

Does nutrient enrichment increase freshwater bryozoan abundance and growth?

Hanna-Leena Hartikainen^{a,b} and Beth Okamura^b

^aSchool of Biological Sciences, University of Reading, h.hartikainen@nhm.ac.uk

^bDepartment of Zoology, Natural History Museum, London, b.okamura@nhm.ac.uk



Freshwater bryozoans are benthic filter-feeding animals that are common in most lakes, rivers and ponds. Due to their combined clonal and colonial life-style, they can exhibit explosive growth rates, leading to high biomass during the summer. Bryozoans can cause significant biofouling problems in water treatment works and irrigation systems, clogging filters and pipes. Despite their potentially large biomass and wide-spread occurrence, bryozoans are generally overlooked in biological water quality monitoring programmes and field surveys, possibly due to lack of knowledge of the environmental requirements of bryozoans and sampling difficulties. We present a new, quantitative method for assessing bryozoan abundance and establish a relationship between bryozoan abundance and eutrophication.

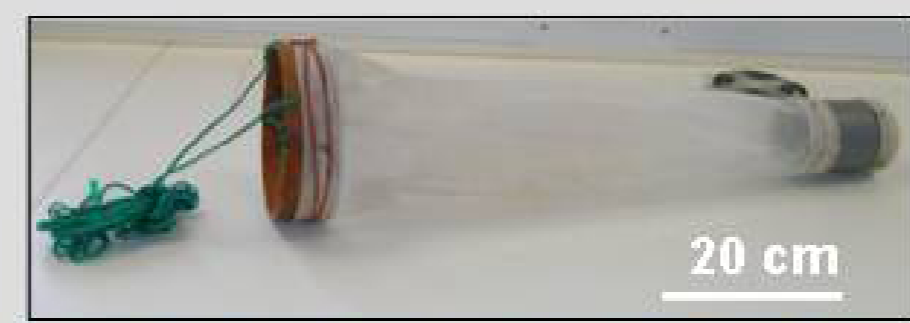
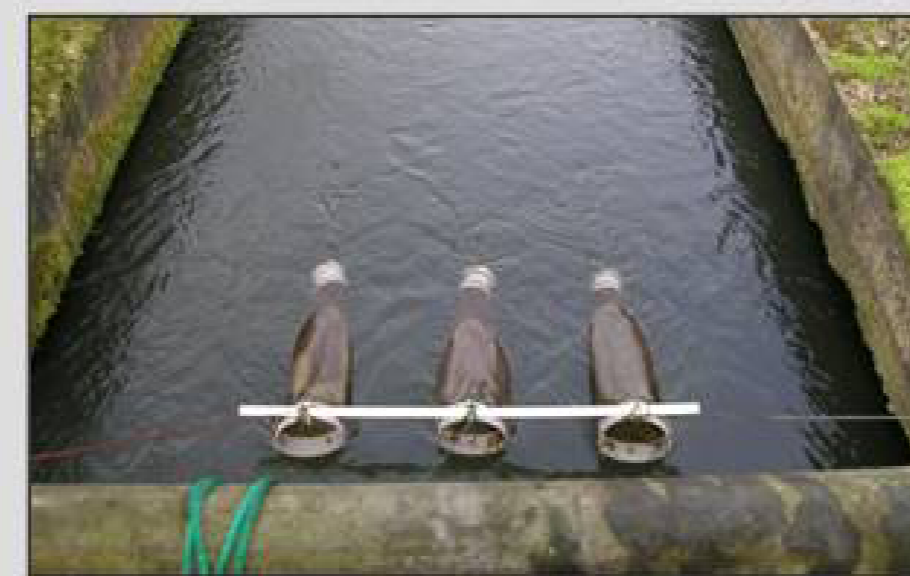


