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 in 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.

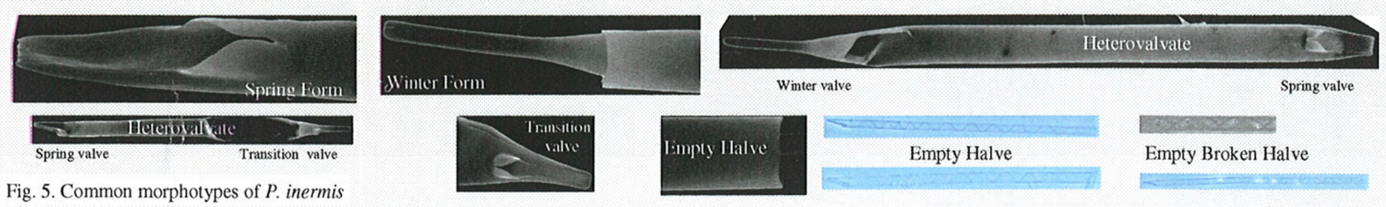
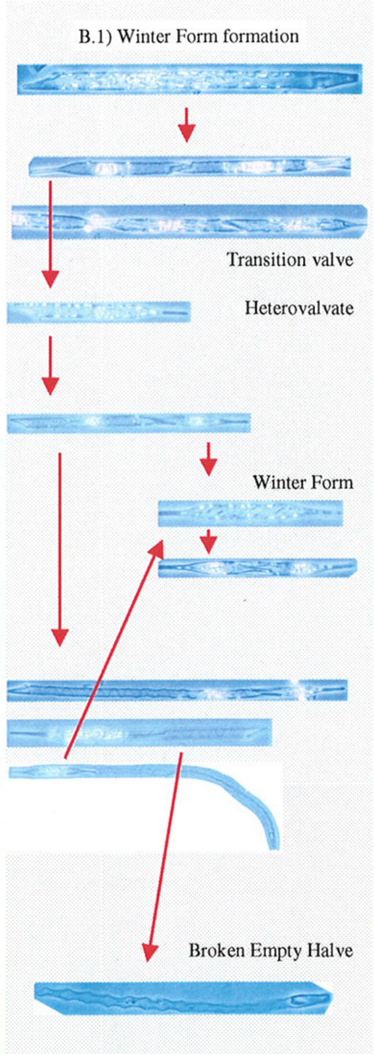


Fig. 5. Common morphotypes of *P. inermis*



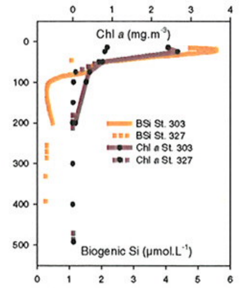
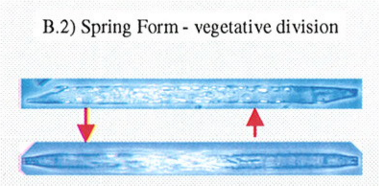


Fig. 1. Chlorophyll *a* and Biogenic silica concentrations from discrete water samples on St.303 and St.327.

METHODS

Water samples were collected off Adelaide Island (West Antarctic Peninsula) during a expedition with "RV Polarstern" ANTXVIII/5b. Within a grid of stations, the shelf location at 66°52'S, 70°29'W, 500m, was sampled twice (St.303 & St.327) (April 18 - 30, 2001). In addition, a set of multicore samples were taken at St.327. Data of T, S, Chla, BSi, dissolved nutrients, POC/N were made available by colleagues. Water and sediment samples were analyzed using light and scanning electron microscopy.



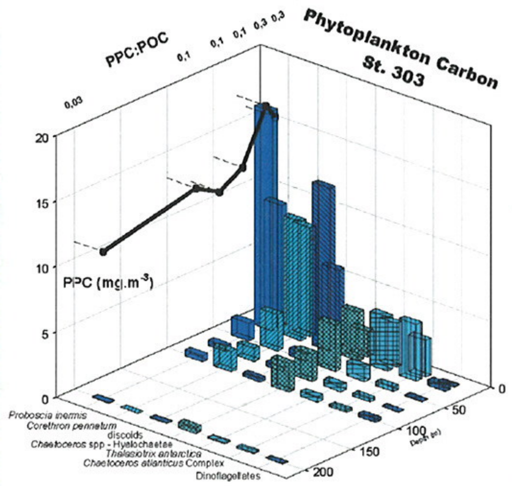


Fig.2. Phytoplankton carbon (PPC) of the most important species in the system. Line on x,z plane represents PPC to POC ratios.

