Particle-colonising copepods in the subarctic food webs: Feeding and reproduction of *Microsetella norvegica* and *Triconia* spp. in the North Atlantic

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Photo: Christian Lindemann

Why particle-colonising copepods?

- **Important for the efficiency of the *biological pump (*Alldredge 1972; Green & Dagg 1997*)*? Feeding on marine snow**

- ***Food-web and climate change* (Turner 2004; Kosobokova; Svensen..): Dominating during the sub-arctic summer? Increasing with the climate change?**

- **Particle-coloniser *ecology* (Uye et al. 2002): Extremely abundant, but with low growth and reproduction rates? Low mortality? One globally distributed species (*Microsetella*) vs. many species with narrow distribution (*Oncaea* / *Triconia*)?**



Hypothesis

Particle-colonising copepods in sub-arctic:

1) Have biomass peak in summer

2) Have vertical distribution peak in pychnocline

3) Profit from high temperature

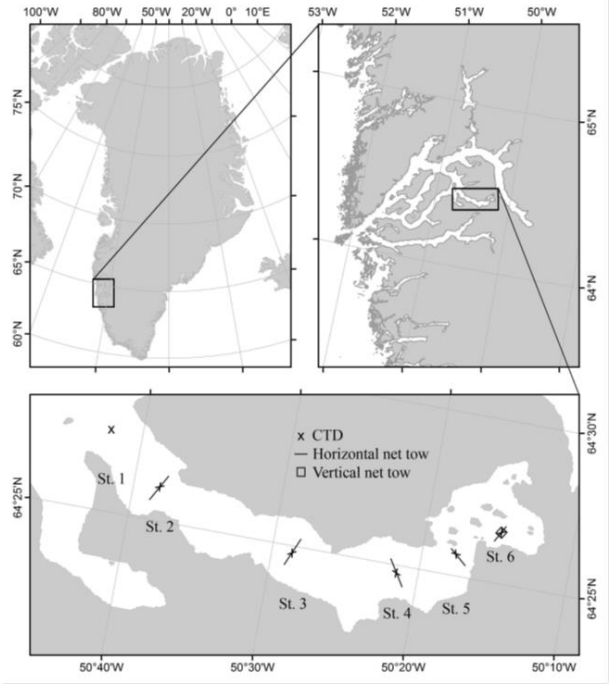
4) Are not limited by food

→ Increasing temperature would decrease the efficiency of the biological pump by promoting species specialised on degradation of marine snow particles

Methods

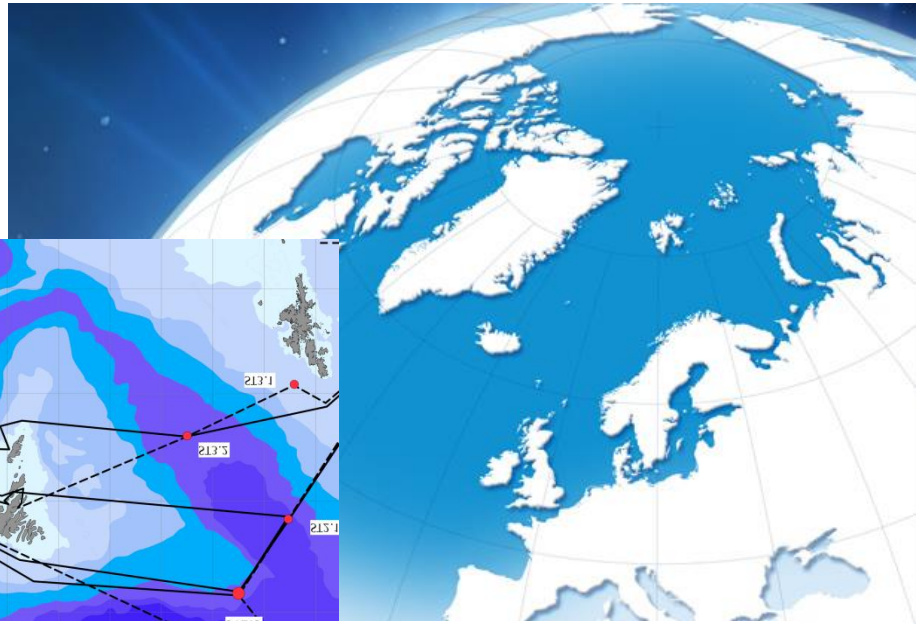
Weekly sampling in Kapisigdlit (SW Greenland)

