



Increased sea ice cover disrupts food web structure in coastal Antarctica



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Sea ice in Antarctica

Antarctic littoral is circled by **sea ice** (up to 20 millions km²)

Sea ice is a **major environmental driver** in Antarctica

Sea ice is **highly dynamic** (seasonal breakup)

At the moment: **sea ice cover increases** in some regions of Antarctica



Sea ice cover increase in Antarctica



East Antarctica, **Adélie Land**
Dumont-d'Urville station (FR)

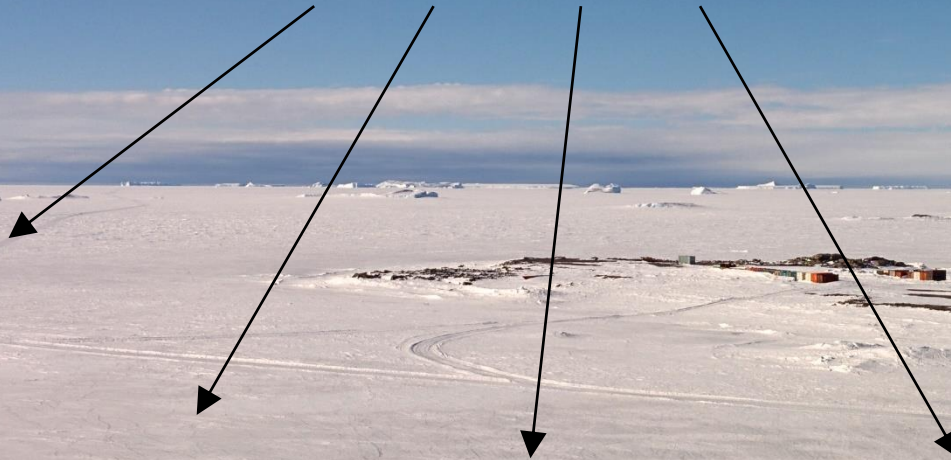
Increase in spatial and temporal **sea ice cover**

No seasonal breakup during 3 of the past 4 years

Sea ice cover increase in Antarctica

Time of sampling : Austral summer 2014-15

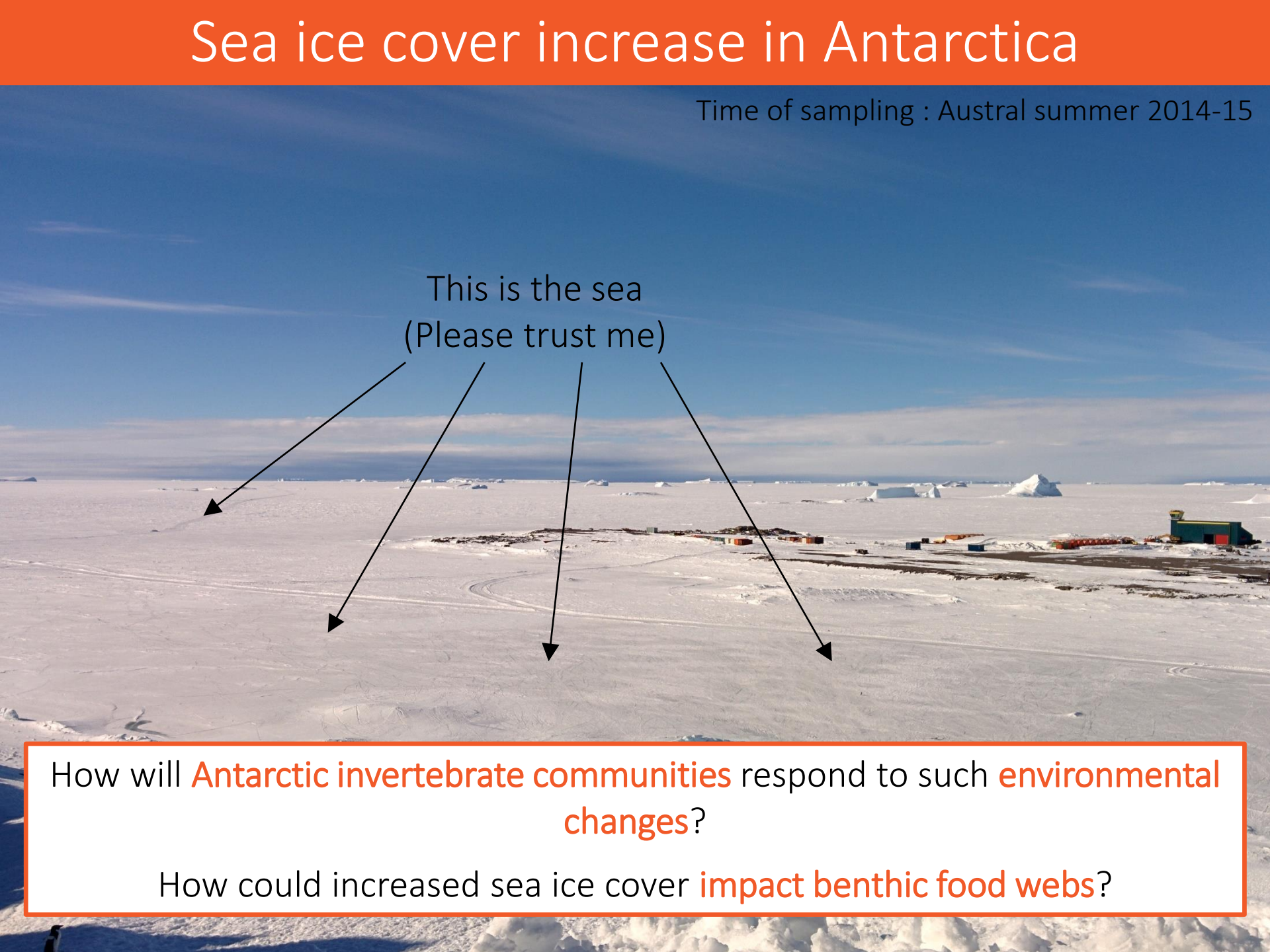
This is the sea
(Please trust me)



