The functional biology of krill *(Thysanoessa raschii)*

- with focus on its ecological role in a Greenlandic fjord

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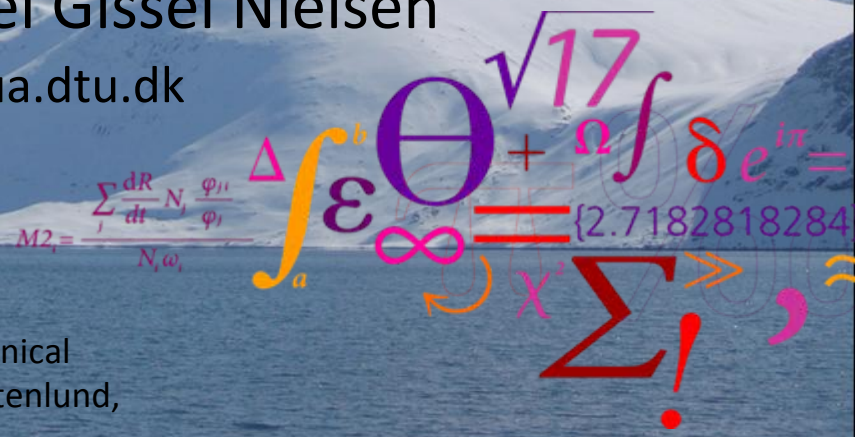
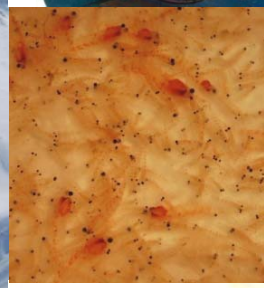


DTU Aqua, National Institute of Aquatic Resources, Technical University of Denmark, Kavalergaarden 6, 2920, Charlottenlund, Denmark.

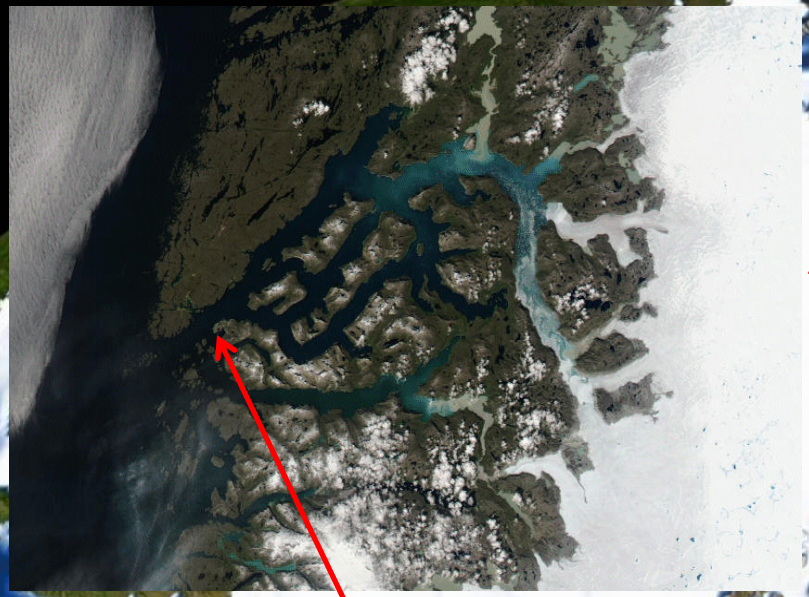
Outline

- Background – who, what, where?
- Aim
- Materials and methods
- Results
- Summary




Where?