- March-August
- 5 depths
- Multinet Mini
- CTD, Chl-*a*
- 4 Stations



4 weeks cruise in North Atlantic (Faroese)

- April; 1-3 visits per station
- 5 depths
- Multinet Midi
- CTD, Chl-*a*
- 3 Stations



Abundance, stage distribution, body size, egg production, vertical distribution

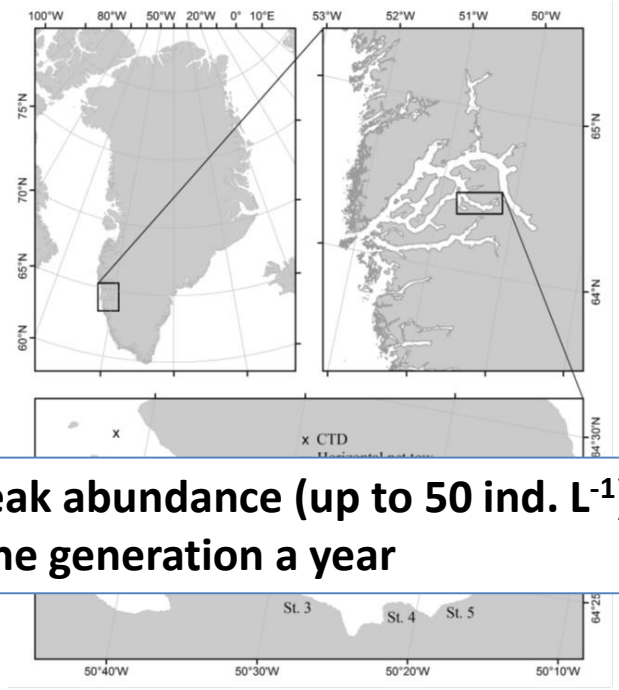
Laboratory experiments

- 3-5 types of marine snow particles
- 3 species of particle-colonising copeods
- 5 marine snow concentrations
- Pellet production as a index of feeding

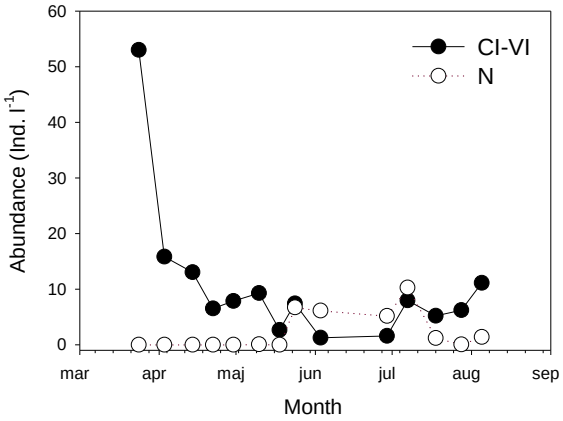
→ Functional response of feeding (encounter rate, handling time and maximum feeding rate) on different marine snow types

Results: Seasonal distribution

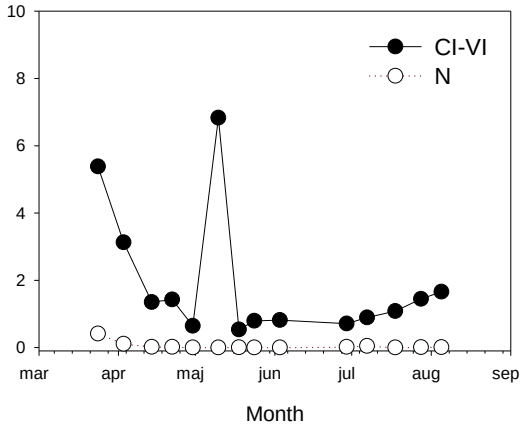
SW Greenland (Kapisigdlit)