Sea ice cover increase in Antarctica

Time of sampling : Austral summer 2014-15

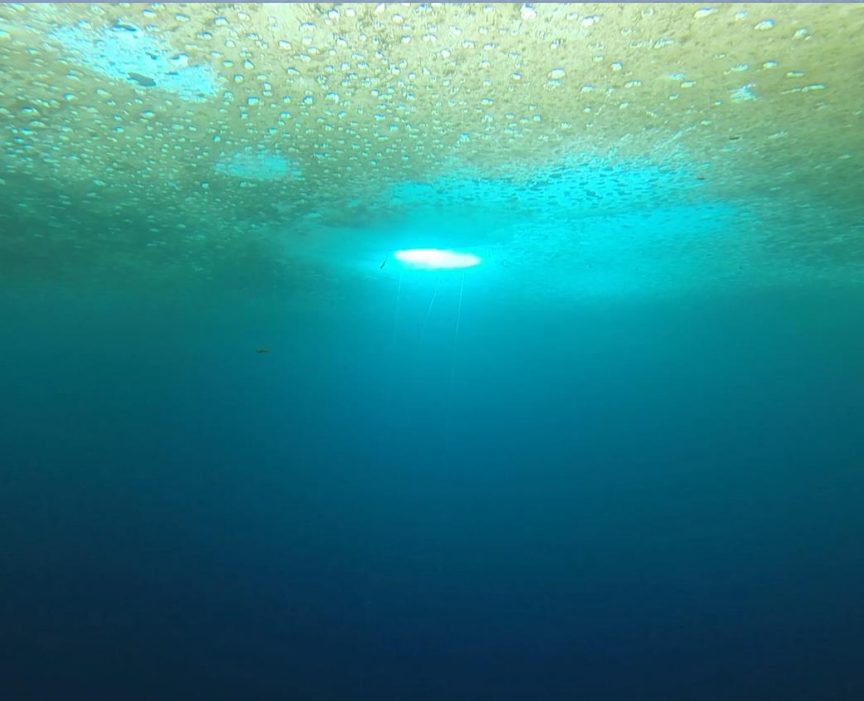
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(Please trust me)



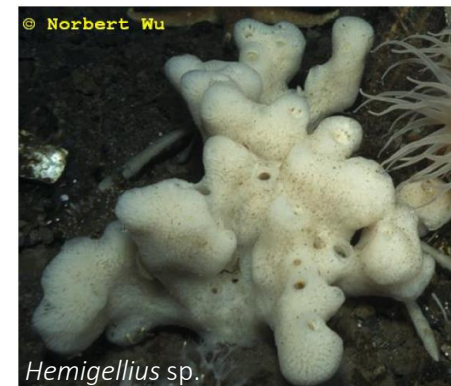
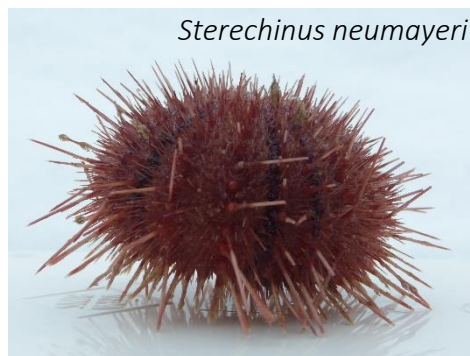
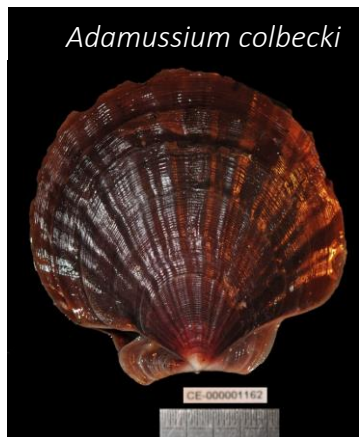
How will **Antarctic invertebrate communities** respond to such **environmental changes**?

How could increased sea ice cover **impact benthic food webs**?

Sampling: under ice SCUBA diving



Some sampled taxa



Some sampled taxa



Harmothoe sp.

Perkinsiana sp.



©Shawn Harper

Flabelligera mundata



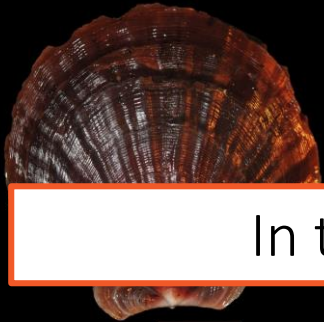
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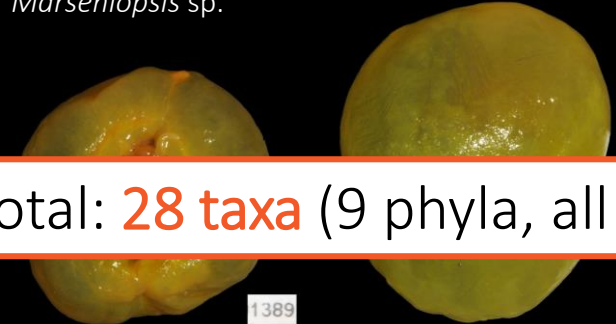
Trophon longstaffi

Adamussium colbecki



CE-000001102

Marseniopsis sp.



1389



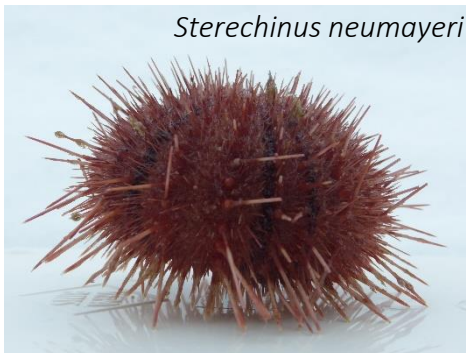
Ammothea carolinensis

In total: **28 taxa** (9 phyla, all present functional guilds)

Heterocucumis sp.



