

In Situ Community Structure of Marine Photosynthetic Picoeukaryotes

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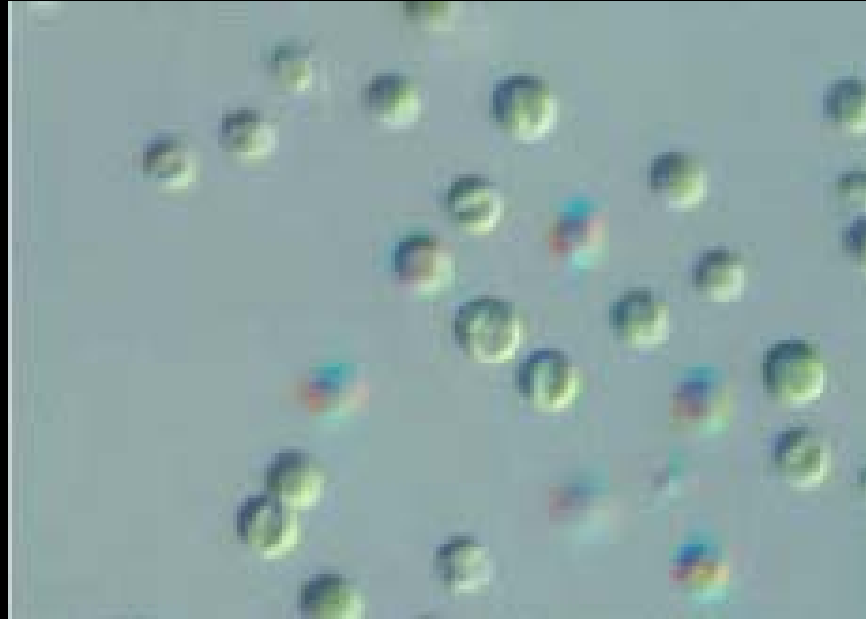
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Marine photosynthetic picoeukaryotes



- found in most oceanic regions
- greater abundance in mesotrophic waters
- 10-100x less numerous than *Synechococcus* & *Prochlorococcus*
- can dominate at DCM (low light, high nutrients)

Ecological significance of PPEs

- Picoeukaryotes are significantly larger than their prokaryotic counterparts

- In the central North Atlantic Ocean averaged over depth & season:

	<i>Pro</i>	<i>Syn</i>	<i>PPE</i>
Cell numbers, %	78	12	10
Light scatter (C biomass), %	11	2	87
Red fluorescence (chl biomass), %	28	11	61
Primary productivity, %	19	13	68

Li (1994). L&O 39:169-175

- Thus, picoeukaryotic algae can dominate the biomass and productivity of picophytoplankton *in situ*.