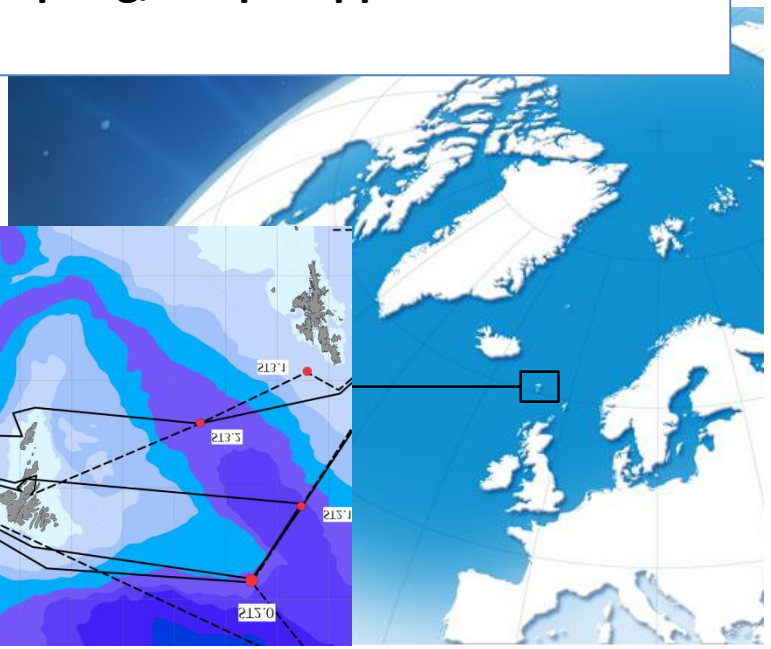
Microsetella norvegica



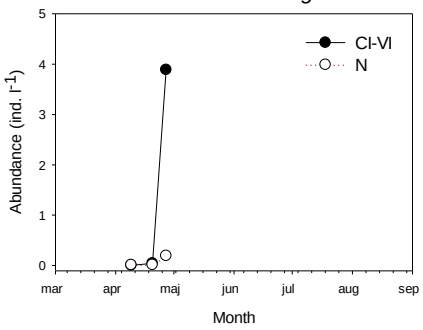
Triconia spp.



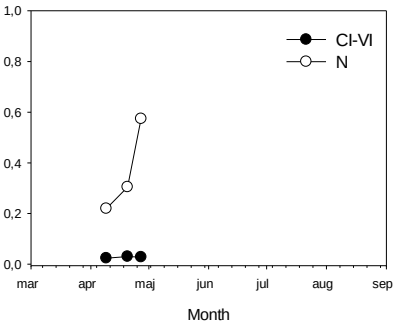
Peak abundance (up to 50 ind. L^{-1}) of females in early spring, nauplii appear in summer. One generation a year



Microsetella norvegica

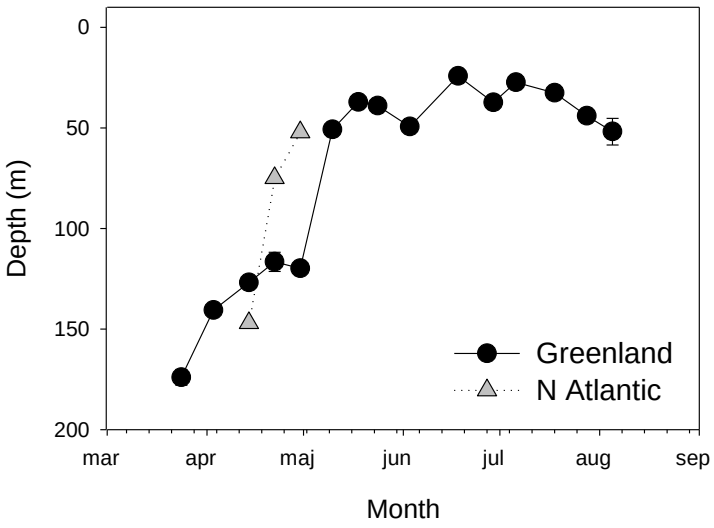


Oncaea spp. / *Triconia* spp.

