

Pelagic energy transfer to top trophic levels in two contrasting Arctic fjords

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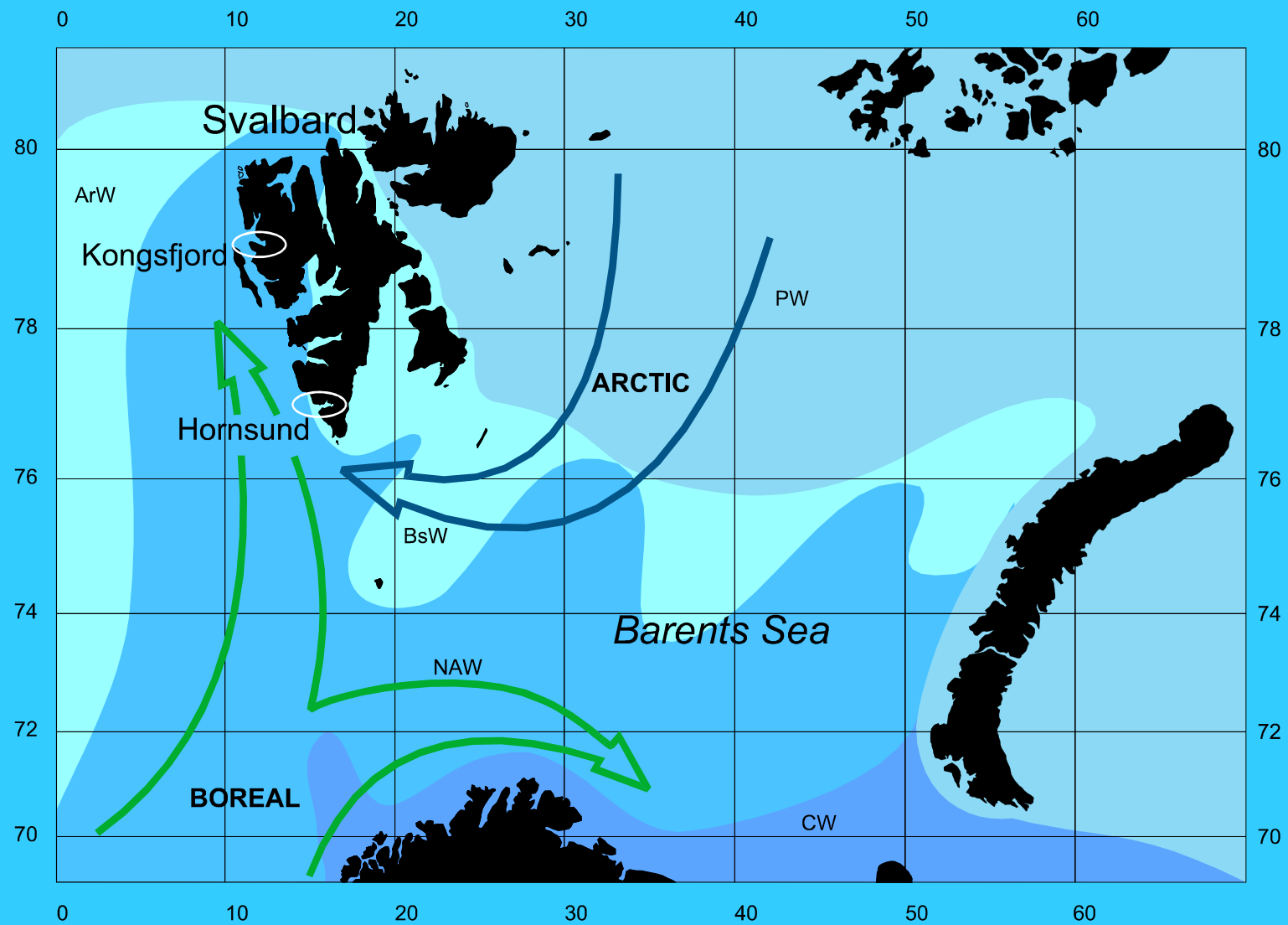
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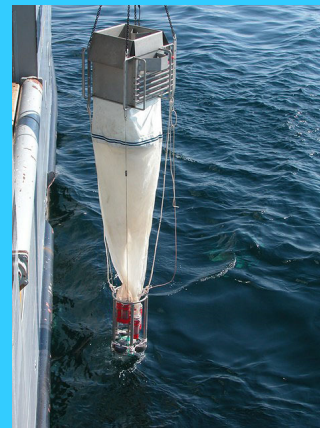
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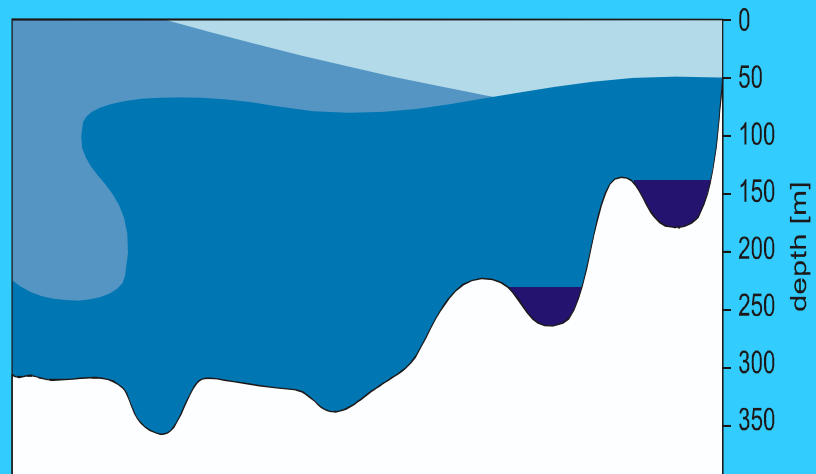