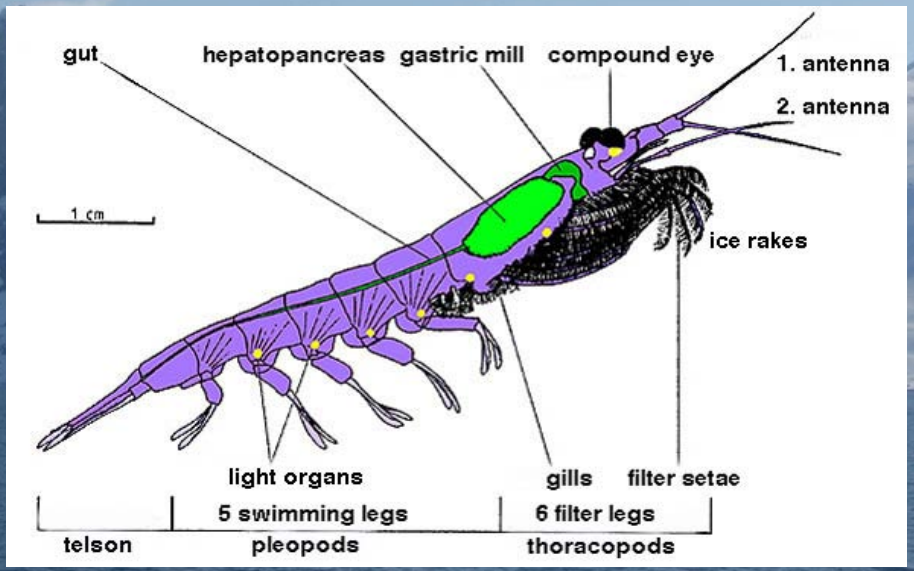


NASA

Krill - Euphausiids

- Large schools - patchy
- Pelagic living
- Diel vertical migration

Photo: Russ Hopcroft



http://upload.wikimedia.org/wikipedia/commons/b/bb/Krillanatomykils.jpg

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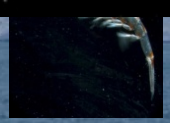
Krill in Western Greenland

- 4 species
  - *Thysanoessa raschii*

Meganyctiphanes norvegica

Thysanoessa inermis

Thysanoessa raschii



Thysanoessa longicaudata

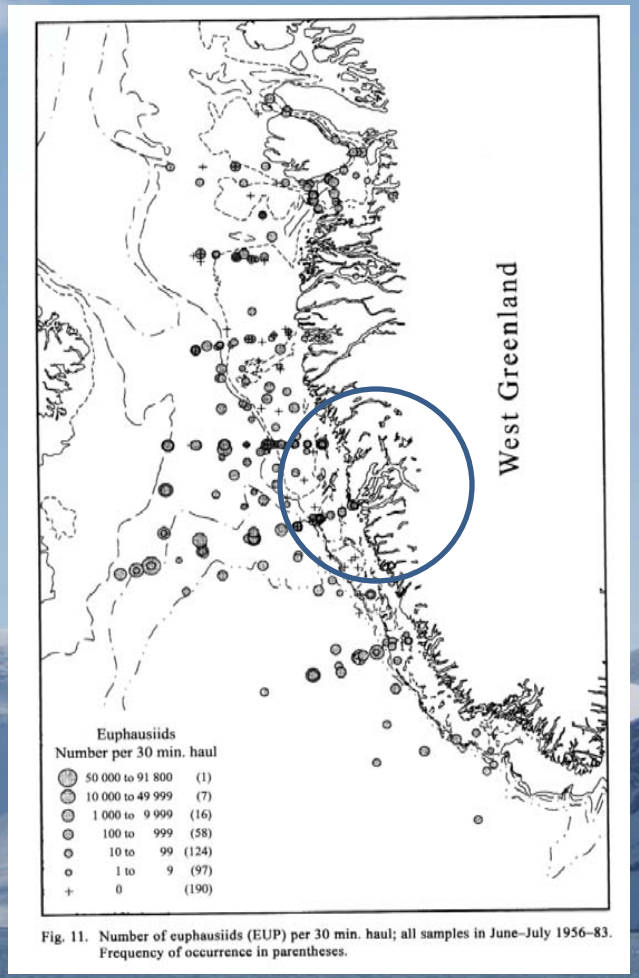


Fig. 11. Number of euphausiids (EUP) per 30 min. haul; all samples in June–July 1956–83. Frequency of occurrence in parentheses.

Pedersen & Smidt 2000

Photos: Russ Hopcroft

The food web

- Arctic krill not so well studied compared to Antarktic krill
- Key role
- Knowledge is crucial in understanding ecosystem dynamics