Sterechinus neumayeri



Odontaster validus

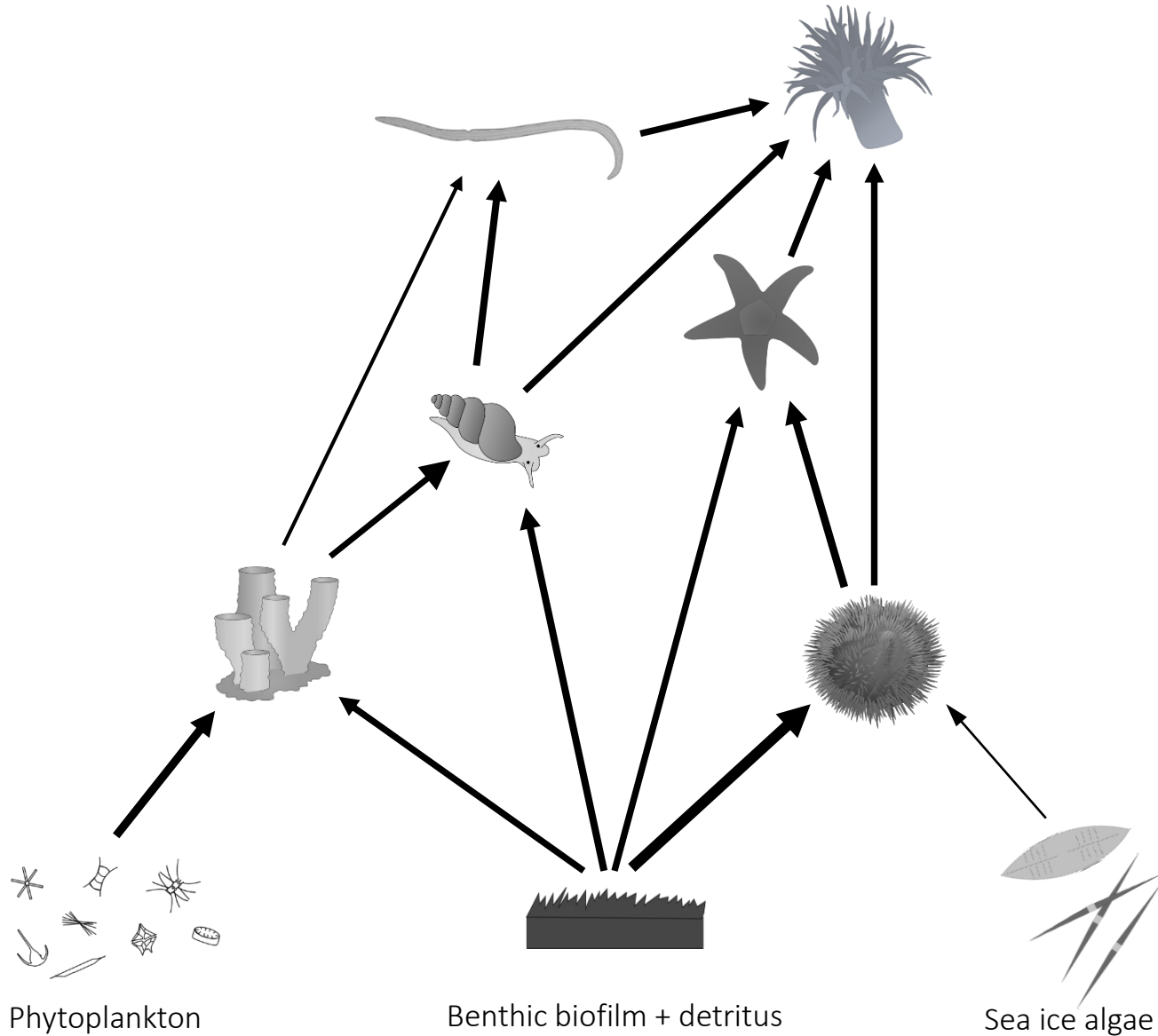
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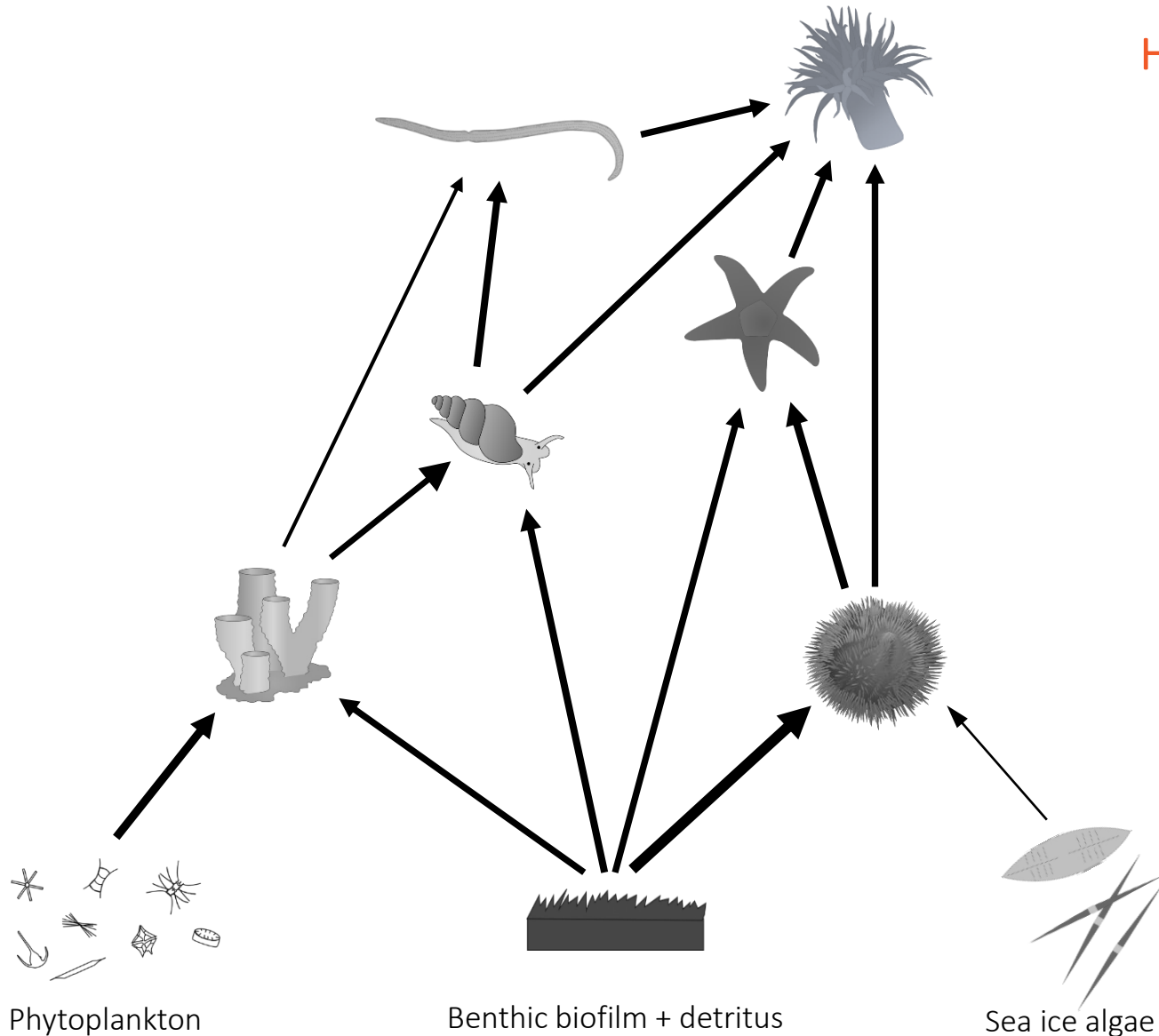
Hemigellius sp.

