

A scanning electron micrograph (SEM) showing numerous spherical coccolithophores. The organisms are covered in intricate, lattice-like structures called coccoliths. Three prominent spheres are highlighted in color: a green one on the left, an orange one in the center, and a pink one on the right. The background is a grayscale SEM image of many other similar organisms.

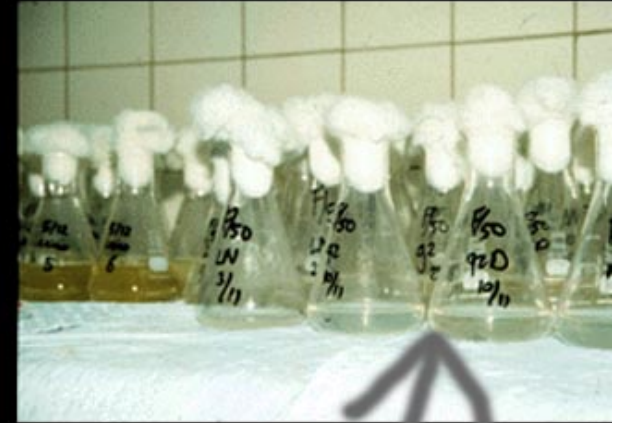
Coccolithophores

Jeremy Young  
Earth Sciences, UCL

coccolithophores have always been prominent in ocean acidification research...

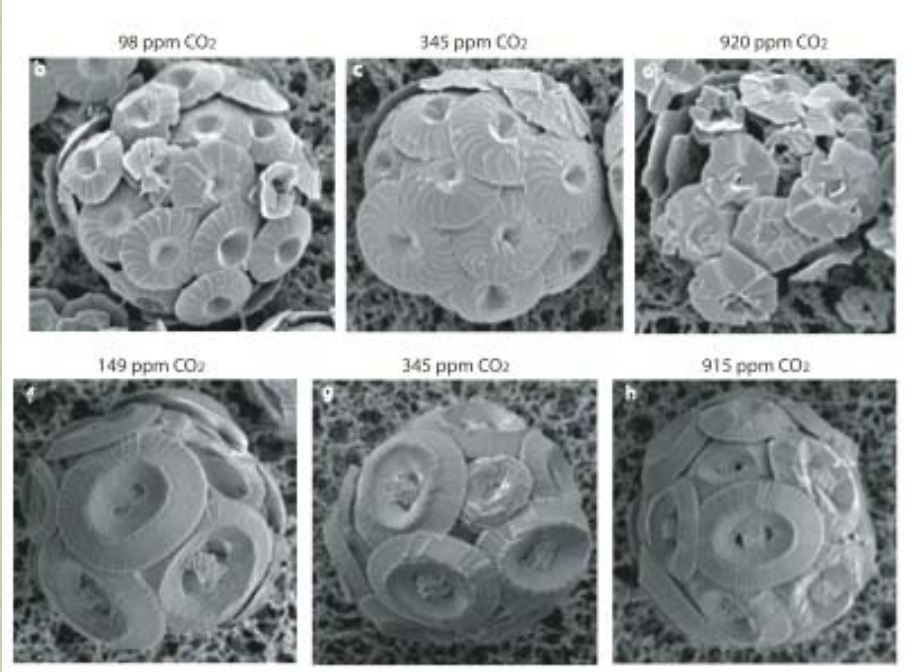
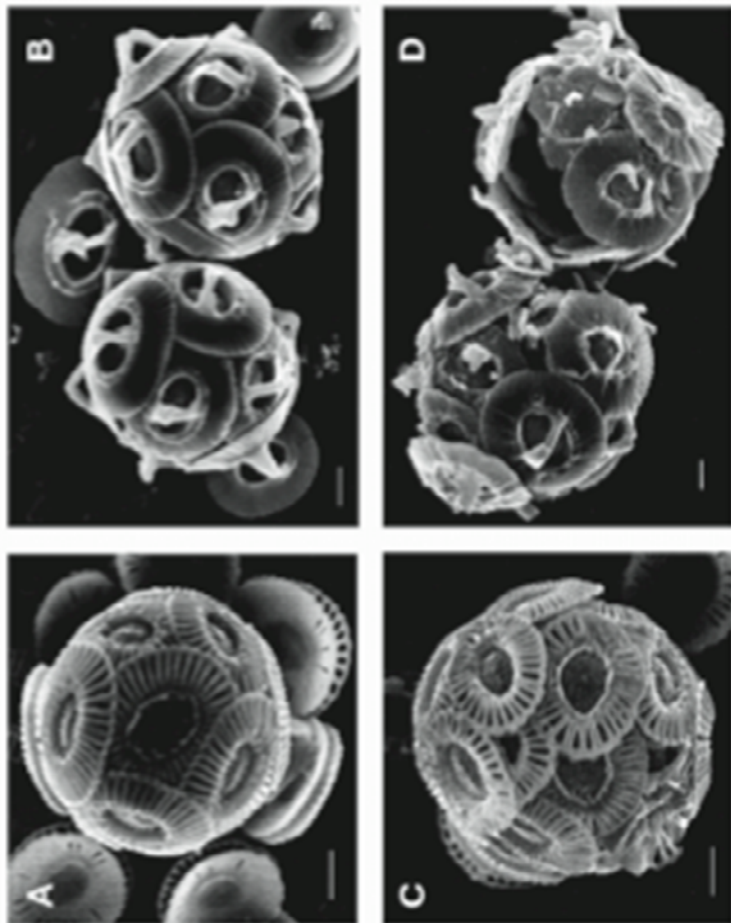