Phytoplankton
Microplankton
Copepods
Detritus

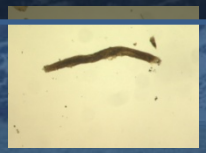


Photo: Thomas Juul Pedersen

Faecal pellets can sink hundreds of meters a day

Transport of carbon





Aim

To gain knowledge on the functional biology of this species

To study the trophic role of krill in the Arctic food web

Combination of field work and lab experiments

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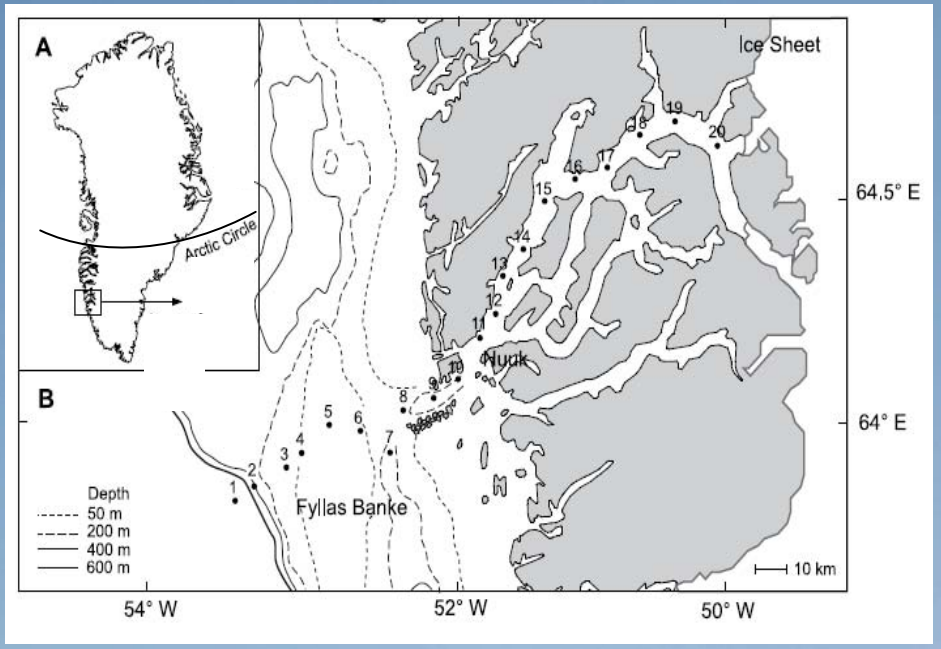
In the field

ECOGREEN cruise - july/august 2008

- Hydrography - CTD
- Biomass data
- Difference in abundance of krill offshore and inside the fjord?
- Krill vs. other zooplankton groups



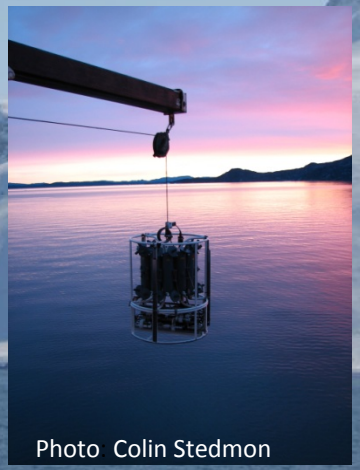
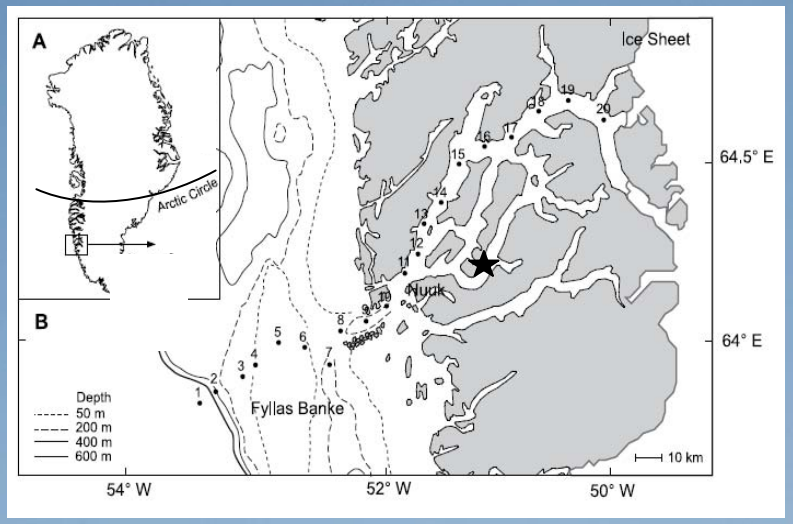


Photo Colin Stedmon

Laboratory



- Capture of krill in the fjord
- Grazing experiments
  1) Prey size spectrum experiment
  2) Functional response