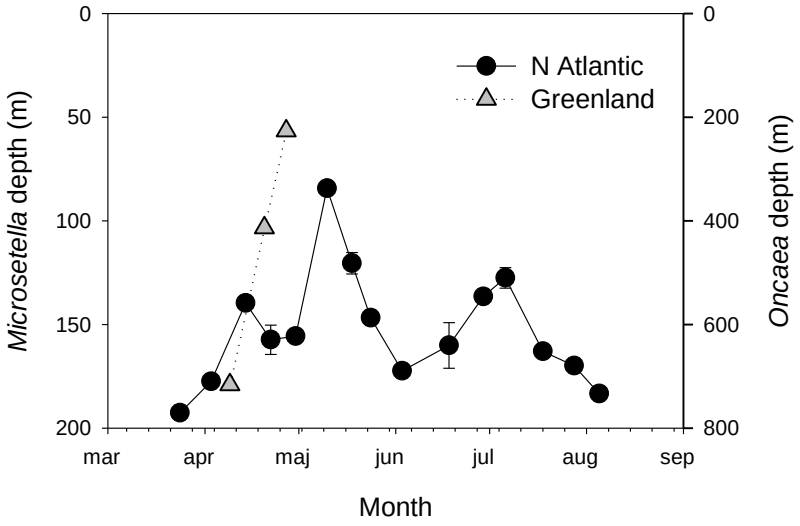


Results: Vertical distribution

Microsetella norvegica

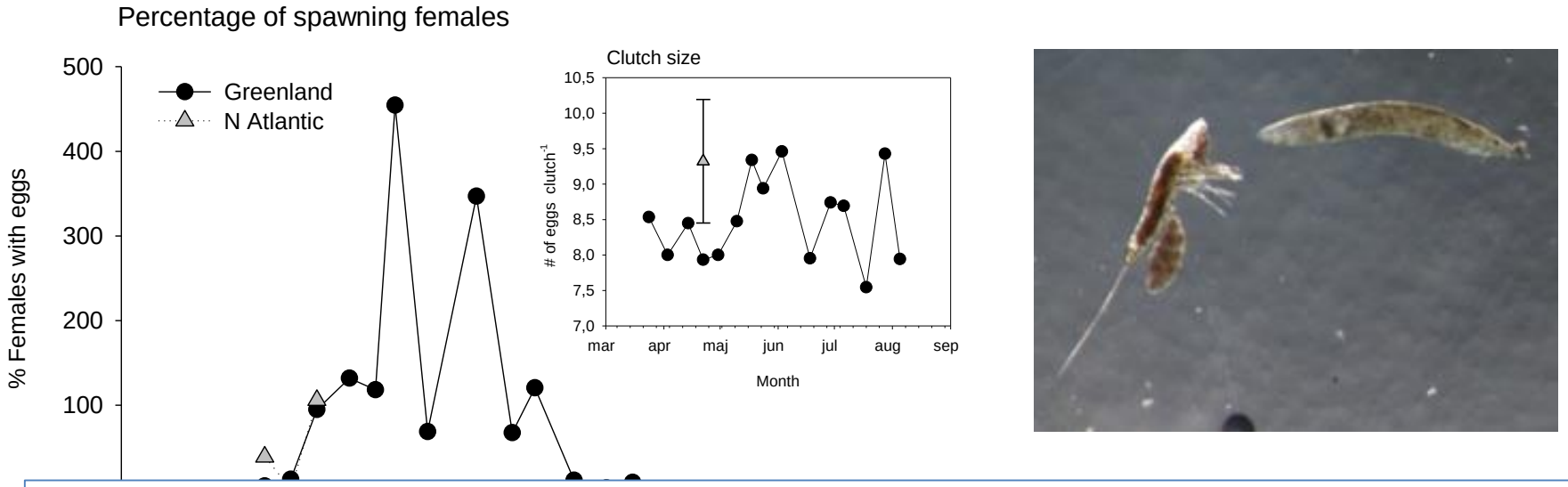


Triconia spp. / *Oncaea* spp.