*Culture isolation, by Ian Probert*

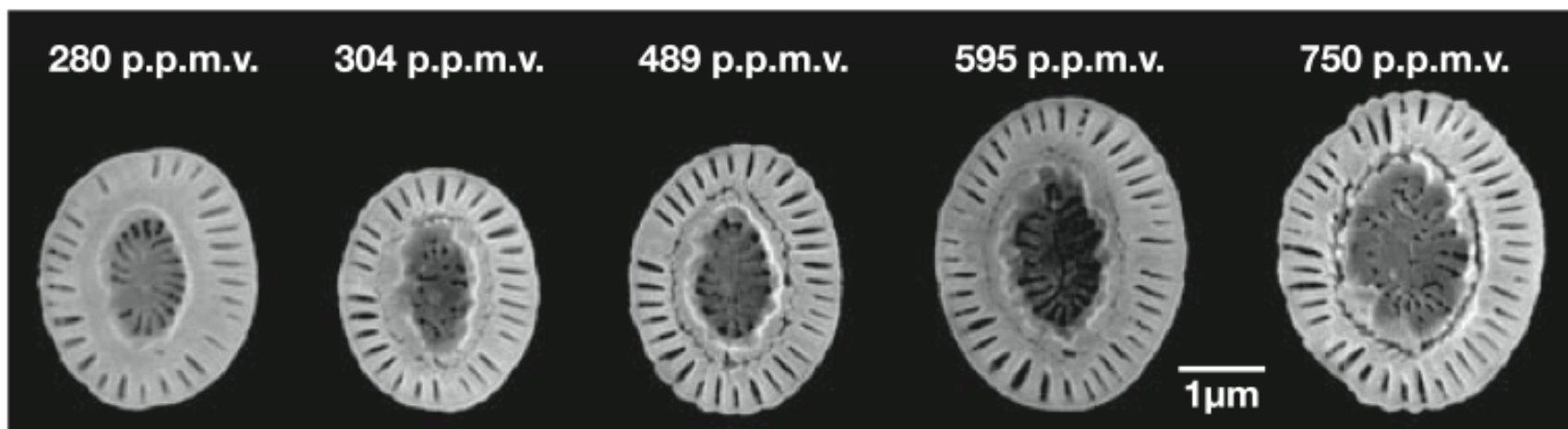
# Ocean acidification and coccoliths



Langer et al. 2005

Riebesel et al. 2001

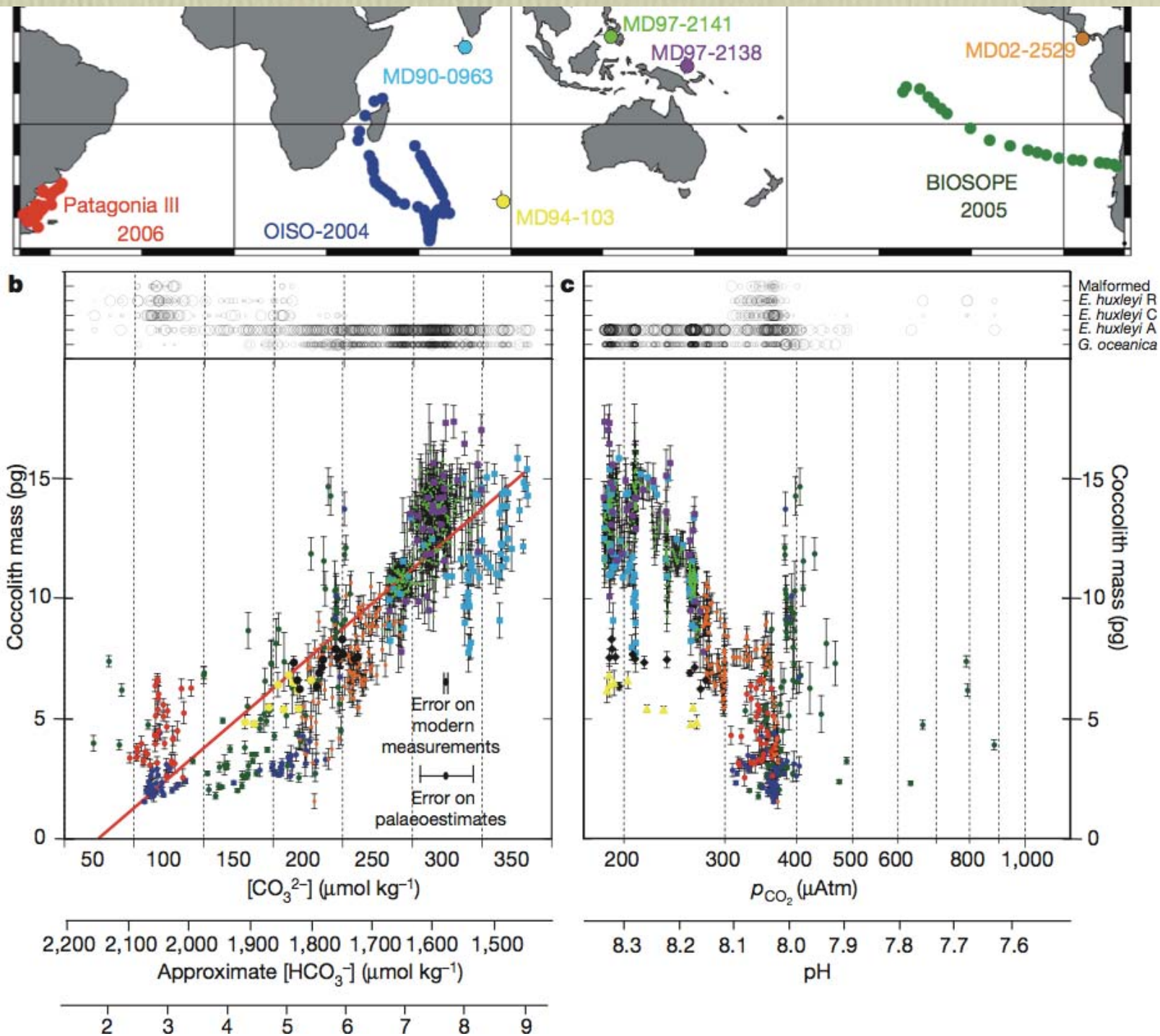
Iglesias et al. 2008

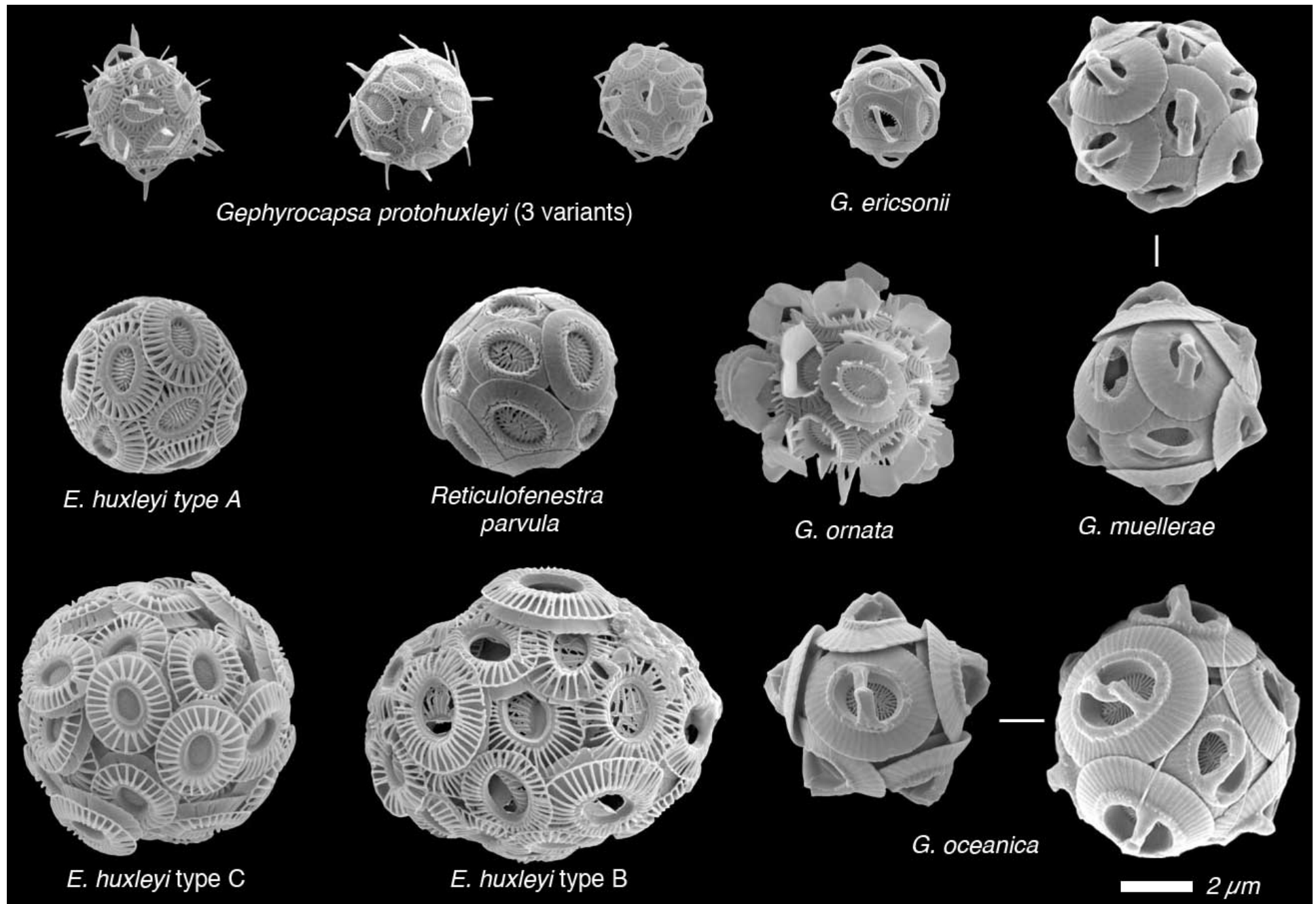




Beaufort et al. Nature 2011

-> carbonate chemistry is prime determinant of coccolithophore ecology





*Gephyrocapsa protohuxleyi* (3 variants)

*G. ericsonii*

*E. huxleyi* type A

*Reticulofenestra parvula*

*G. ornata*

*G. muelleriae*

*E. huxleyi* type C

*E. huxleyi* type B

*G. oceanica*

2 μm

*extant Noelaerhabdaceae*

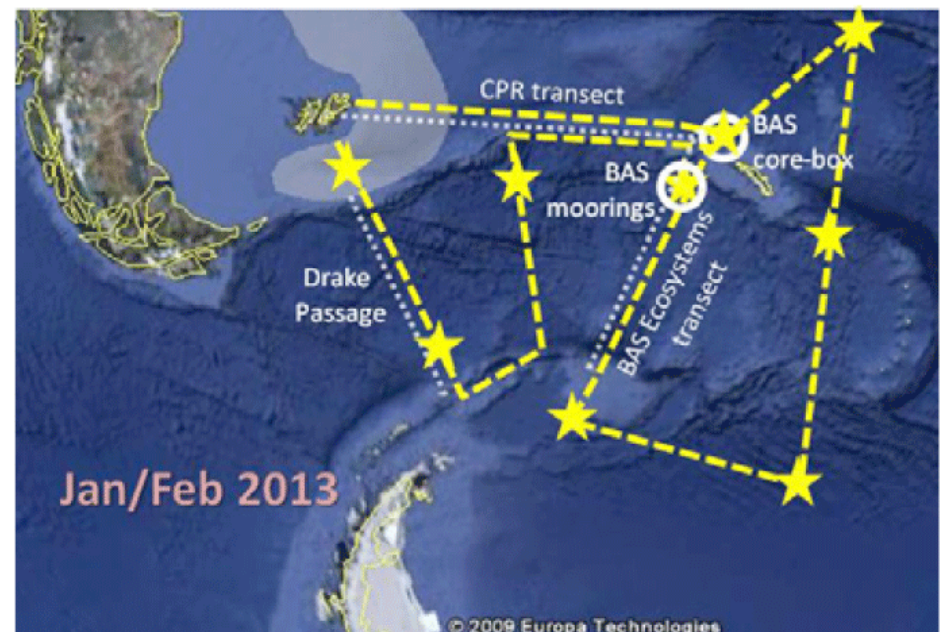
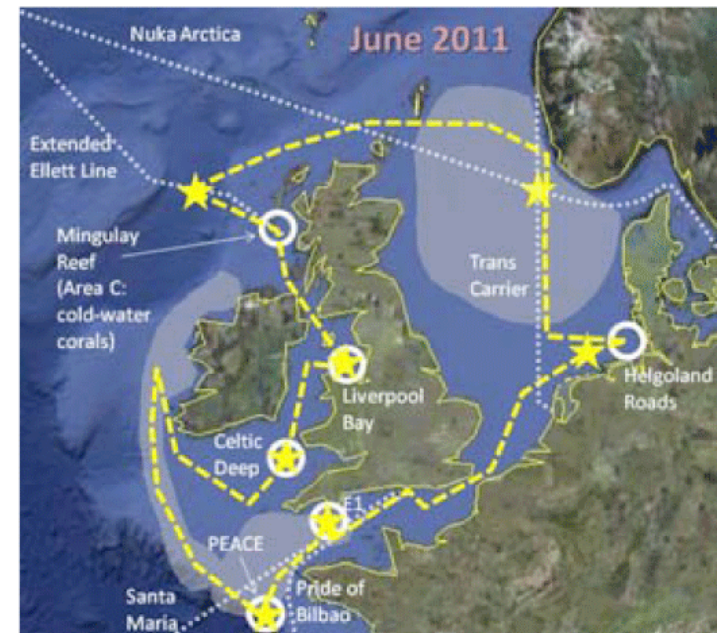


# planned cruises

cruises in areas with pH gradients

- combination of *in-situ* observations and deck incubation experiments (bioassays)