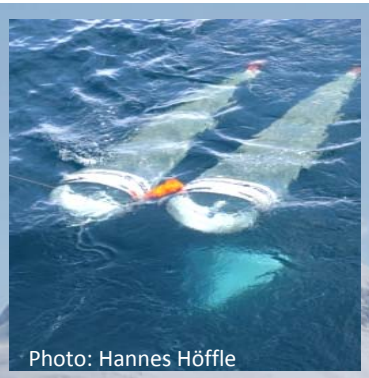


Photo: Hannes Höffle

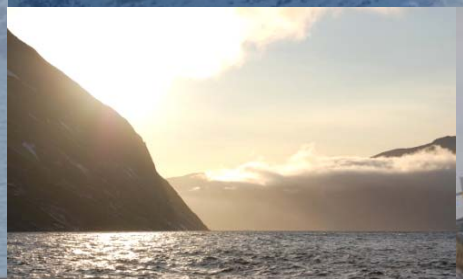


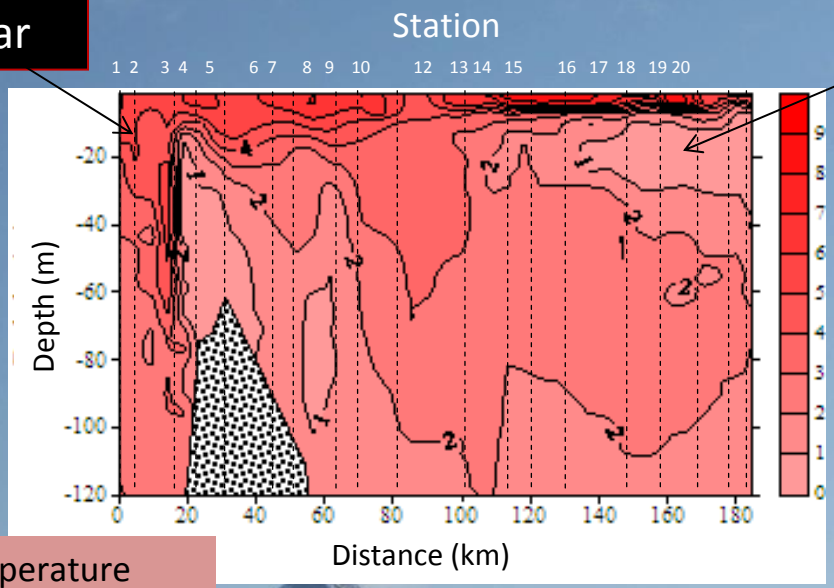

Photo: Russ Hopcroft

Results

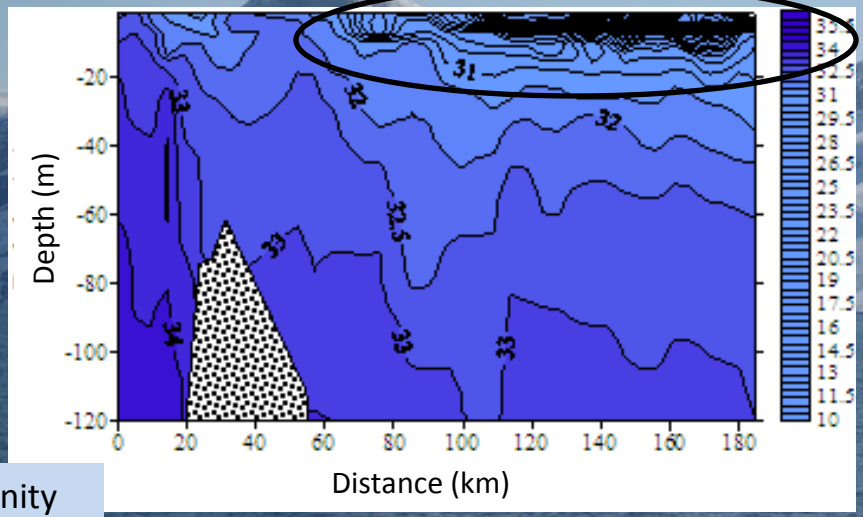
Hydrography – july/august 2008

War m

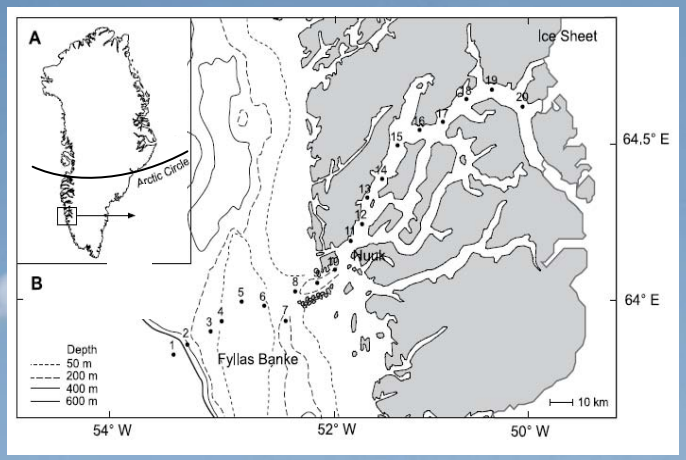
Cold

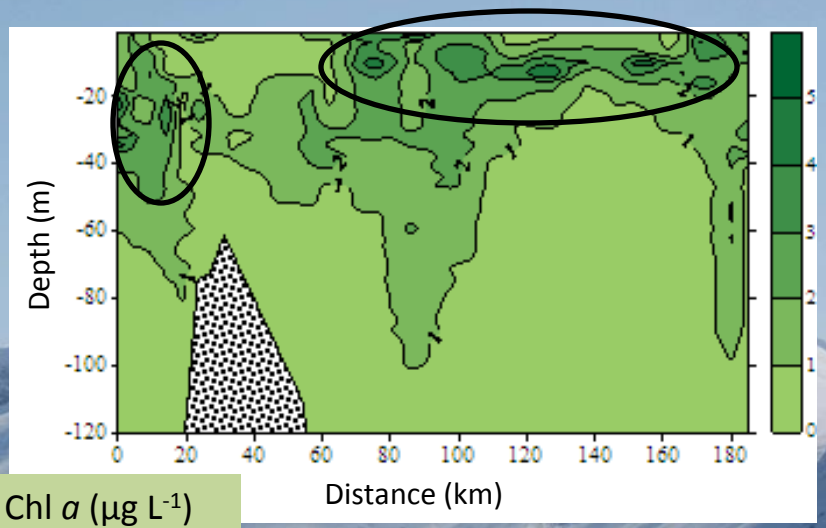


Temperature (°C)