Introduction

Field Experiment

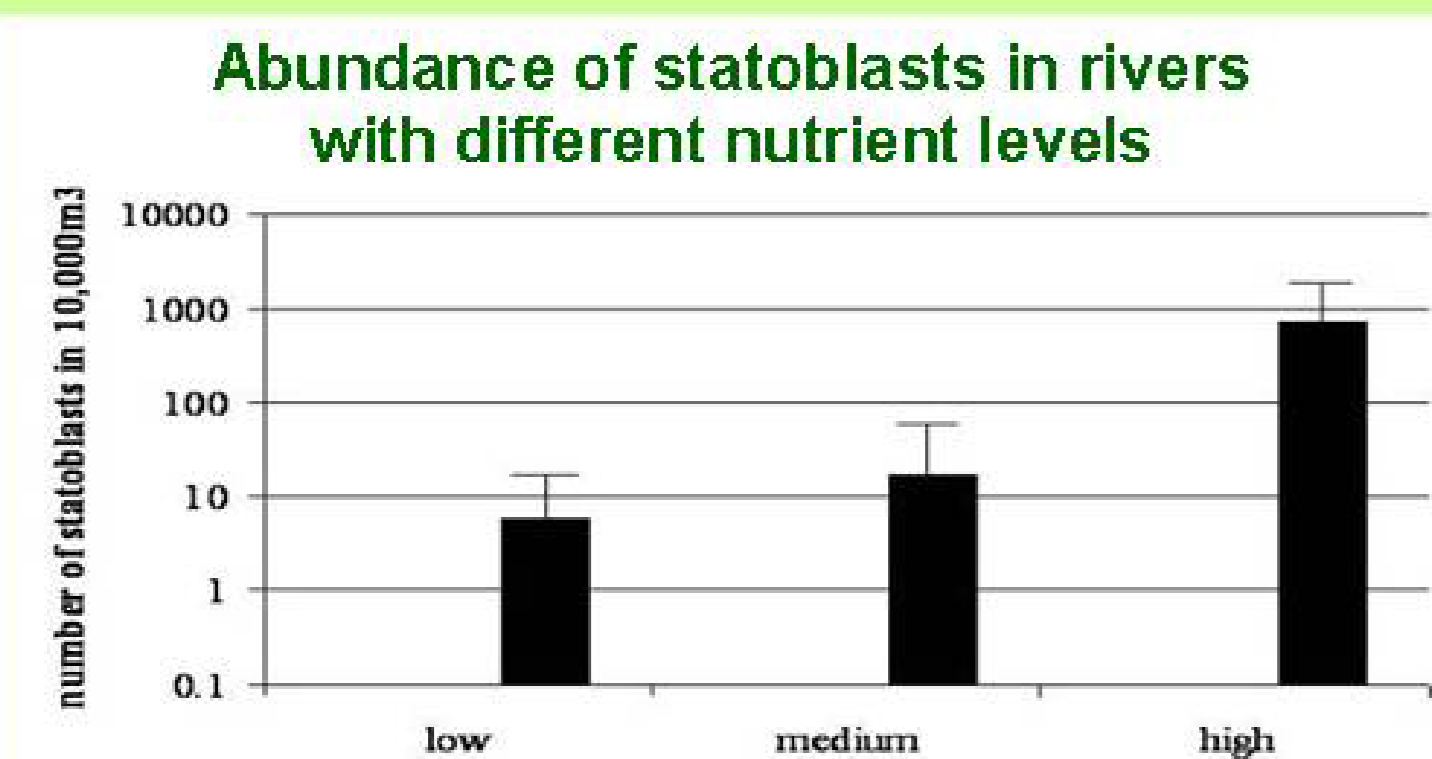
Methods

- Floating traps to catch bryozoan dispersive propagules (statoblasts)
- Total of 20 rivers sampled in 2005 and 2006
- Sites spanned a range of nutrient levels (from <0.06mg/l P to >1 mg/l P)
- Statoblast concentrations per 10,000m³ of water determined using data from Environment Agency flow gauge records