Food web structure & stable isotopes



Food web structure & stable isotopes

Horizontal dimension



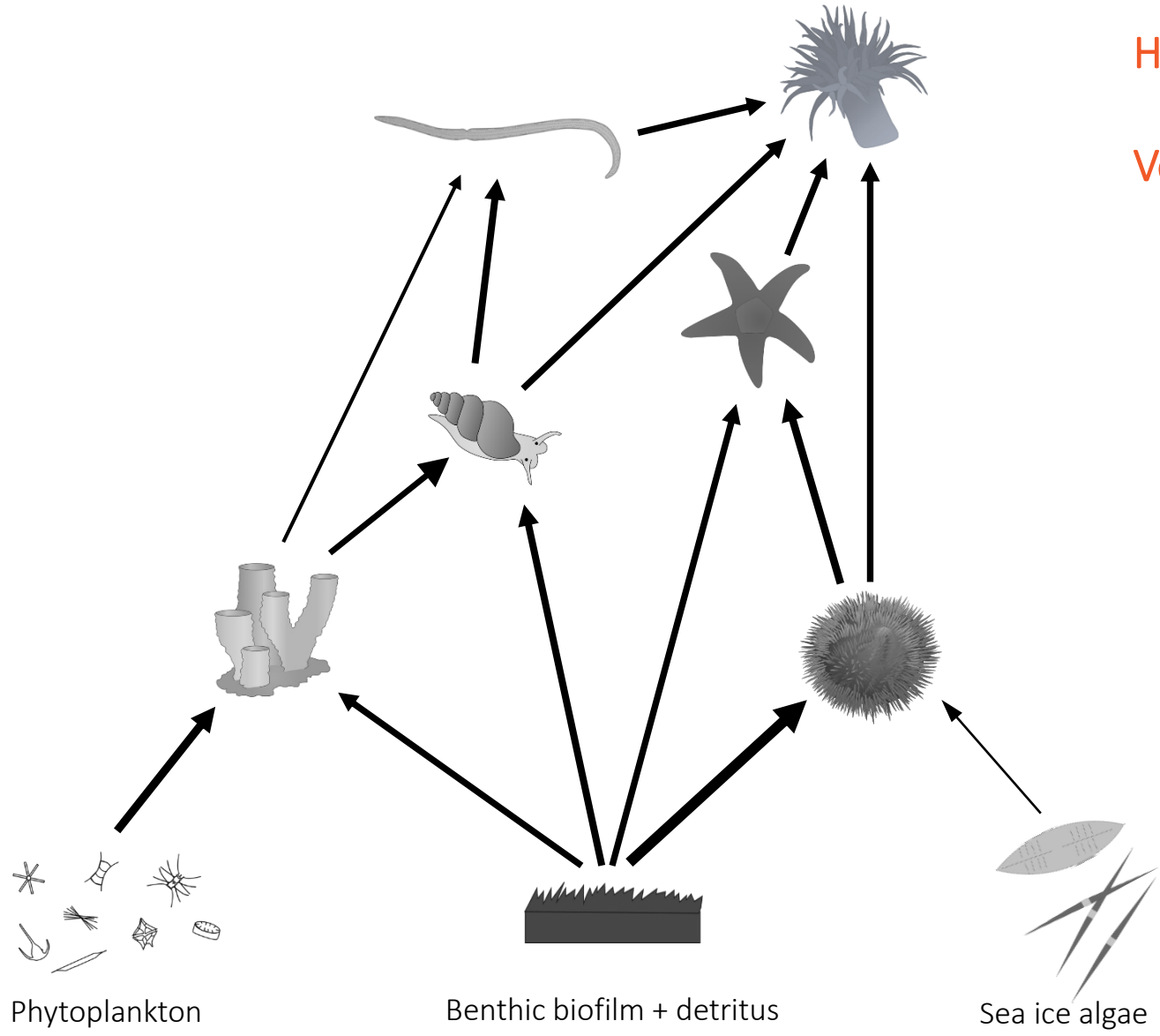
Resources supporting the consumers

Food web structure & stable isotopes

Trophic position of the consumers

Horizontal dimension

Vertical dimension



Resources supporting the consumers

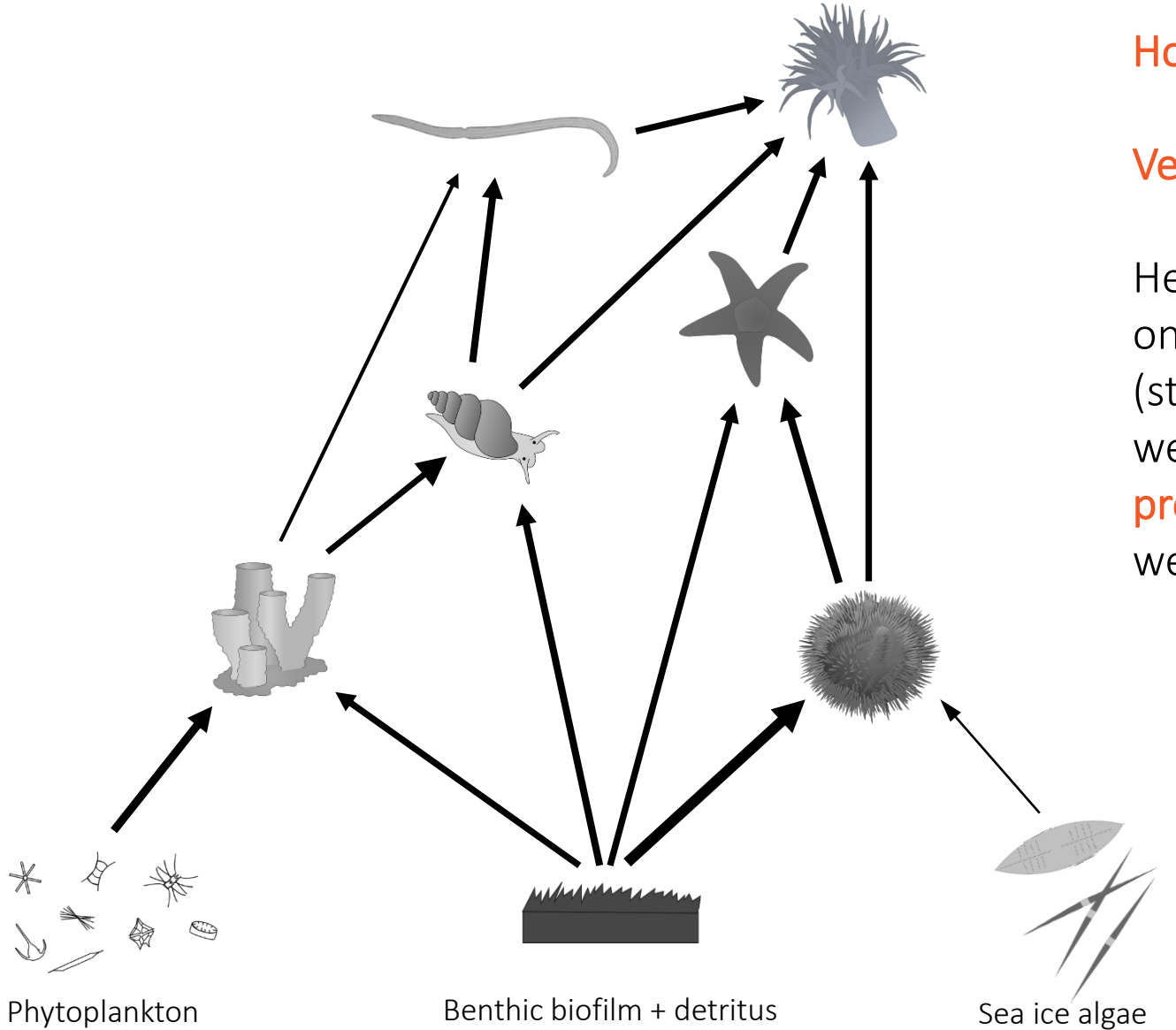
Food web structure & stable isotopes

Trophic position of the consumers

Horizontal dimension