- coccolithophores, forams and pteropods





# Container for Controlled Bioassays



Typical approach  
incubate on deck



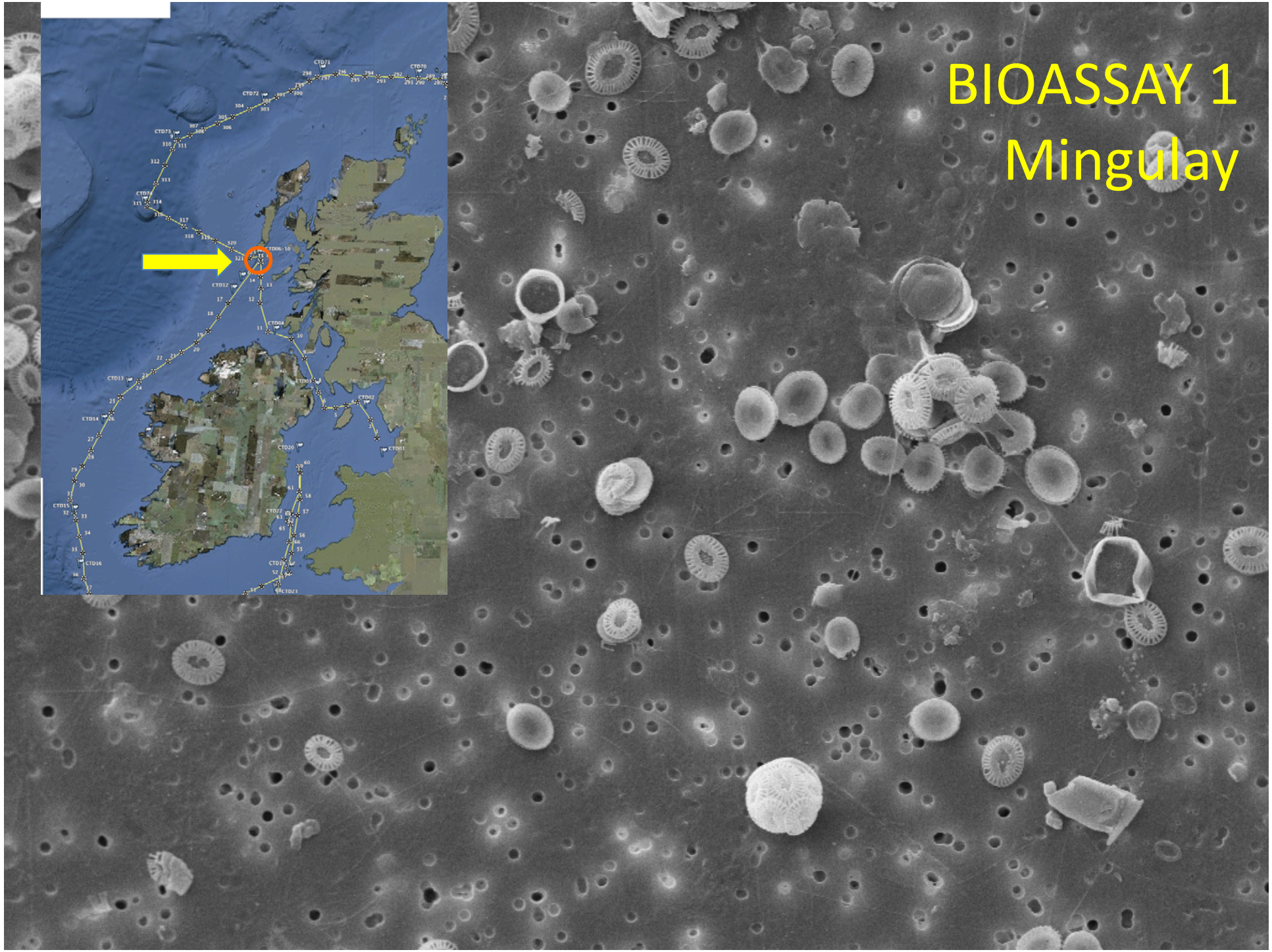
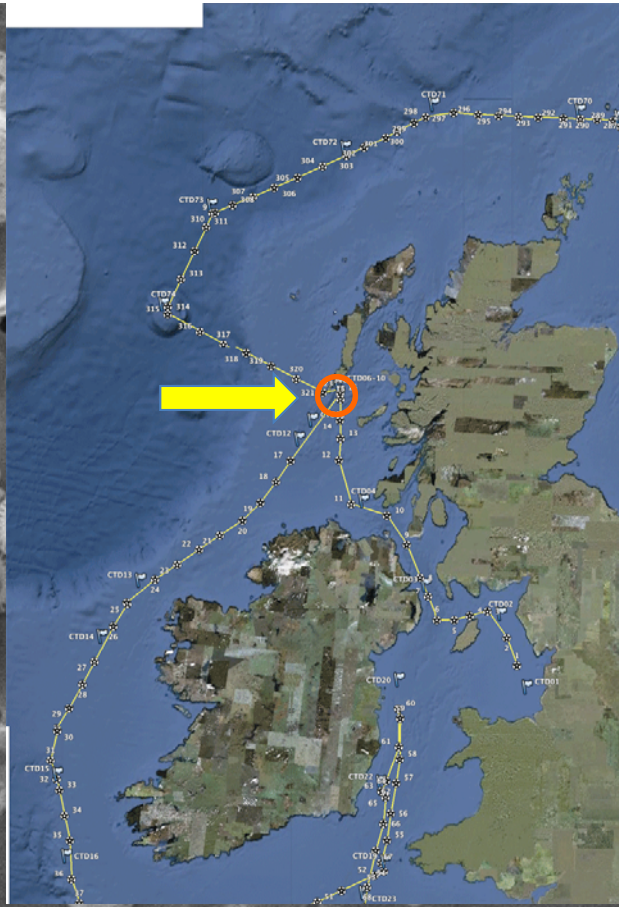
Our approach - incubate  
inside a temperature and  
light-controlled  
environment (a customised  
container)



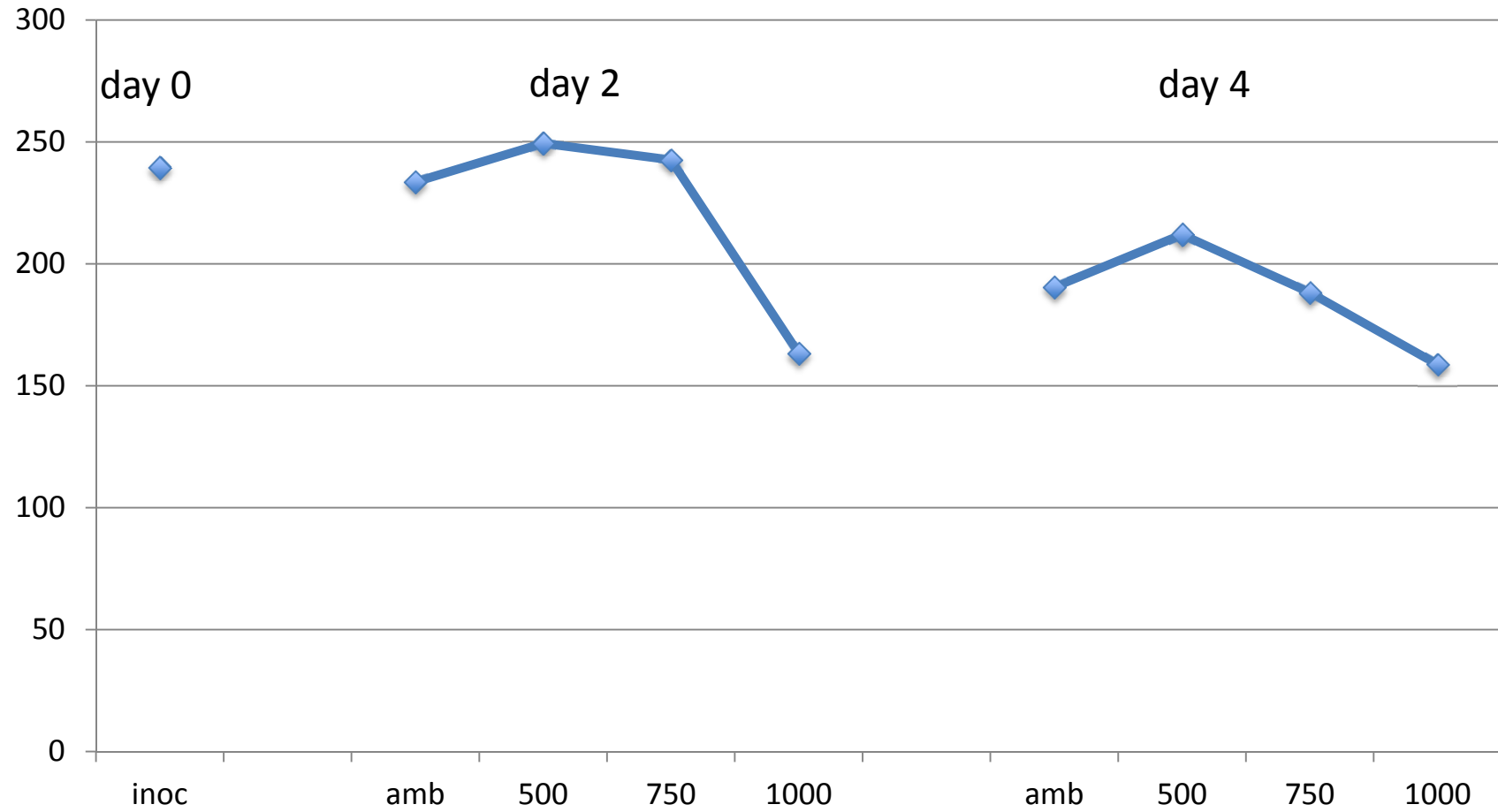
UK Ocean Acidification  
Research Programme



# BIOASSAY 1 Mingulay

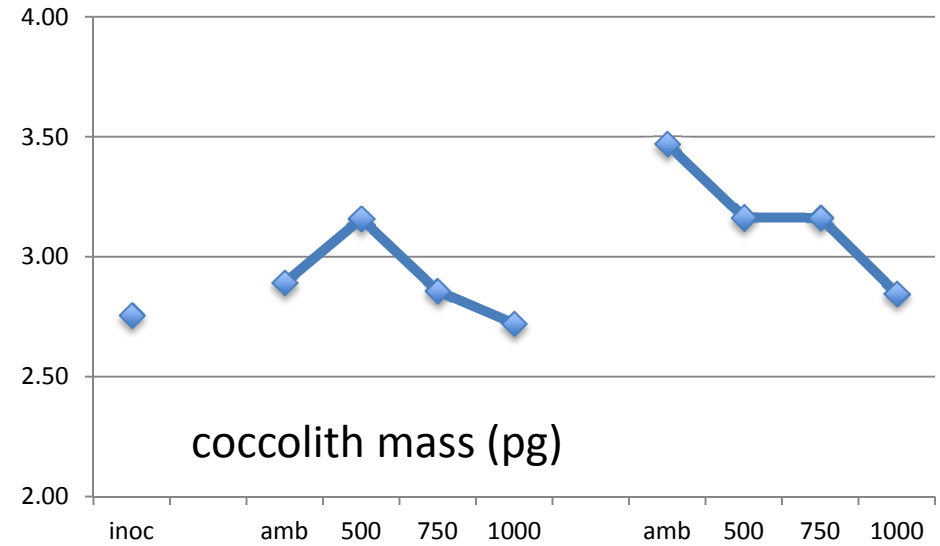
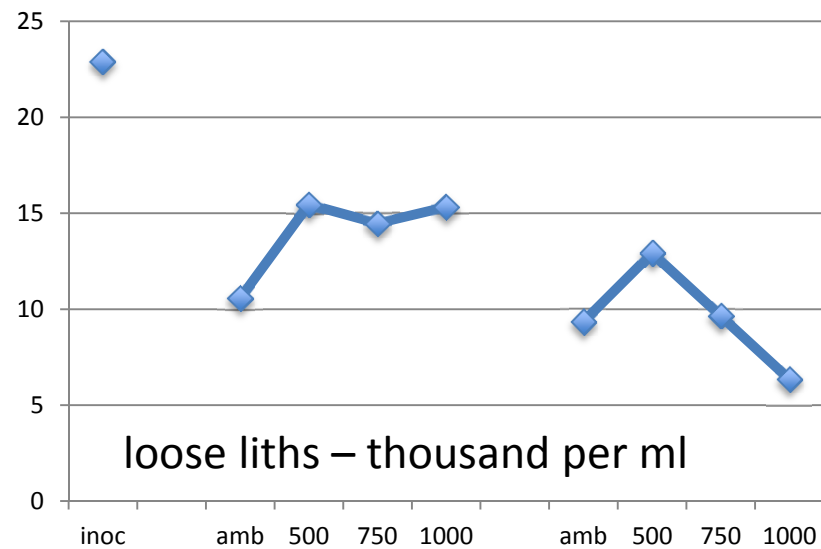
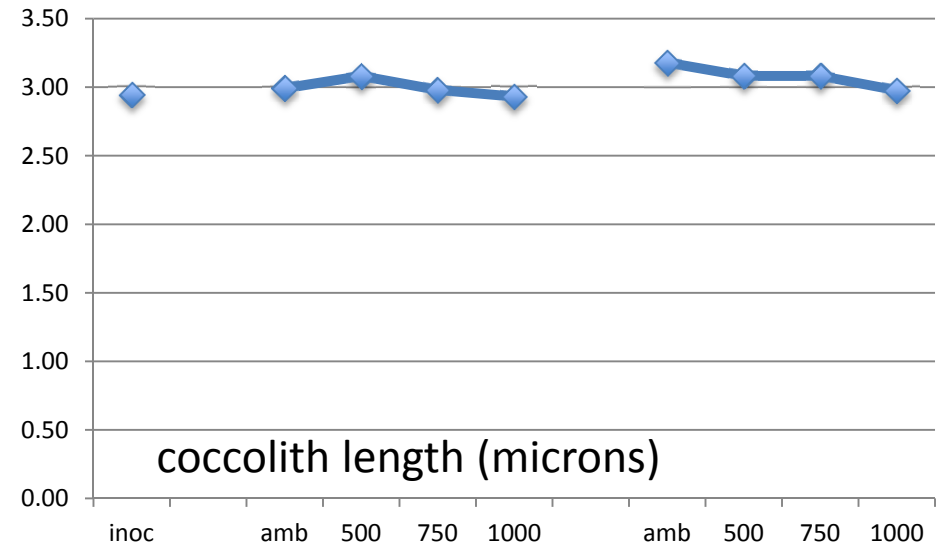
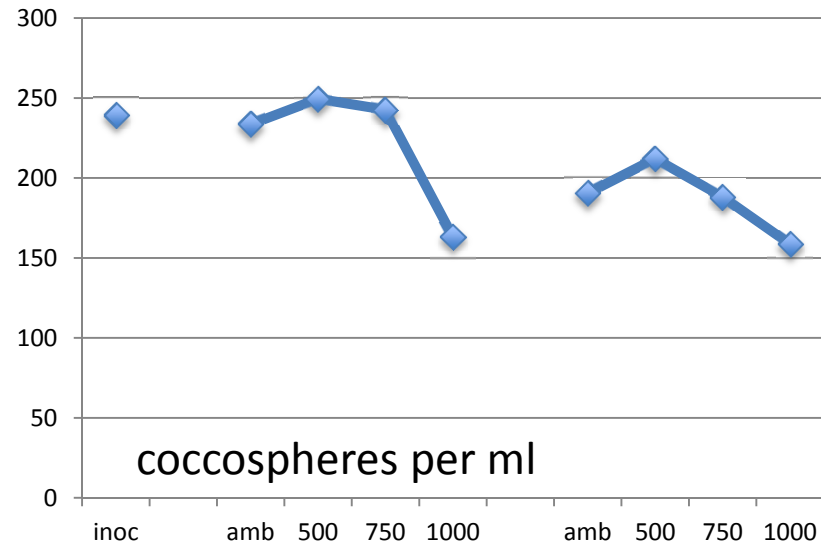


