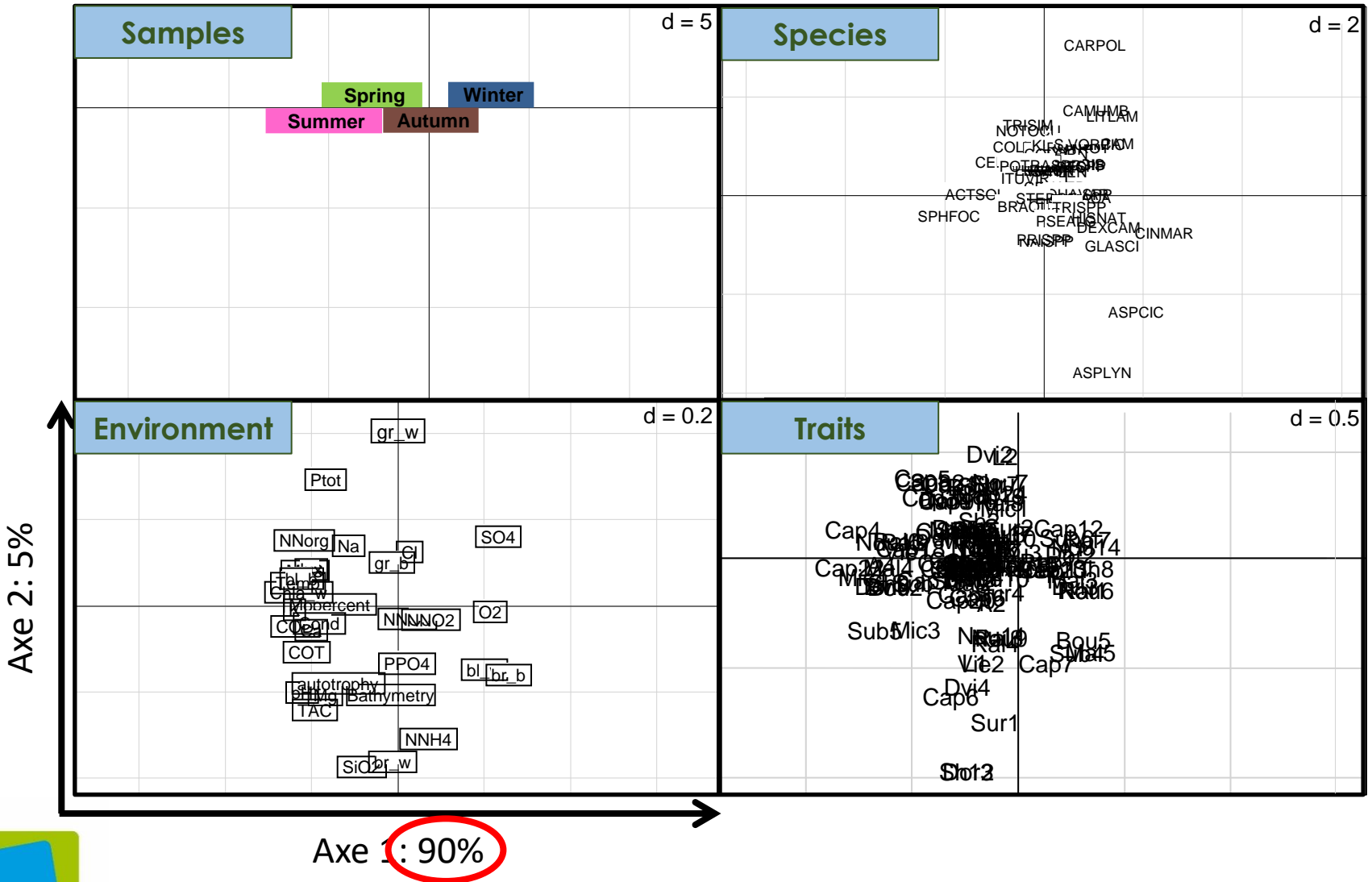
Results & Discussion



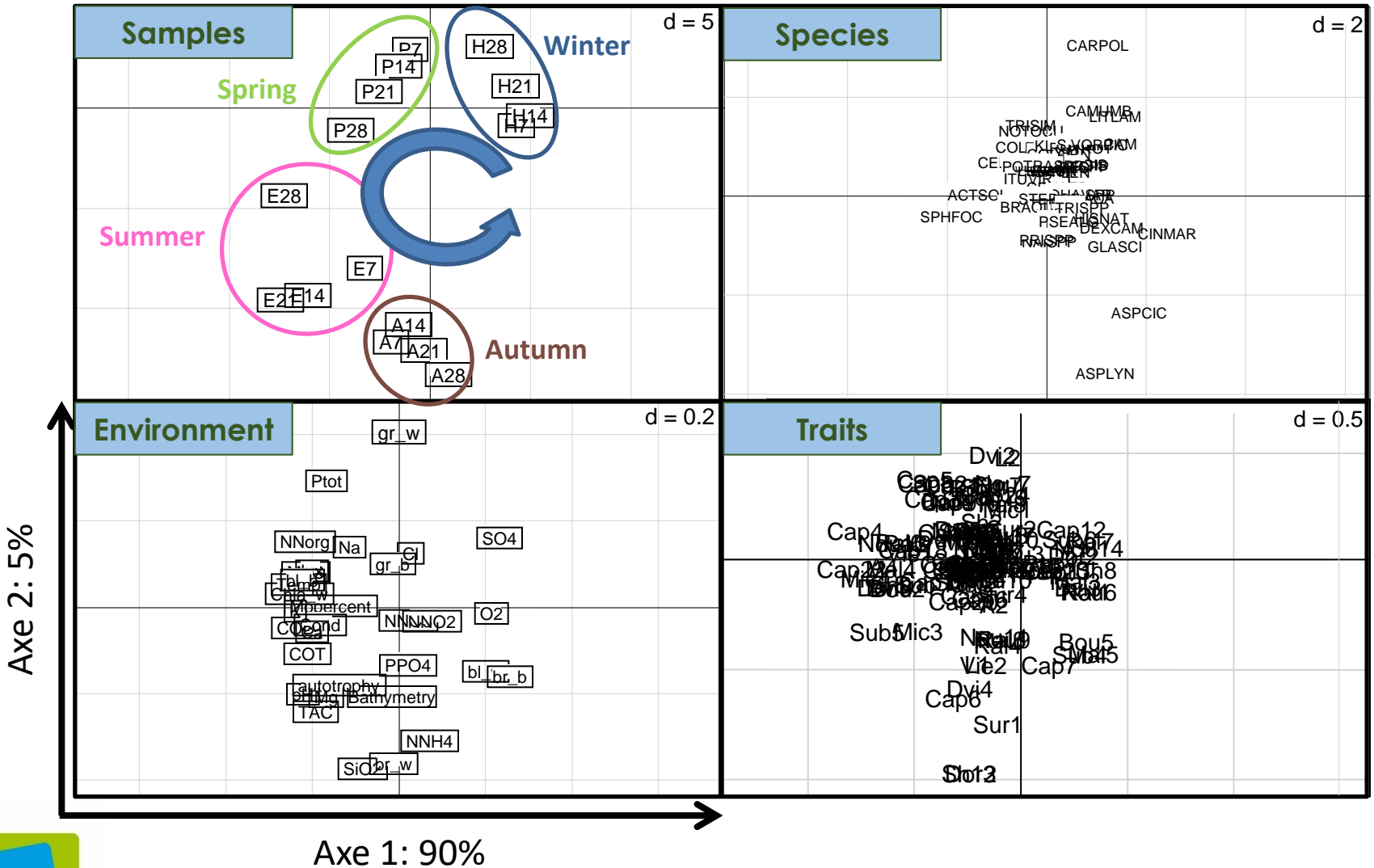
Results & Discussion



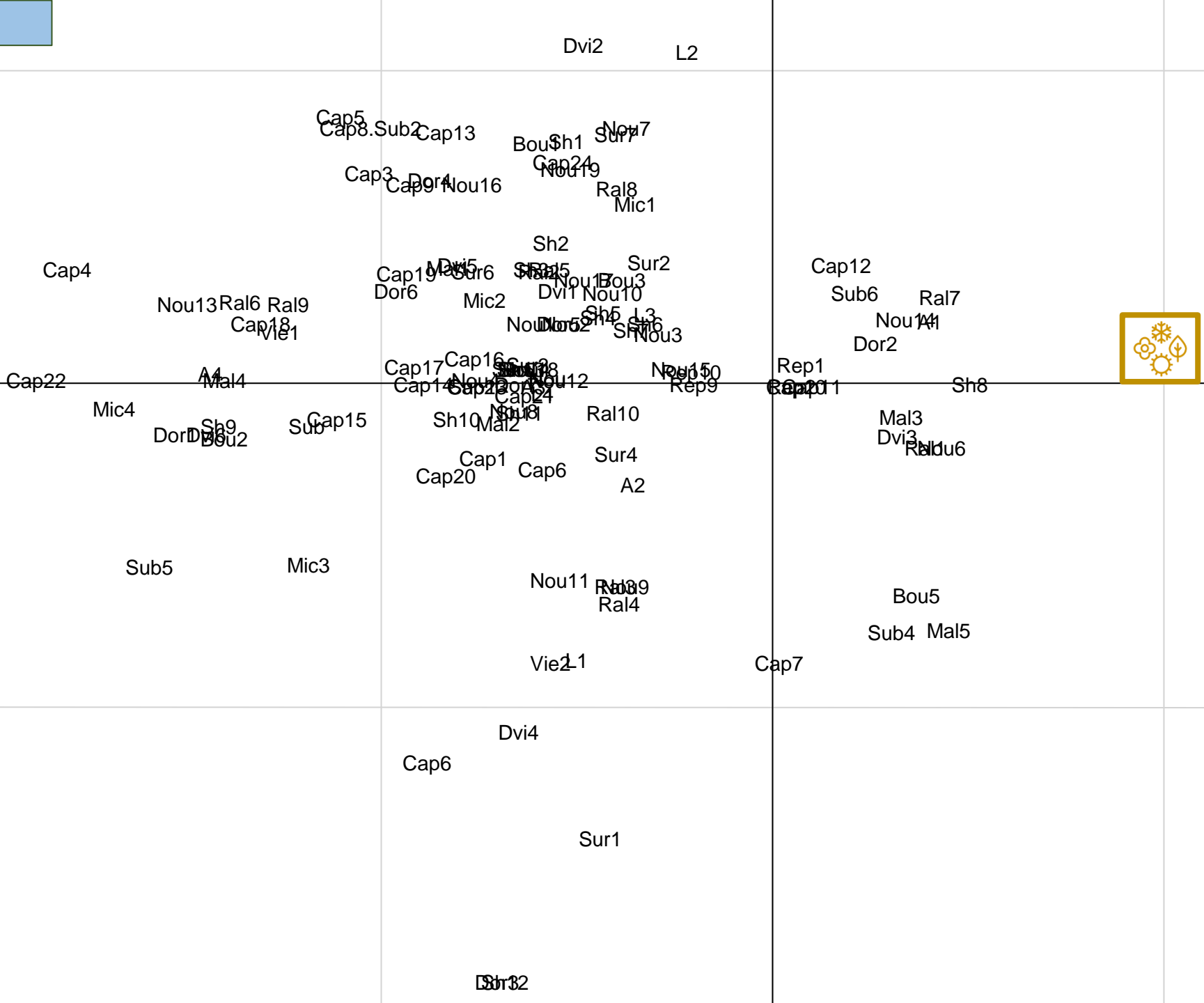
Results & Discussion



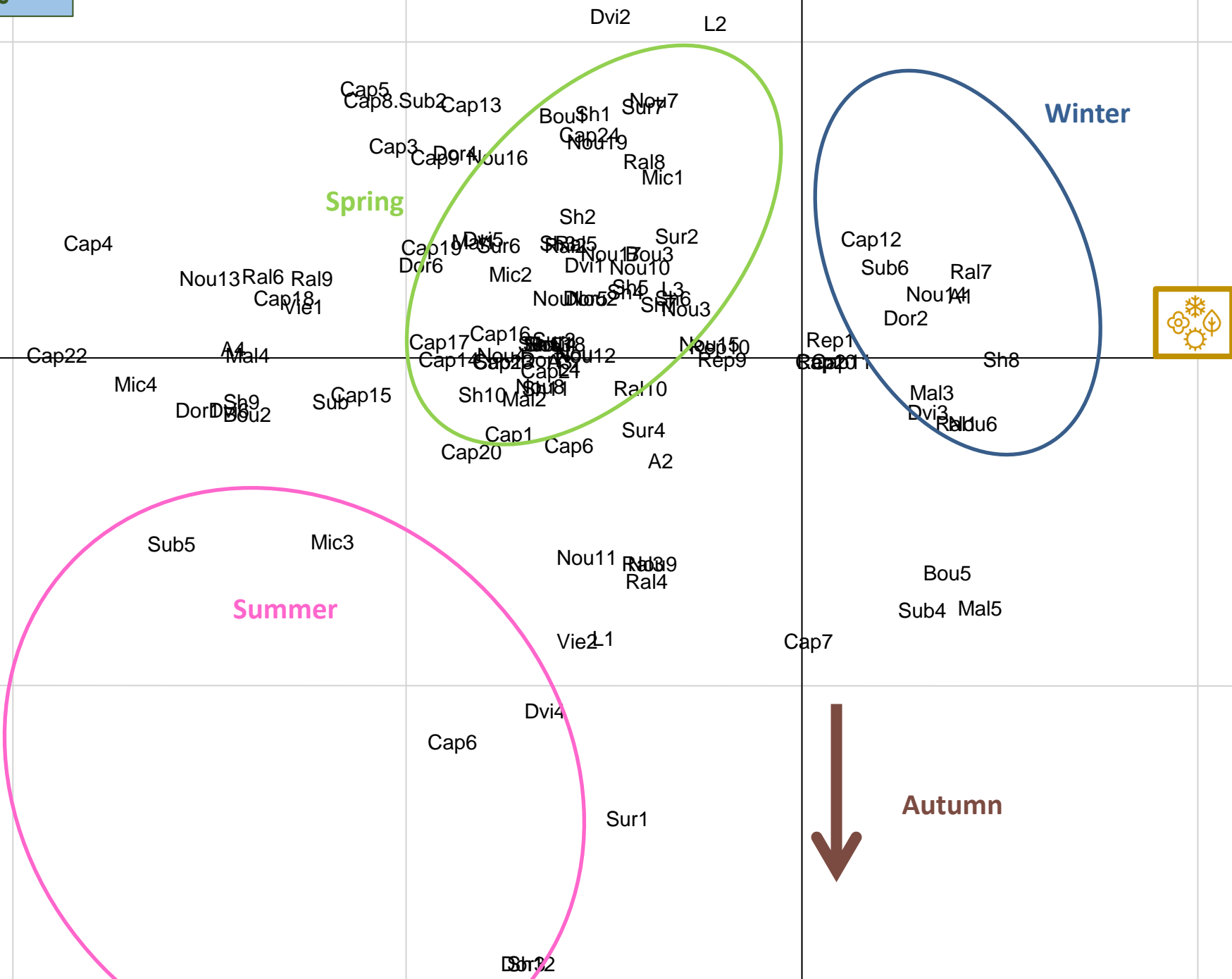
Results & Discussion



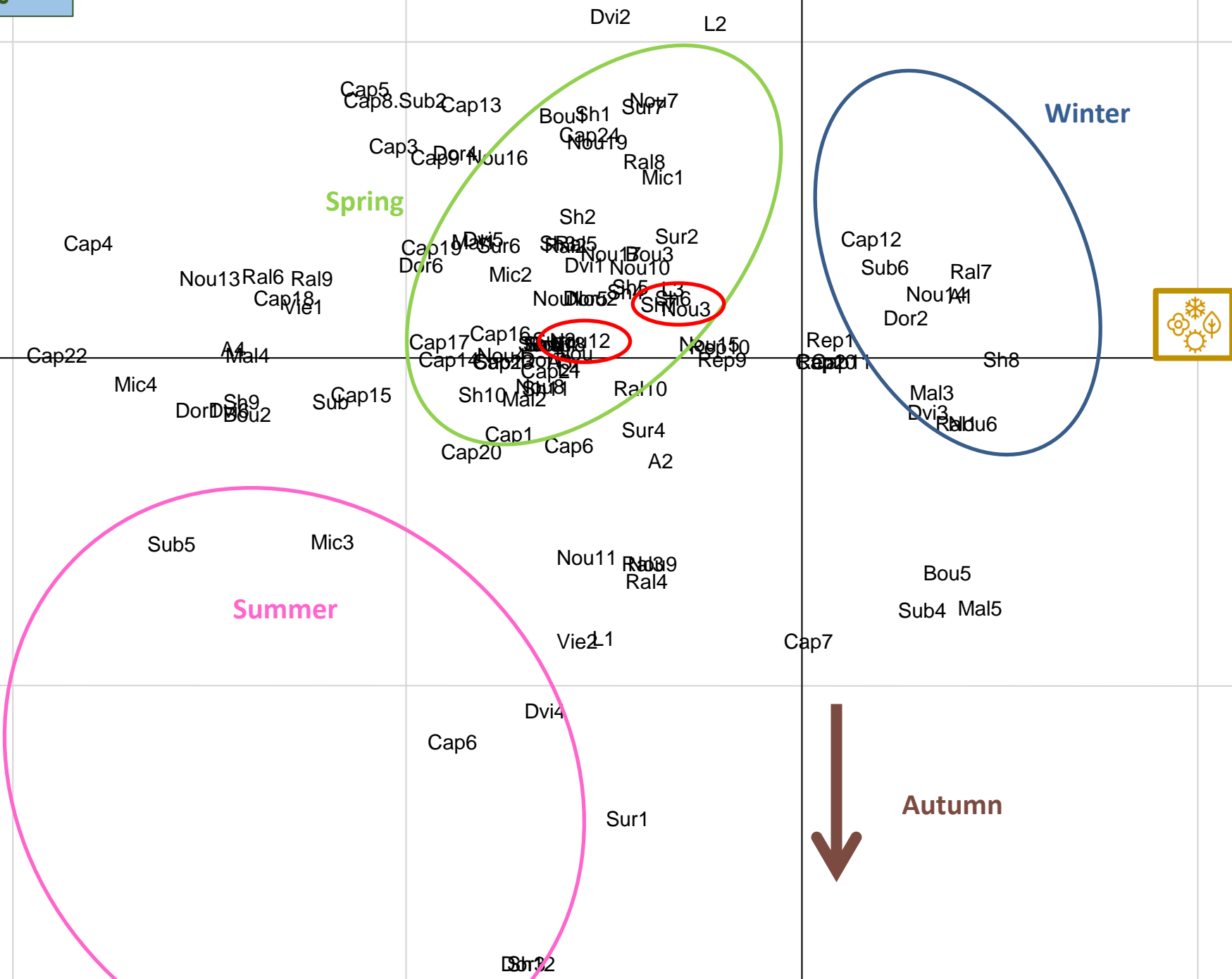
Traits



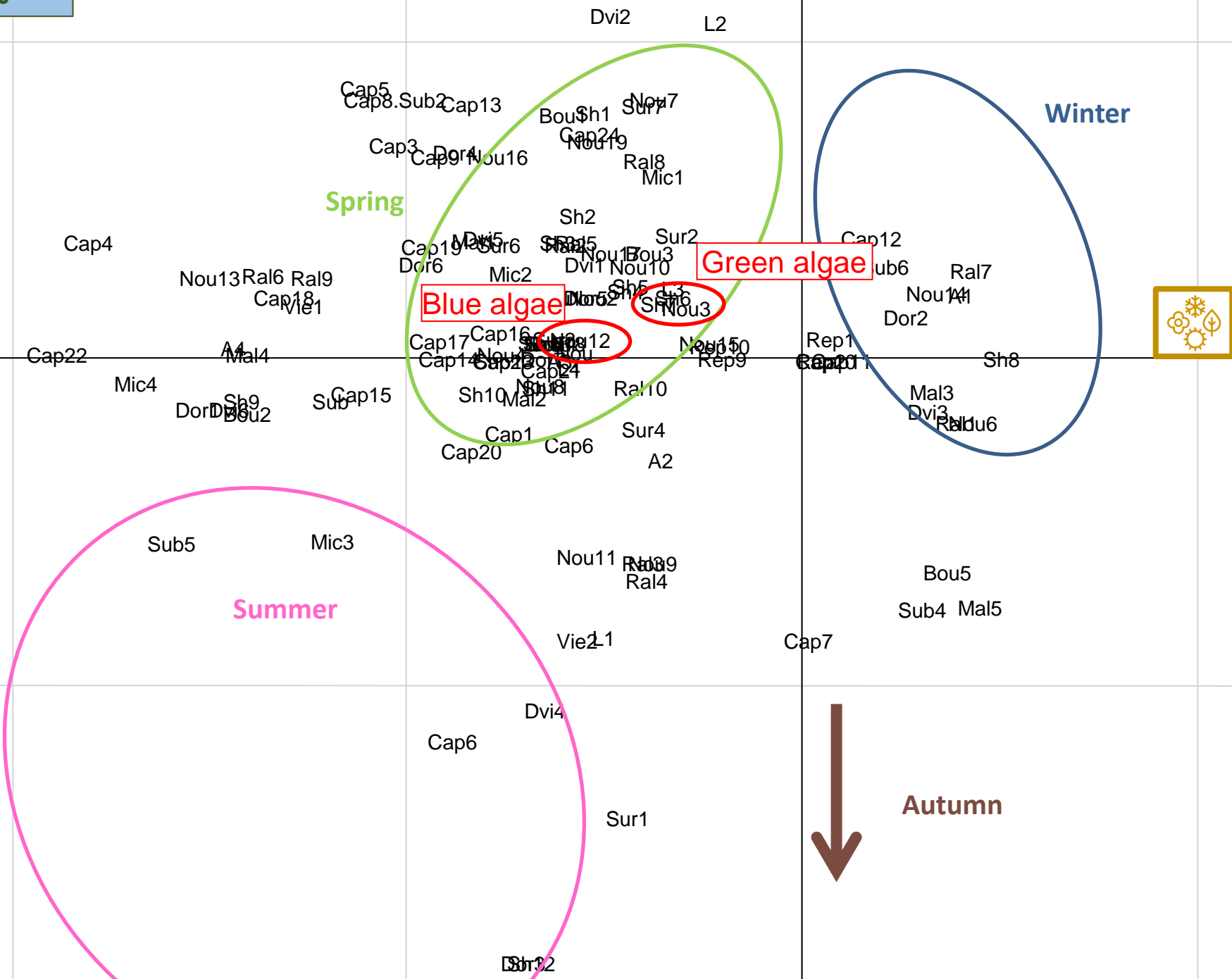