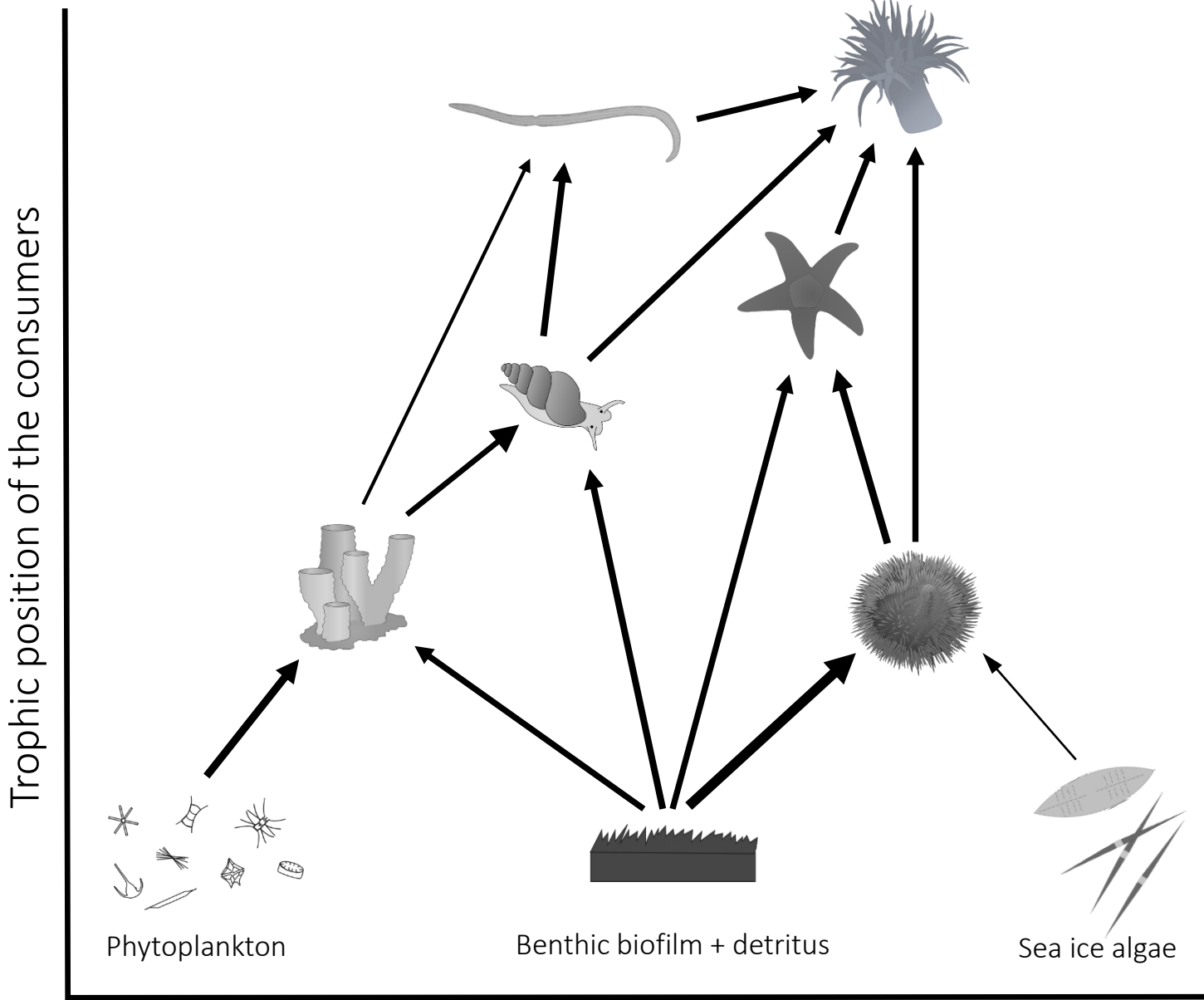
Vertical dimension

Here: **models** based on **trophic markers** (stable isotope ratios) were used to as **proxies** of **both** food webs **dimensions**



Resources supporting the consumers

The food web we expected

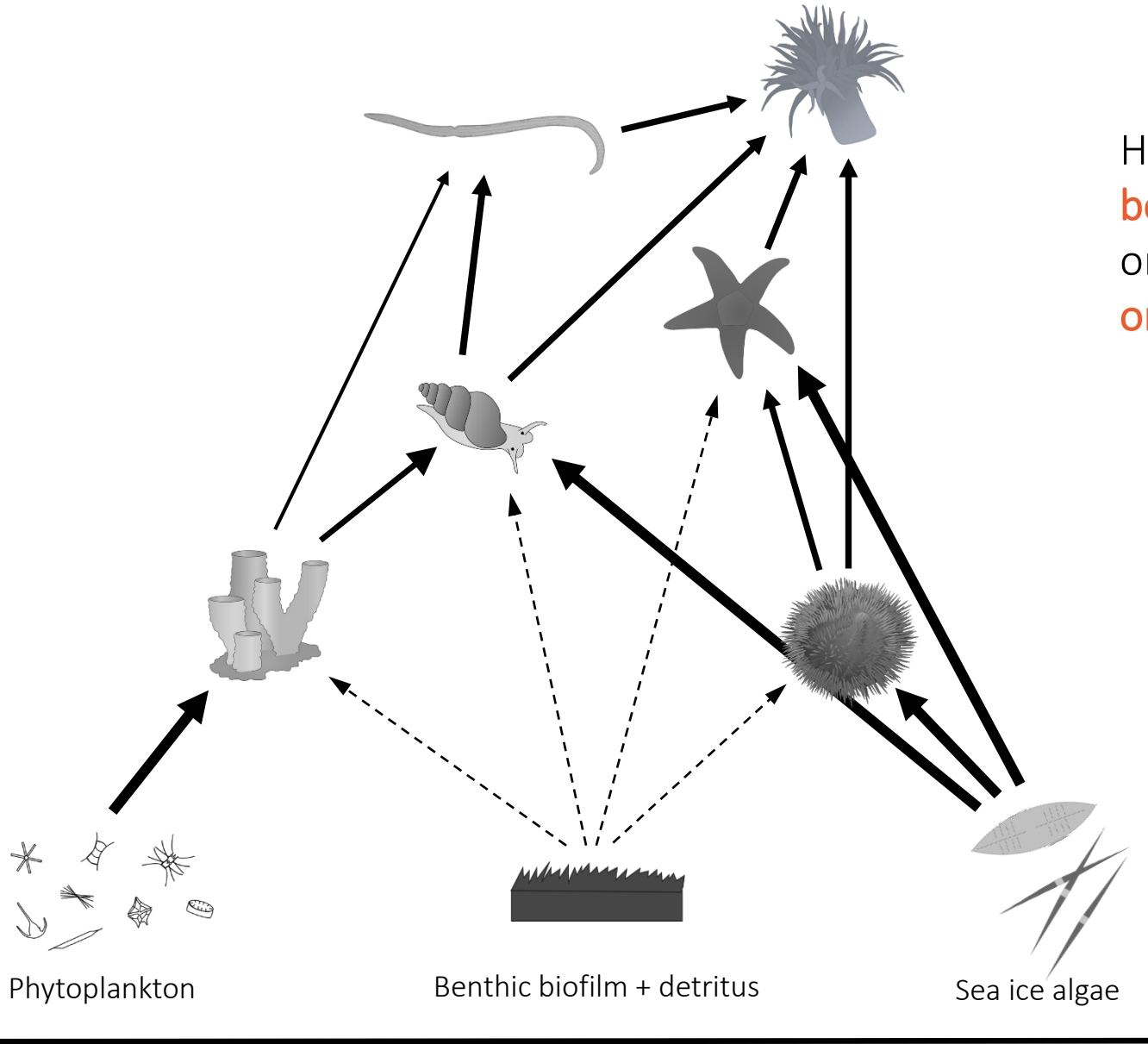


Resources supporting the consumers

Shift in resource supporting consumers

Trophic position of the consumers

High **dependency** of **benthic** invertebrates on **sea ice-derived organic matter**