r/v OCEANIA - regular monitoring survey on zooplankton and macrobenthos in Kongsfjorden and Hornsund since 1996

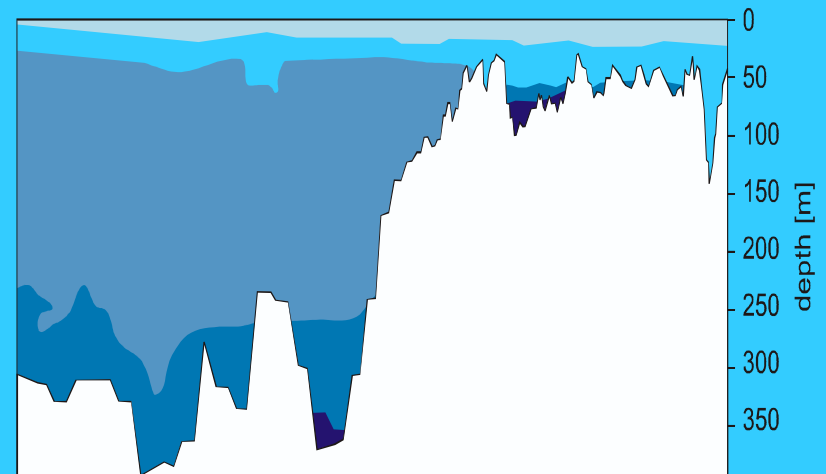


