**Proboscia inermis**: A key diatom species in Antarctic autumn

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**INTRODUCTION**

In Antarctic waters Proboscia species have been repeatedly reported. They can occur in high numbers during summer-autumn months, contributing a large amount to the total phytoplankton biomass. Occasionally, they are found in sediment records. The three Proboscia species living in the Antarctic exhibit a winter life stage characterized by a heavily silicified theca and likely a slow metabolism while remaining vacuolated (Fryxell, 1990). Here, we present data from an autumnal cruise to the Antarctic as part of a "Southern Ocean-GLOBAL Ocean Ecosystem Dynamics" (SO-GLOBEC) study. There, relatively high amounts of Proboscia inermis frustules were found in the water column and at the unconsolidated sediment layer. We hypothesize a post blooming situation with a fast sinking event triggered by sexual reproduction and by winter growth stage formation.

**METHODS**

Water samples were collected off Adelaide Island (West Antarctic Peninsula) during a dive expedition with "RV Polarstern" ANTXXVIII/5Bi. Within a grid of stations, the shelf location at 66°58'S, 79°20'W, 500 m, was sampled twice (St.303 & St.327) (April 18-30, 2001). In addition, a set of multidate samples were taken at St.327. Data of T, S, Chl-a, nHCO₃, dissolved nutrients, PO4C, Zn, Cu, and Pb were made available by colleagues. Water and sediment samples were analyzed using light and scanning electron microscopy.

**RESULTS/DISCUSSION**

Chlorophyll-a concentrations peaked at St.303 with 2.7 mg m⁻³ at 25 m (Fig. 1). As we returned to the location of St.303 (now St.327) Chlorophyll-a dropped to 0.8 mg m⁻³ and a thick (5 cm) phytoplankton layer was found on the bottom (pictures below).

*P. inermis* contributed 21% to total phytoplankton carbon (PPC) (Fig. 2). High numbers of Empty Halves and Broken Empty Halves contribute to total frustules in the water column and on the sediment. *P. inermis* exhibited different forms: Spring-Winter Form and transitional stages (Fig. 3), 32 morphotypes in total. Here we depict 3 possible ways for the formation of the morphotypes found:

1. Winter form formation: Spring-Winter Form
2. Vegetative division: Spring-Spring
3. Sexual asexual division:

We suppose the origin of:

- Empty Halves from male and female gametangial cells.
- Broken Empty Halves mostly from Winter Form formation.
- Transitional stages originated from Winter Forms.

These assumptions are supported by the sequences of pictures (B.1-3) and size-frequency distributions (Fig. 5a-d). Vegetative divisions within Spring Form lineage, although in small numbers, as well persist (Fig. 7).

**Fig. 1.** Chlorophyll-a and Biogenic silica concentrations from diverse water samples at St.303 and St.327.

**Fig. 2.** Phytoplankton carbon (PPC) of the most important species in the system. Line on x-y plane represents PPC to FOC ratios.

**Fig. 3.** Proportion of empty *P. inermis* frustules to total *P. inermis* frustules. Abundance of empty or dead total diatoms and empty or dead *P. inermis* in St.303.

**Fig. 4.** Relative contribution of empty frustules to empty frustules related to depth and temporal differences.

**Fig. 5.** Size-frequency distributions of morphotypes and size-lengths of different types in *P. inermis* in the water column and on the sediment.

**Fig. 6.** Size-frequency distributions of morphotypes and size-lengths of different types in *P. inermis* in the water column and on the sediment.

**Fig. 7.** Cell numbers of the null, 1st and 2nd most abundant types of *P. inermis*. Red line represents the sum of all cell types found in St.327. Nine different scales.