

Pelagic Ecosystem CO₂ Enrichment Study

-The copepods point of view-

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The aim of the study was to examine effects of different CO₂ concentrations on a natural plankton community during the course of a diatom bloom. In a total of 9 mesocosms the seawater carbonate system was manipulated to achieve 3 different CO₂ levels with 3 replicates each. A detailed description of the experimental setup is given in a poster by Riebesell et al. (this session).

With the focus on mesocosm 1 (near pre-industrial), 4 (present-day) and 7 (Glacial- atmospheric CO₂ level) the zooplankton abundance was determined and a number of egg and fecal pellet production experiments were performed throughout the 3 weeks of the experimental setup in Bergen, Norway.

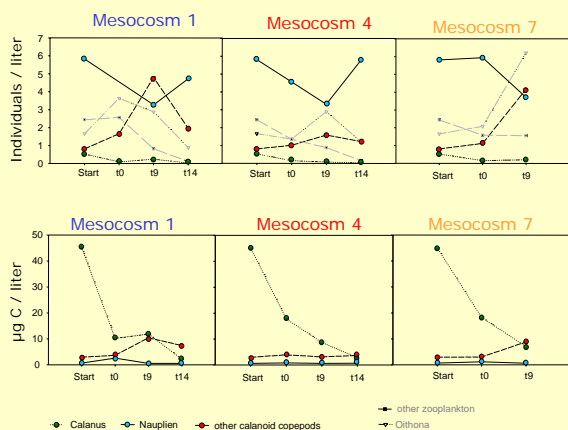


Fig. 1: Development of the zooplankton community in the first 14 days of the experiment.



Zooplankton Abundance

Zooplankton abundance was determined in the beginning of the experiment. Additionally net samples were taken 3 times during the experiment with a small zooplankton net (9,3 cm diameter; 90µm mesh size) from 8-0 meter. Zooplankton was classified, size was measured and converted into carbon.

Calanus finmarchicus made up for the largest part of zooplankton carbon in all mesocosms for the first 10 days.

Maximum *C. finmarchicus* biomass was reached in the beginning of the experiment with more than 45 µg C / liter.



Egg production of *Calanus finmarchicus*

Incubation water for the experiments was taken from mesocosm 1, 4 and 7. *C. finmarchicus* was incubated for 24 hours at constant temperature and dim light. Egg production rate was determined after 24 hours and eggs were incubated for additional 48 hours for hatching.

Egg production rate and hatching success of *C. finmarchicus* was very high throughout the whole experiment.

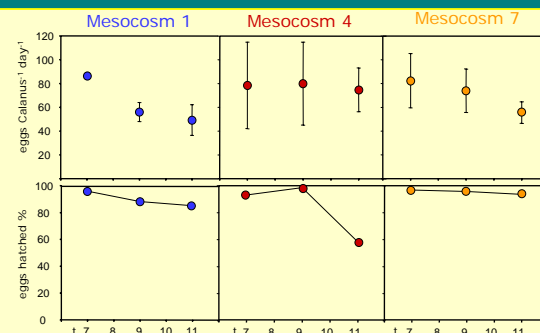


Fig. 2: Results of the egg production and egg hatching experiments of *Calanus finmarchicus*. Experiments were performed in the lab with water from three different mesocosms.

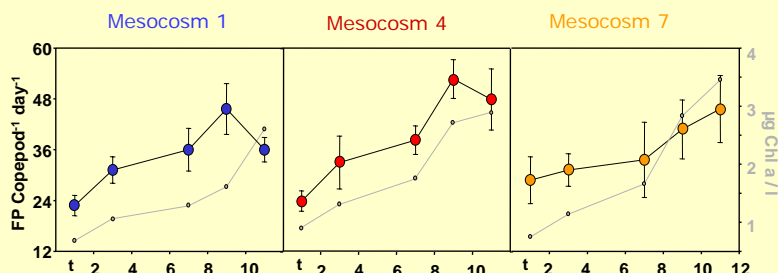


Fig. 3: Results from the fecal pellet production experiment (*Calanus finmarchicus*). Incubation water was taken from the mesocosms. Chlorophyll concentration from the incubation water is indicated.



Fecal pellet production experiments

Fecal pellet production of *C. finmarchicus* was determined in the laboratory at 5 times throughout the mesocosm experiment. Fecal pellets were counted under the binocular. Length and diameter of the fecal pellets were measured and volume and fecal pellet carbon was calculated.

Fecal pellet production was converted into „ingested carbon“ (Nejstgaard et al. 2001)

**~ 20 µgC Copepod⁻¹ day⁻¹ were ingested by one *C. finmarchicus*.
Produced fecal pellet carbon: 1 – 4 µgC Calanus⁻¹ day⁻¹**



Fecal pellet carbon (FPC) sedimentation

Sediment traps from the mesocosms were retrieved and splitted ten times during the experiment. Length and diameter of sedimented fecal pellets were measured and volume was converted into carbon (mgC m⁻² d⁻¹).

FPC sedimentation ranges between 30 – 150 mgC m⁻² d⁻¹

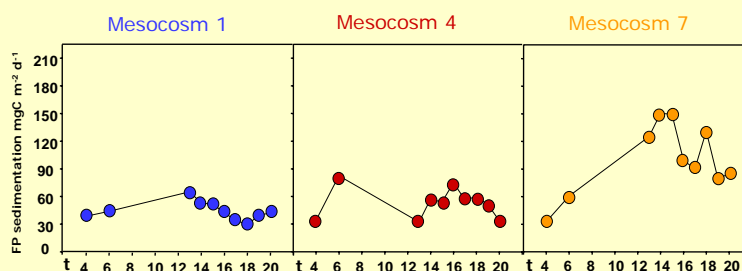


Fig. 4: Fecal pellet carbon (FPC) sedimentation over the three weeks of the mesocosm experiment.