What we know

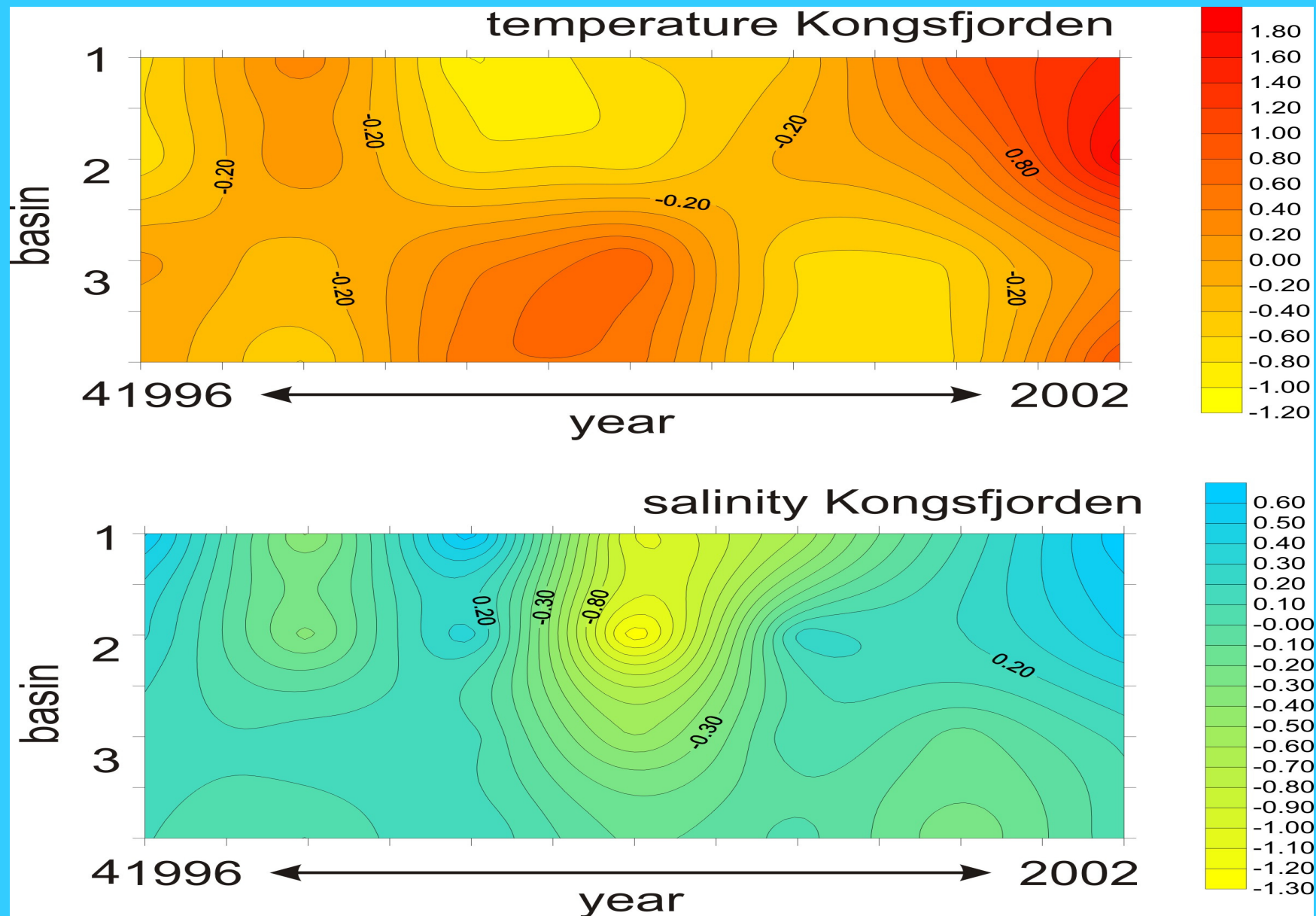
HORNSUND



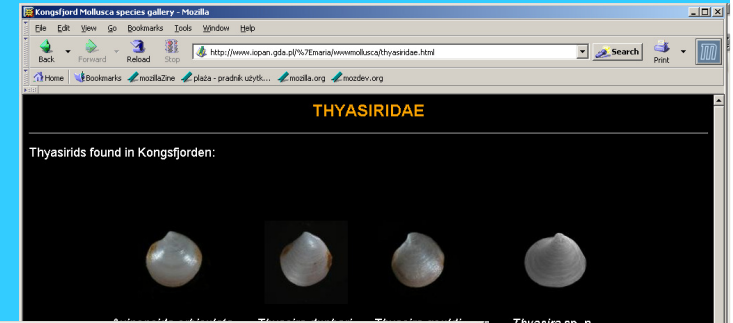
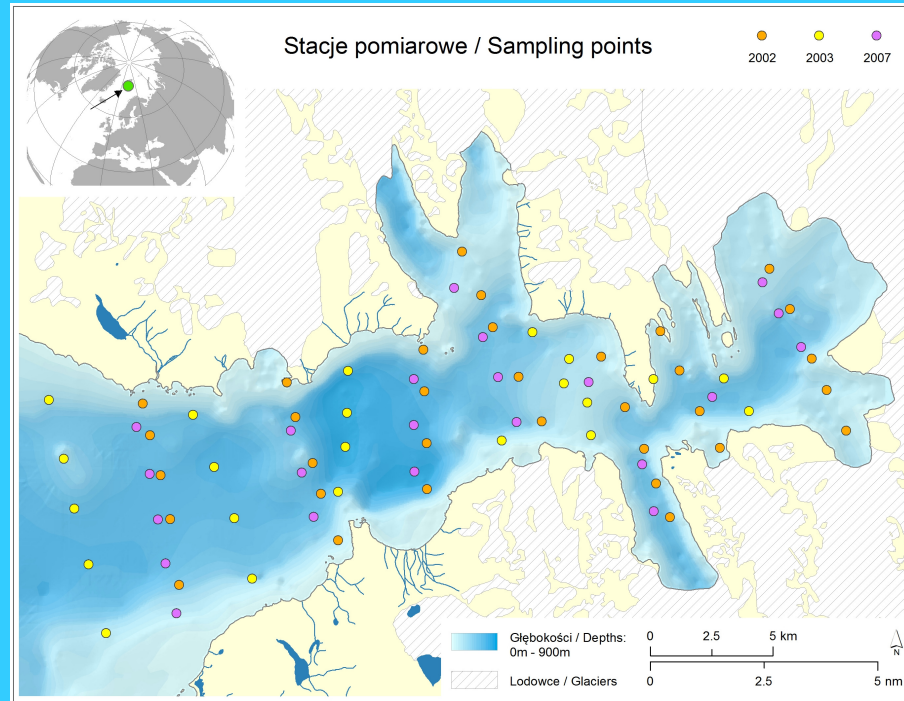
KONGSFJORDEN