Traits



Traits



Traits



Traits

Winter

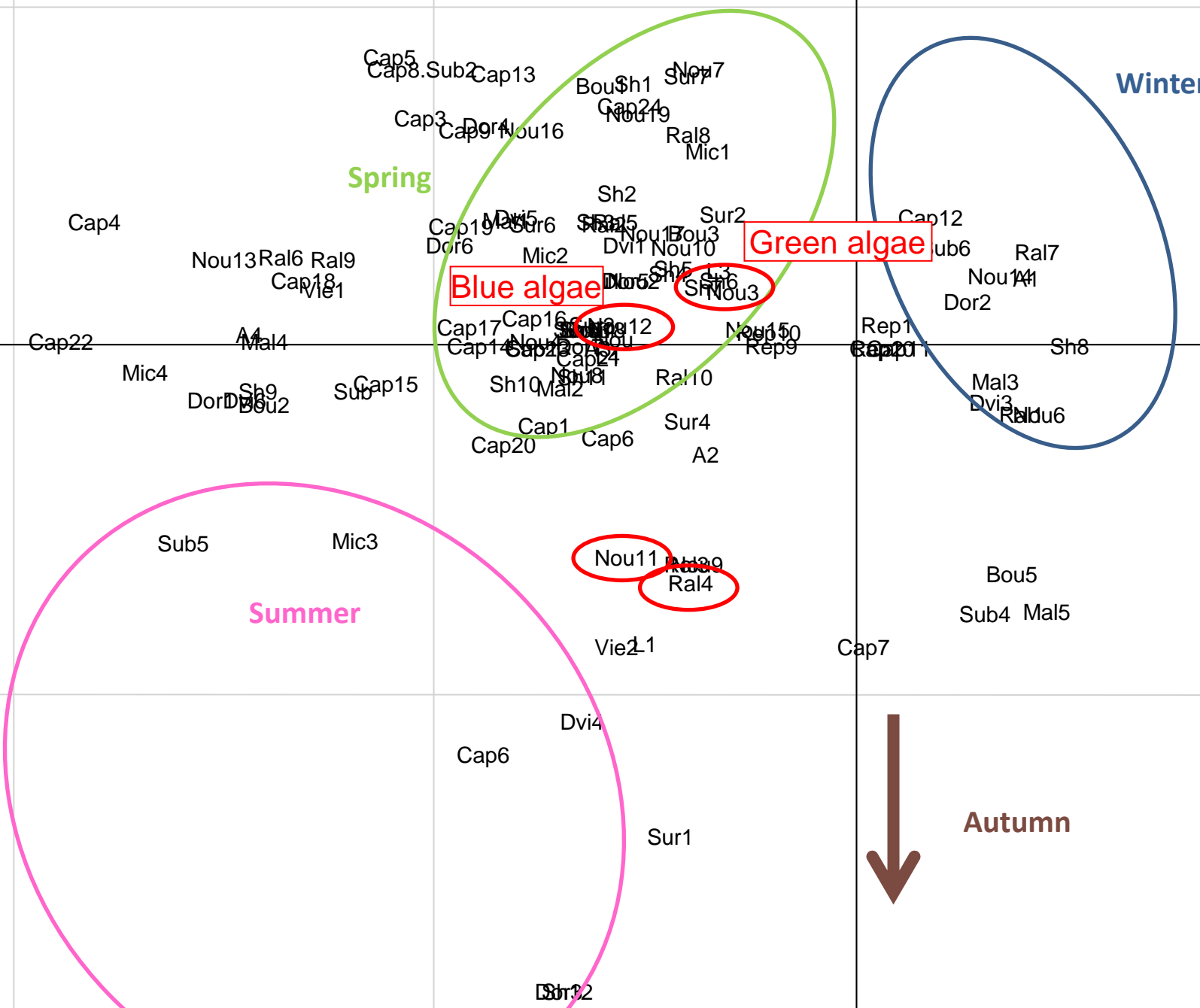
Spring

Green algae

Blue algae

Summer

Autumn



Cap5, Cap8, Sub2, Cap13, Bou1, Sh1, Sur7, Nou7, Cap24, Nou19, Ral8, Mic1, Cap3, Dor4, Nou16, Sh2, Sur2, Cap12, Cap19, Sur6, Str15, Nou1, Bou3, Sub6, Ral7, Nou13, Ral6, Ral9, Cap18, Vie1, Dor6, Mic2, Dvi7, Nou10, Sh5, Sh6, Nou3, Cap17, Cap16, Str10, Nou12, Nou15, Rep9, Rep1, Cap20, Sh8, Cap22, Mic4, Mal4, Nou14, Dor2, Nou4, Cap14, Cap24, Sh10, Mal2, Str11, Ral10, Rep1, Cap21, Mal3, Dvi3, Ral1, Dor1, Bou2, Sub15, Sh9, Ral10, Nou15, Rep9, Cap7, Mal5, Sub4, Bou5, Sub5, Mic3, Nou11, Mal3, Ral4, Vie2, Vie1, Cap6, Dvi4, Sur1, Sur2, Sur12