# coccospheres/ml

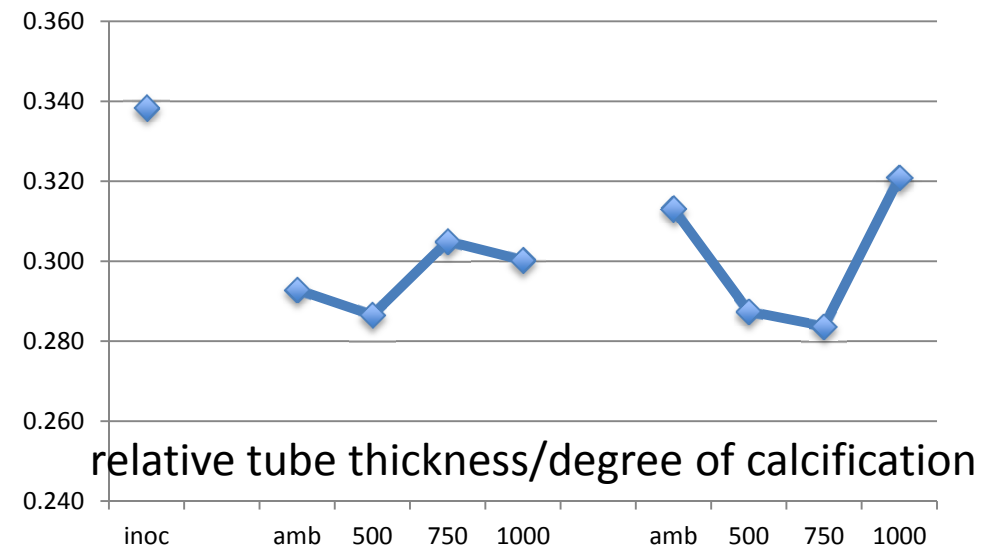
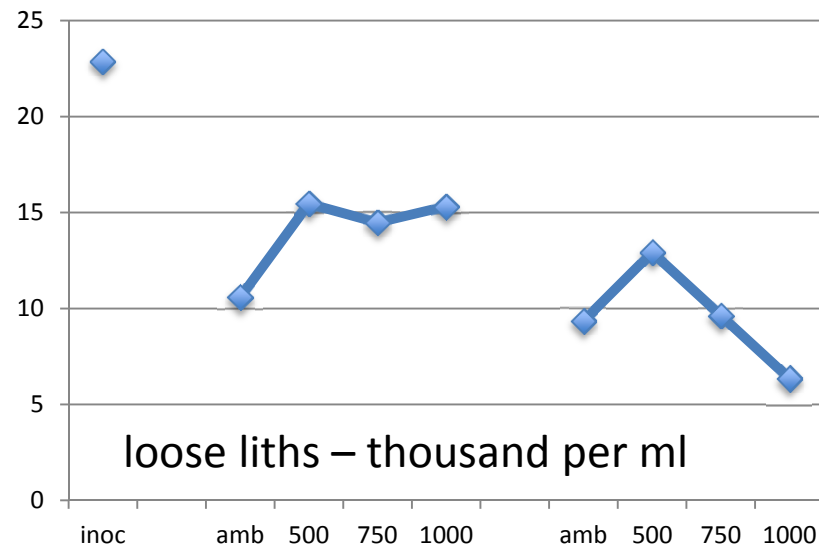
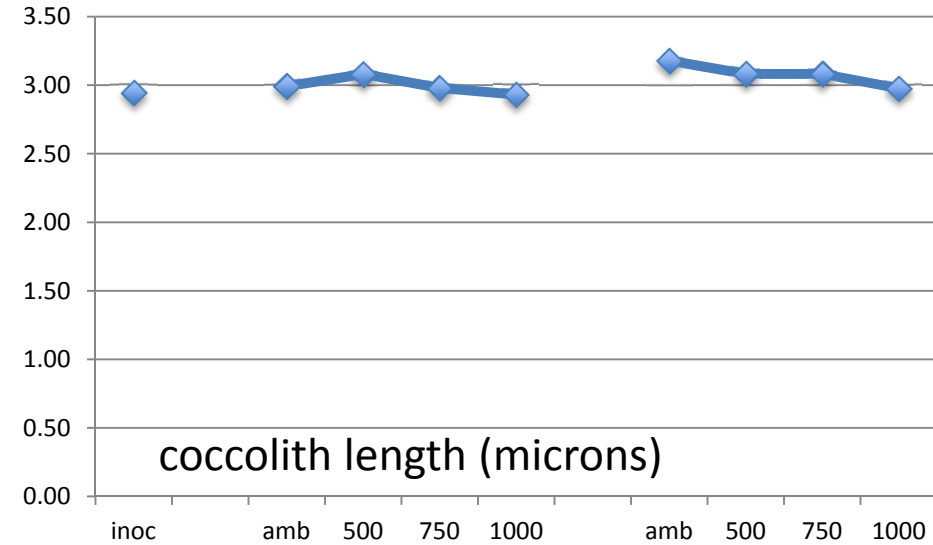
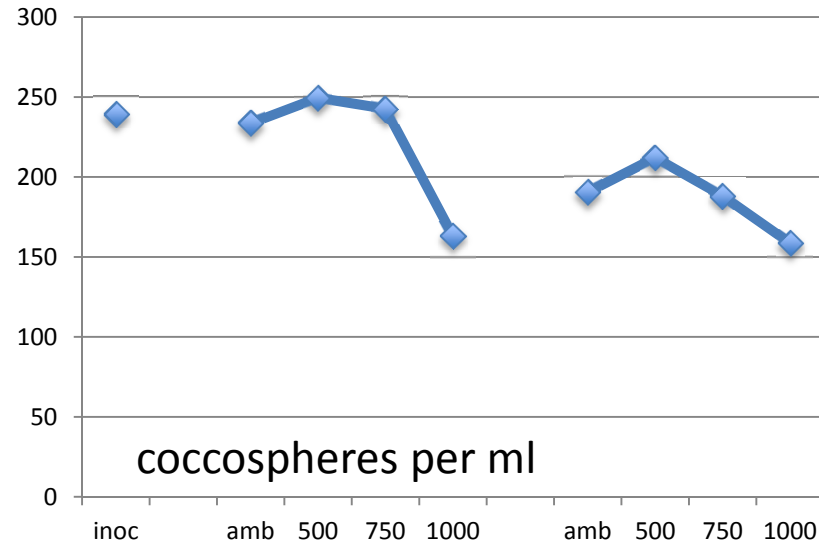