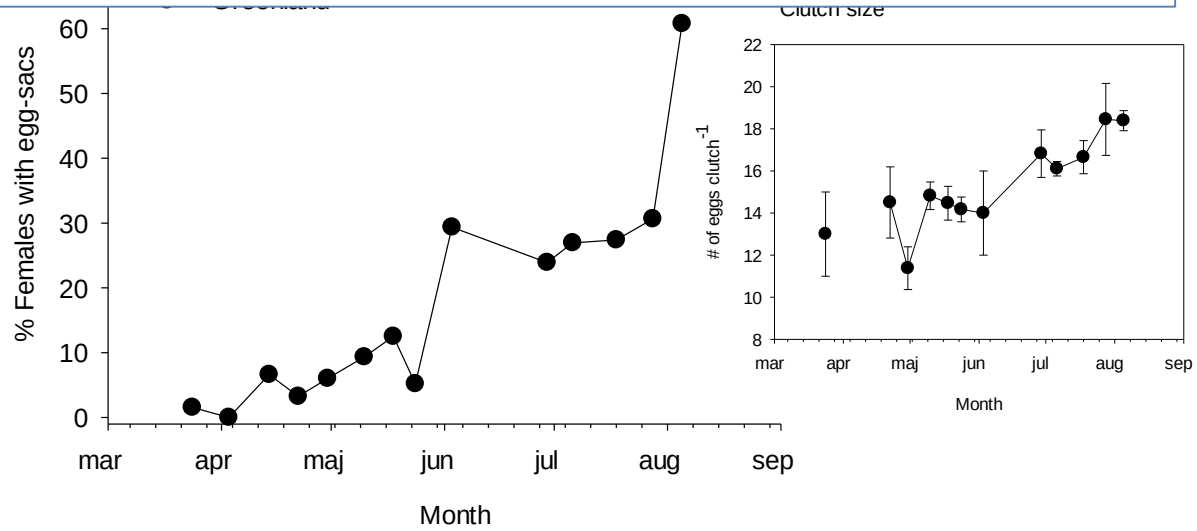


***Microsetella* females ascend to the surface layer in spring, *Triconia* stays deeper**

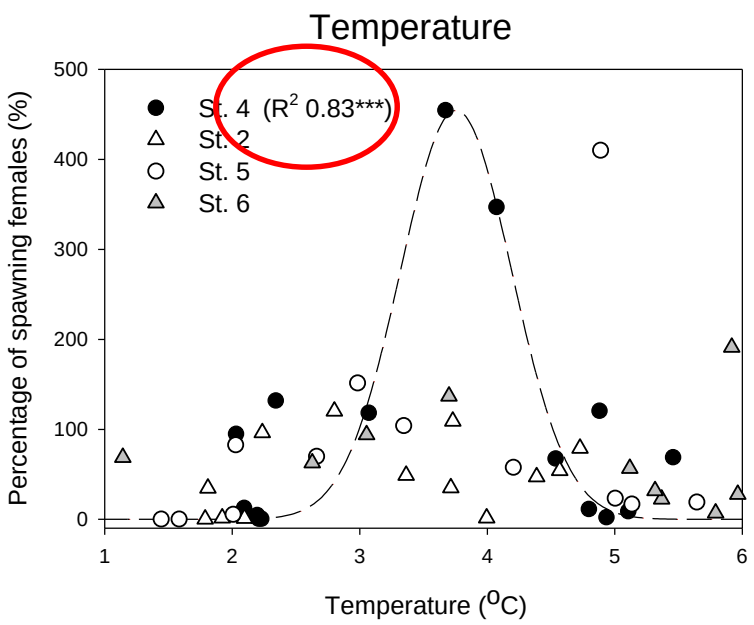
Results: Reproduction

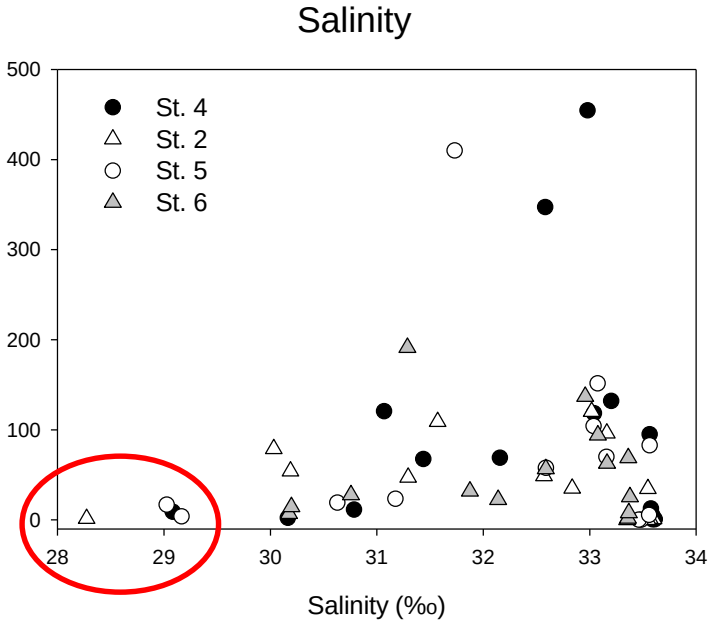


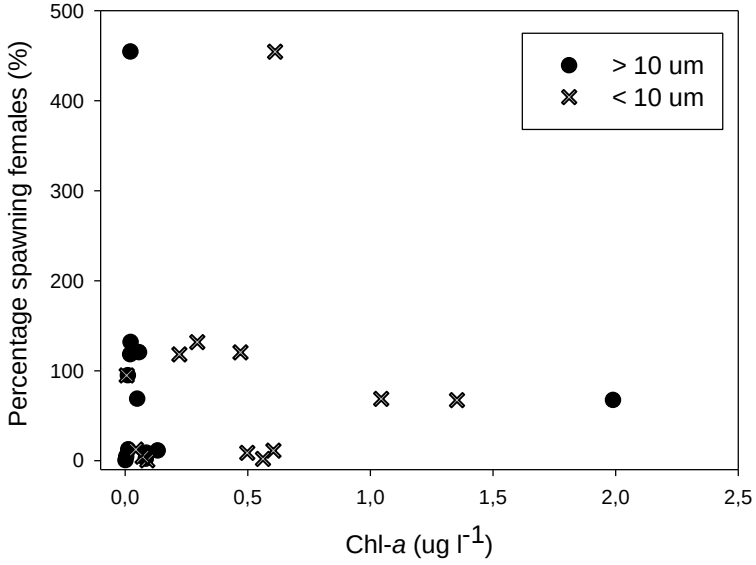
Peak reproduction of *Microsetella* in mid summer, *Triconia* in late summer