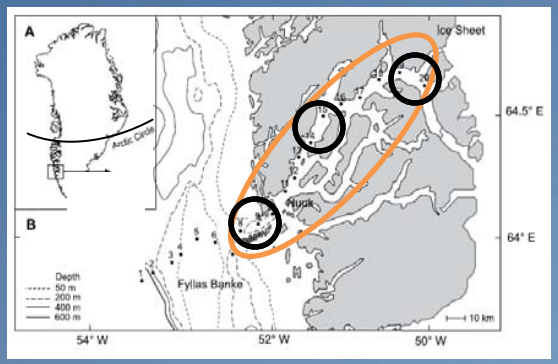
Salinity



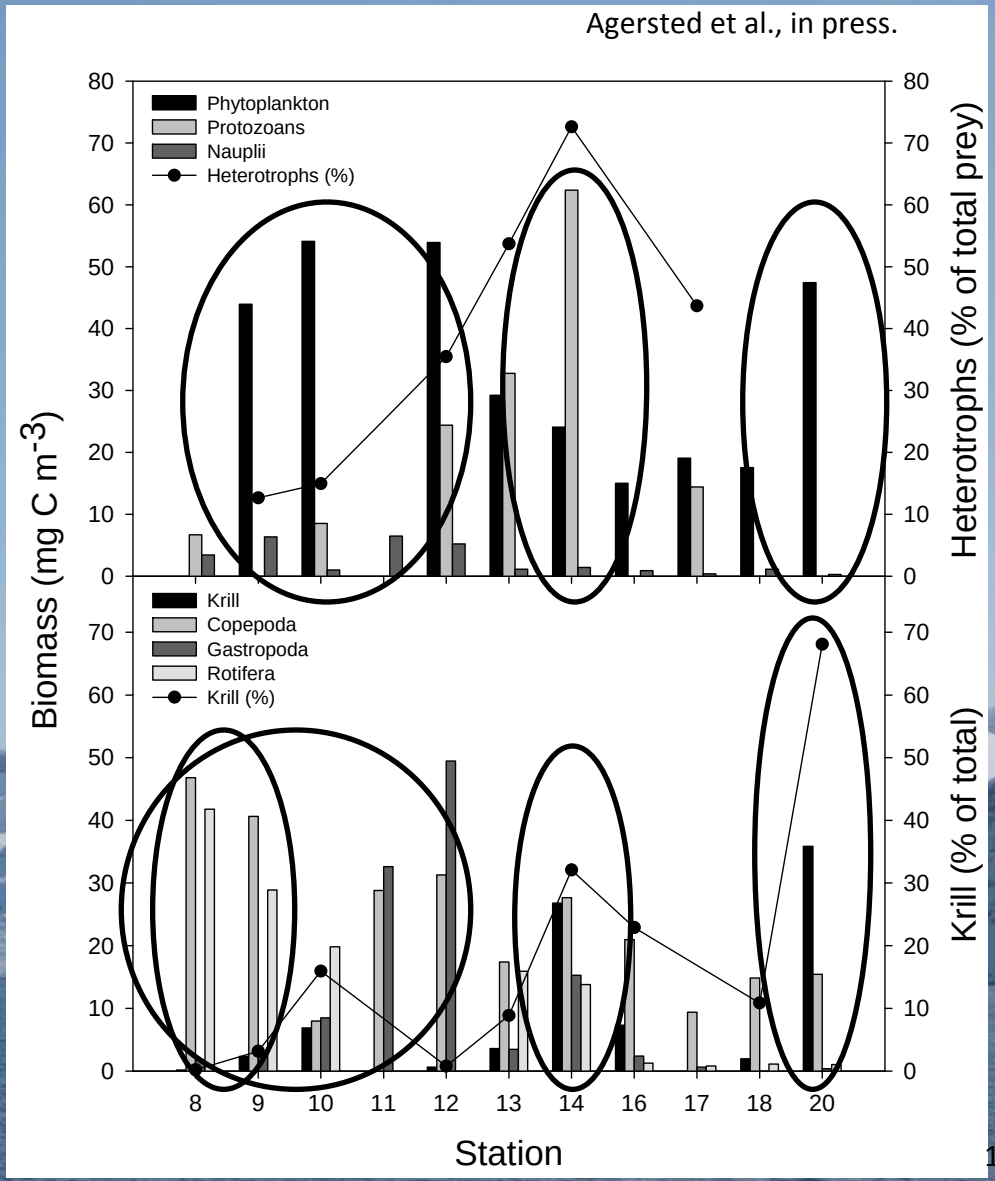


Chl *a* (µg L^{-1})

Biomass of predators and prey – july/aug. 2008



- Phytoplankton biomass largest near the fjord entrance and inner fjord
- Heterotrophs dominates in the middle fjord
- Copepods were the dominating zooplankton group
- Krill dominates in the inner fjord