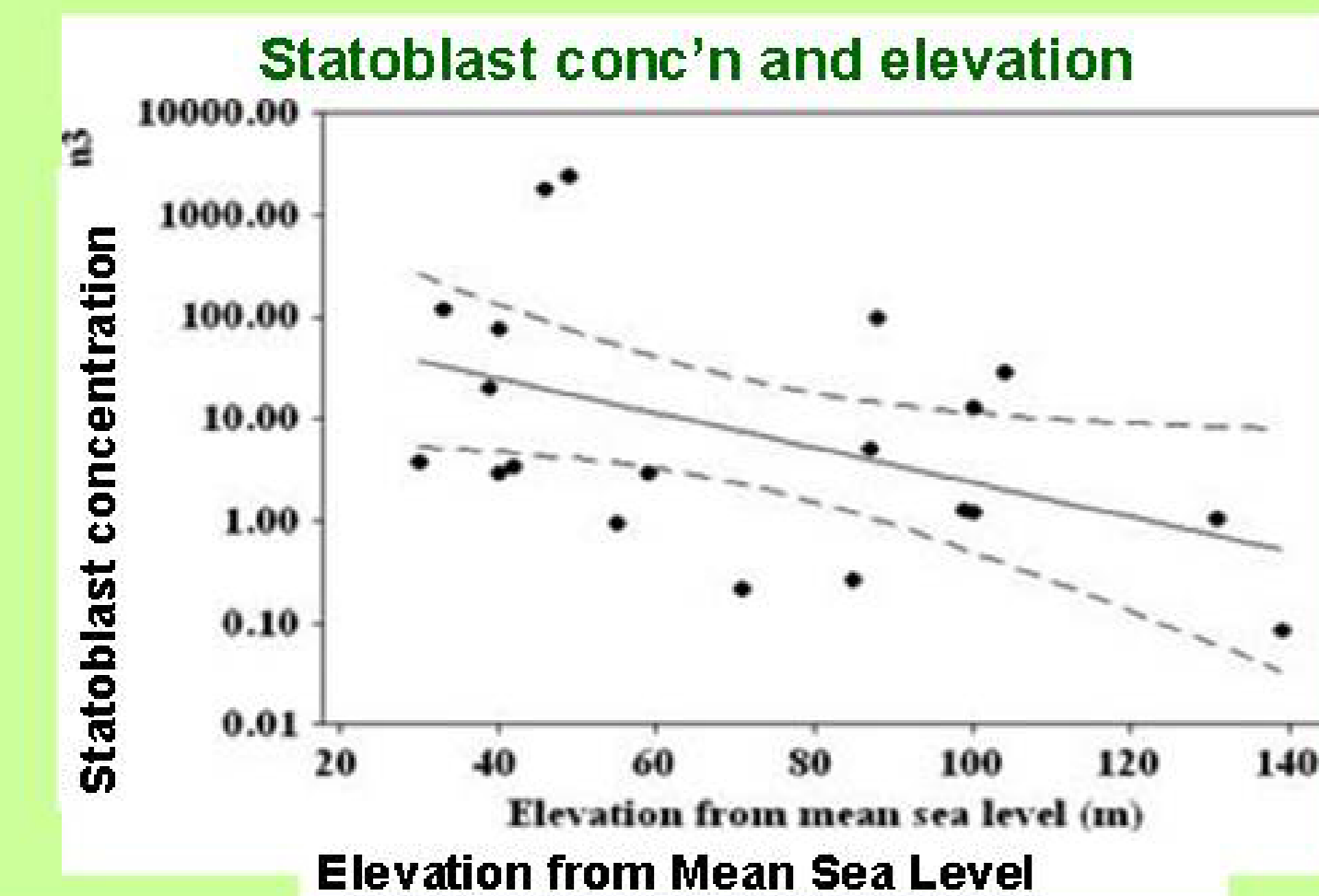
statoblasts

Results



Nested ANOVA (year nested within nutrient level)
 $F_{2,16}=28.5, p < 0.001$

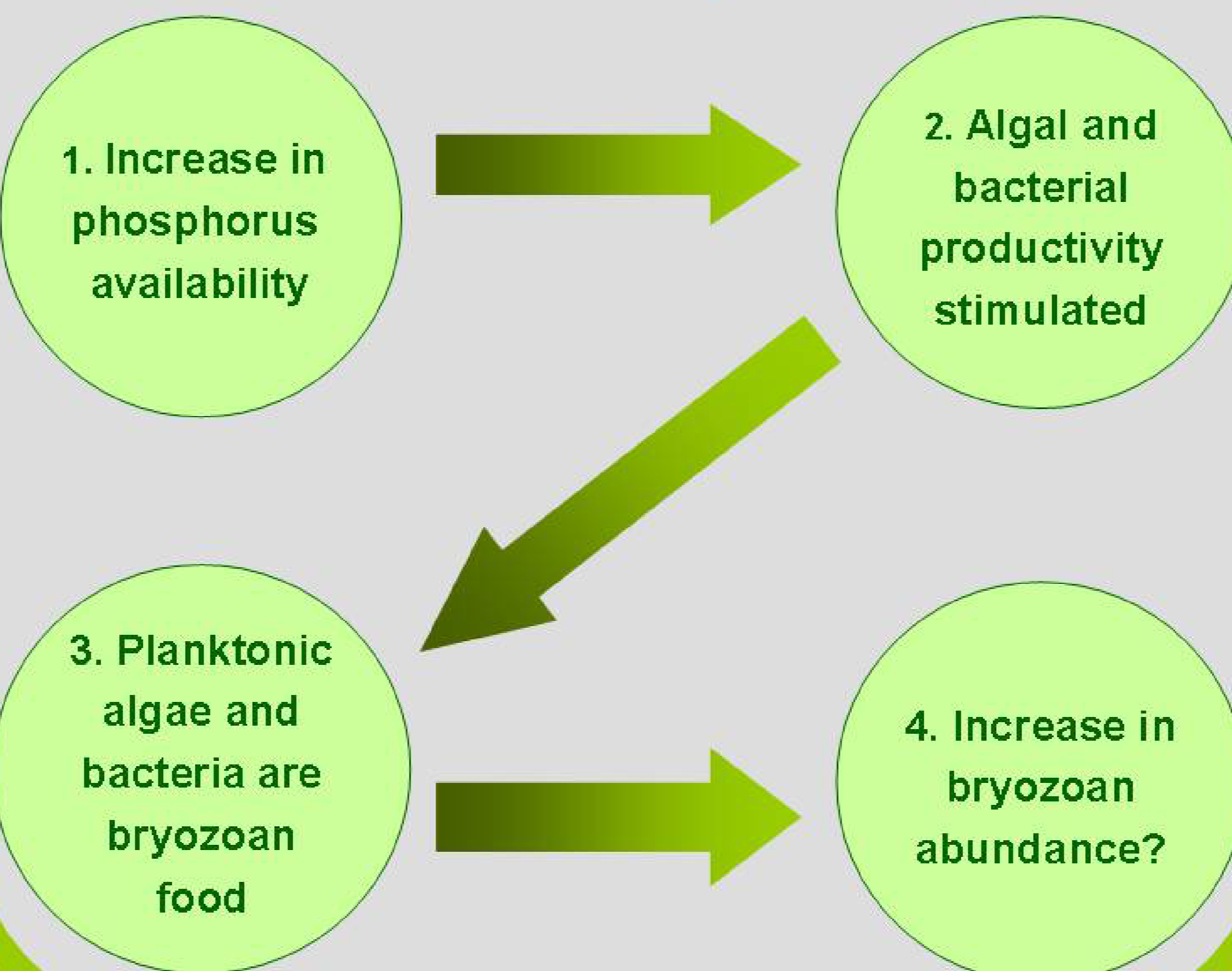
- Significantly more statoblasts occurred in high nutrient rivers



Linear Regression, $y = -0.017x + 2.07, R^2 = 22\%, p = 0.038$

- Statoblast concentration increased as elevation decreased

Hypothesis: Eutrophication drives bryozoan abundance



Conclusions

- Two independent studies confirm that nutrient enrichment has positive effects on bryozoan growth and abundance
- Statoblast concentrations offer a new tool for assessing ecological water quality
- Bryozoan biofouling problems may be exacerbated with continuing nutrient enrichment
- Future studies are needed to assess the role of bryozoans in ecosystem functioning