Traits

Winter

Spring

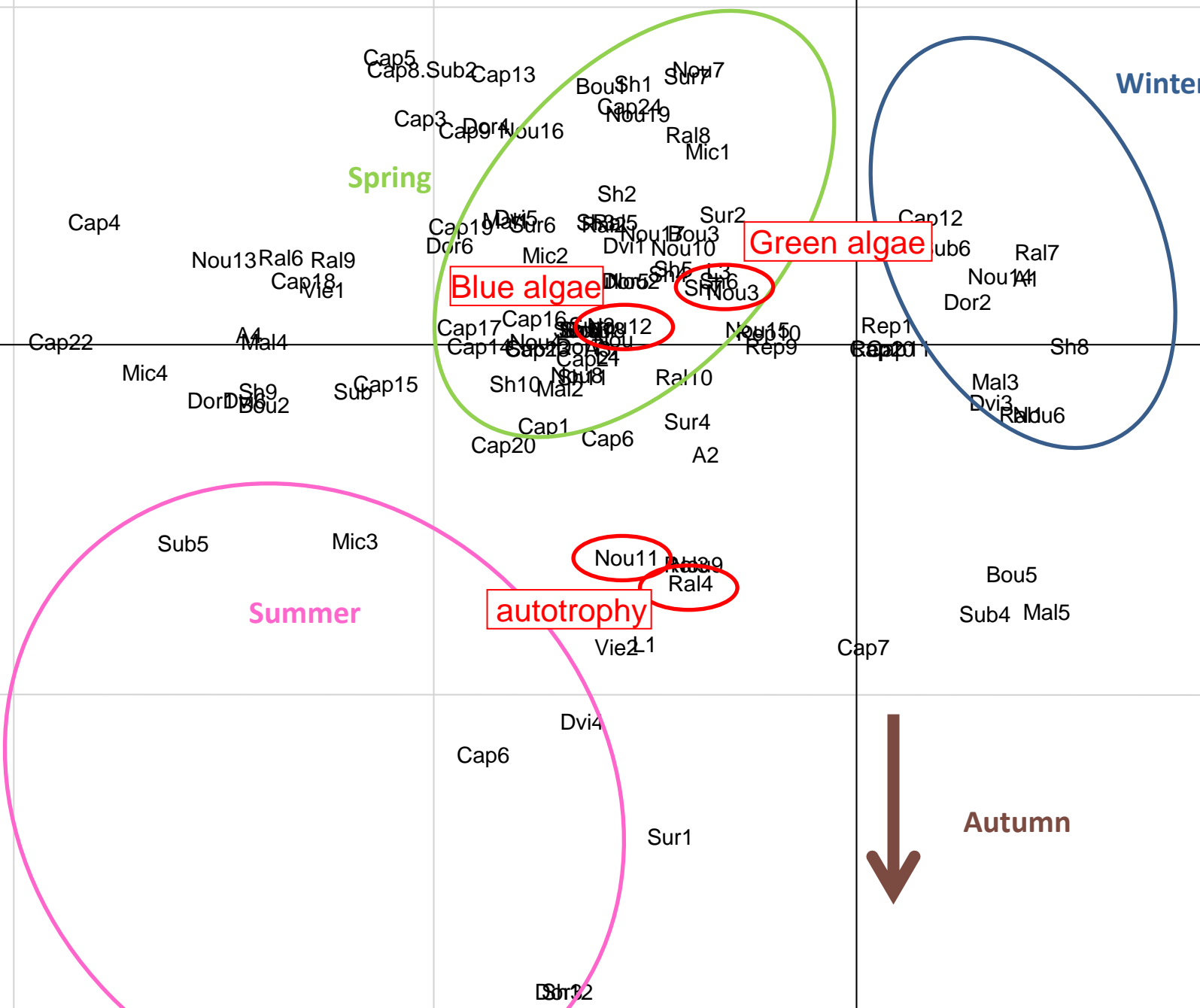
Green algae

Blue algae

Summer

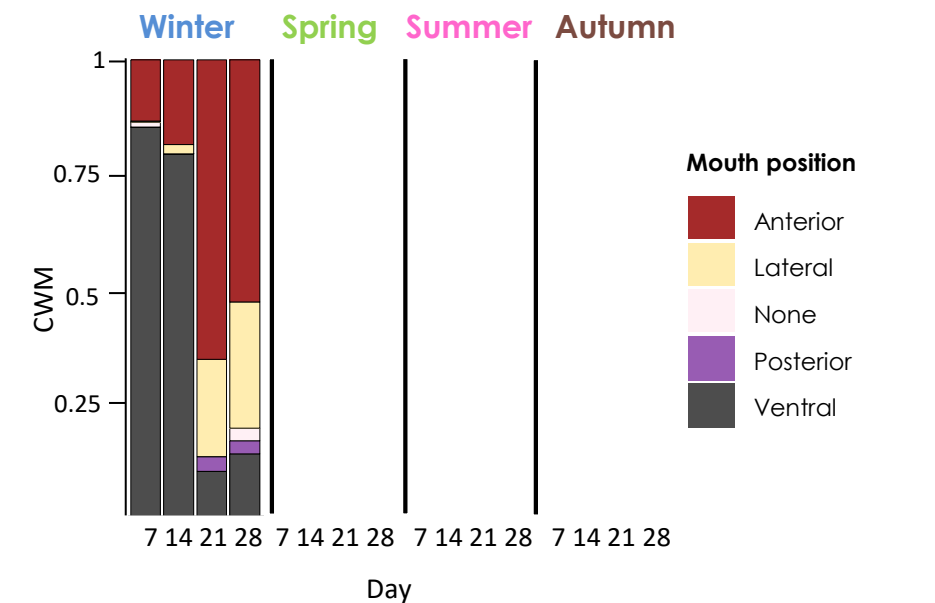
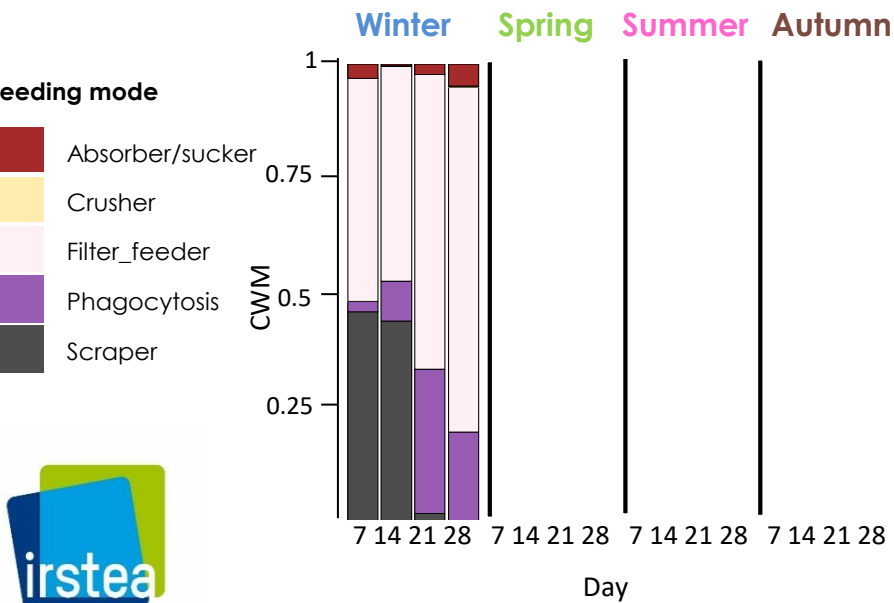
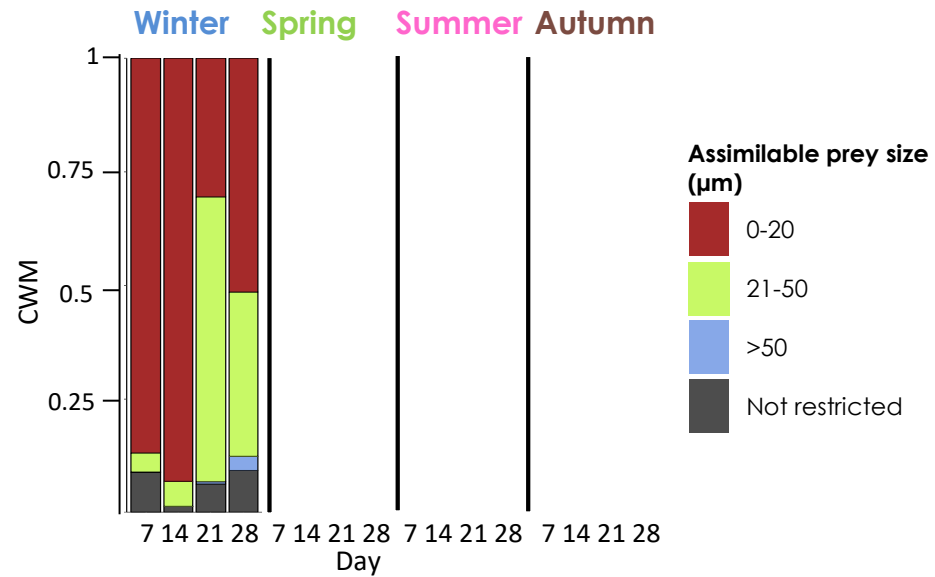
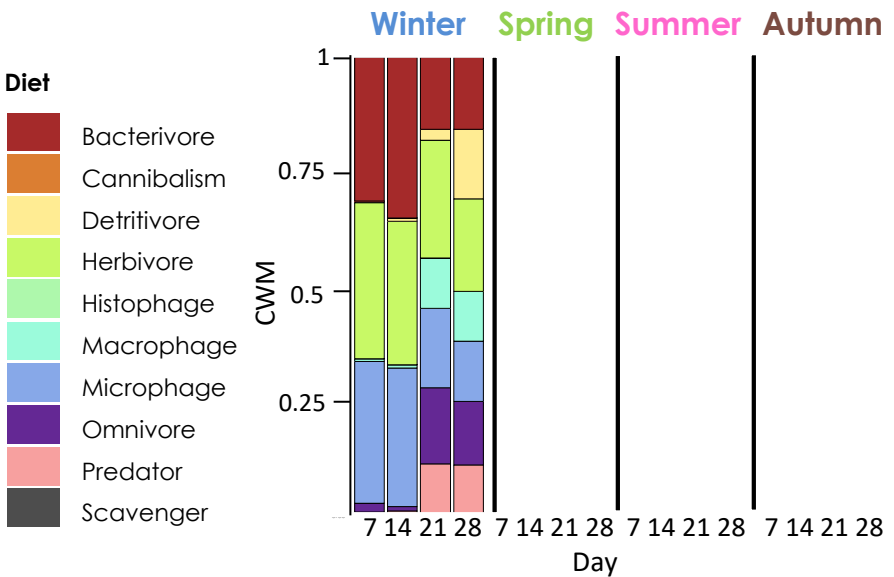
autotrophy

Autumn

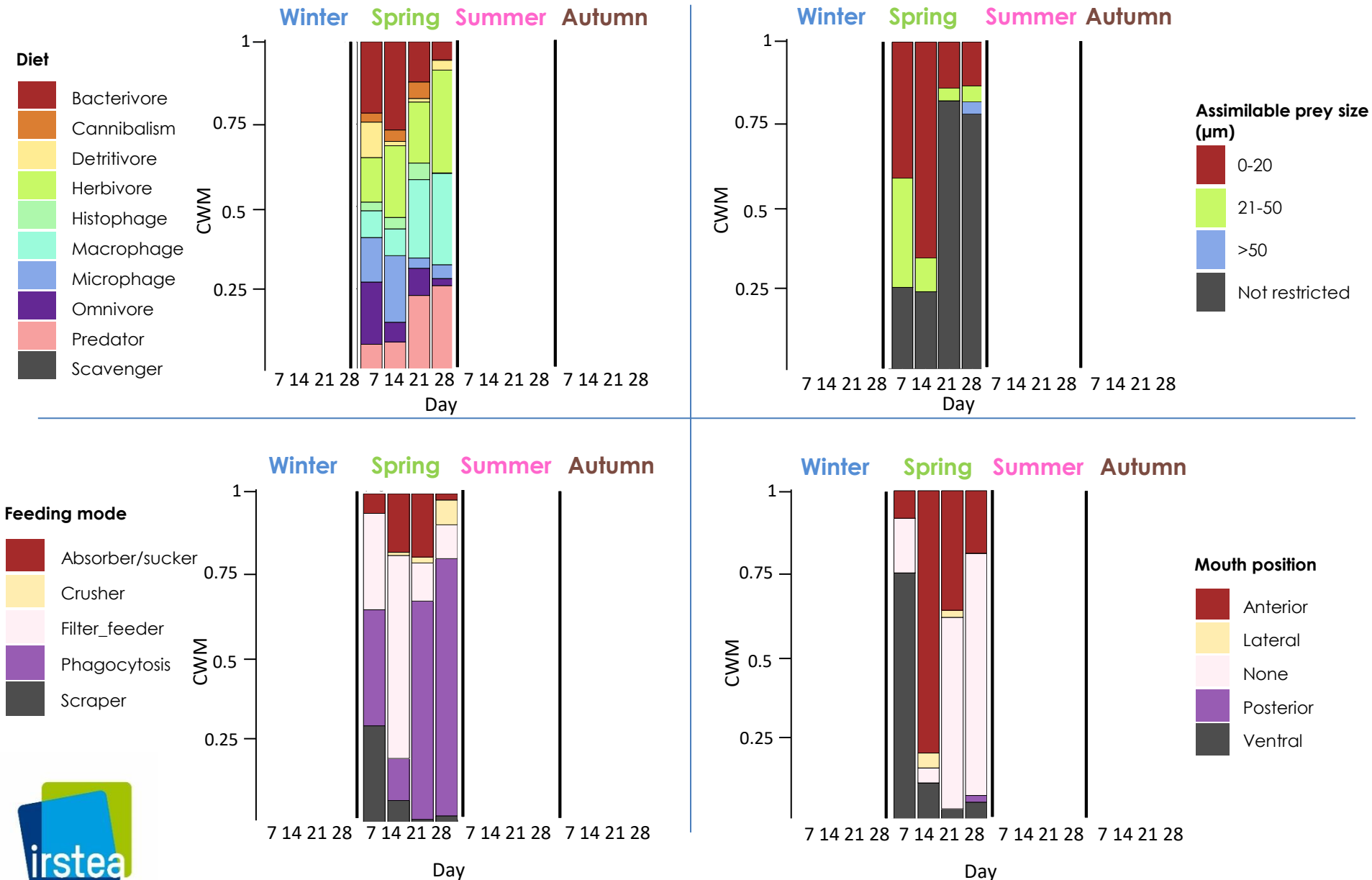


Cap5, Cap8, Sub2, Cap13, Bou1, Sur7, Nou7, Cap24, Nou19, Ral8, Mic1, Cap3, Dor4, Nou16, Sh2, Sur2, Cap12, Sub6, Ral7, Nou13, Ral6, Ral9, Cap18, Vie1, Dor6, Mic2, Dvi7, Nou10, Sh5, Sh6, Sh3, Nou3, Cap19, Sur6, Str15, Nou1, Bou3, Dvi5, Str15, Sur2, Cap17, Cap16, Sur10, Nou12, Nou15, Rep9, Rep1, Cap20, Sh8, Cap22, Mic4, Mal4, Dor2, Nou14, Dor2, Mal3, Dvi3, Ral1, Ral6, Cap15, Sh10, Mal2, Sur4, A2, Sub5, Mic3, Nou11, Mal3, Ral4, Bou5, Sub4, Mal5, Cap7, Cap6, Dvi4, Sur1, Sur2, Vie2-1

