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 µm
- 50-0 m or 180-100 m depth
- Sorting of live CIV, CV, females
- Deep-freezing of 3*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!