

Digestive enzyme activities during the ontogenetic vertical migration of *Calanus glacialis*

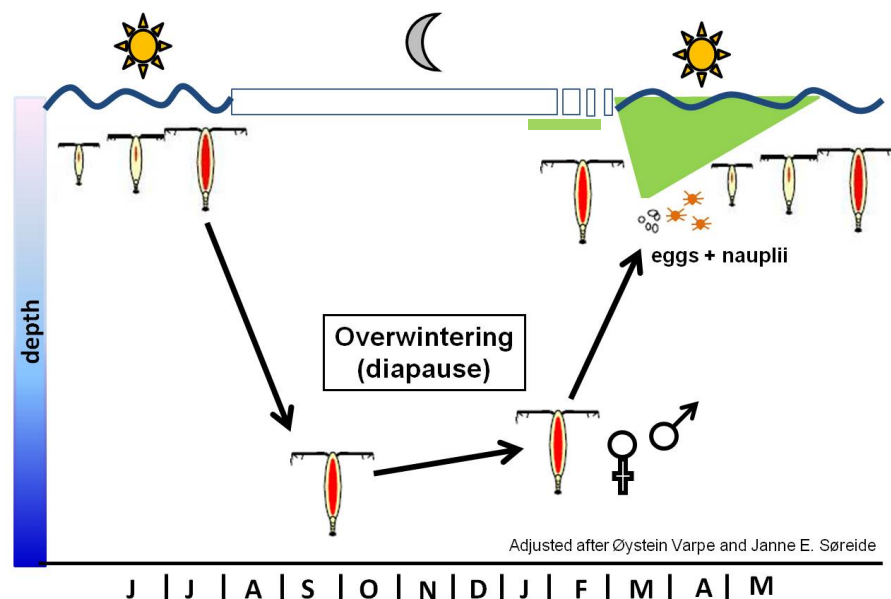
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Calanus glacialis



- Dominant on the Arctic shelf
- Mainly herbivorous
- Link primary production to higher trophic levels



- Feed on ice and pelagic algae
- Egg production and growth in surface waters
- Store wax esters
- Diapause in deep water

Diapause

- Arrested development at a certain stage
(in *C. glacialis*: copepodite stage IV and V)
- Reduction of metabolic activity
- No feeding
- Torpid
- Survive unfavorable conditions
(in *C. glacialis*: long period without food, avoid predators)

How will *C. glacialis* respond to changes in the primary production regime?

Objectives

- Determine digestive enzyme activity as a measure of feeding activity
- Base-line values over all the seasons

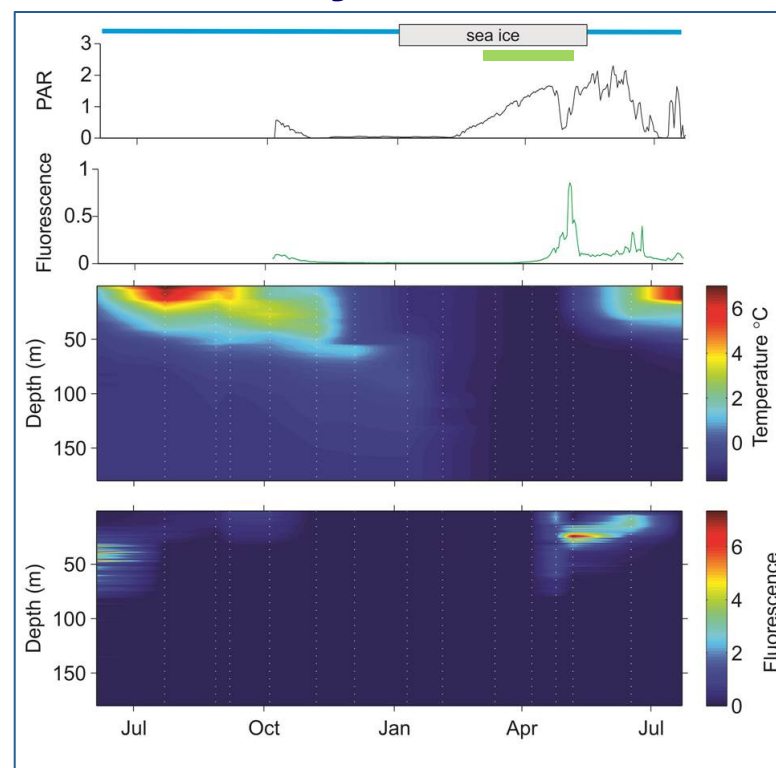
Questions

- How much does the activity differ between active and overwintering *C. glacialis*?
- Is there indication for internal or external regulation of enzyme synthesis?