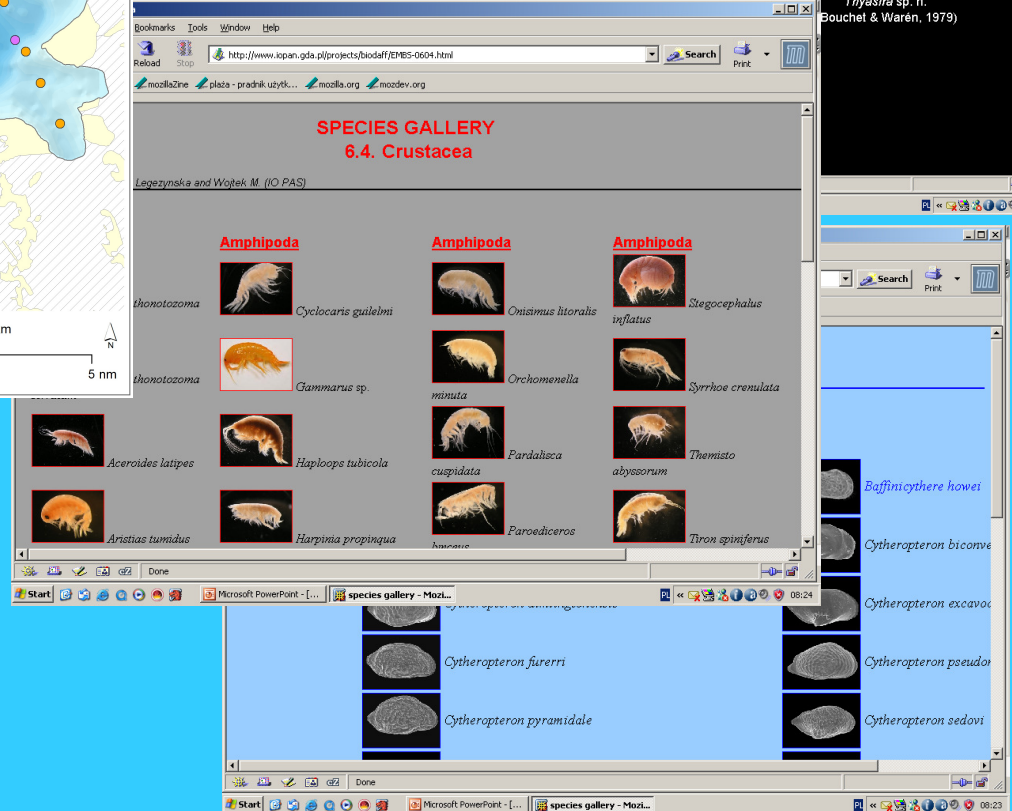
Near bottom temperature and salinity in Kongsfjorden (r/v OCEANIA)



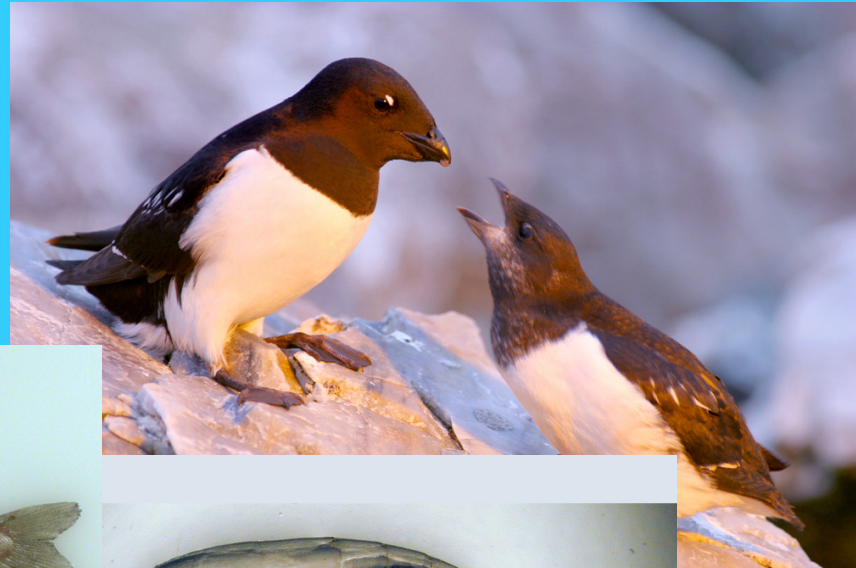
ATBI – All taxa biodiversity inventory



Thyasira sp. n.
Bouchet & Warén, 1979)