Microcosm Experiment

Methods

- 3 enrichment levels were created in laboratory microcosms by additions of inorganic phosphate and nitrate

low = 0.06mg/l P
 medium = 0.15mg/l P
 high = 1mg/l P

Each level replicated 3 times

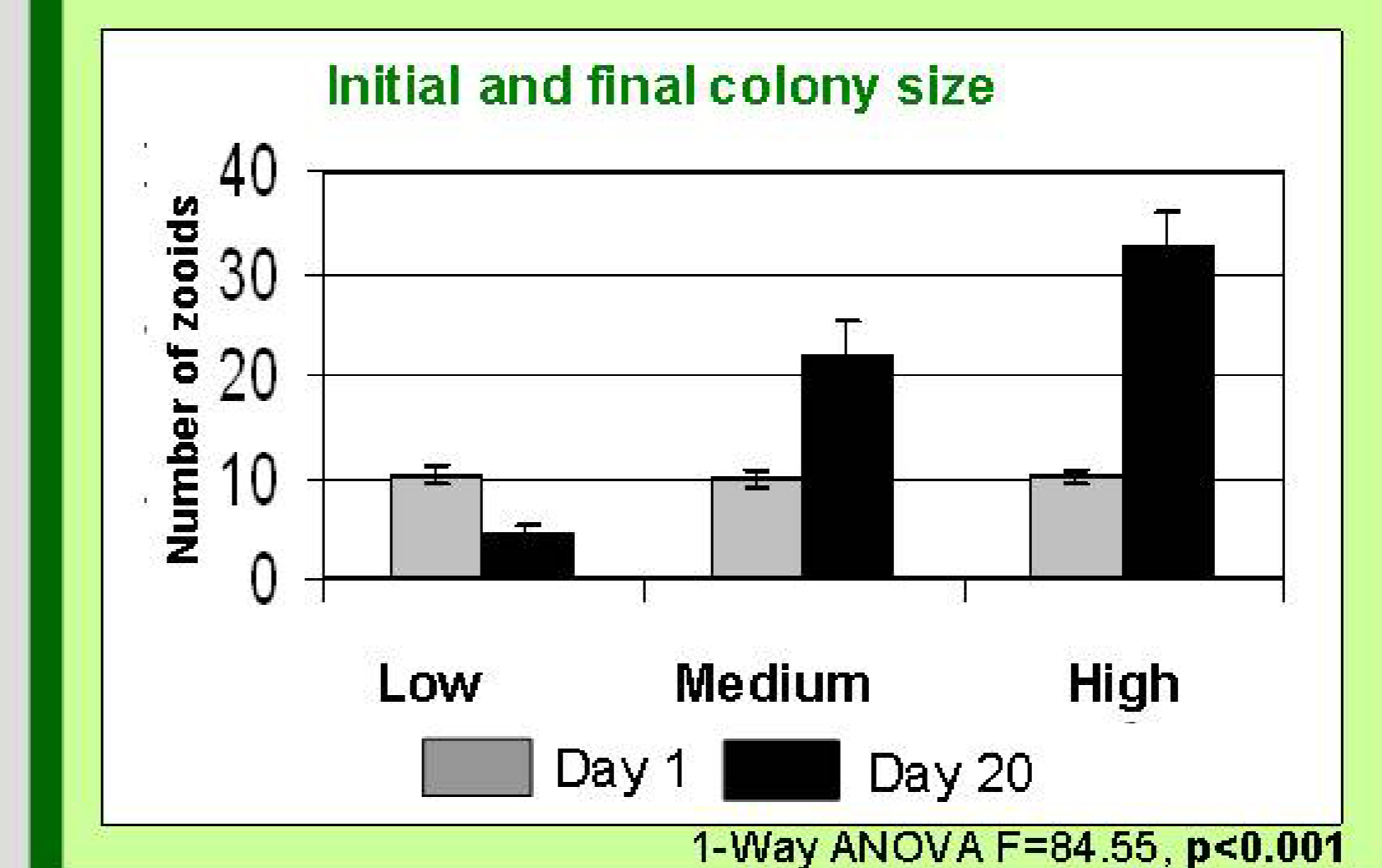
- Bryozoan growth rates were followed for 20 days