Sampling during CLEOPATRA II from July 2012-2013



- Billefjorden (Arctic) sill fjord, low advection
large *C. glacialis* population



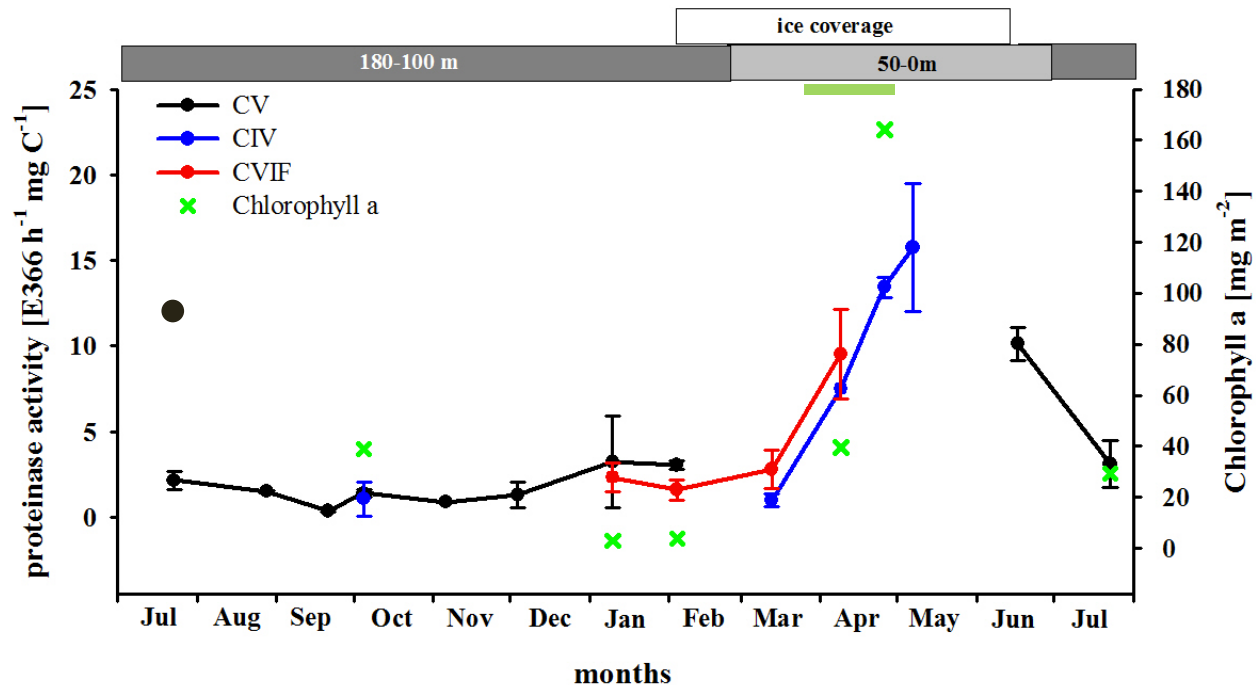
Mostly low algal biomass
Ice algae in late March/April 2013
Phytoplankton bloom in May 2013



- Monthly
- WP 2 or WP 3 nets, $>200 \mu\text{m}$
- 50-0 m or 180-100 m depth
- Sorting of live CIV, CV, females
- Deep-freezing of $3 \cdot 10$ copepods
- Determination of enzyme activities