# Bioassay 1 - Mingulay

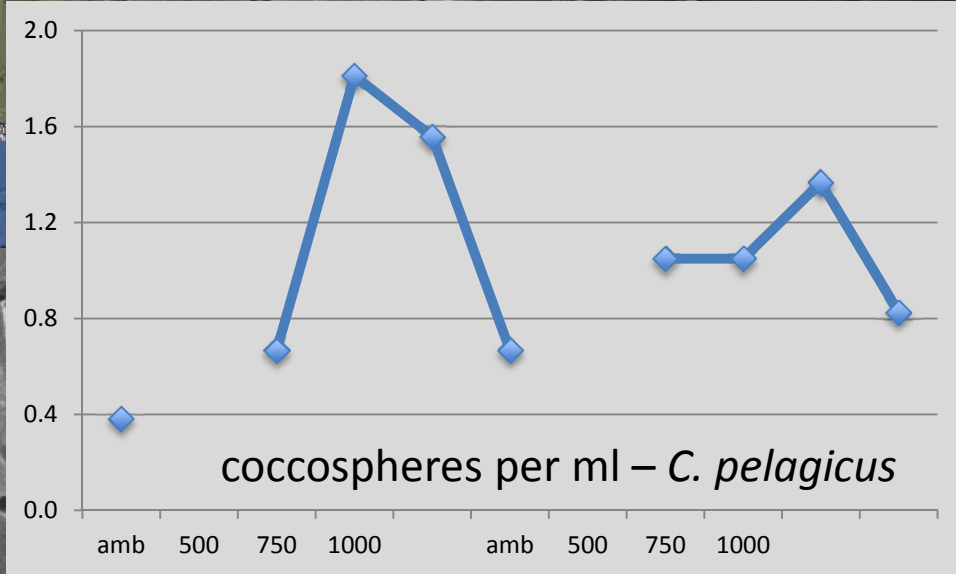
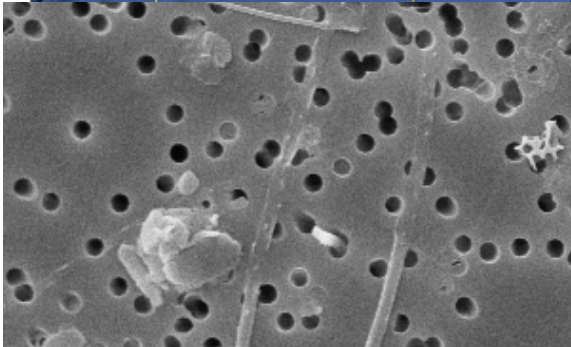
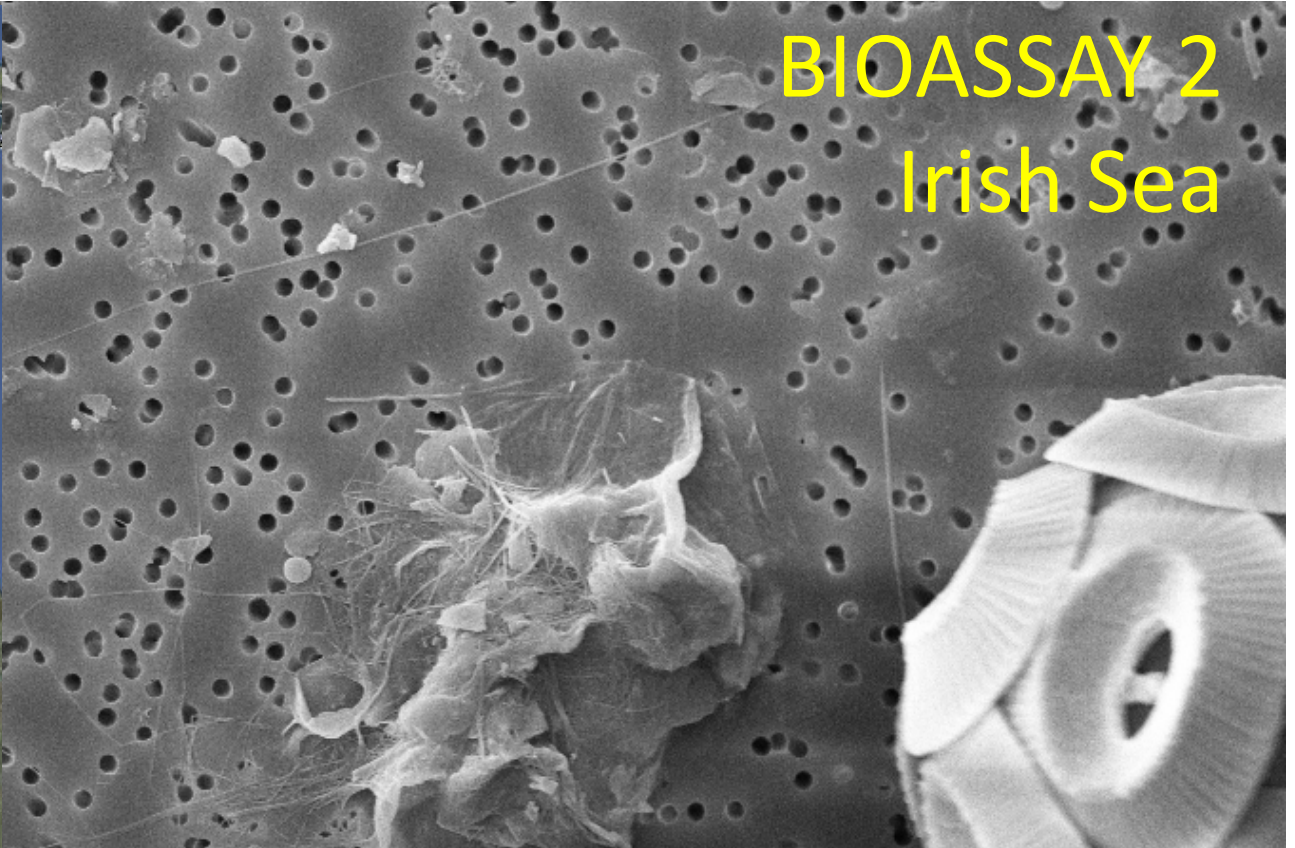


# Bioassay 1 - Mingulay



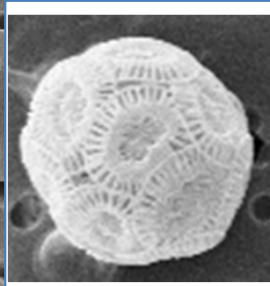
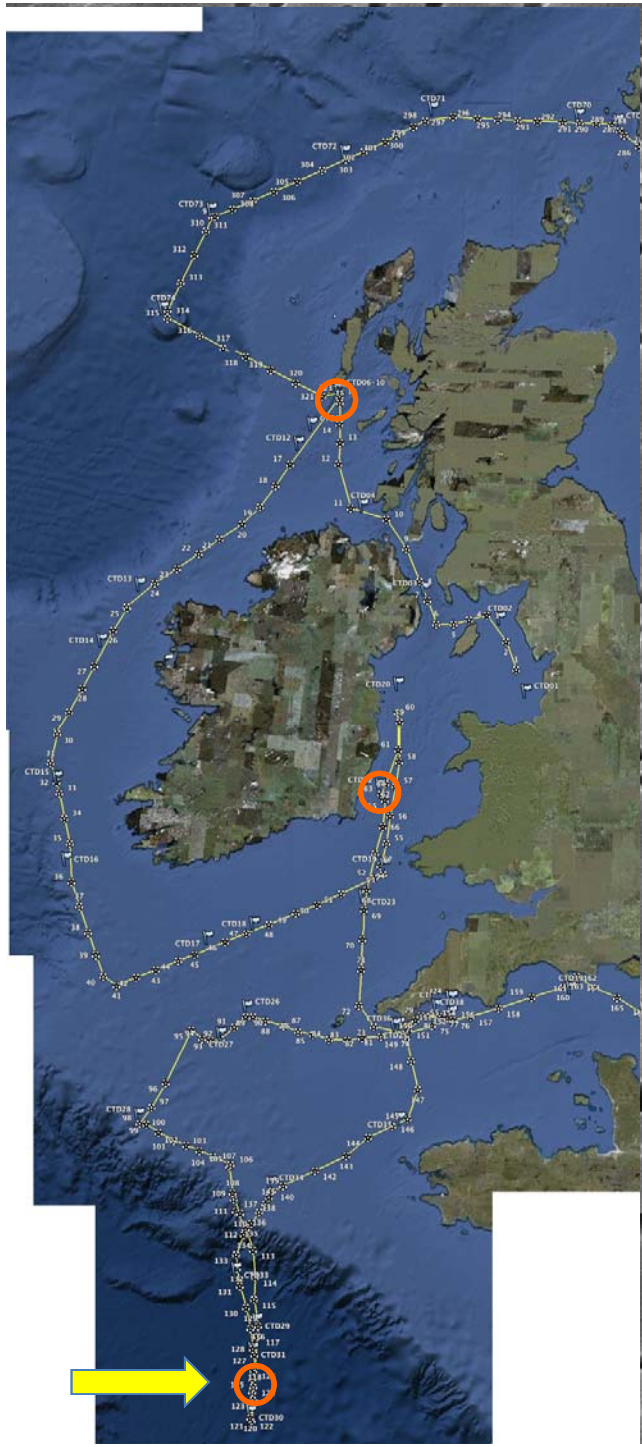


