The endoparasite *Blastodinium* sp. Affects Vital Rates of *Calanus finmarchicus*

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Introduction

Copepods are the most abundant metazoans in the sea and small changes in their abundance, productivity and grazing rates have important ramifications for ecosystem function. Parasitic infection of copepods can produce delays in molting, reduced fecundity and increased mortality.

Several species of *Blastodinium* (Dinoflagellata) are gut parasites of marine planktonic copepods, but information on the occurrence and infection frequencies of *Blastodinium* spp. in the field is limited, and the functional impact on their hosts is understudied.

Here, we report upon the effects of *Blastodinium* spp. infection on *Calanus finmarchicus* from the northeastern Atlantic, off the coast of southern Norway. The high rate of infection as well as significance of its impact suggests *Blastodinium* may have considerable impact on *Calanus* populations and their ecosystems.

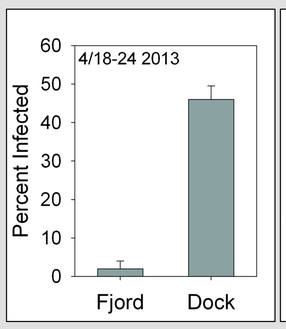
Austevoll Research Station, Norway

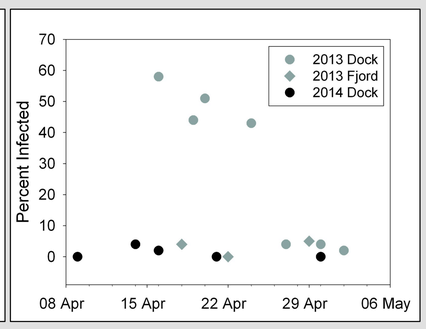
Calanus Collection

Calanus finmarchicus females were sampled from the waters surrounding the Austevoll Research Station (60.08°N, 5.26°E) in spring 2013 and 2014. Temperature and salinity were measured at 5 depths during sampling.

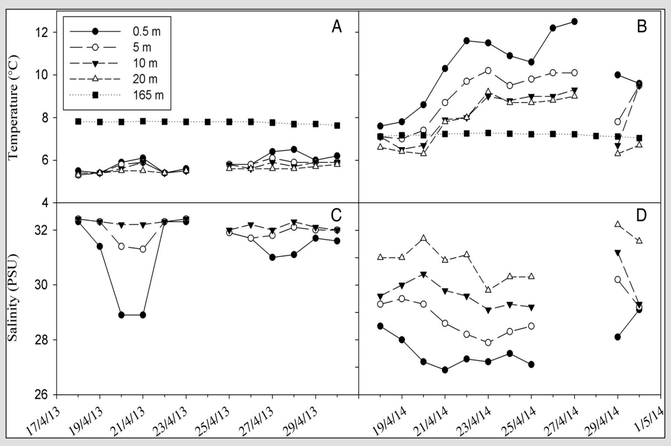
Two sampling techniques were used:

- Light traps set overnight at 35m depth
- Oblique plankton tows 3–5km from shore, at 250–300m depth





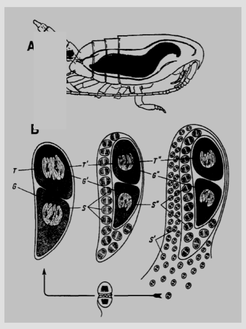
Infection rates in offshore tows (fjord) were never higher than 5%. The infection appeared to be a coastal phenomenon and did not return in 2014.