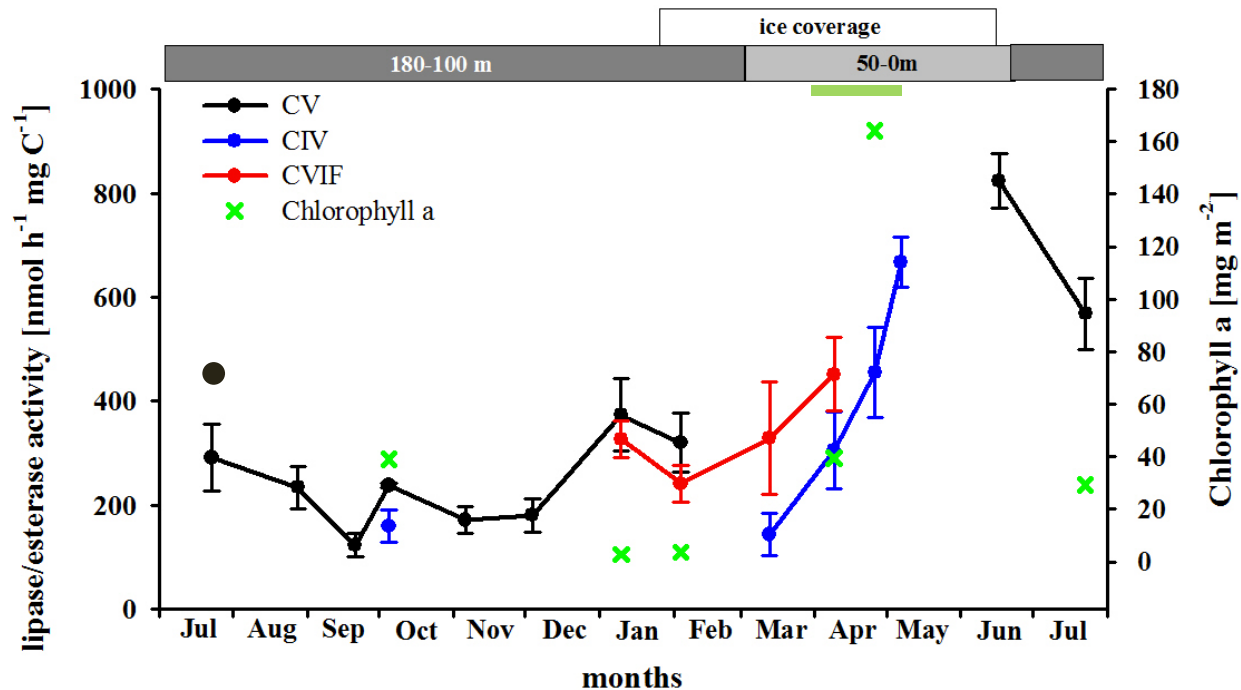


Proteinases: degradation of dietary proteins



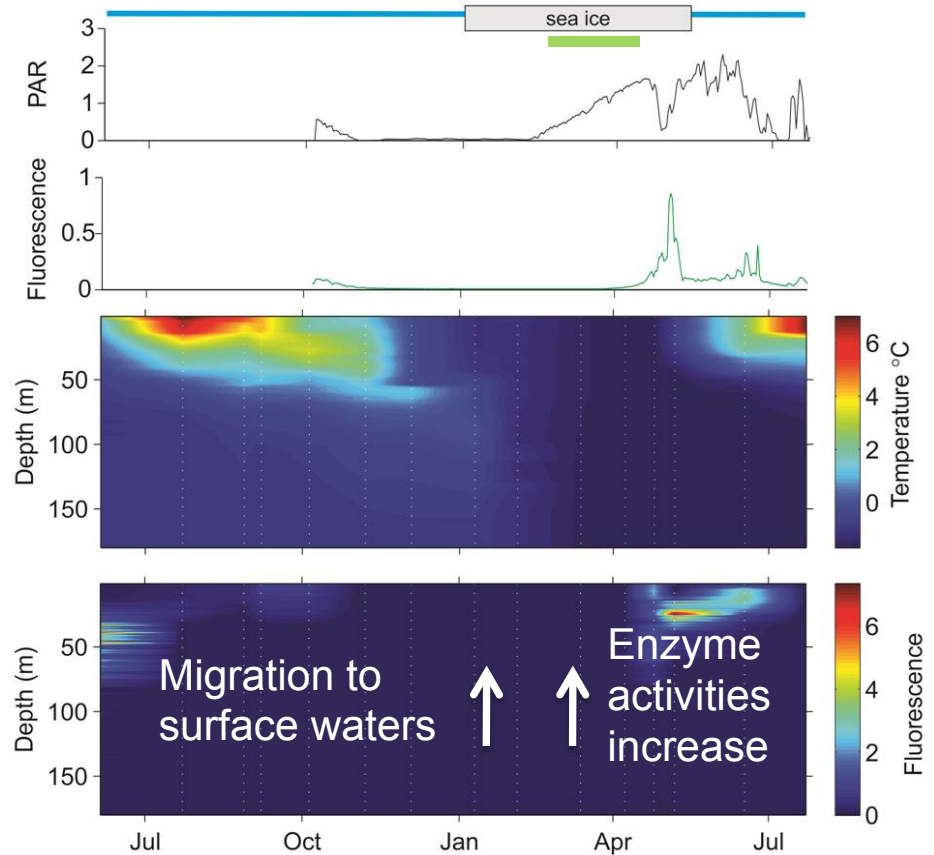
- Specific activities are independent of stage
- Low in copepods at depth $>100m$ from July 12 – March 13
- Increases in spring when first ice and later pelagic algae develop

Lipase/esterases: degradation of dietary lipids



- Specific activities differ among females and CIV activity in CIV increases later than in females
- Low in copepods at depth >100m
- Increases in spring when first ice and later pelagic algae develop

- Clear seasonal pattern
low activities in autumn/winter:
proteinase 15% of maximum
lipase 25% of maximum
- Upward migration prior
to appearance of food
- Feeding on ice algae
induces enzyme activity
- Early enzyme synthesis
allows to efficiently utilize
phytoplankton bloom



As digestive activity relates to food availability,
C. glacialis should be able to cope
with shifts in the primary production regime

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Thank you for your attention!