**Keystone species in both fjords
are the same**

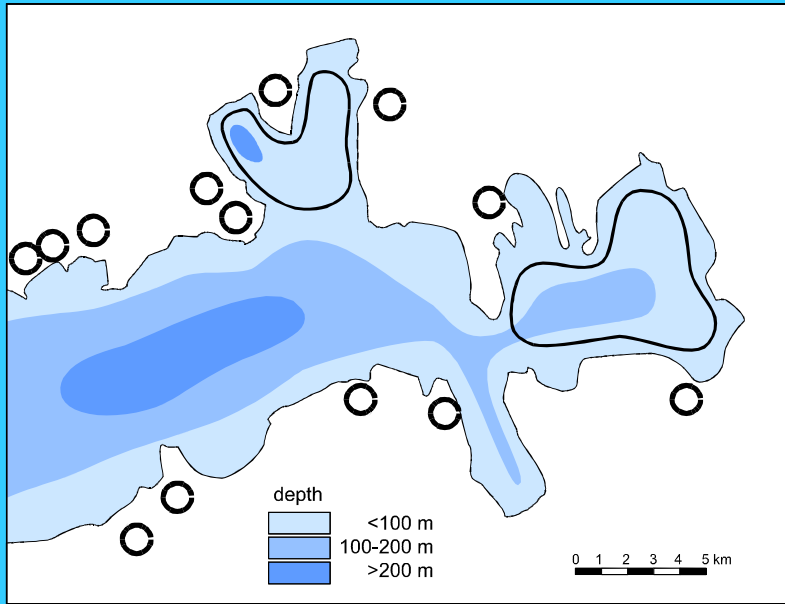


Sheiko

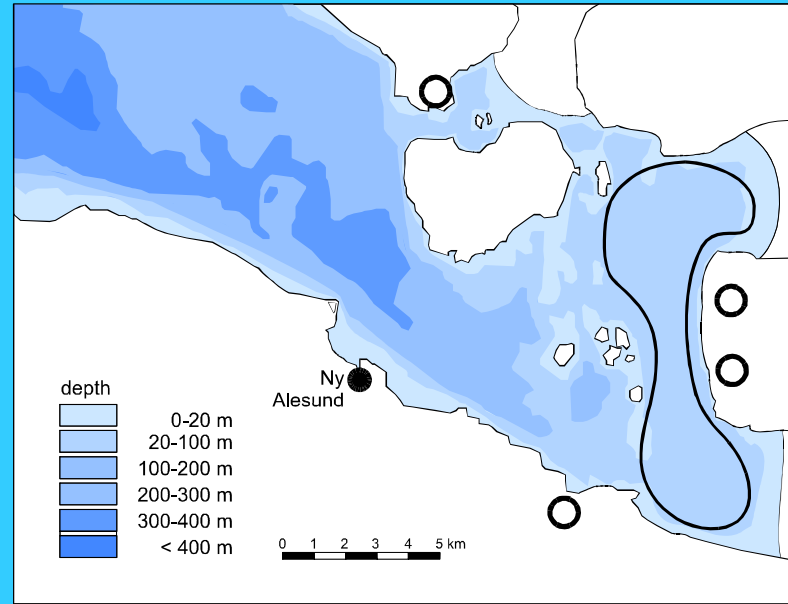


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Hornsund

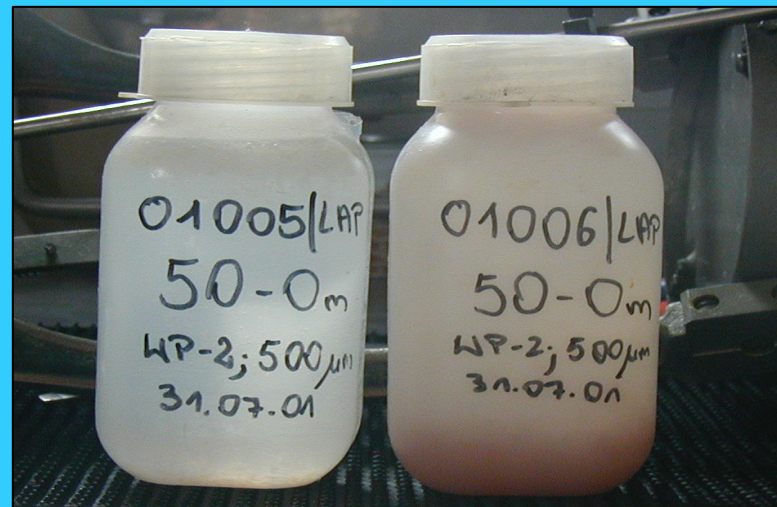


Kongsfjorden

 LARGE SEABIRDS COLONIES
 REGULAR OCCURENCE OF SEALS

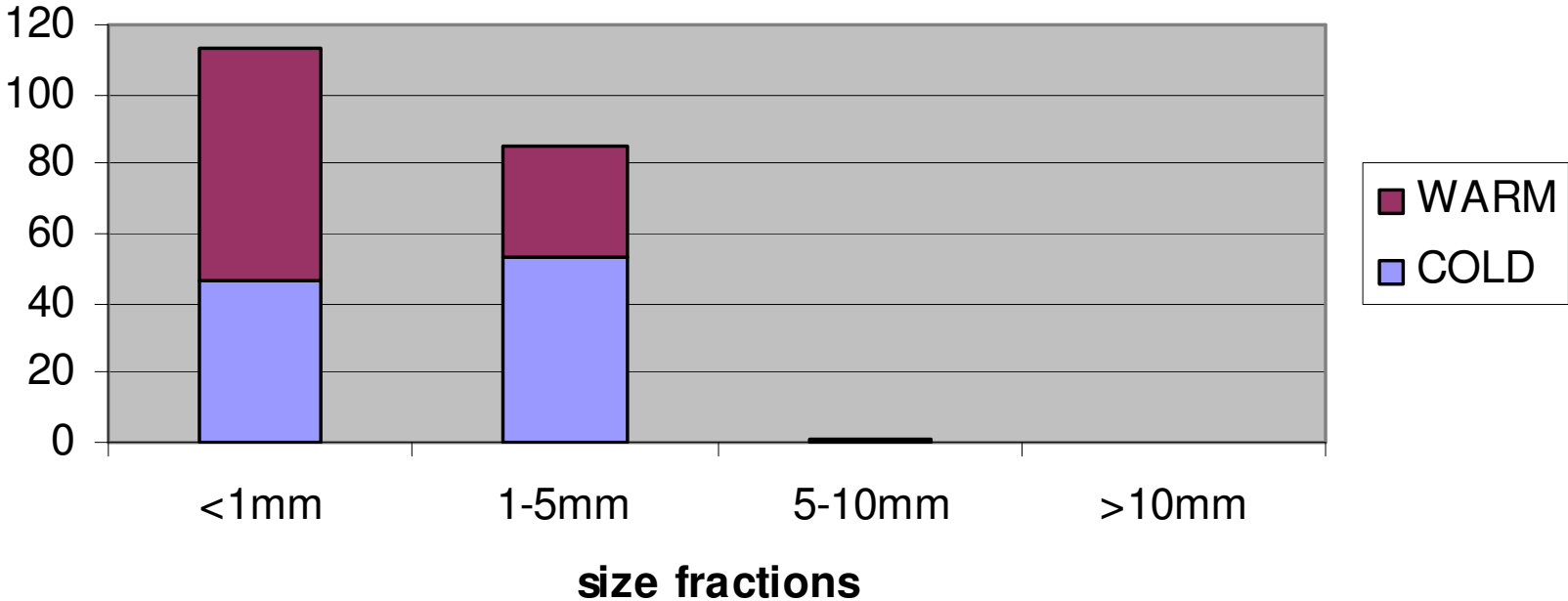
Large (eidible) zooplankters in Arctic and Atlantic waters off Hornsund