Resources supporting the consumers

Shift in resource supporting consumers

Trophic position of the consumers



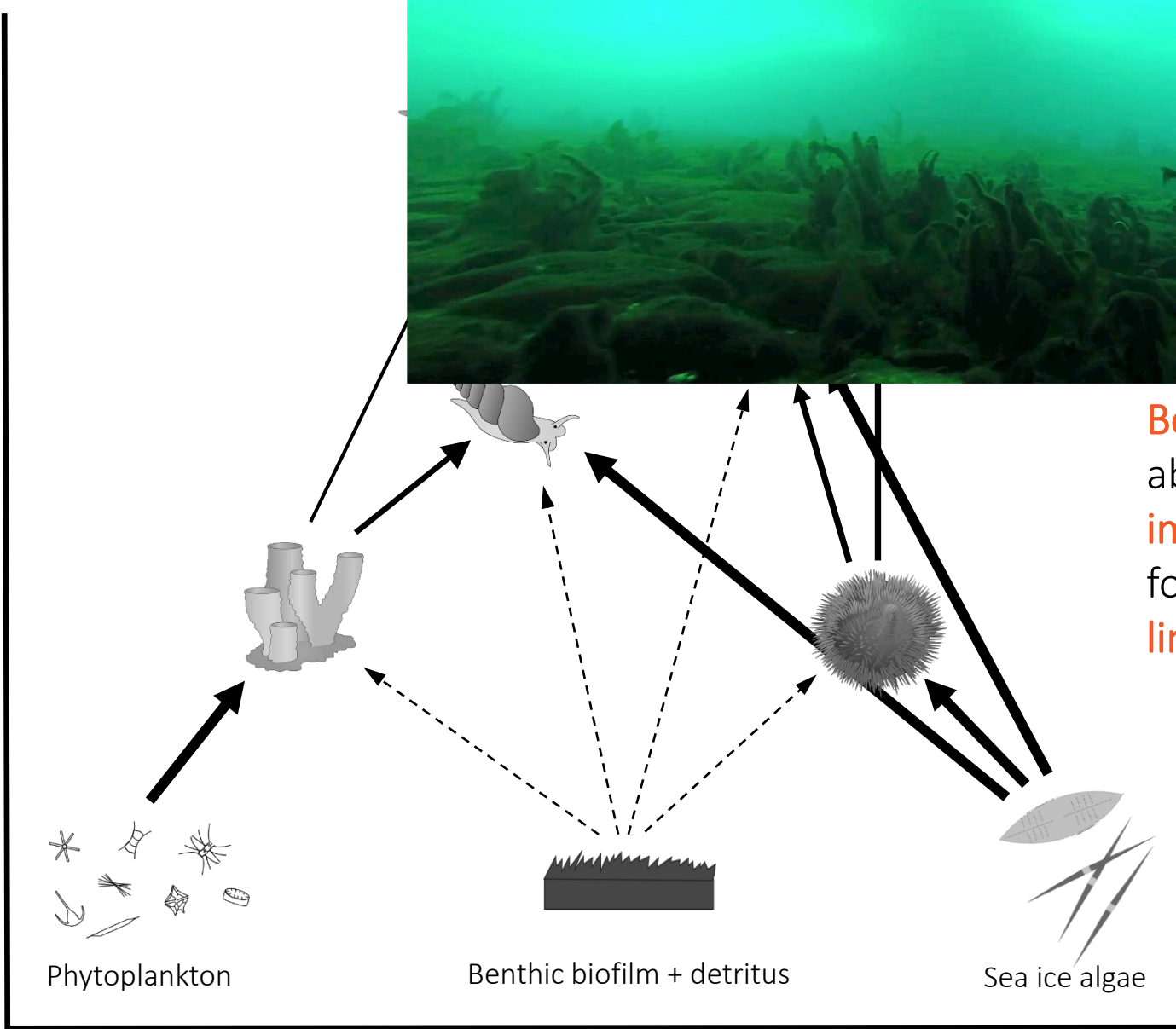
Benthic biofilm: very abundant, but **importance** in the food web seems **limited**

Phytoplankton

Benthic biofilm + detritus

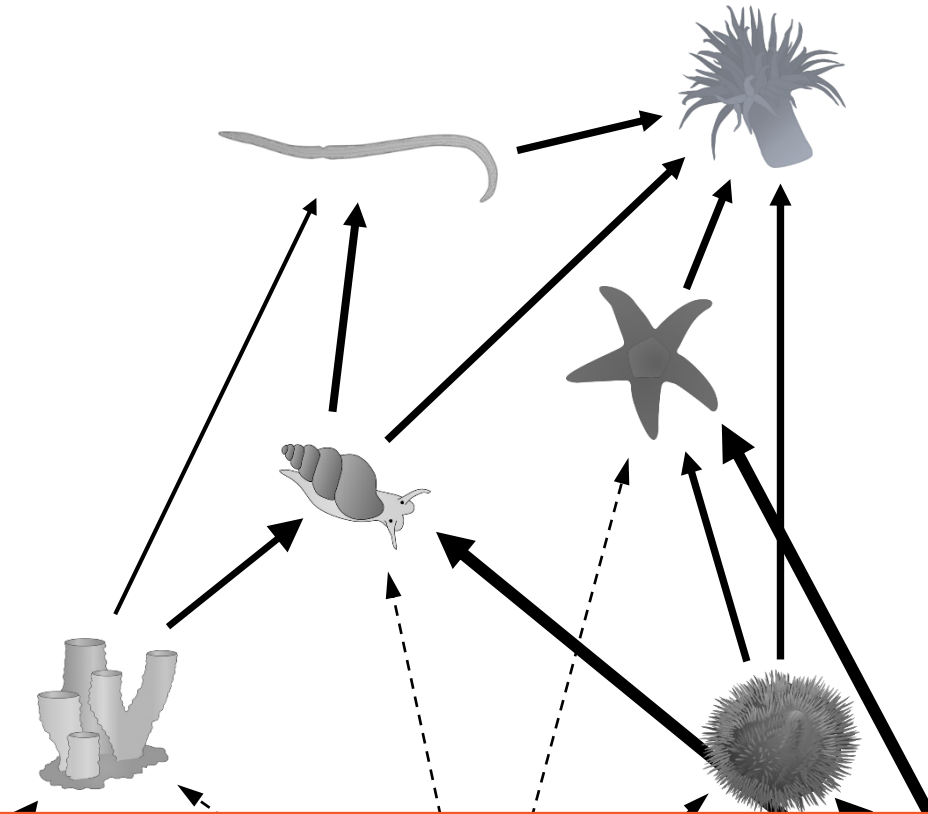
Sea ice algae

Resources supporting the consumers



Shift in resource supporting consumers

position of the consumers



High **dependency** of **benthic** invertebrates on **sea ice-derived organic matter**

Benthic biofilm: very abundant, but **importance** in the food web seems **limited**

Influence on interspecific **ecological interactions** (e.g. competition) and **community structure**?