# BIOASSAY 2 Irish Sea

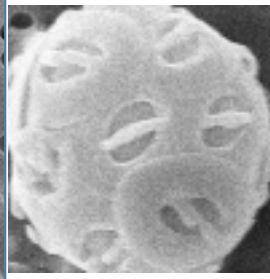




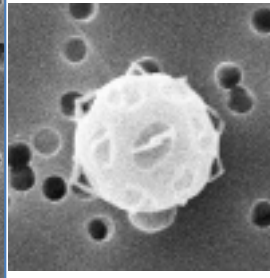
# BIOASSAY 3 Bay of Biscay



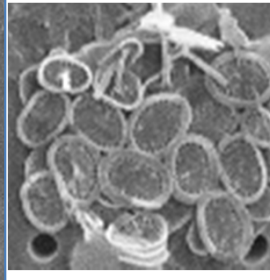
*E. huxleyi*



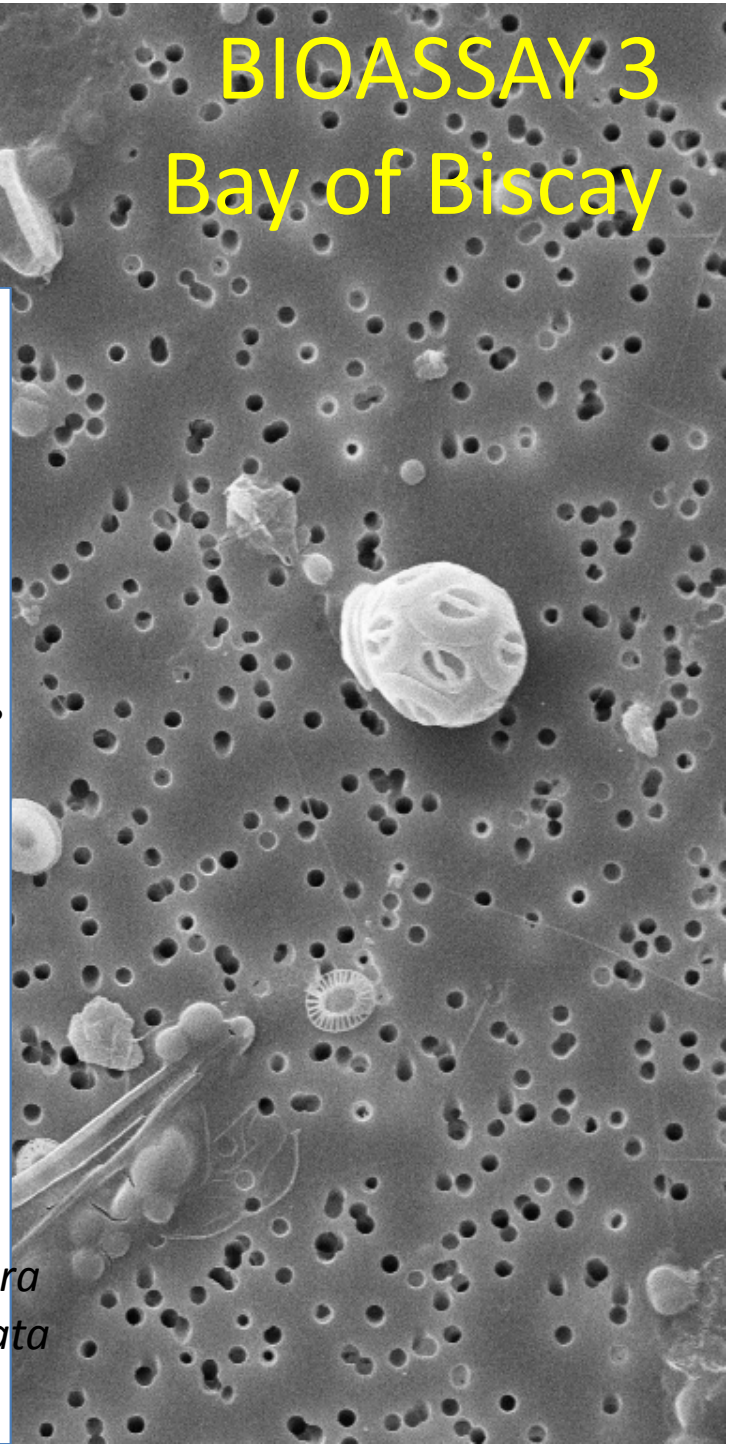
*G. muellerae*



*G. ericsonii*

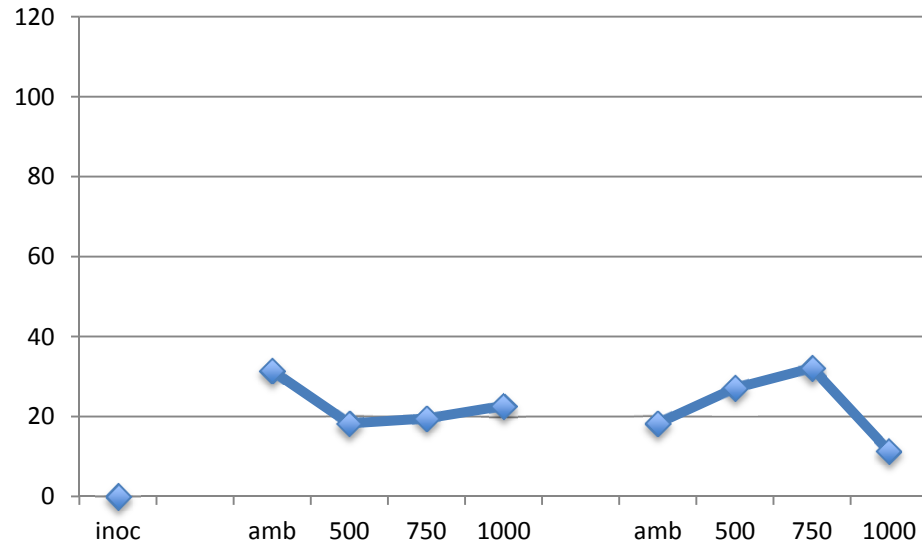


*Syracosphaera marginaporata*

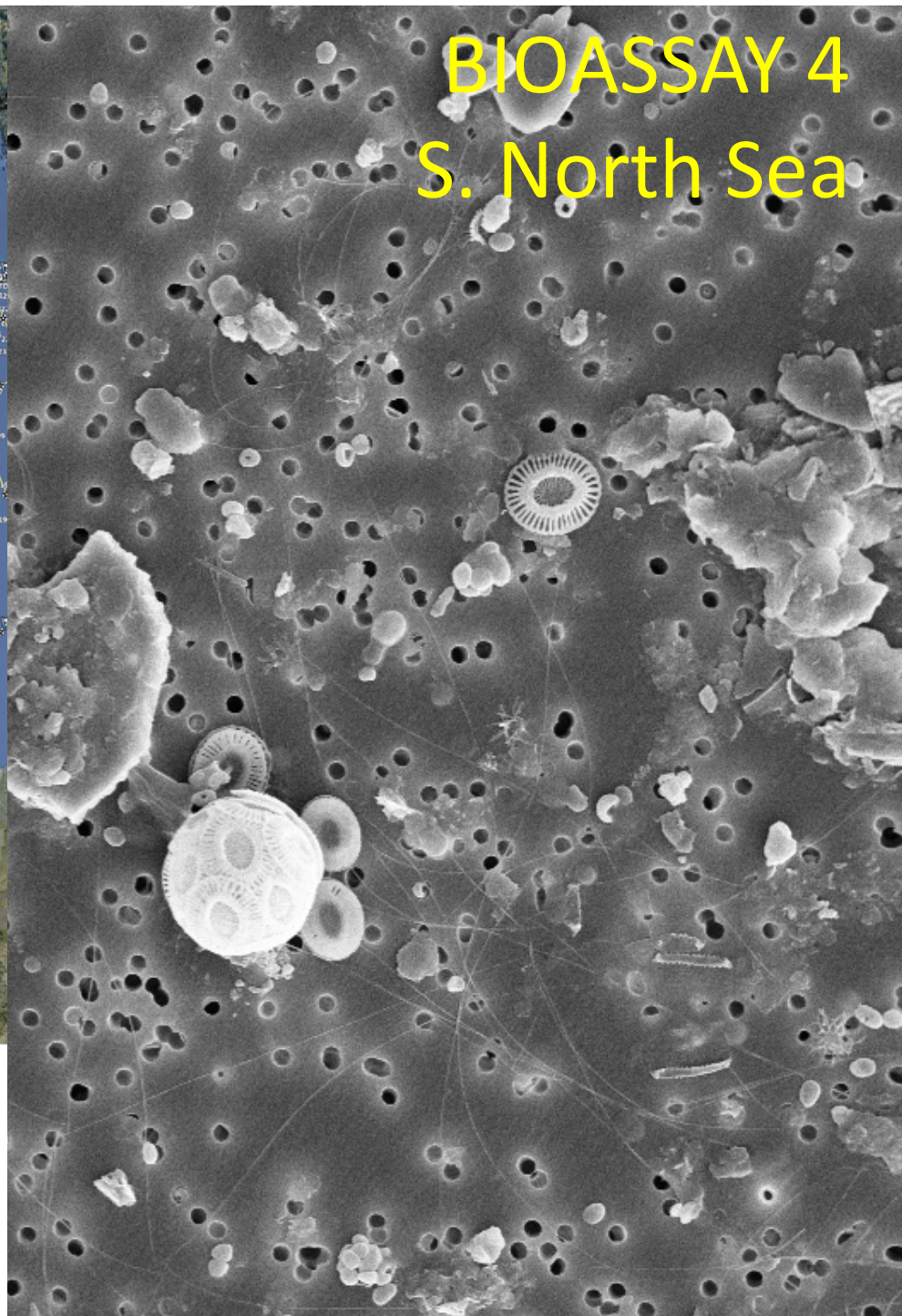
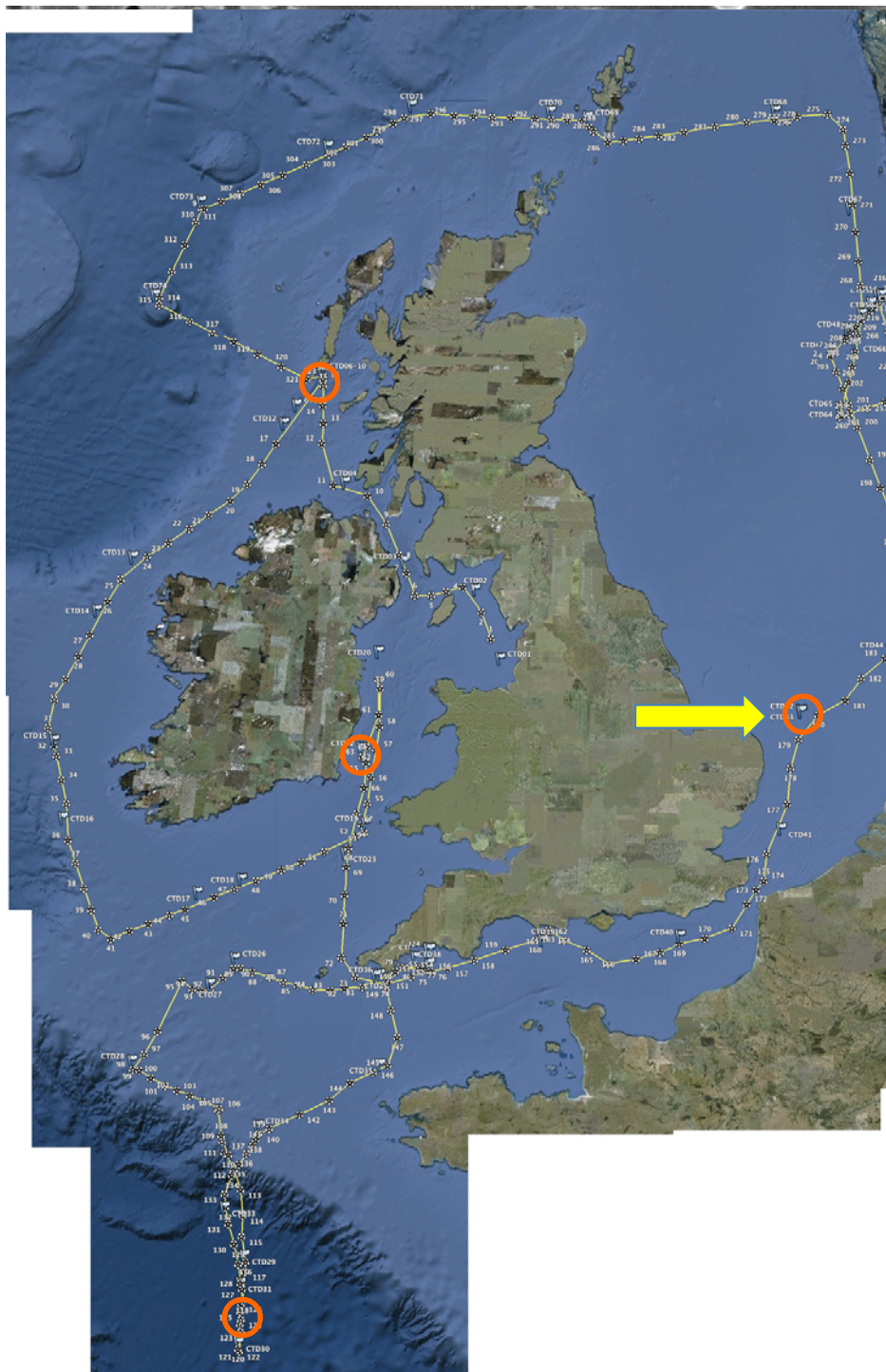