2.2 kJ/m³

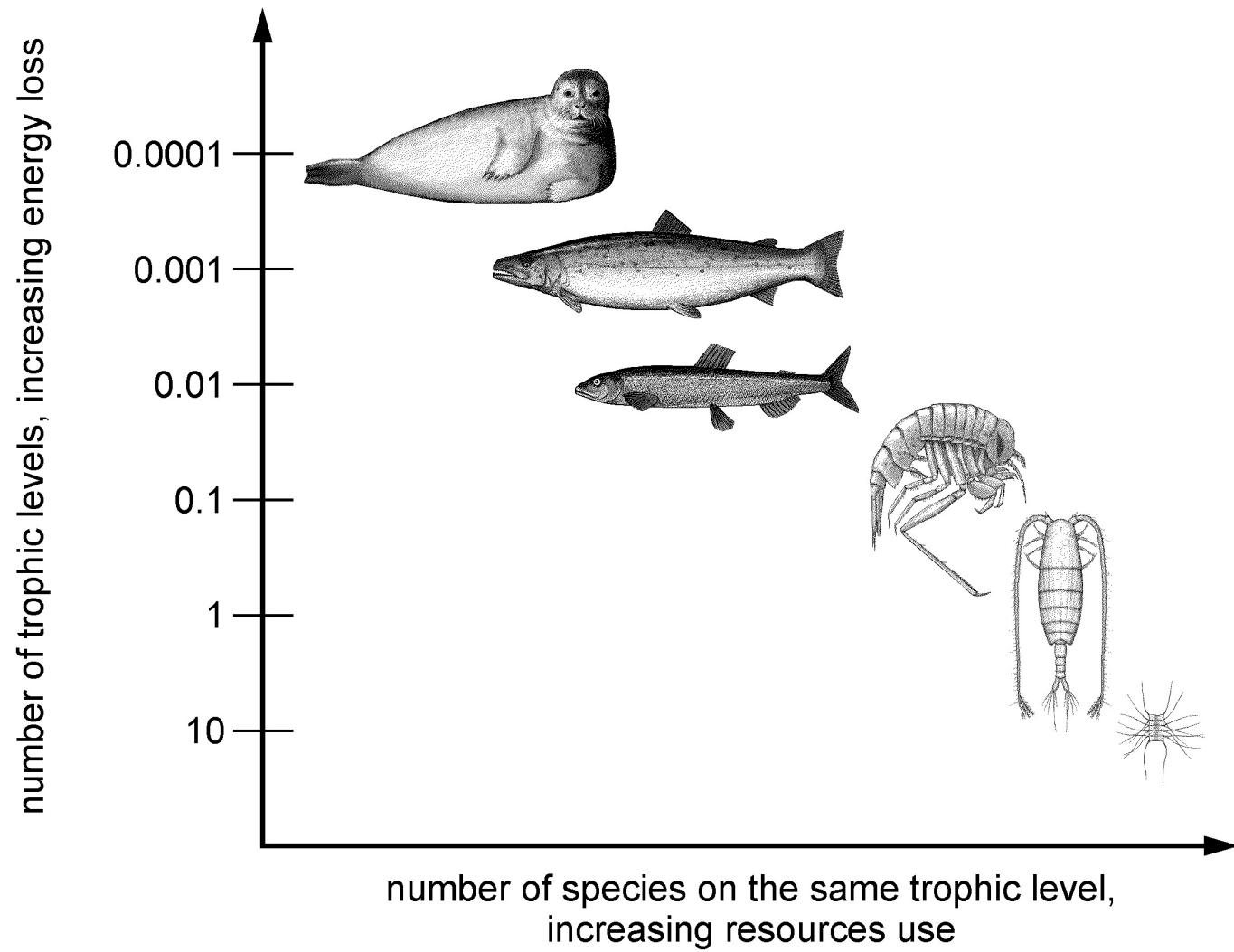


6.9 kJ/m³

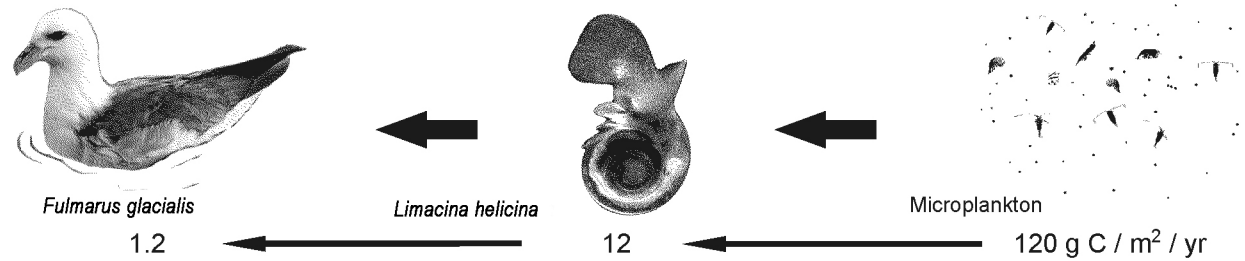
Percentage abundance of zooplankton in size classes



