Microzooplankton grazing in Arctic waters

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Global warming is seriously threatening Arctic wild life

If I don’t do something I will be homeless in a few years
What about plankton?
Here we will focus on microzooplankton, and on their role as grazers of phytoplankton.
• Structure of the microplankton community
• Microzooplankton grazing (dilution technique; Landry and Hassett 1982)

• Phytoplankton mortality rates (grazing)
• Phytoplankton instantaneous growth rates
• Phytoplankton net growth rates
Phaeocystis pouchetii

Latitude (North)

Chlorophyll a (µg L⁻¹)

P. pouchetii

Phaeocystis pouchetii (µg C L⁻¹)
MICROZOOPLANKTON

Ciliate biomass (carbon)

H. dinoflagellate biomass (carbon)

Latitude (North)

H. dinoflagellates (µg L⁻¹)

Ciliates (µg L⁻¹)
Why phytoplankton is vanishing from the water?
Biomass dependent mortality

HIPOTHESES 1:
NUTRIENT LIMITATION

\[ y = 0.023 - 0.036x; r^2 = 0.71 \]

No nutrient limitation
Microzooplankton grazing was significant only at 6 out of 16 stations, and it was very low: 0.13-0.35 d$^{-1}$
Natural *P. pouchetii* mortality (cell digestion assay which tests cell membrane permeability)

After Lasternas and Agustí 2011
In high Arctic waters north and west Svalbard Islands, during July 2007, we faced a senescent community, in which many organisms were dying, most likely not result of microzooplankton grazing.
Chlorophyll $a$ in the Godthåbsfjord
Chlorophyll $a$ in the Kapisigdlit Fjord

Distances (Km):
- K2
- K4

Chlorophyll $a$ concentration (µg Chl $a$ L$^{-1}$) vs. distance and depth.
Was phytoplankton growth dependent on biomass?

Phytoplankton growth rates were biomass-dependent. This seems to indicate the bloom was still developing.
Microzooplankton grazing rates ($d^{-1}$)

- $\geq 0.4$
- 0.3-0.4
- 0.2-0.3
- 0.1-0.2
- n.s.
- Positive slope

Image: Google Maps
In the Godthåbsfjord system and adjacent waters we found a phytoplankton community expanding from the glacier out, heavily grazed in the middle part, but uncoupled from microzooplankton grazing in the inner and outer part of the fjord.

No much PP seems to be exported out of the fjord.
Do our data compare with previous estimates of microzooplankton grazing in the Arctic and Sub-Arctic Ocean?

% PP grazed daily

- 0 – 30%
- 30 – 80%
- > 80%

Gifford et al. 1995
Olson et al. 2002
Paranjape 1987
Sherr et al. 2009
Strom and Welschmeyer 1991
Strom et al. 2007
Verity et al. 2002
% PP grazed daily
- 0 – 30%
- 30-80%
- > 80%

Burkhill et al. 1995
Froneman et al. 1996
Froneman et al. 1997a
Froneman et al. 1997b
Froneman et al. 2004
Froneman & Perissinotto 1996

Landry et al. 2002
Landry et al. 2001
Li et al. 2001
Pearce et al. 2010
Safi et al. 2007
Selph et al. 2001
Tsuda & Kawaguchi 1997

Image: www.cnes.fr
Thanks!