High reproduction – up to 20 eggs f^{-1} d^{-1}
More egg-sacs than females – high EP due to high number of spawning females rather than a high number of eggs per clutch



Results: Effect of the environment



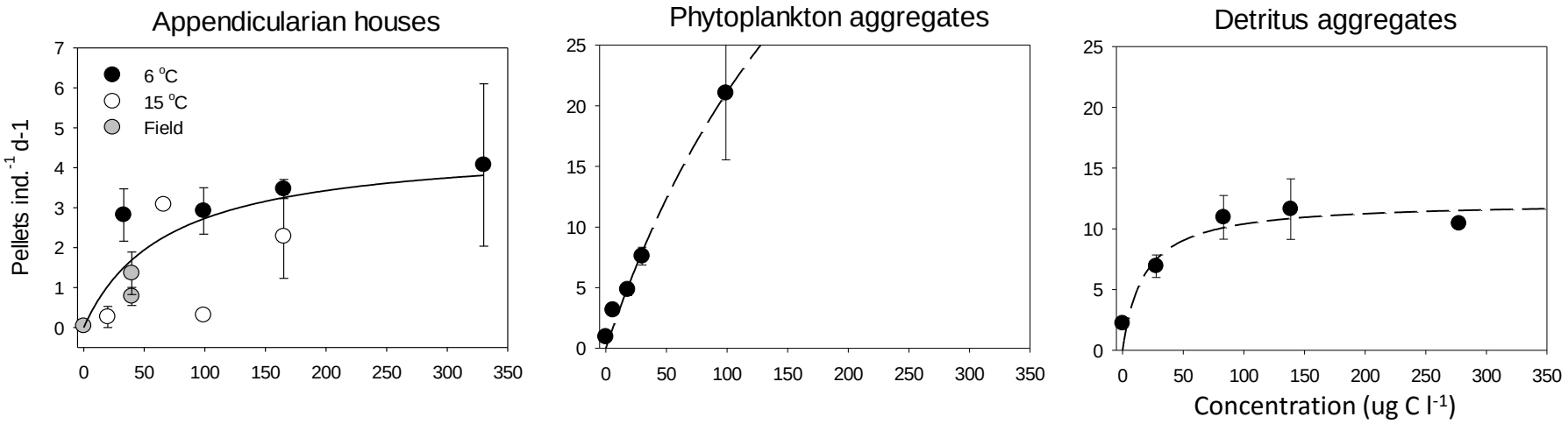




Temperature optima around 4 °C?
Salinity threshold around 30 ‰?
No connection to Chl-*a*