Prey size spectrum experiment

Thysanoessa raschii

http://bioloc.coas.oregonstate.edu/SherrLab/GLOBEC.html

http://portal.nfrdi.re.kr/sp/saf/rts/webpage/movie/movie_01_10.jsp

http://microbes.limnology.wisc.edu/outreach/majorgroups.php

Foto: Signe Jung-Madsen

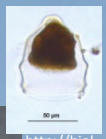
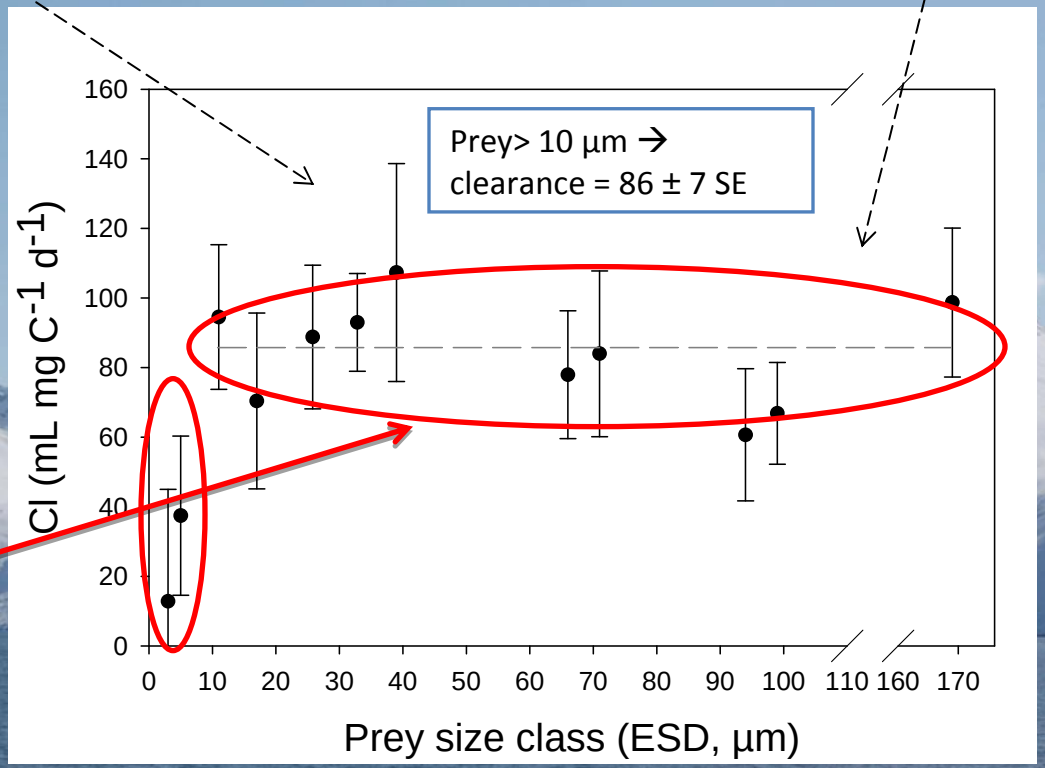