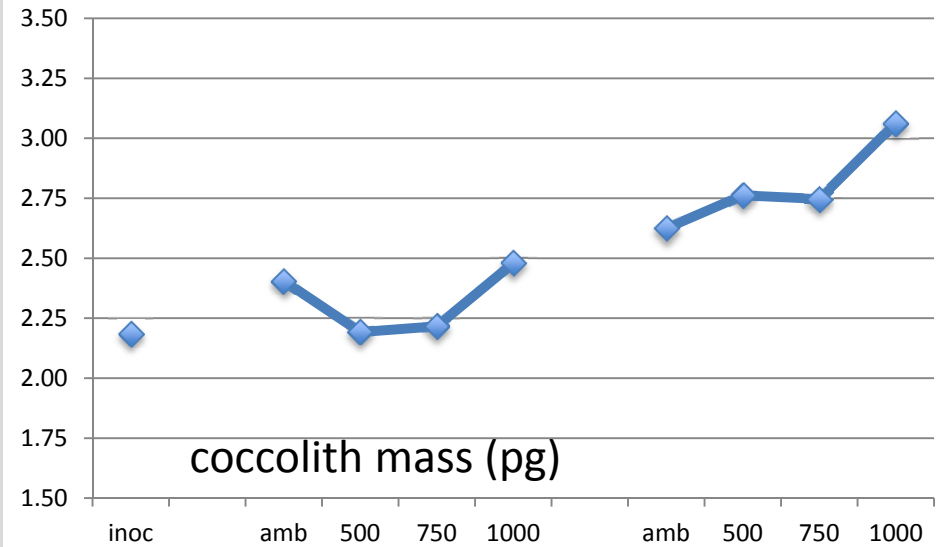
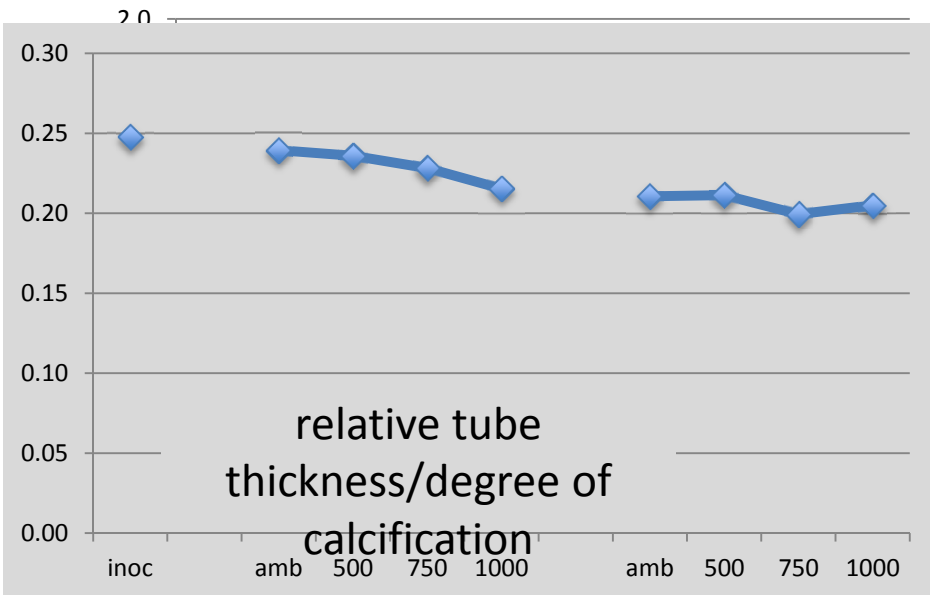
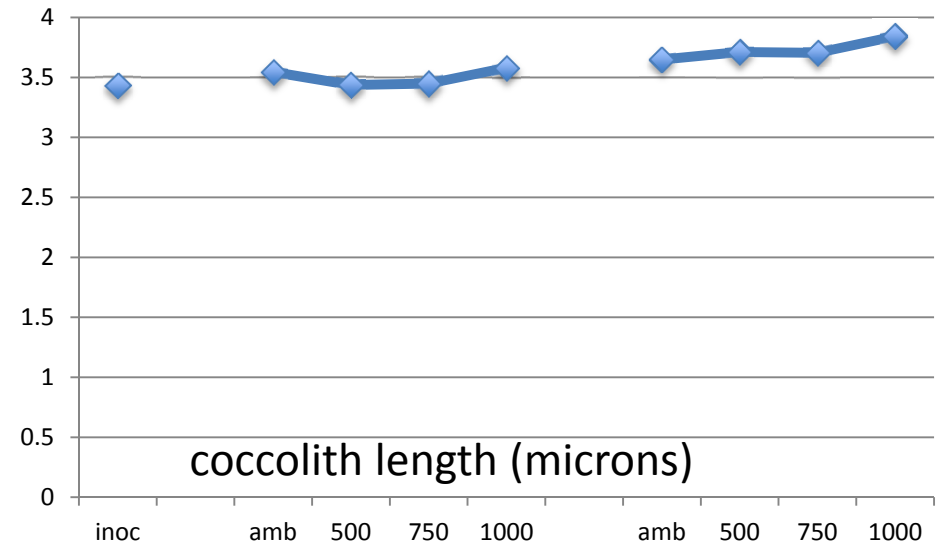
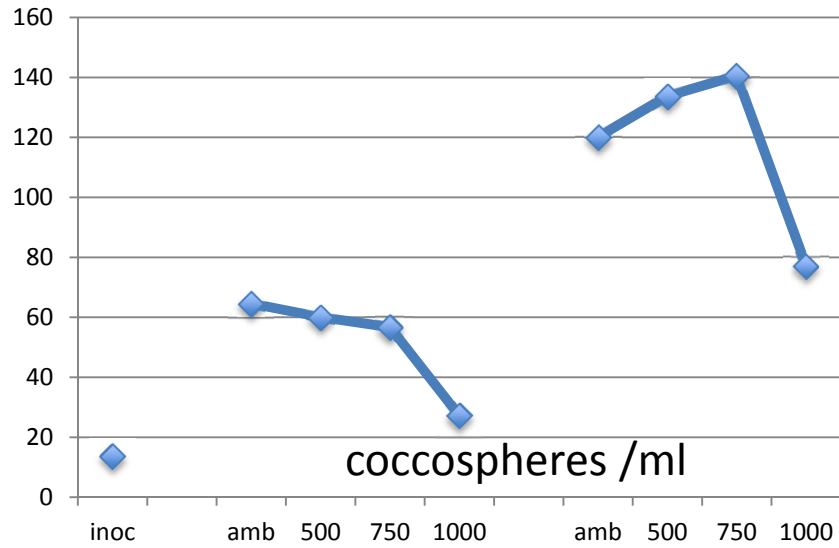
# Bioassay 3 – Bay of Biscay



# BIOASSAY 4 S. North Sea

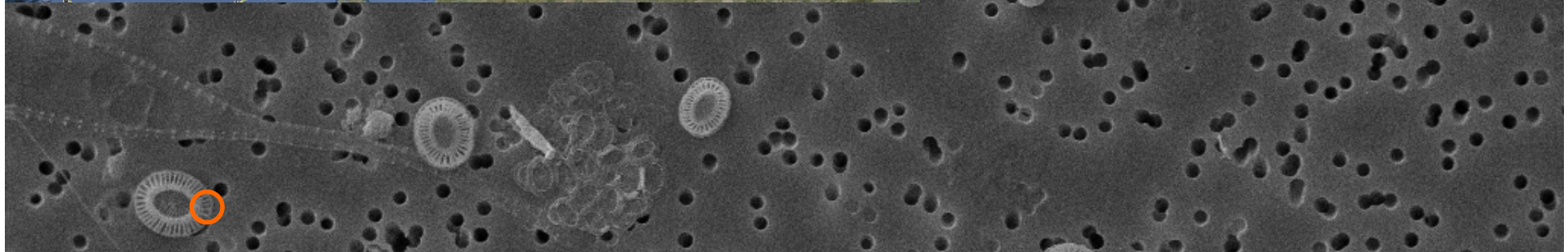
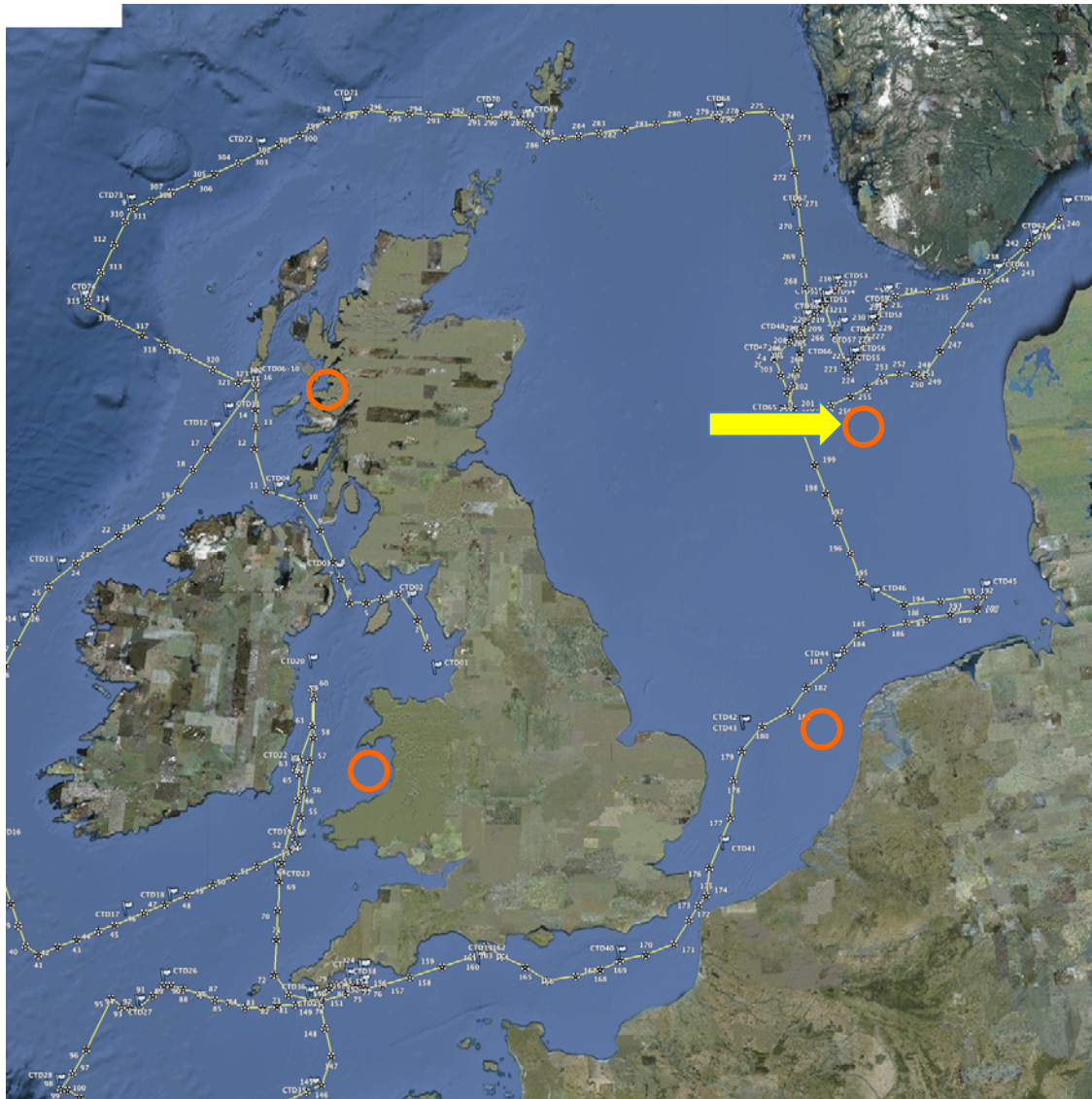