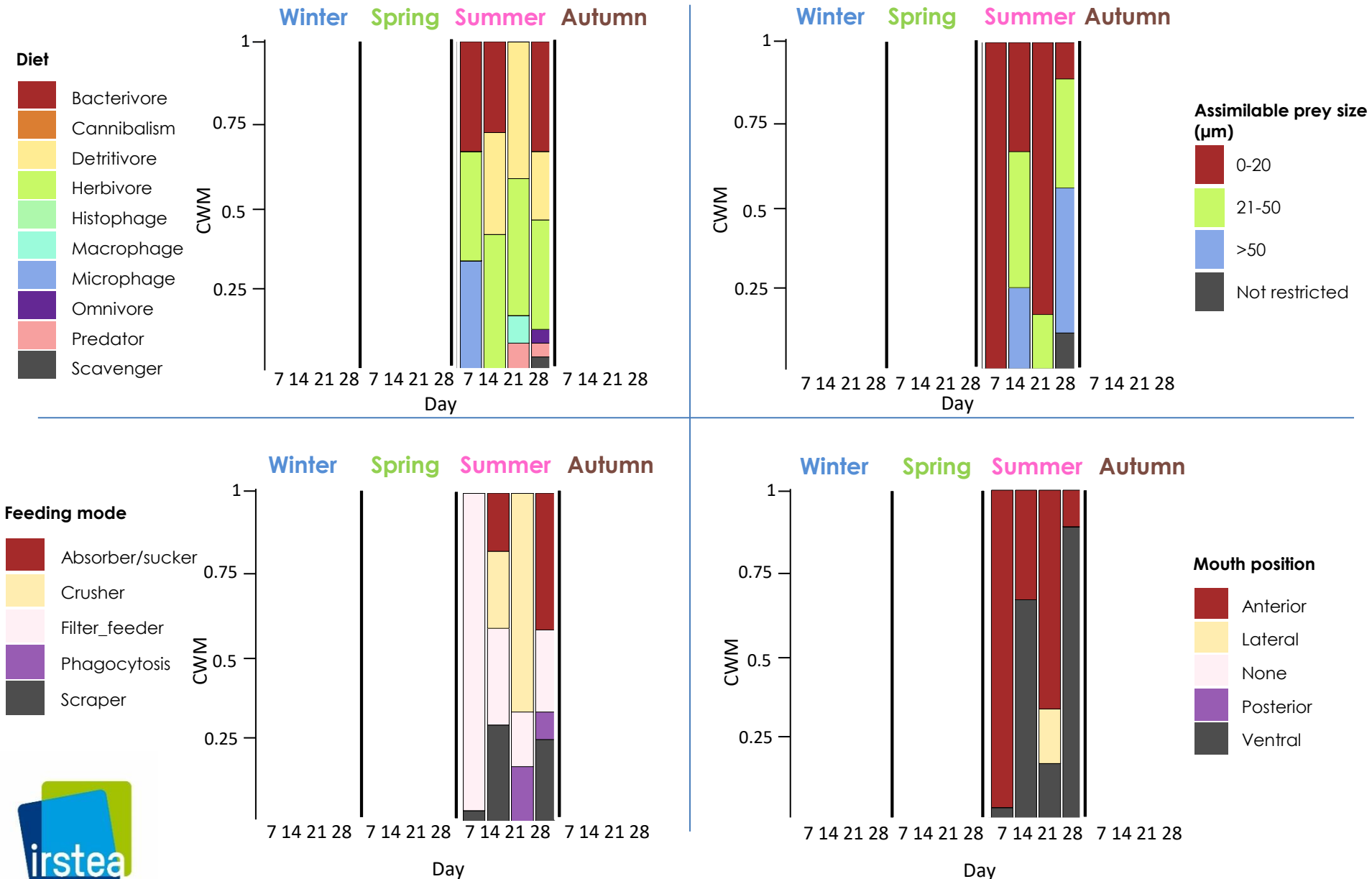
Results & Discussion



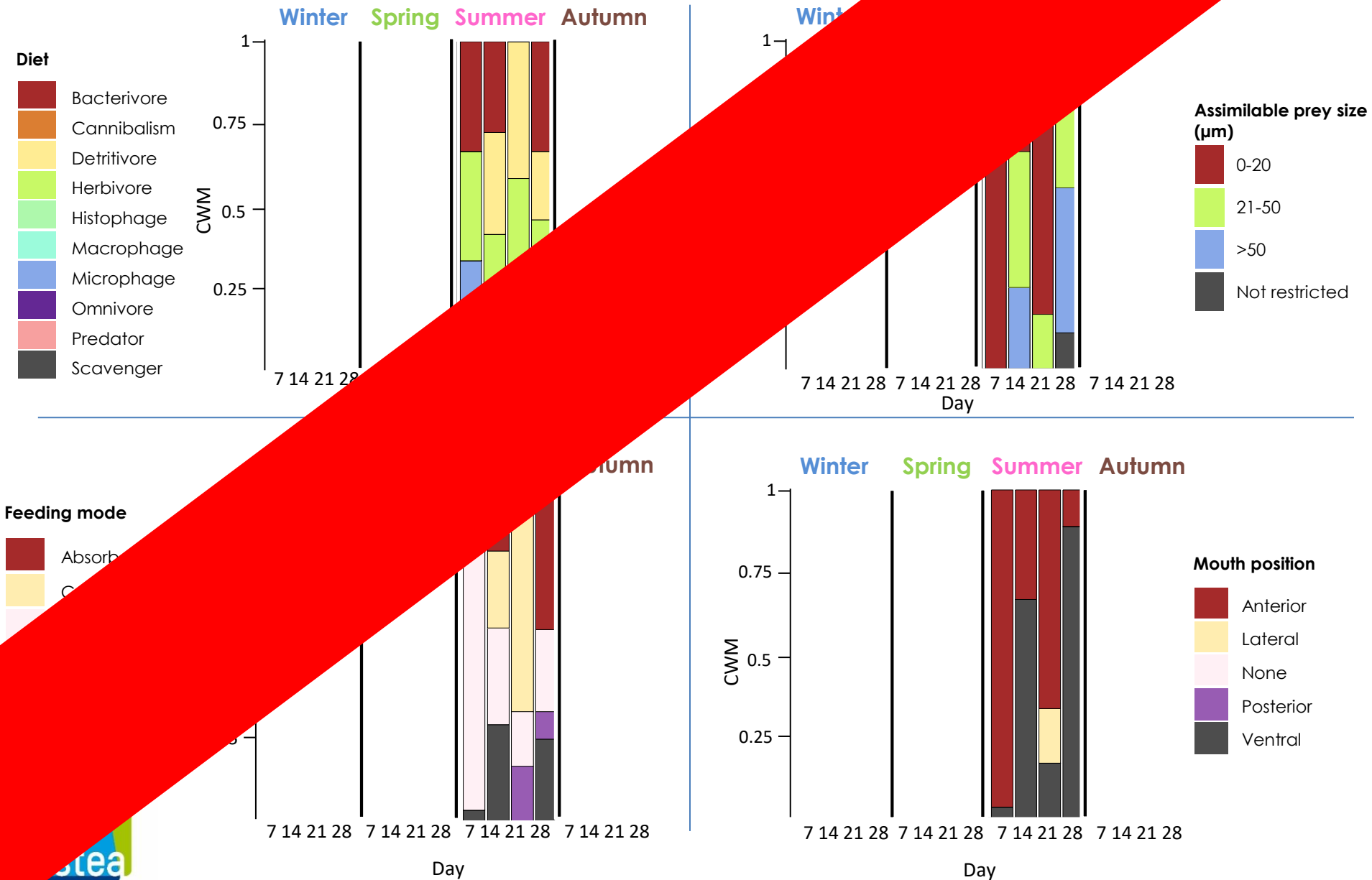
Results & Discussion



Results & Discussion



Results & Discussion



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
Low abundance
No diversity

Diet

- Bact
- Can
- Detr
- Herb
- Histo
- Mac
- Micr
- Omr
- Pred
- Scal



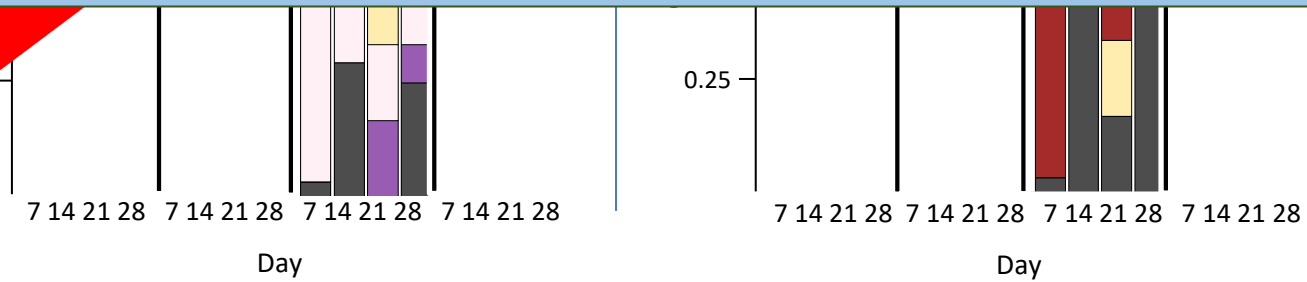
able prey size
0
50
restricted

Feeding mode

- Absor
- C
-

osition
terior
eral
ne

- Posterior
- Ventral



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
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No diversity