Phytoplankton



Benthic biofilm + detritus



Sea ice algae

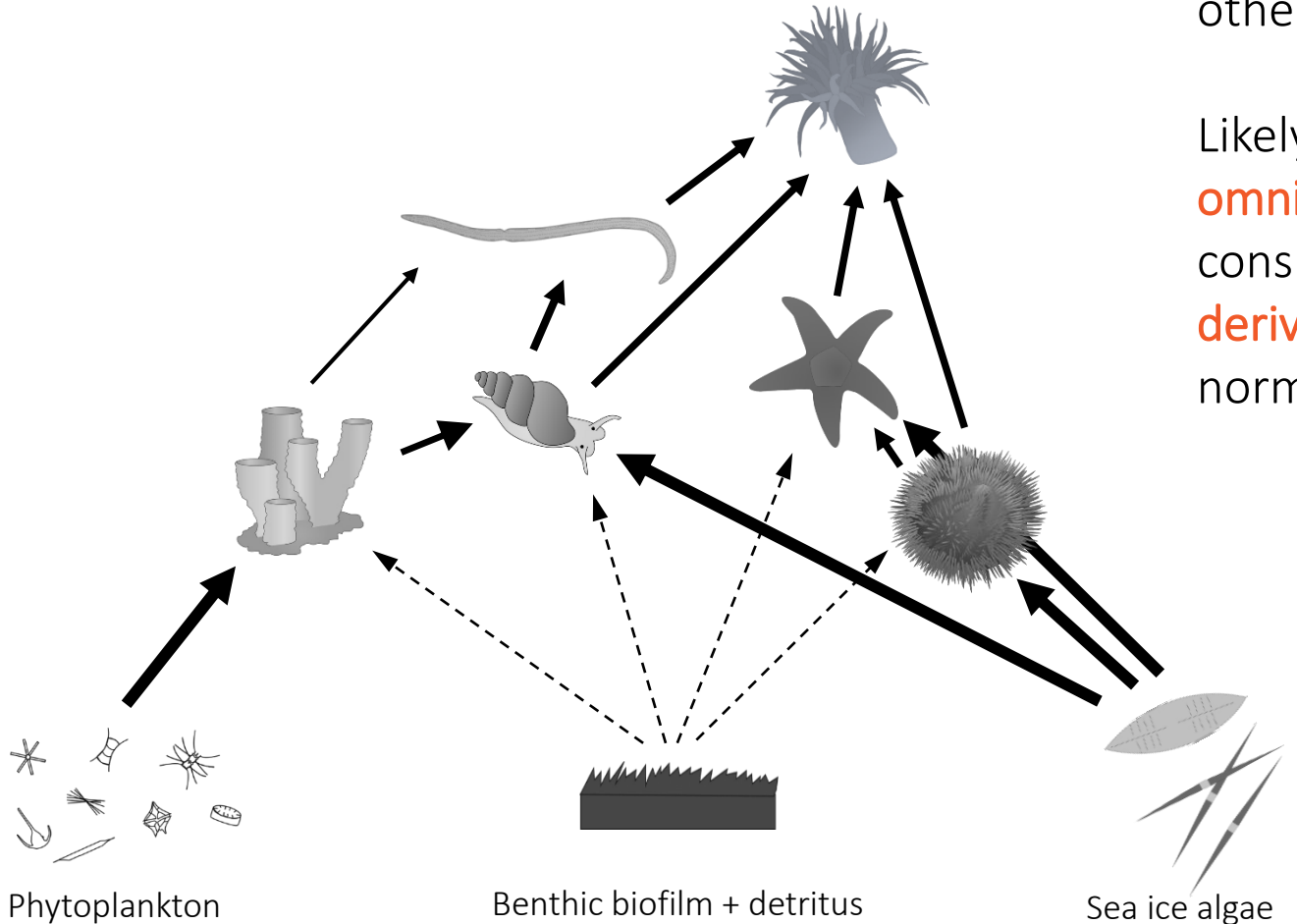
Resources supporting the consumers

Shift in trophic position of consumers

Trophic position of the consumers

Trophic positions of many consumers **lower** than in other studies

Likely linked with **omnivore** invertebrates consuming **less animal-derived material** than in normal sea ice conditions