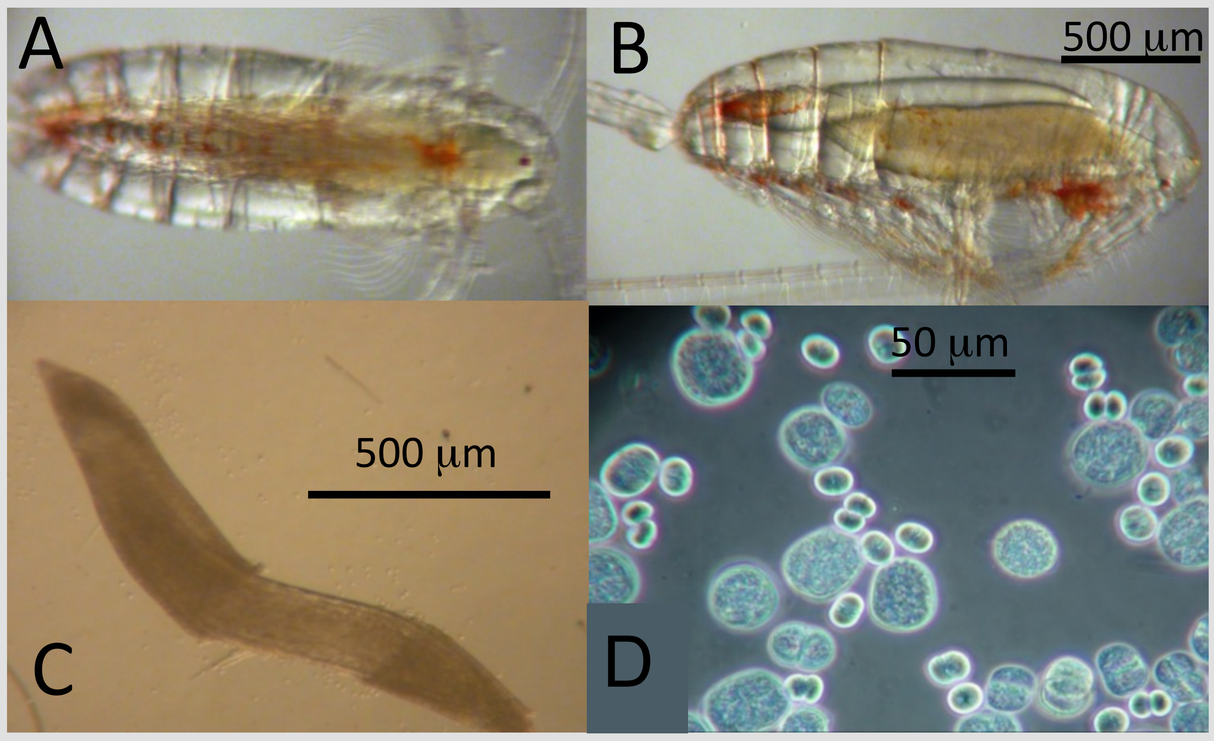
Warmer temperature profiles at the near shore sampling sites during the 2014 sampling period (B, D) may have caused an earlier appearance of the Blastodinium infection.

Parasite Life History and Host Infection

Host copepods ingest a unicellular dinospore during their early life stages. The dinospore divides in the host's gut into a trophocyte (T) and gonocyte (G).



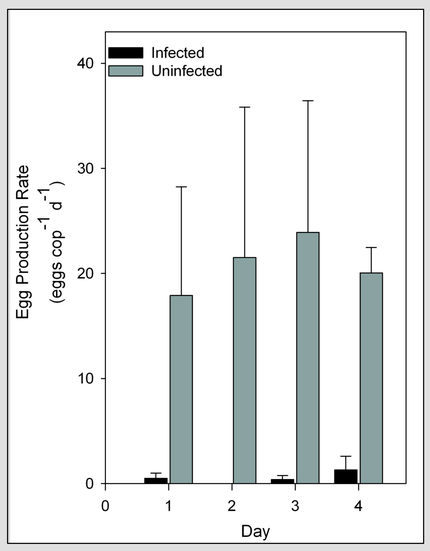
The gonocyte produces sporocysts (S). This multicellular stage is called a trophont. At maturity, new dinospores are released from the host's anus as free cells or in fecal pellets.



Images: (A, B) Dorsal and lateral view of infected copepods; (C) An individual trophant removed from its host; (D) Cells within a trophant (gonocytes - large, sporocytes - small).

Egg Production

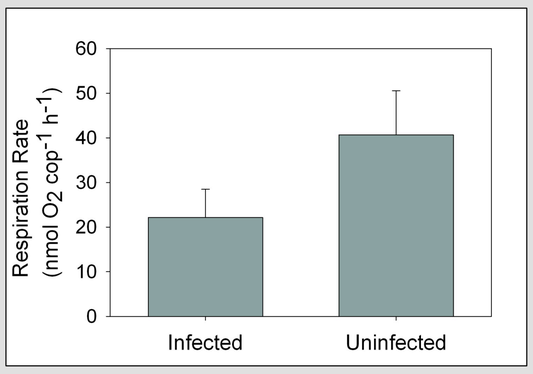
The few eggs produced by infected females during incubation likely came from animals that voided the trophont over the course of four days.



Replicate containers (n=5) were inoculated with 4 female copepods. These chambers were nested inside a larger volume filled with a superabundance of algae (*R. baltica, Isochrysis galbana, Skeletonema sp., Chaetoceros sp.*). Containers were gently moved into fresh algae daily. Eggs and fecal pellets settled through a mesh bottom for daily counting.