Diet

- Bact
- Can
- Detr
- Herb
- Histo
- Mac
- Micro
- Omr
- Pred
- Scav

Feeding mode

- Absor
- C
- P

Prey size

0

50

restricted

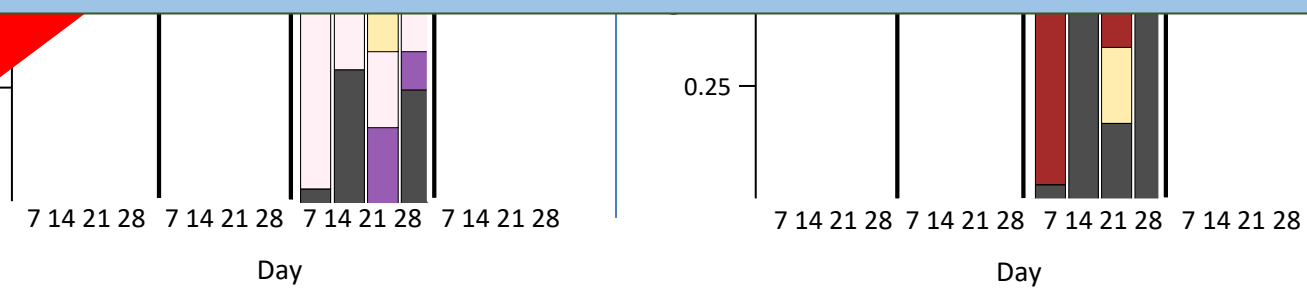
Position

Anterior

Medial

Line

- Posterior
- Ventral



Results & Discussion

Winter Spring Summer Autumn | Winter

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Diet

- Bact
- Can
- Detr
- Herb
- Histo
- Mac
- Micro
- Omr
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- Scav

Feeding mode

- Absor
- C
- P

Prey size

0

50

restricted

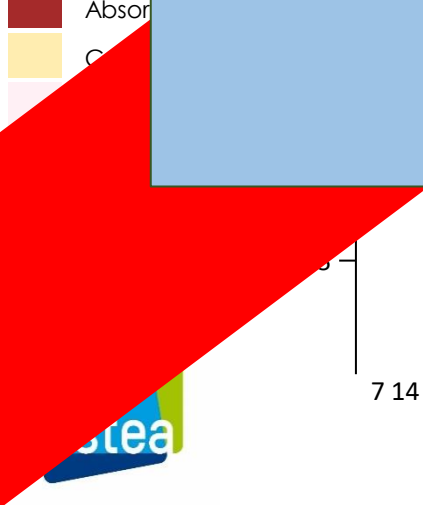
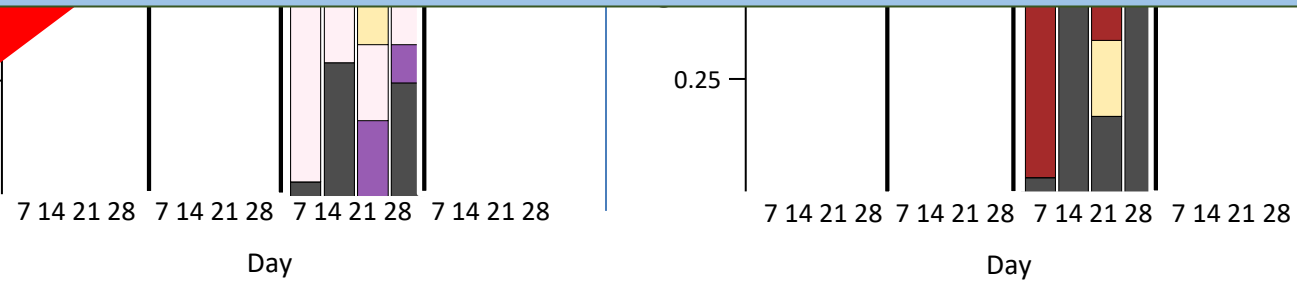
Position

Anterior

General

None

- Posterior
- Ventral



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
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Diet



Feeding mode



Prey size

0

50

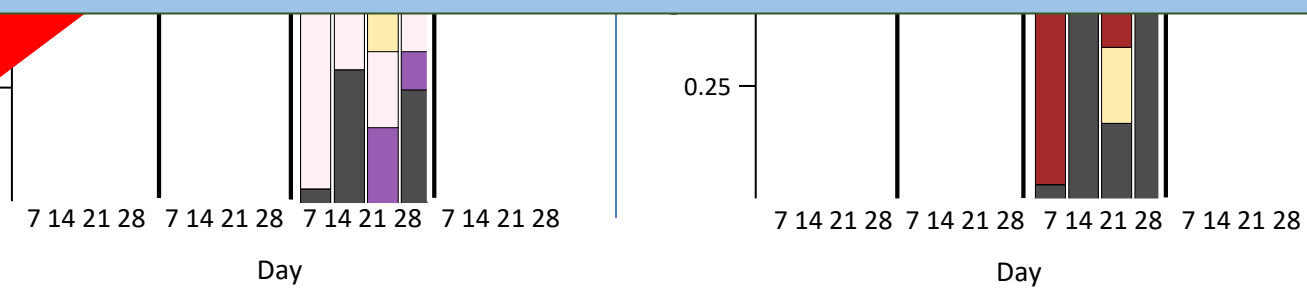
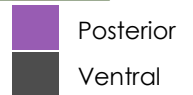
restricted

Position

Anterior

Medial

Line



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
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No diversity



Diet

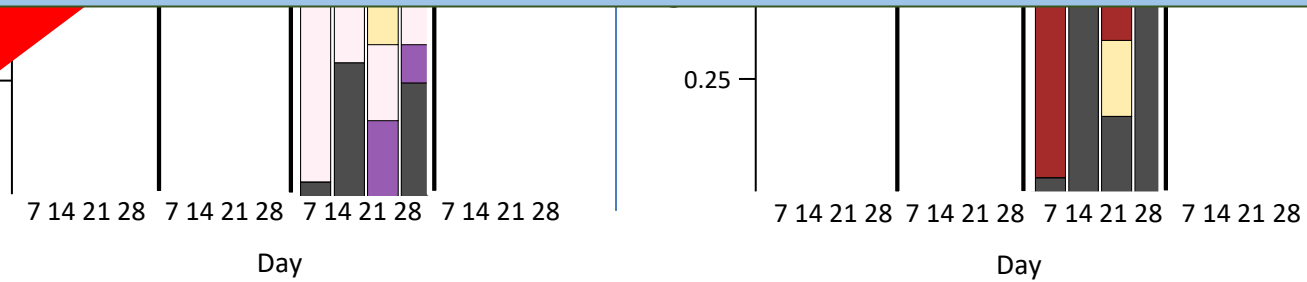


Prey size
0
50
restricted

Feeding mode



Position
Anterior
Lateral
Ventral



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
Low abundance
No diversity



Diet



Feeding mode



Prey size

0

50

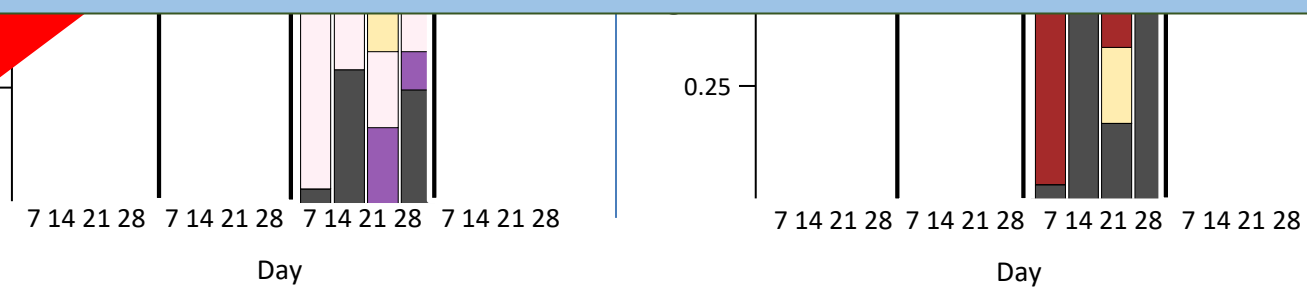
restricted

Position

Anterior

Medial

Line



Results & Discussion

Winter Spring Summer Autumn | Winter

Few species
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No diversity



able prey size
0
50
restricted

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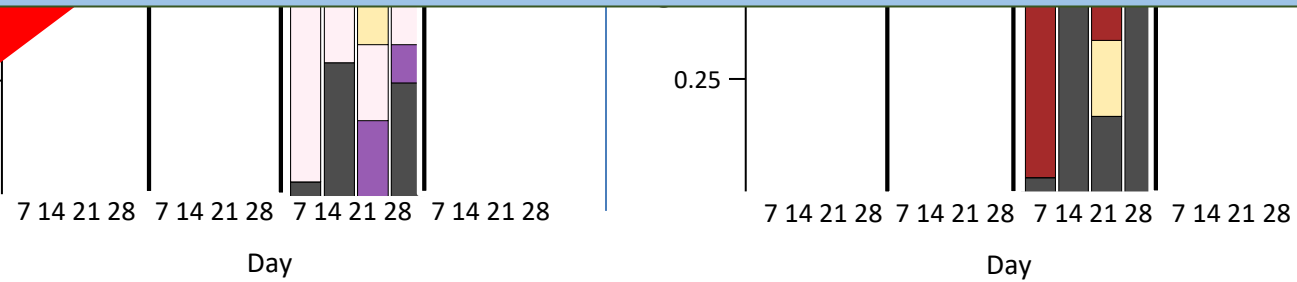
Posterior
Ventral