# Bioassay 4 – S. North Sea

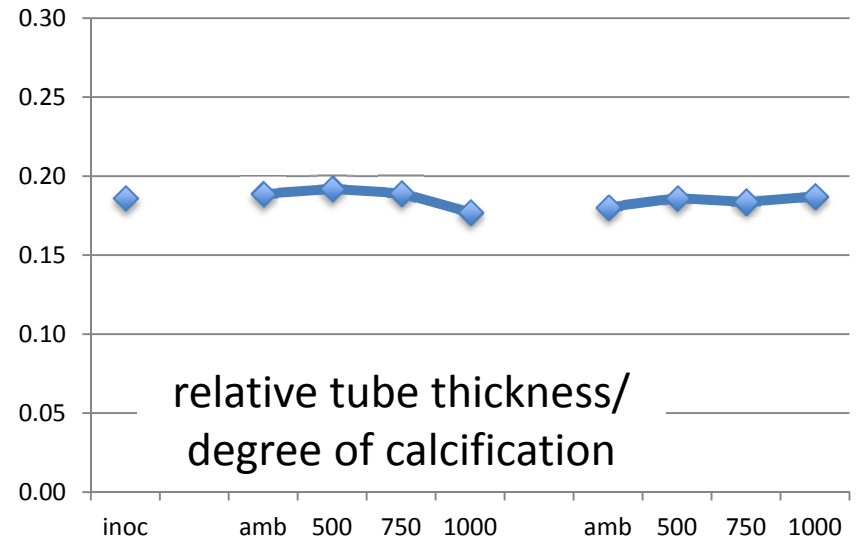
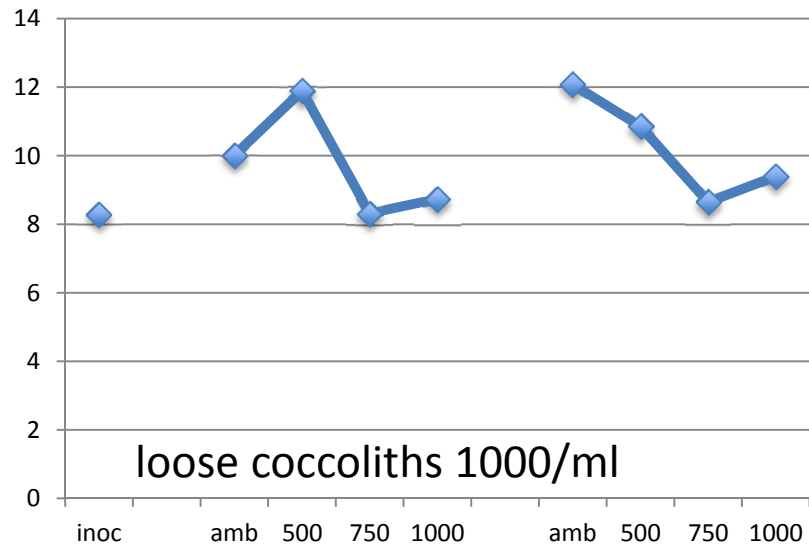
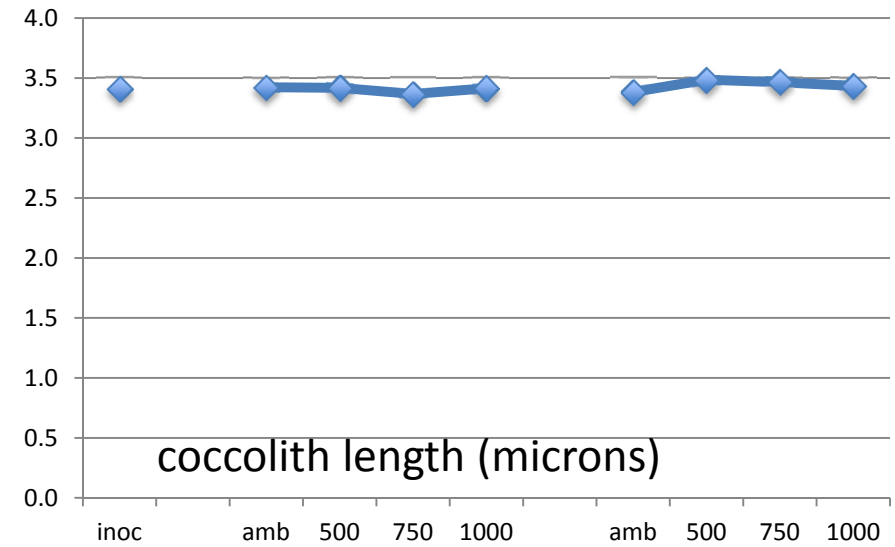
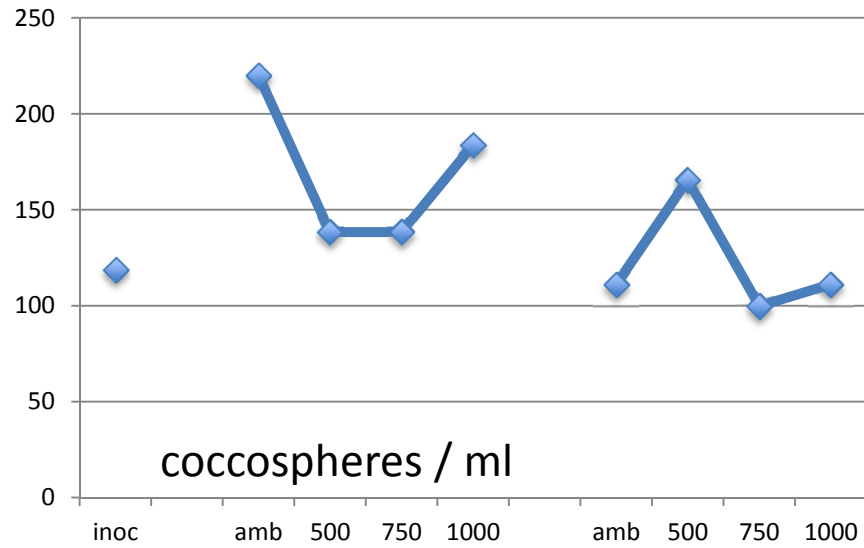




# BIOASSAY 5 N. North Sea

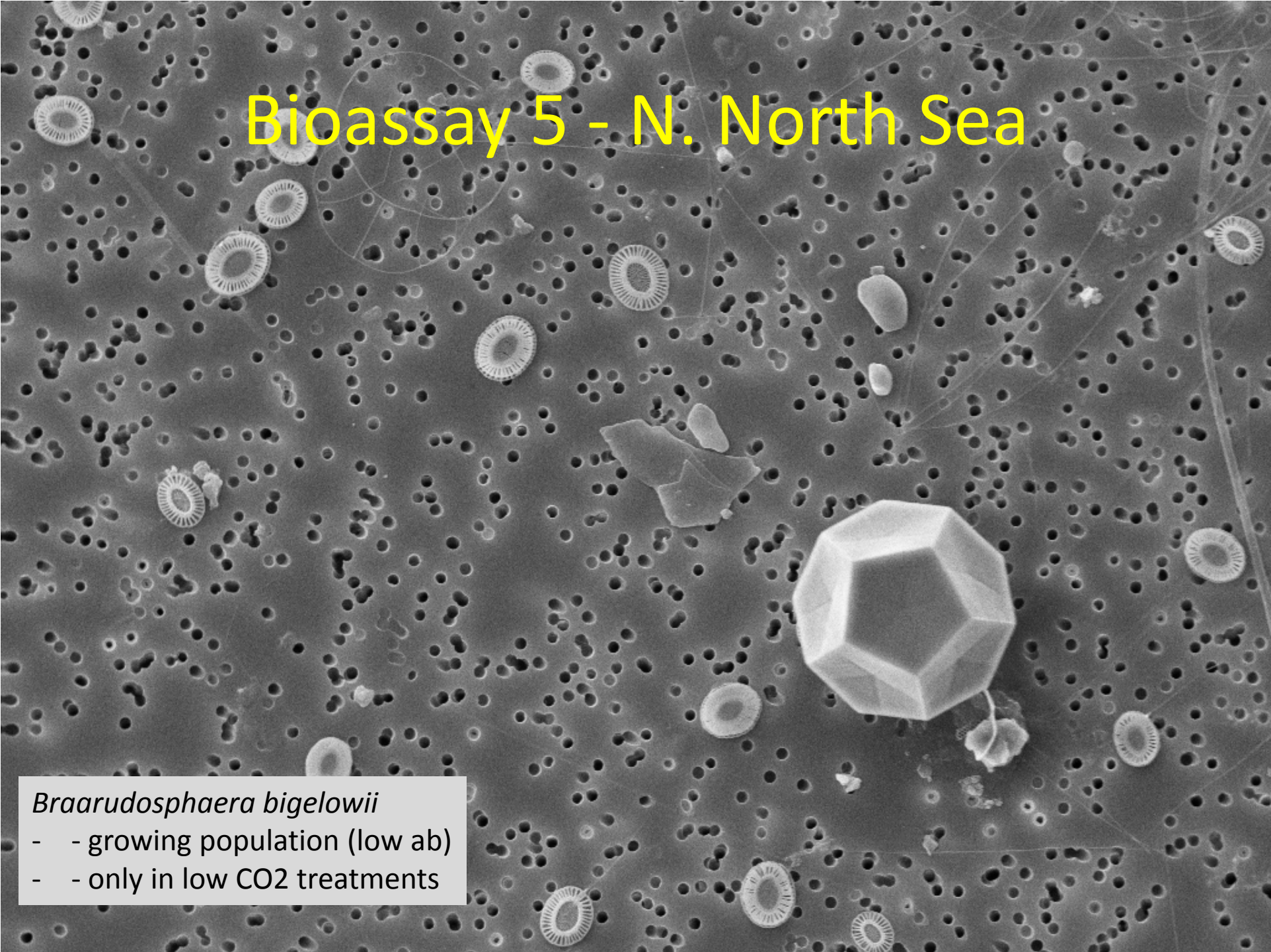


# Bioassay 5 – N. North Sea





# Bioassay 5 - N. North Sea

A grayscale micrograph showing a dense population of Braarudosphaera bigelowii cells. The cells are spherical and exhibit a characteristic radial pattern of pores on their surface. A large, prominent, faceted cell is visible in the lower right quadrant. The background is filled with numerous smaller, similar cells, some of which are slightly out of focus. The overall appearance is that of a rich, multi-species microbial community.

*Braarudosphaera bigelowii*

- - growing population (low ab)
- - only in low CO<sub>2</sub> treatments



# Summary

- work in progress - more analyses, more bioassays, env. samples and more cruises to come
- provisional result higher CO<sub>2</sub>:
  - decreases growth rates
  - increases lith size
  - decreases calcification
  - but not by a lot