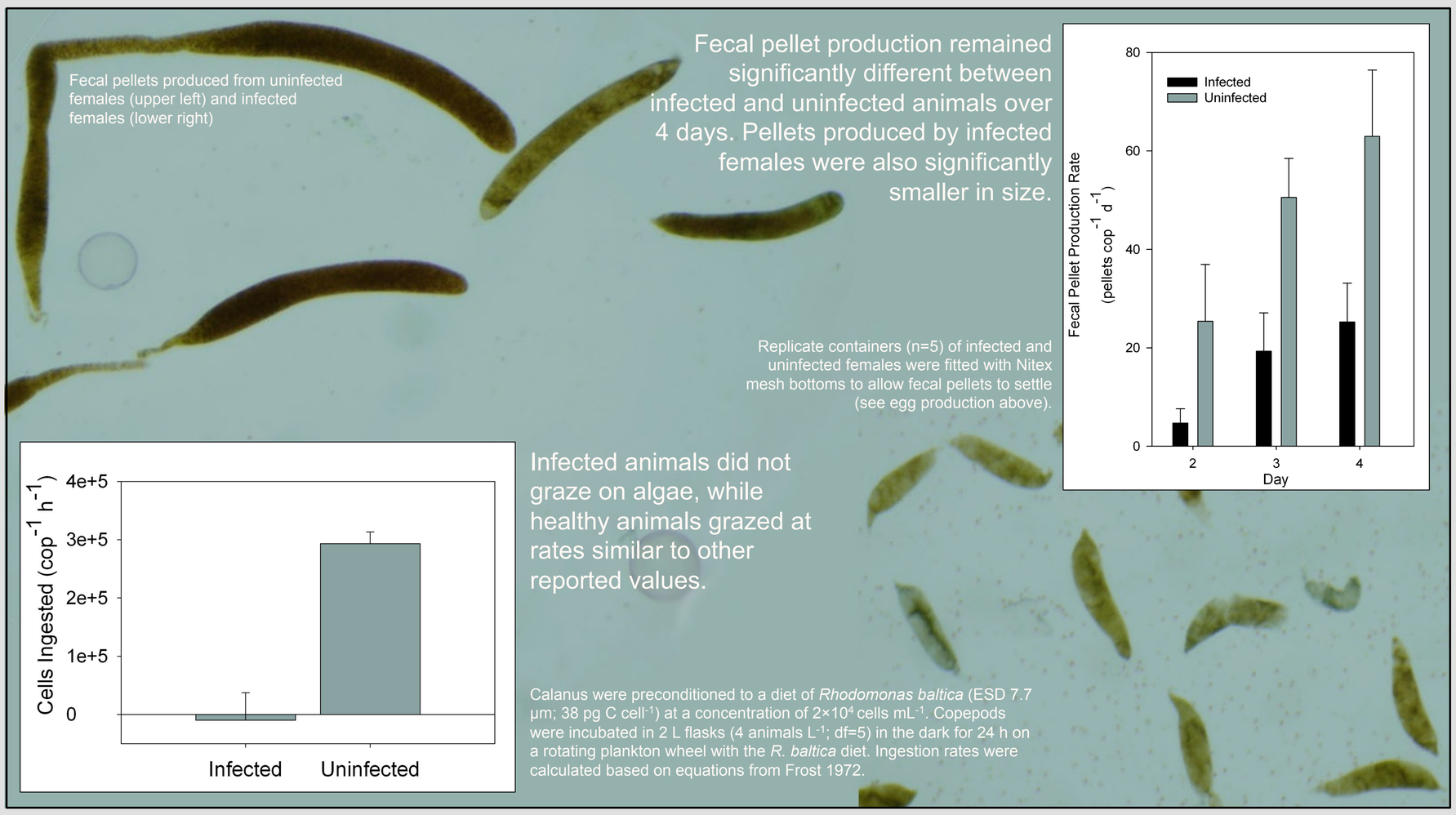
Respiration

Infected animals respired at roughly half the rate of uninfected animals.



Respiration rates were measured with a calibrated Clark-type oxygen micro-electrode. Measurements were made at 12°C (± 0.01°C). Animals were placed in a gently stirred, O_2 saturated 4.8mL chamber. Each replicate (n=3) consisted of 3 animals. Oxygen concentrations never decreased by >20% below saturation during measurement.

Ingestion and Fecal Pellet Production



Fields DM, Runge JA, Thompson C, Shema SD, Bjelland RM, Durif CMF, Skiftesvik AB, and Browman HI (2015). Infection of the planktonic copepod *Calanus finmarchicus* by the parasitic dinoflagellate, *Blastodinium* spp: effects on grazing, respiration, fecundity and fecal pellet production. *J. Plankton Res.* 37(1): 211–220. **doi:10.1093/plankt/fbu084**

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