Diet

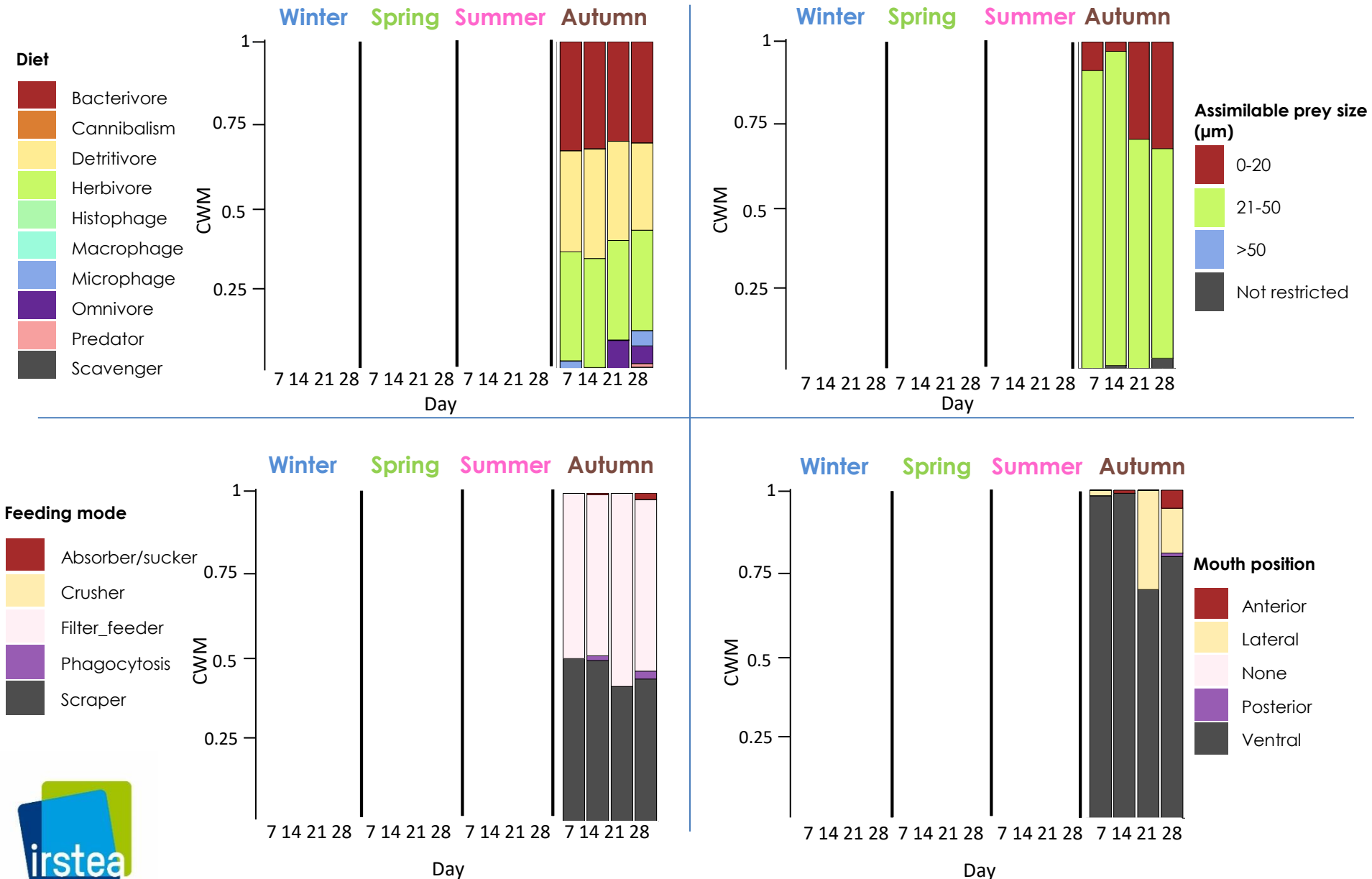
- Bact
- Can
- Detr
- Herb
- Histo
- Mac
- Micr
- Omr
- Pred
- Scav

Feeding mode

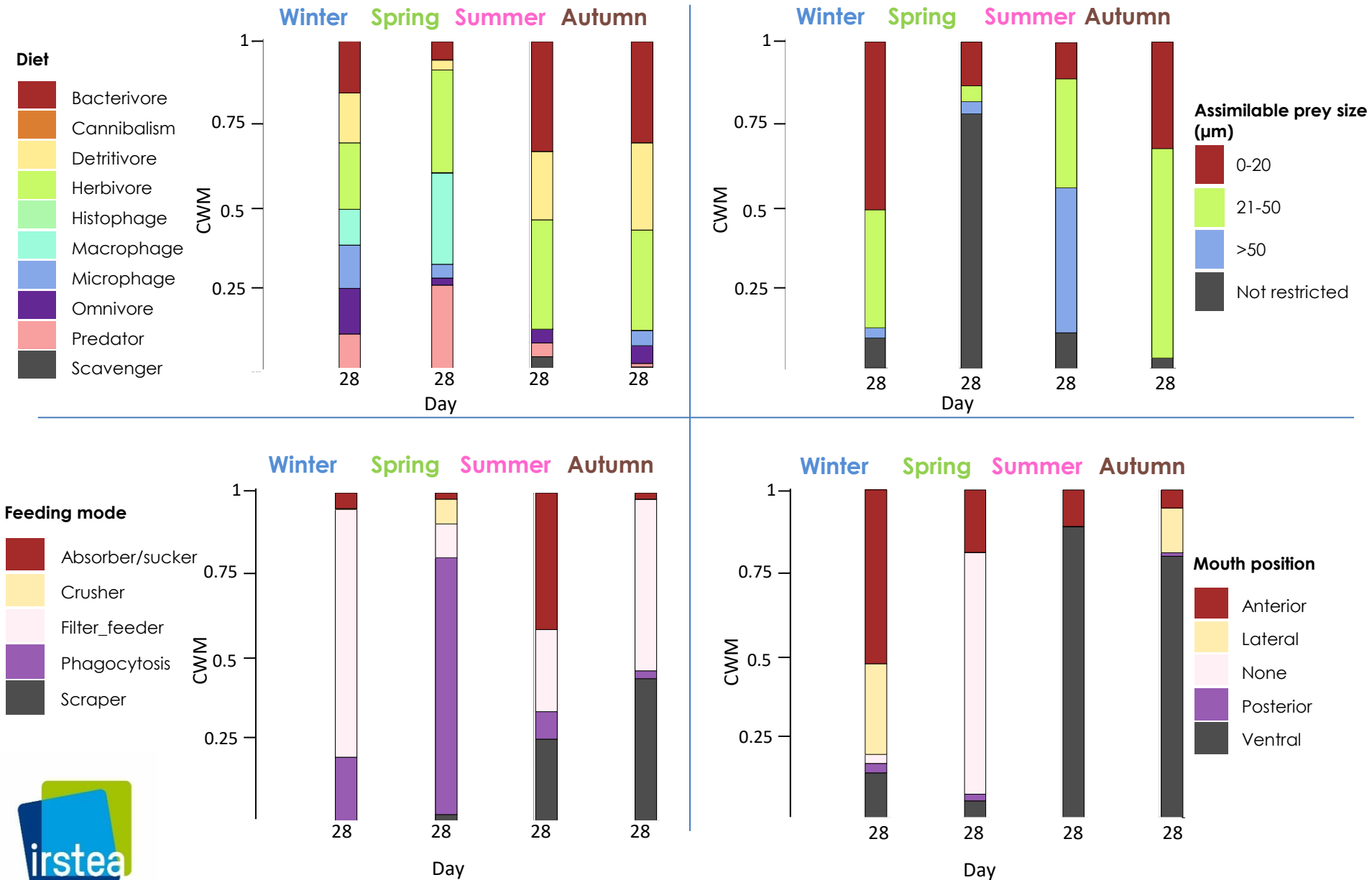
- Absor
- C
-



Results & Discussion



Results & Discussion



Conclusion

Functional diversity is changing with season...

Annual cycle:

	Winter	Spring	Summer	Autumn
Prey size	0-20 μm	Not restricted by prey size	0-50 μm	21-50 μm
Feeding mode	Filter-feeders	Phagocytosis	Filter-feeders Crusher	Filter-feeders Scrapers
Diet	Herbivores Bacterivores Microphages	Herbivores Macrophages Predators	Bacterivores Herbivores Detritivores	Bacterivores Herbivores Detritivores

Conclusion

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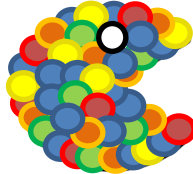


Microfauna

Conclusion

Functional diversity is changing with season...


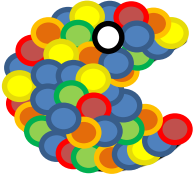

Annual cycle:

	Winter	Spring	Summer	Autumn
Prey size	0-20 μm	Not restricted by prey size	0-50 μm	21-50 μm
Feeding mode	Filter-feeders	Phagocytosis	Filter-feeders Crusher	Filter-feeders Scrapers
Diet	Herbivores Bacterivores Microphages	Herbivores Macrophages Predators	Bacterivores Herbivores Detritivores	Bacterivores Herbivores Detritivores
	 Microfauna	 Meiofauna		

Conclusion

Functional diversity is changing with season...


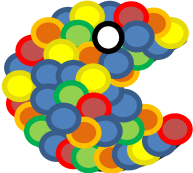
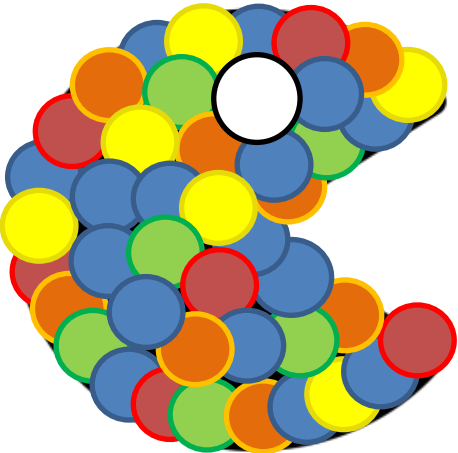
Annual cycle:

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	 Microfauna	 Meiofauna		

Conclusion

Functional diversity is changing with season...


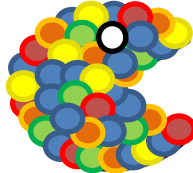
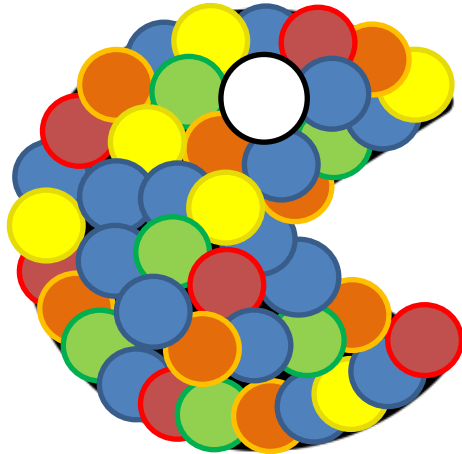

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	 Microfauna	 Meiofauna	 Macrofauna	

Conclusion

Functional diversity is changing with season...