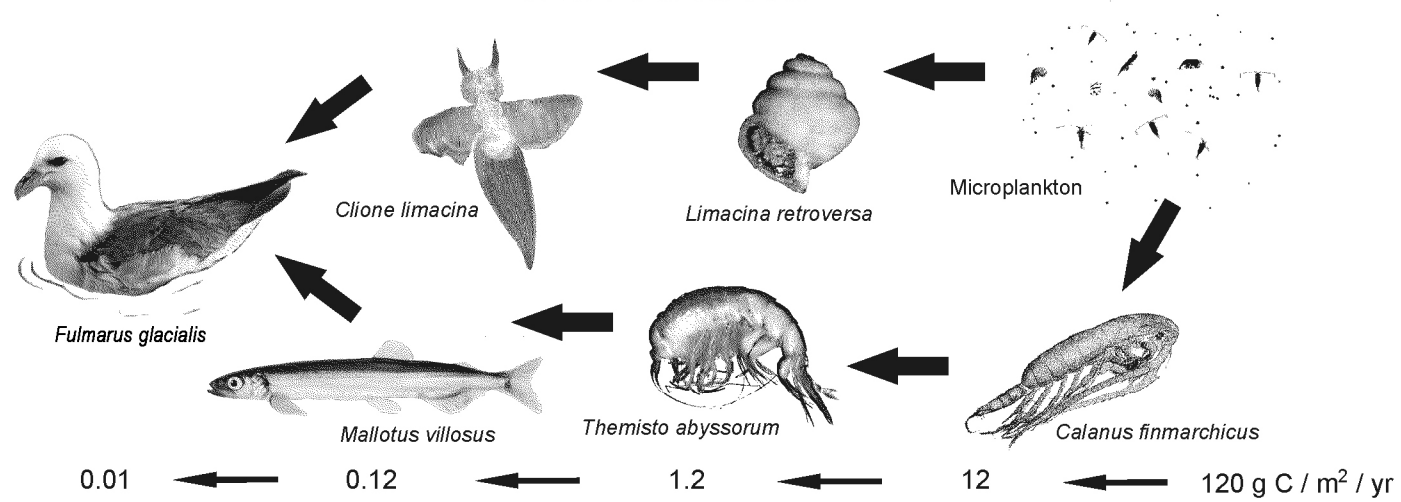
What we expect



ARCTIC



SUB-ARCTIC



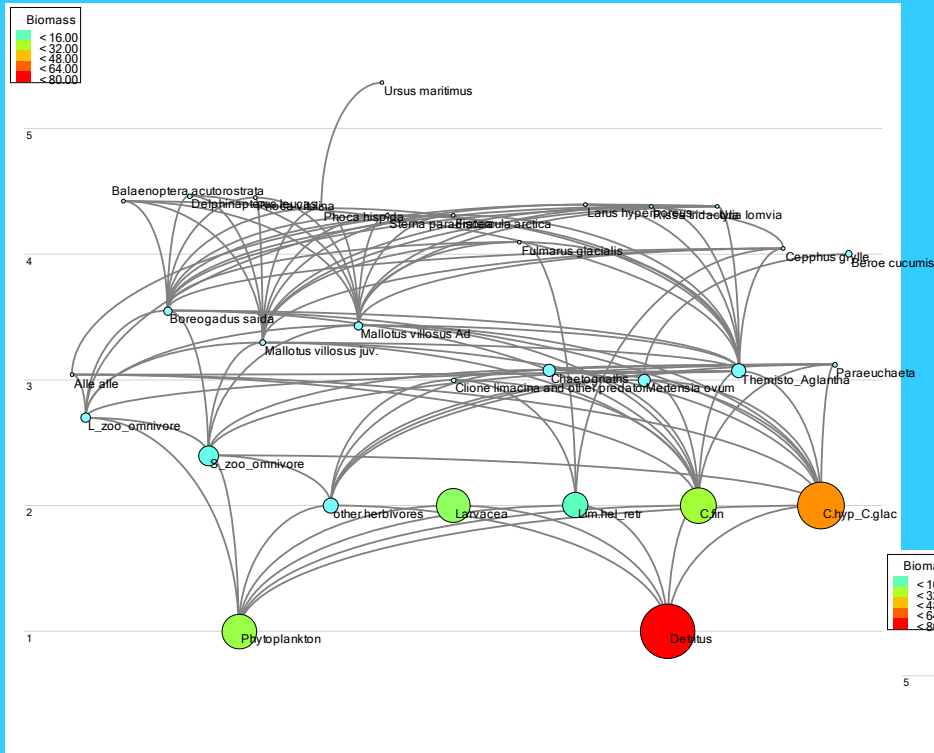
What we have modelled

ECOPATH - ECOSIM

- Christensen et al. 2004
- Considering Production, Biomass, Diet, Consumption
- Up to 33 compartments (analysed groups)

main group	species accounted
top predators	2
whales and seals	4
seabirds	6
pelagic fish	4
planktonic small predators	6
planktonic herbivores	4
planktonic omnivores	2
phytoplankton	4
detritus	1

Together 33 groups in the model



Kongsfjorden:

More species

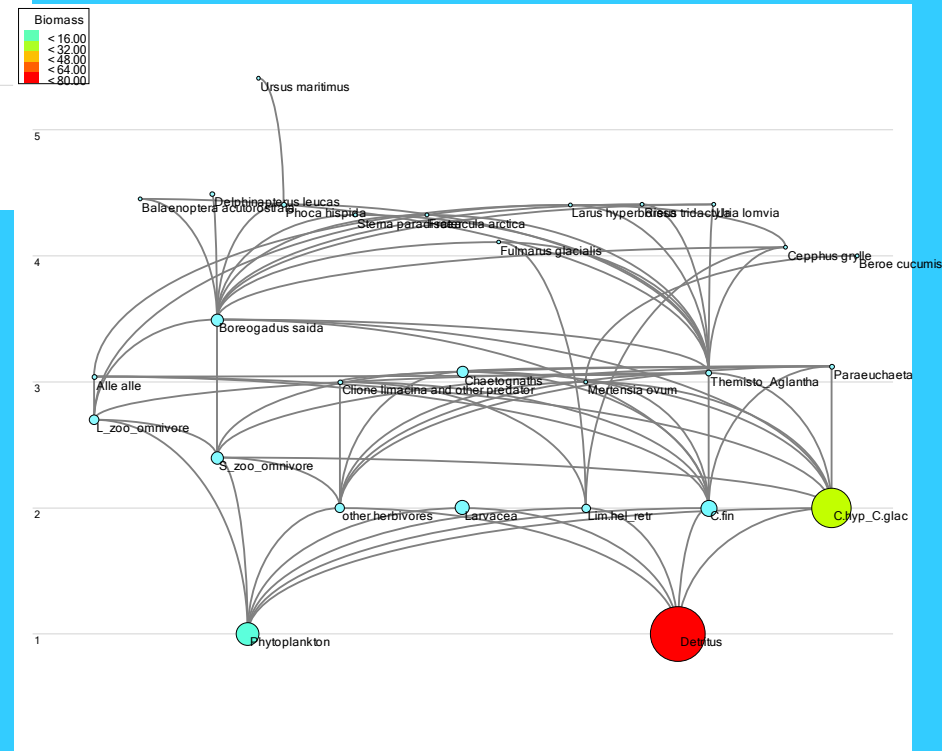
More complex network

Longer distance between trophic levels

Less advection required

Less energy to top predators ?

Higher stability ?



Hornsund:

Less species

Simpler network

Shorter distance between trophic levels

More advection required

More energy to top predators ?

Lower stability ?

Parameter	KGF	H	Units	
Total system throughput	3960	9268	t/km ² /ti me	indicates the size of the system flow
Calculated total net primary production	1232	4320	t/km ² /ti me	
Total primary production/total respiration	2	13	t/km ² /ti me	closer to 1 indicates maturity
Total primary production/total biomass	6	54	t/km ² /ti me	lower the rate in more mature system
Total biomass (excluding detritus)	193	80	t/km ²	
Proportion of total flow originating from detritus	0,29	0,46		higher in stressed, non matured systems
Transfer efficiencies between TL	11,1	12,4		mean for coastal water between 10 and 15%
Finn's cycling index (% of total throughput cycled)	5,05	0,63		indicates system integrity
Finn's mean path length	2,97	2,12	none	

What remains to be done

- Diet studies on lower trophic levels
- Share of the microbial loop
- More species to be included in the model

Far reaching conclusions

- In terms of energy flow the warming of the Arctic means the maturation of the system
- Warmed up coastal Arctic waters may easily be dominated by small (down to microbial loop) food web compartments
- Lack of ice need not to be beneficial to fishery...