Microcosm setup in laboratory

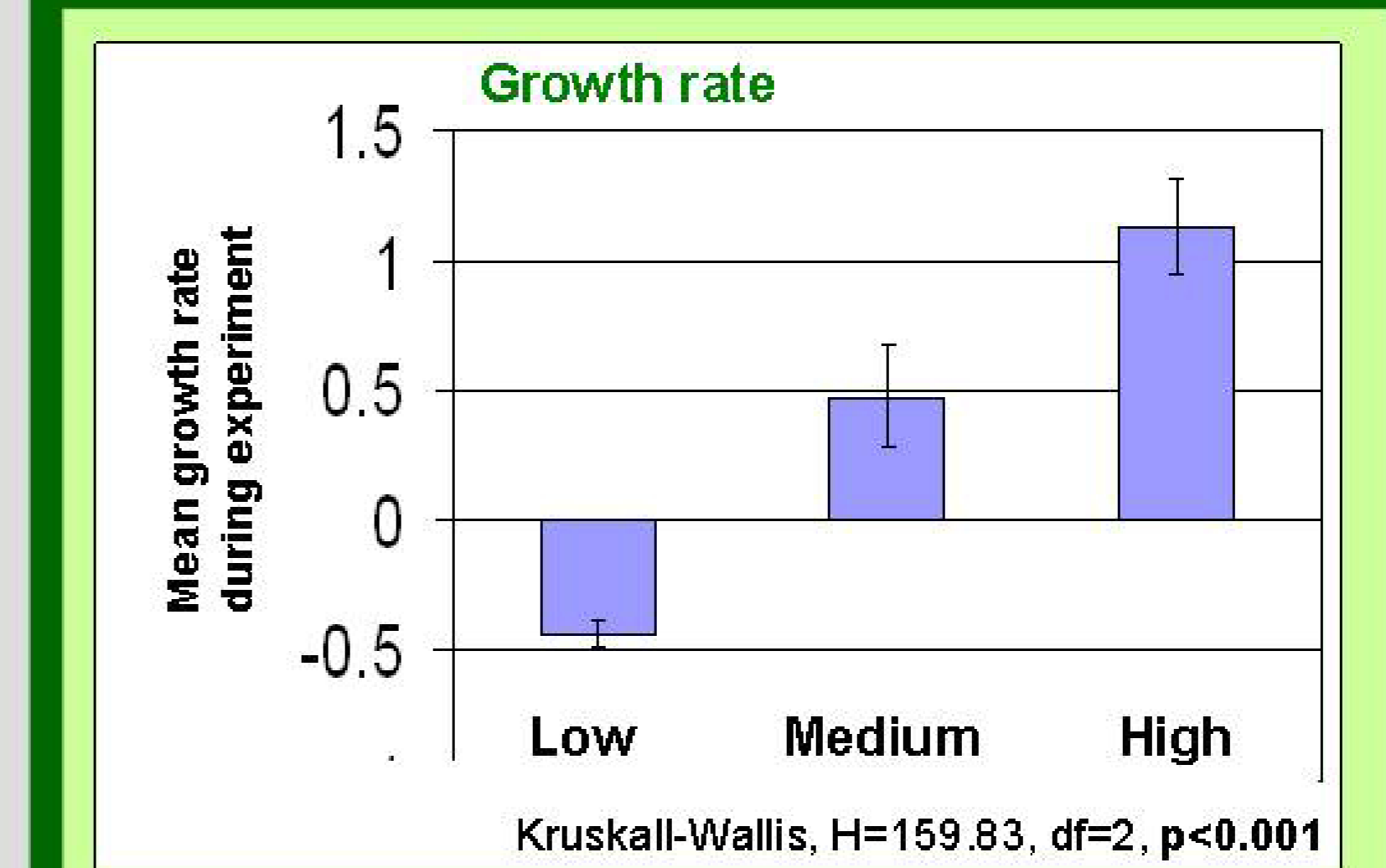


Low and high food level microcosms

Results



- Bryozoans grew significantly larger in high nutrient microcosms



- Growth rates were significantly higher in high nutrient microcosms
- Bryozoans regressed in low nutrient levels