How to investigate Picophytoplankton composition best?

B Knefelkamp

My Thesis Committee: KH Wiltshire (AWI), GO Kirst (Uni HB, rtd), R Amann (MPI), J Throndsen (UIO, rtd), G Gerdts (AWI), W Eikrem (UIO), D Vaulot (SBR)

Other participants: A Wichels (AWI), K Metfies (AWI), L Medlin (AWI), R Niestroj (AWI / FTH Berlin), C Gescher (AWI), N Simon (SBR), S Masquelier (SBR), E Foulon (SBR)

The aim of this work is to obtain expertise allowing to investigate the role of picophytoplankton in the pelagic trophodynamic processes ("Helgoland Foodweb Project"). Picophytoplankton are the smallest (< 3 µm), single celled plants and cyanobacteria, living in worldwide waters. They occur at all trophic states and form the dominating biomass. The autotrophs play an important role in the production of oxygen and are therefore a basis of life in, for example marine, water habitats. However, until now they are poorly identified and only small investigations on their physiology and interactions are carried out. This may occur from the lack of a suitable method to describe the range of picophytoplankton organisms in a whole.

This PhD project is based on an international cooperation and is part of the Marmic programme. In detail, the eukaryotic picophytoplankton organisms off Helgoland shall be identified, examined genetically, structurally and physiologically (with methods like HPLC, a fluorometer, FISH, DGGE, flow cytometry and EM), and their recognised basic role in trophodynamic processes shall be deliberated. All samples were taken from the surface at the Helgoland roads (54°11.18' N, 07° 54' E) between March 2005 and March 2006. For picophytoplankton investigations, the water was pre-filtered over 10 and 3 µm with a maximum pressure of 200 mbar.

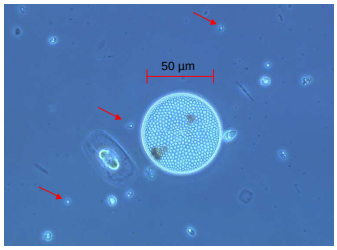

Figure 1: Picophytoplankton organisms are "the little green dots" in the light microscope.

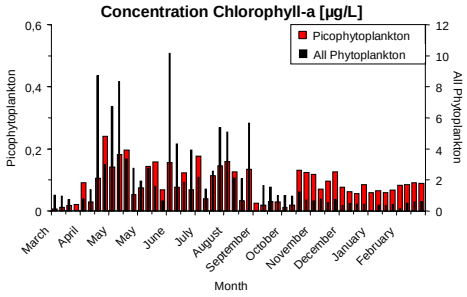

Figure 2: Chlorophyll-a concentration measured by HPLC

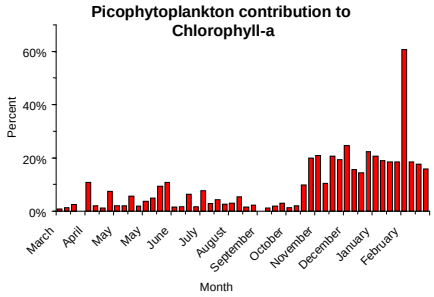

Figure 3: Picophytoplankton contribution

Picophytoplankton concentration increases when larger Phytoplankton decreases

Percentage of Picophytoplankton high in winter, low in summer

But WHO are they ?

Polyphasic analysis can give an answer !

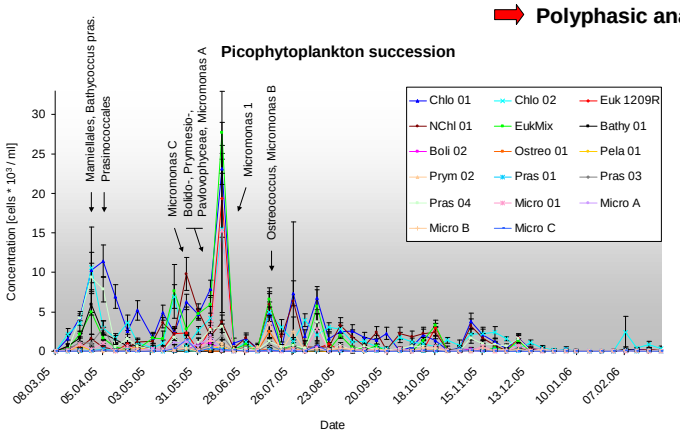

Figure 4: FISH analysis, specific peaks during the year are highlighted

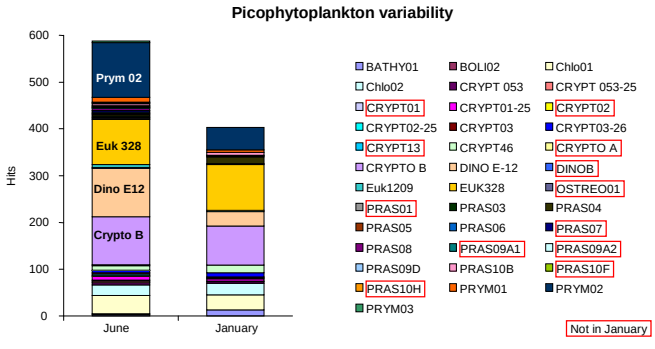

Figure 5: Microarray analysis of the Picophytoplankton composition (carried out by R. Niestroj)

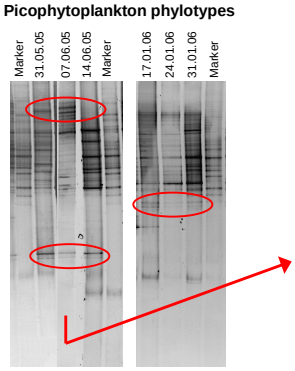

Figure 6: DGGE of Picophytoplankton

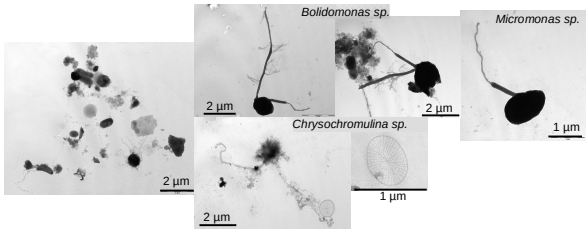

Figure 7: EM pictures of the sample taken on 07.06.2005

Higher Picophytoplankton variability in June than in January

Differences in the occuring phylotypes in June and January

References chlorophyll-a of all Phytoplankton: Wiltshire & Manly, 2004; Franke H-D, Buchholz F, Wiltshire KH, 2004 http://www.pangaea.de

Name: Britta Knefelkamp
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