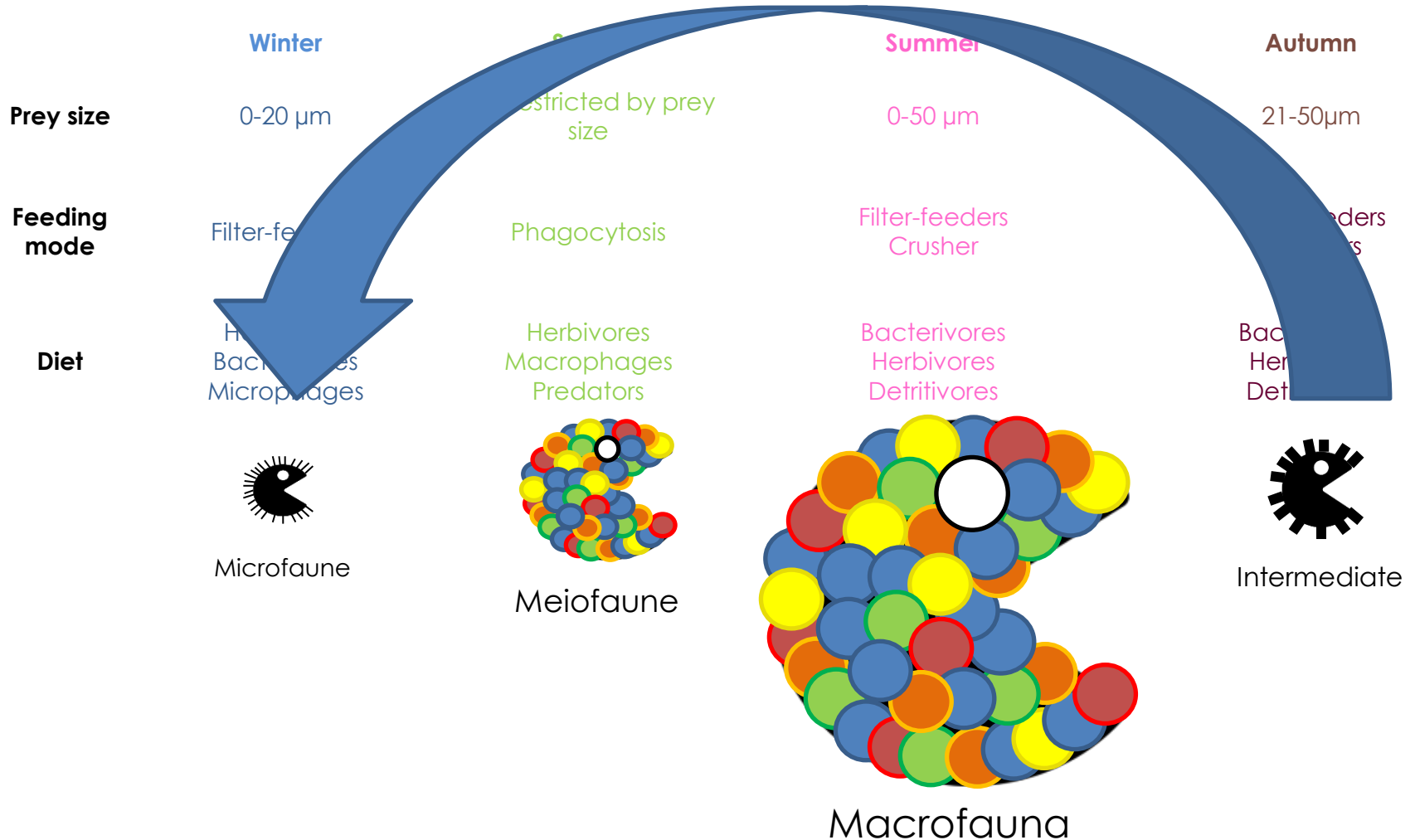
Annual cycle:

	Winter	Spring	Summer	Autumn
Prey size	0-20 μm	Not restricted by prey size	0-50 μm	21-50 μm
Feeding mode	Filter-feeders	Phagocytosis	Filter-feeders Crusher	Filter-feeders Scrapers
Diet	Herbivores Bacterivores Microphages	Herbivores Macrophages Predators	Bacterivores Herbivores Detritivores	Bacterivores Herbivores Detritivores
	 Microfaune	 Meiofaune	 Macrofauna	 Intermediate

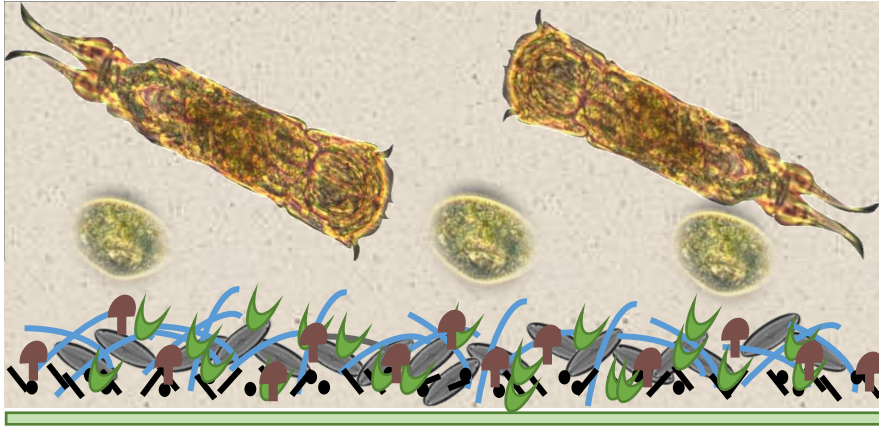
Conclusion

Functional diversity is changing with season...

Annual cycle:



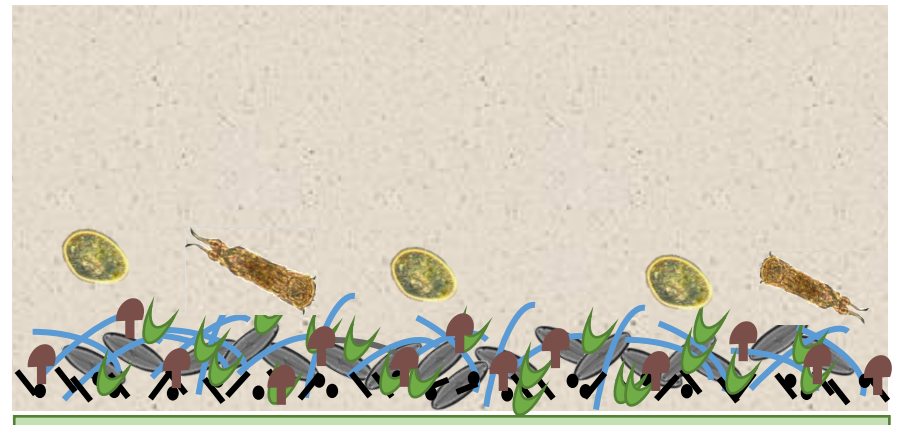
Conclusion



Dry weight

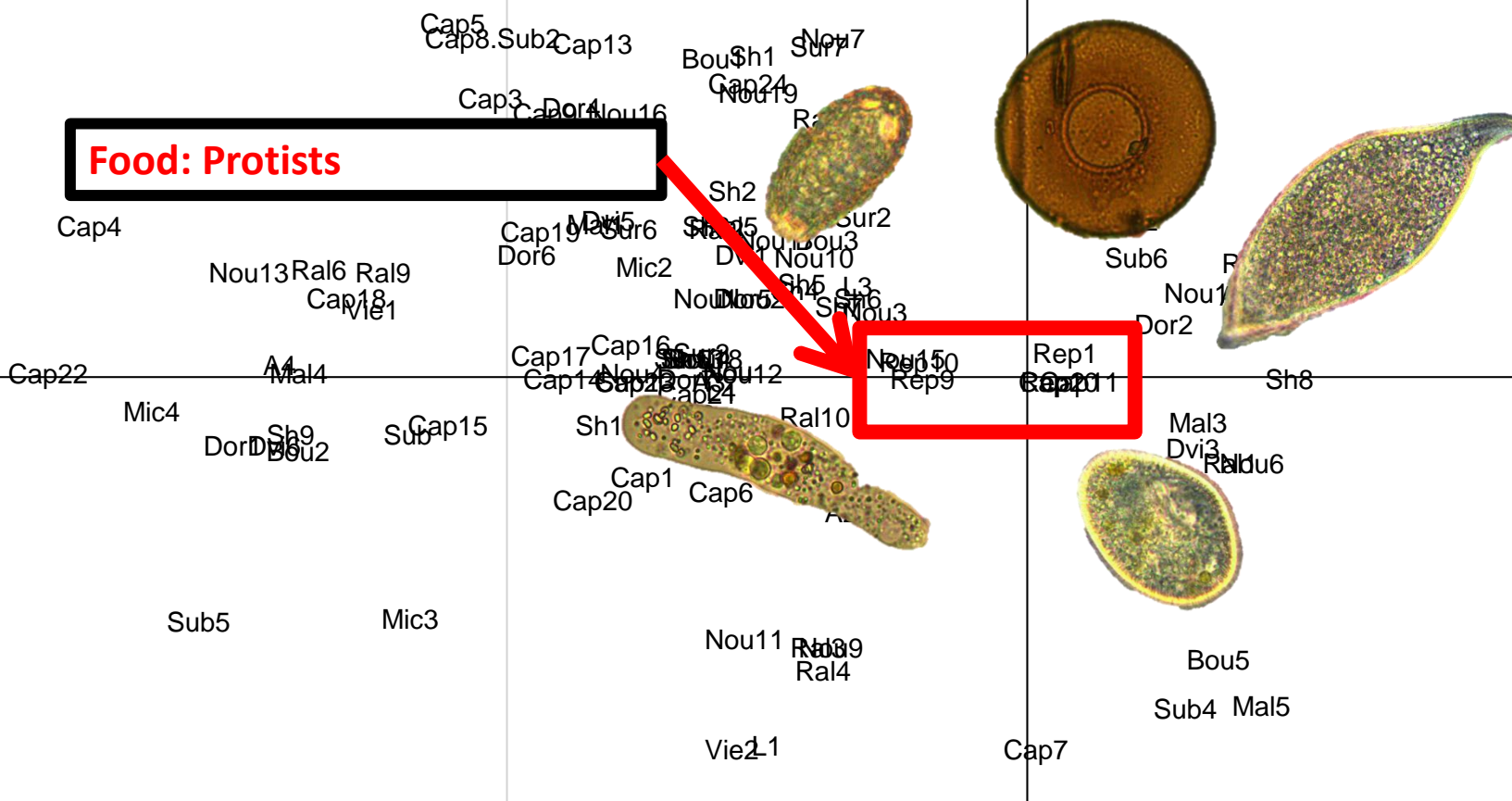
VS

Abundance



Dvi2 L2

Food: Protists



A photograph of a pond with a thought bubble overlay. The pond is surrounded by trees and a building in the background. The water is dark and reflects the surrounding environment. A thought bubble is positioned in the upper left quadrant of the image, containing the text "Be quiet... It is growing...". The thought bubble is connected to a series of smaller circles that trail towards the center of the pond. The circles are white with black outlines, and the largest one is the thought bubble itself. The text inside the thought bubble is in a bold, black, sans-serif font.

**Be quiet... It is
growing...**

Thank you for your attention...

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