Foto: Sigrún Jónasdóttir

http://bioloc.coas.oregonstate.edu

- Grazing on all organisms from 5-400 µm
- Mainly prey >10 µm

Clearance rate

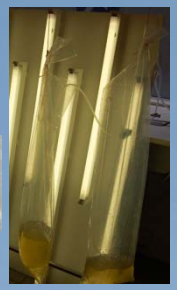


Agersted et al., in press.

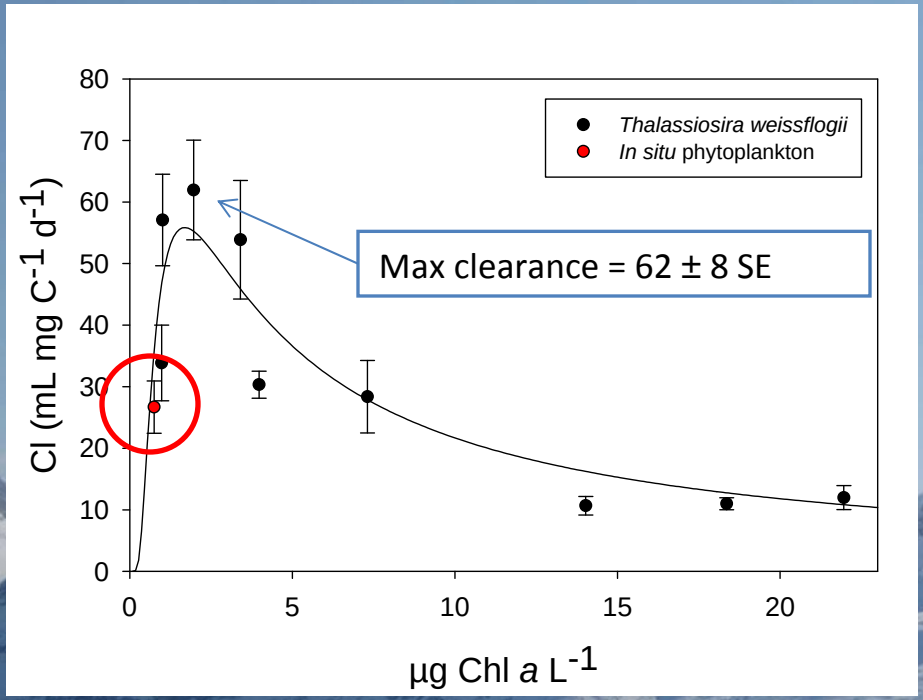
Thysanoessa raschii

Functional response

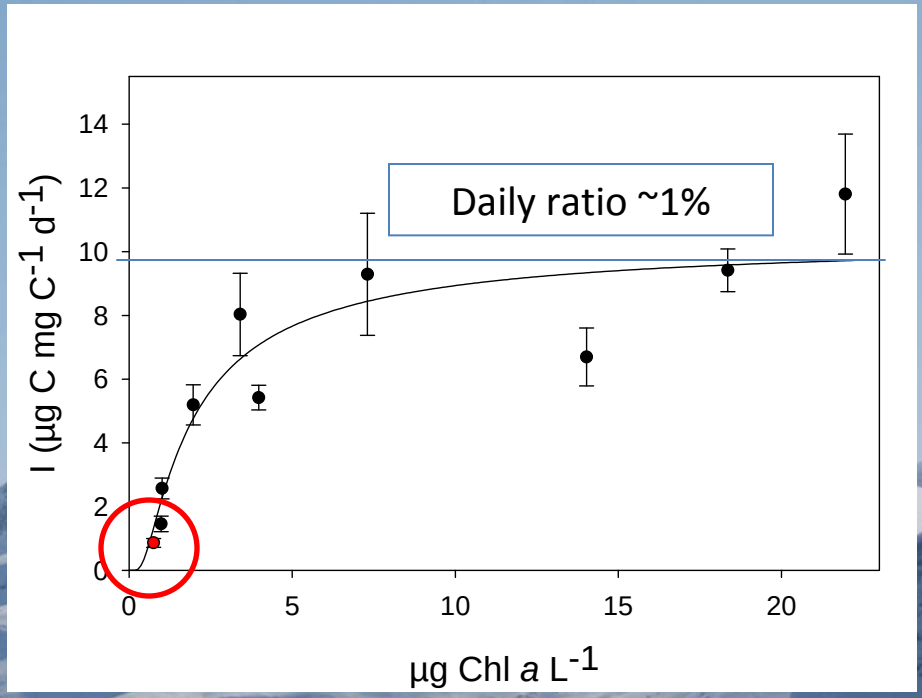
Thalassiosira weissflogii



Clearance rate



Ingestion rate

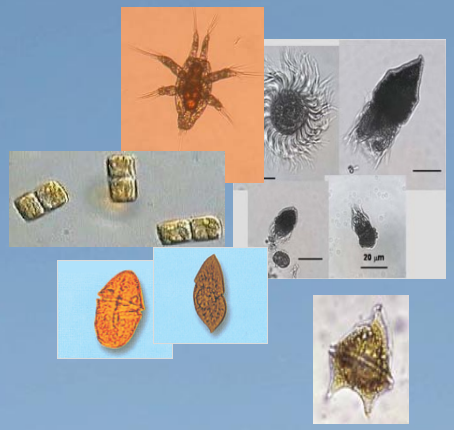


Agersted et al., in press

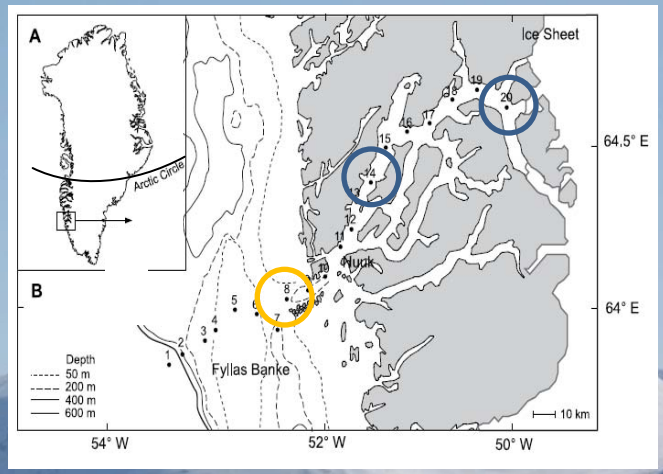
Model → Type III

Photo: Russ Hopcroft

Grazing in the fjord



Station	Mean temperature ± SD (°C)	Phytoplankton carbon % grazed d^{-1}	Protozooplankton carbon % grazed d^{-1}	Nauplii spp. carbon % grazed d^{-1}
8[1]	-	-	0.001	0.001
9	2.9 ± 1.1	0.007	-	0.021
10	3.1 ± 0.7	0.019	0.062	0.062
11	-	-	-	-
12	2.9 ± 08	0.002	0.006	0.006
13	2.4 ± 0.7	0.010	0.031	0.031
14	2.5 ± 1.1	0.073	0.231	0.231
16	2.3 ± 1.2	0.020	-	0.062
17	2.2 ± 1.1	-	-	-
18	2.0 ± 1.3	0.005	-	0.016
19	1.8 ± 0.9	-	-	-
20	1.7 ± 0.6	0.092	-	0.294
Alle (st. 9-20)	2.4 ± 1.1	-	-	-



Agersted et al., in press.





Summary

- Krill are able to graze on planktonic organisms that covers several trophic levels
- Krill did not have a significant grazing impact on the plankton populations
- An insight into the functional biology of *T. raschii*





Thank you

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Kam Tang and Thomas Kiørboe
Torkel Gissel Nielsen

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Agersted, M. D., Nielsen, T. G., Munk, P., Vismann, B. and Arendt, K. E. (in press). The functional biology and trophic role of krill *(Thysanoessa raschii)* in a Greenlandic fjord. Marine Biology

Boyd CM, Heyraud M, Boyd CN (1984) Feeding of the Antarctic krill *Euphausia superba*. Journal of Crustacean Biology 14: 123-141

Pedersen and Smidt (2000). Zooplankton Distribution and Abundance in West Greenland Water, 1950-1984. Journal of Northwest Atlantic Fishery Science, 26: 045-102

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