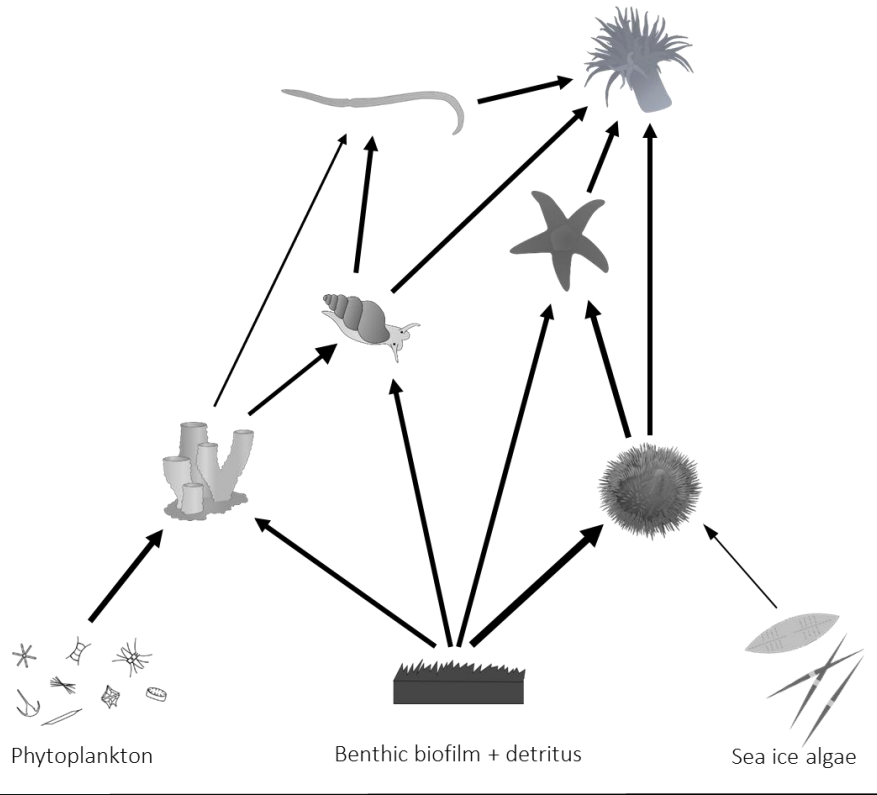
Phytoplankton

Benthic biofilm + detritus

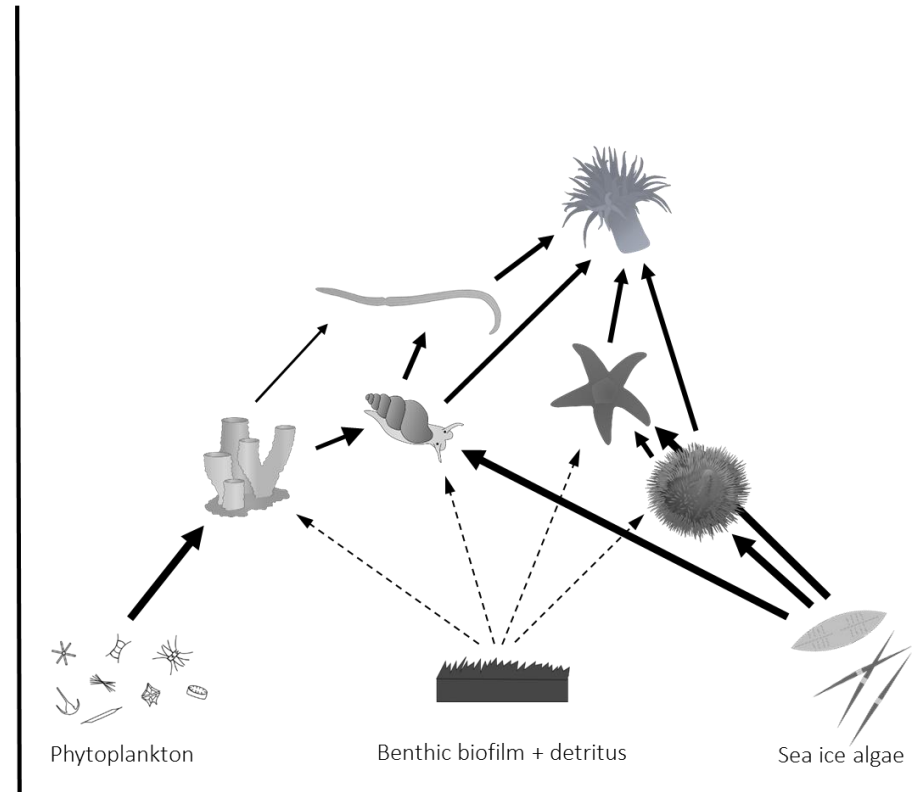
Sea ice algae

Resources supporting the consumers

Sea ice & food web structure



Normal conditions



Increased sea ice conditions

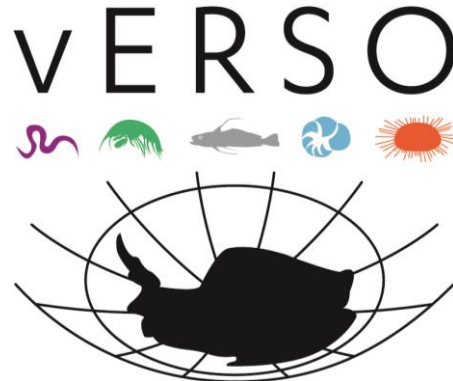
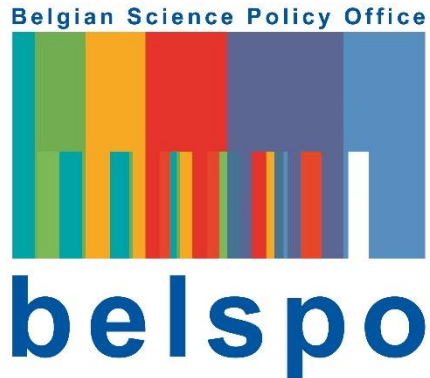
Increase of **sea ice cover** strongly **influences** the **benthic food web** by modifying both its horizontal and its vertical **structure**

Take home message

- **Increased** sea ice **cover modifies** benthic **food web structure** in coastal Antarctica
- These **structural changes** have the potential to influence **ecosystem functioning**
- Despite being interpreted as a positive signal by mainstream media, **local** or **large-scale** trends of **sea ice increase** in **Antarctica** could actually have strong **impacts on benthic ecosystems**



Funding



Belgian Federal Science Policy Office (BELSPO)

vERSO project
(Ecosystem Resilience in Southern Ocean)

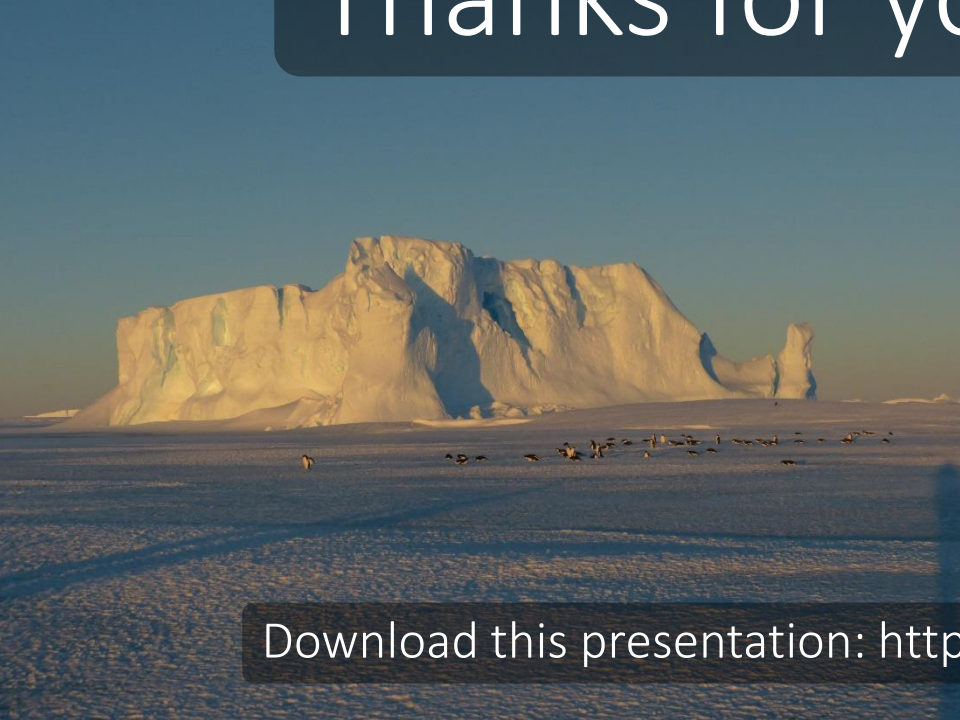
<http://rectoversoprojects.be>



French Polar Institute (IPEV)



Thanks for your attention



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