Picoeukaryote algal classes

Chlorarachniophyceae

Chrysophyceae

Cryptophyceae

Diatomophyceae

Dictyochophyceae¹

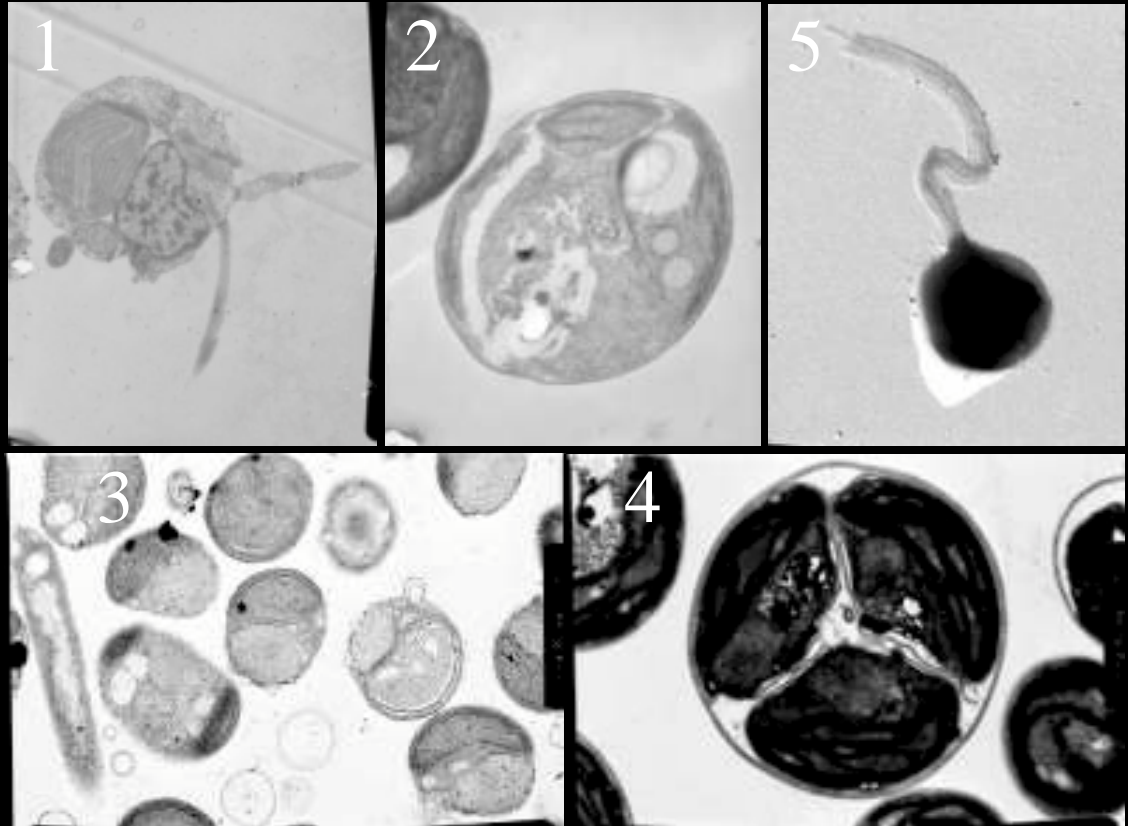
Eustigmatophyceae

Pavlophyceae

Prasinophyceae^{2,3}

Prymnesiophyceae

Trebouxiophyceae⁴



- 3 new picoeukaryote algal **classes** identified during the last decade:

1993 - Pelagophyceae⁵

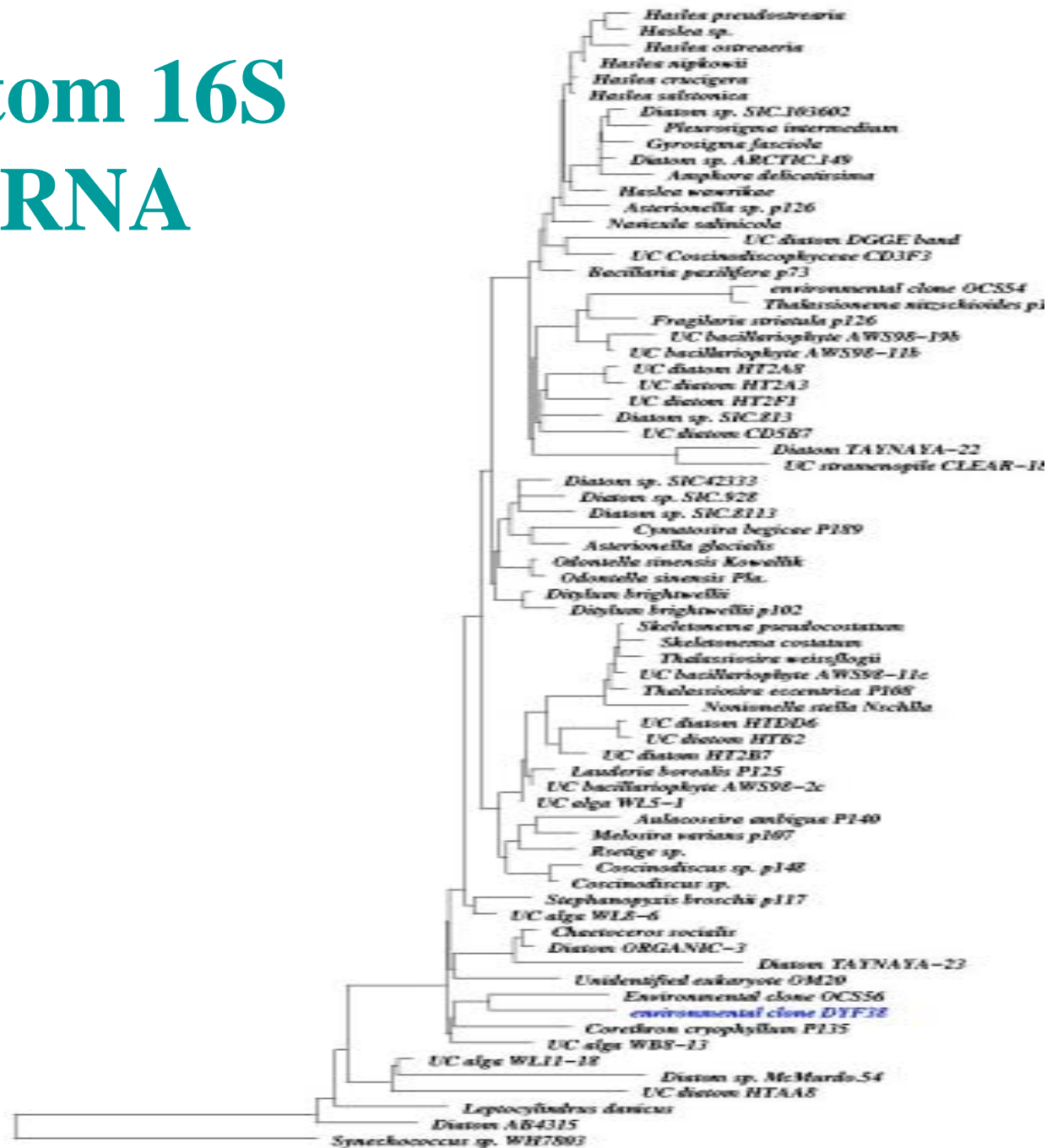
1999 - Bolidophyceae

2002 - Pinguiphyceae

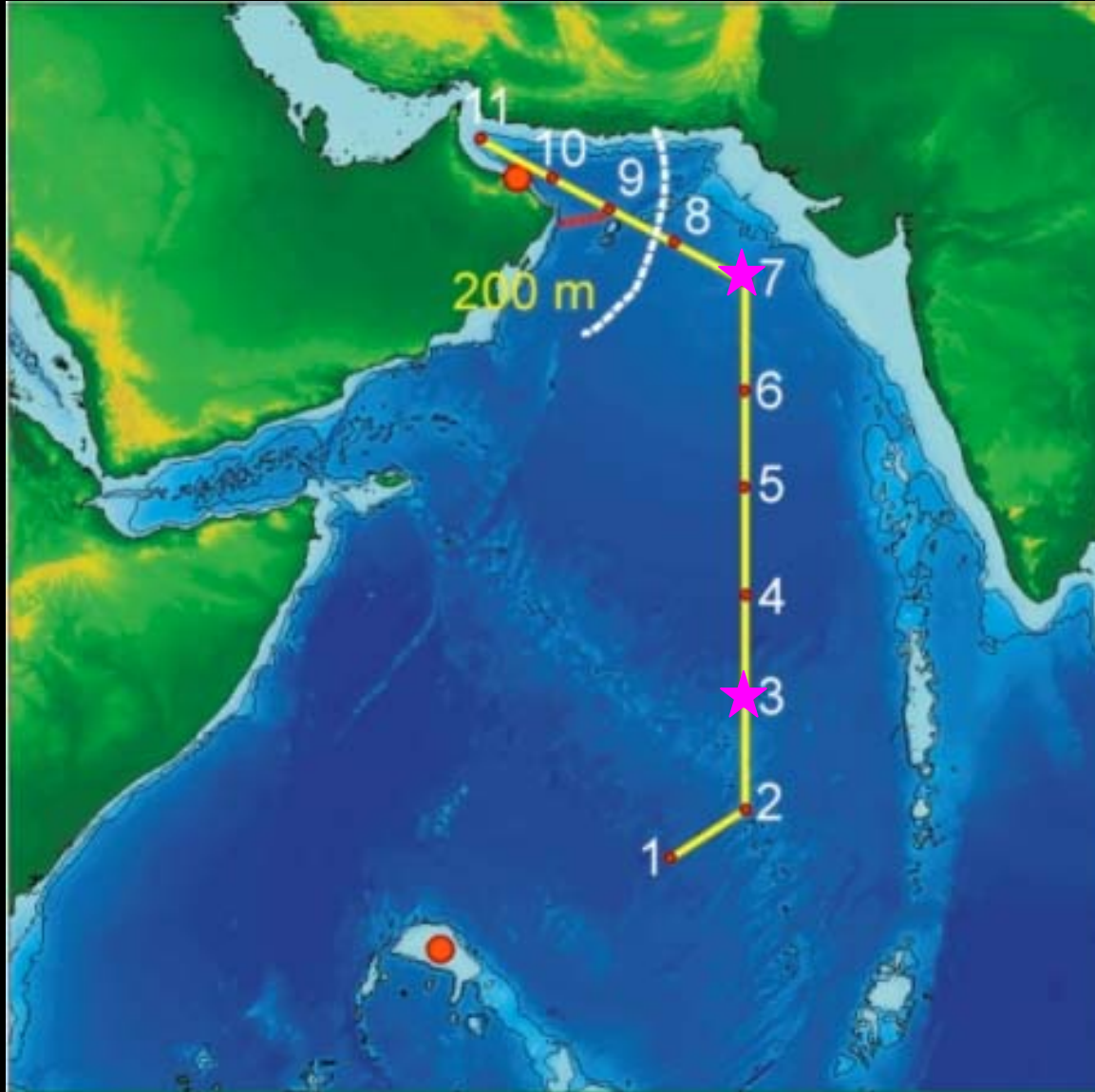
Aims

- Investigate the extent of genetic diversity amongst PPEs specifically using the chloroplast 16S rRNA gene.
- Develop oligonucleotide probes for each class of PPE.
- Determine the spatial variability of PPE diversity in the natural environment (dot blots).
- Correlate PPE community structure with physical and chemical parameters of the water column as well as with the structure of the prokaryotic photosynthetic community.
- Determine the 'active' members of the picoeukaryote community using a RT-PCR based approach following extraction of environmental rRNA (dot blots).

Diatom 16S rRNA



AMBITION



Sampling

- 6 depths
- 11 stations
- 2 diel cycles★

On-deck incubations

- stations 1 & 7

Ancillary data

- pigments
- cell counts
- nutrients
- STD

PPE community structure

DNA extraction (members present)

- PCR with chloroplast-specific primers
- Dot blot analysis with class-specific oligonucleotide probes

RNA extraction (members active)

- As for DNA (RT-PCR)