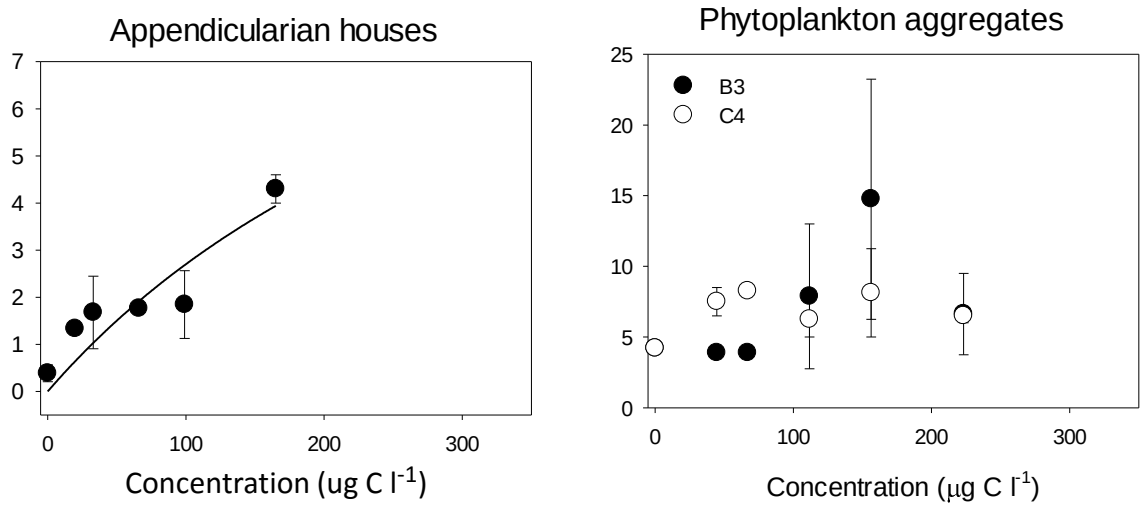
Results: Functional response of feeding

Microsetella norvegica

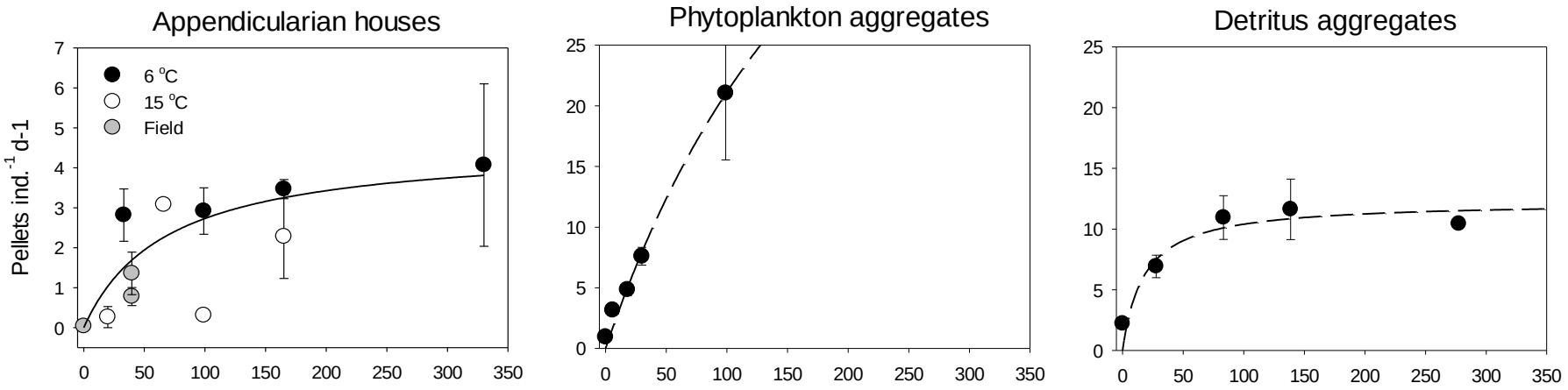


Slopes and saturation differ between aggregate types

Oncaea spp.



Results: Functional response of feeding



Copepod	Aggregate	β (l d^{-1})	T (d)	I (µg C $ind.^{-1}$ d^{-1})
M. norvegica	Houses	0.0001	43.5	0.023
	Algae	0.002	2.8	0.36
	Detritus	0.002	22.2	0.045

10-fold difference in encountering and handling of marine snow depending on aggregate type – (only) algal aggregates can be fed on efficiently

Conclusions

- *Microsetella* females ascend to the surface waters in spring, and reproduce over summer at a high rate

- Reproduction is not controlled by temperature or salinity, although the population in Greenlandic fjords might have a temperature optimum around 4 °C and need a salinity above 30 ‰

- Feeding rates are highly variable depending on aggregate type: Reproduction might be most successful on algal aggregates

→ *Microsetella* might resemble *Calanus* in population dynamics and dependency on the spring bloom (rather than be the summer alternative)

→ *Microsetella* is unlikely to profit from increasing temperature, increasing stratification or decreasing salinity


THANK YOU!