^{13}C incubations

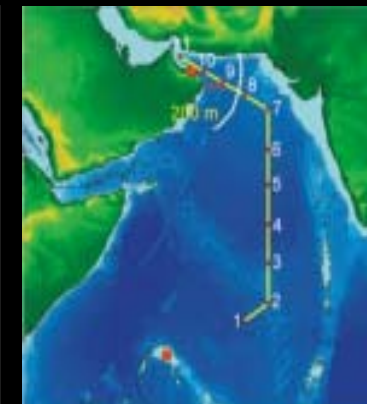
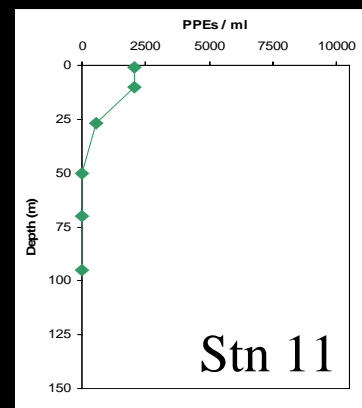
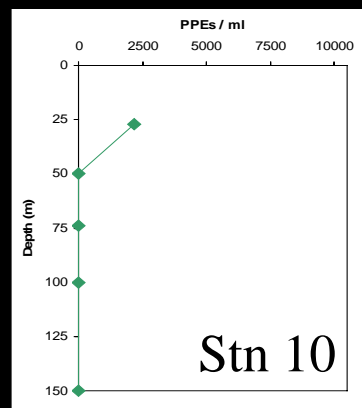
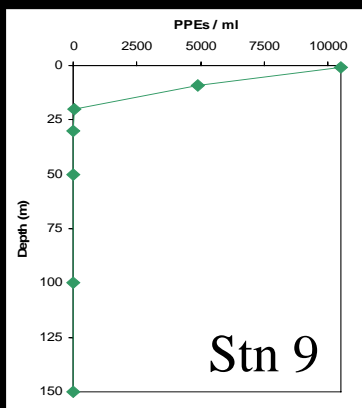
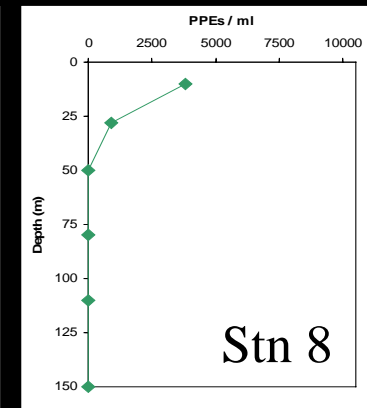
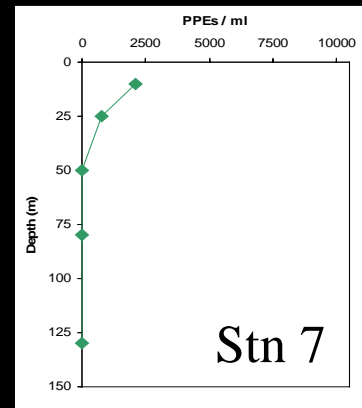
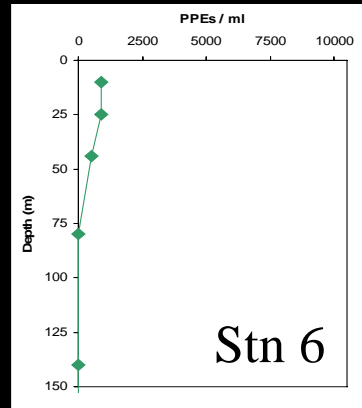
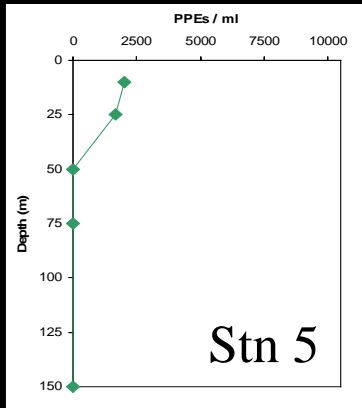
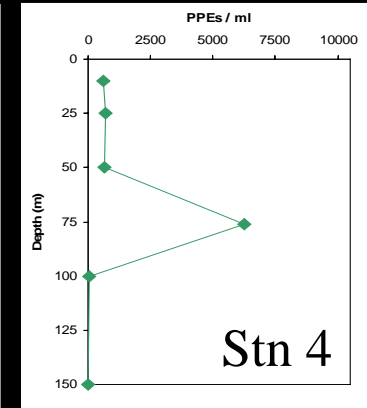
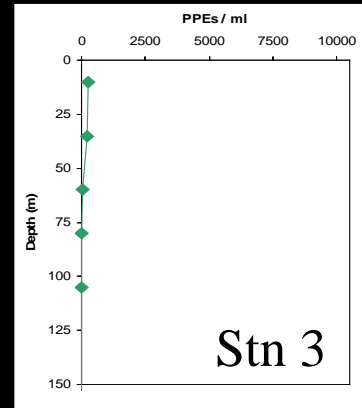
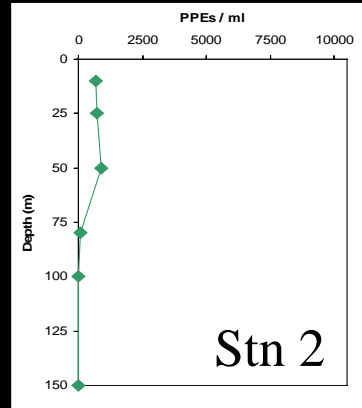
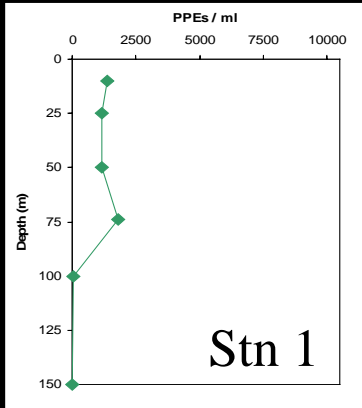
- Preliminary experiment to assess active members by stable isotope probing



PPE isolation

- Sequence analysis of clone libraries from PPE cultures

PPE cell counts



Future Work

- Obtain bolidophyte 16S rDNA sequences
- Design oligonucleotide probes specific for each algal class
- PCR & dot blot analysis of DNA from AMBITION transect
- RT-PCR & dot blot analysis of RNA from AMBITION transect
- Correlation of PPE community structure with environmental variables

Acknowledgements

Picoeukaryote cultures

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Diatom Sequences

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Picoeukaryote clone libraries

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