RESULTS/DISCUSSION

Chlorophyll-*a* concentration peaked at St.303 with 2.7 mg m^{-3} at 25m (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 (5cm) phytodetritus 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. (Fig. 3, 4). *P. inermis* exhibited different forms: Spring-, Winter Form and transitional stages (Fig. 5), 32 morphotypes in total.

Here we depict 3 possible ways for the formation of the morphotypes found:

1) Winter form formation: Spring- Transitional-Winter
2) vegetative division: Spring - Spring
3) sexual auxospore formation.

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-frequencies distributions (Fig. 6a-d). Vegetative divisions within Spring Form lineage, although in small numbers, as well persist (Fig. 7).

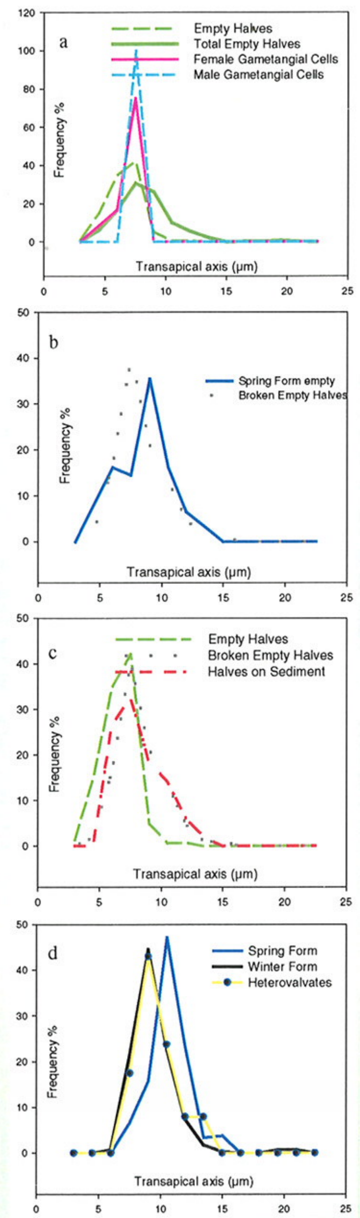
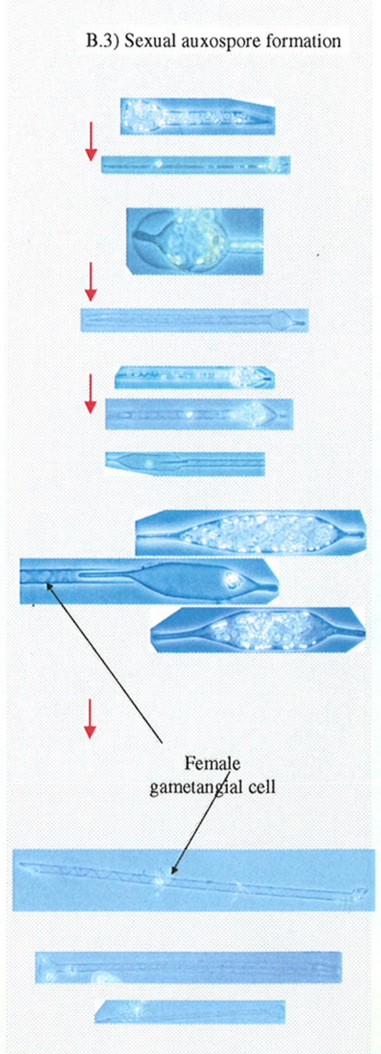


Fig. 6 a-d. Size-frequency distributions of transapical axis lengths of different types in *P.inermis* in the water column and on the sediment.



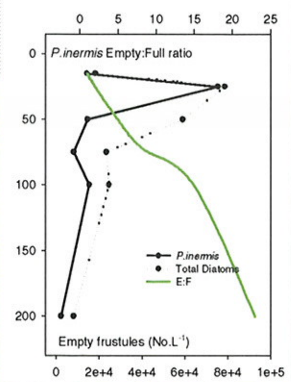


Fig. 3. Thick line represents the ratio of empty *P. inermis* frustules to full *P. inermis* frustules. Abundances of empty or dead total diatoms and empty or dead *P.inermis* in St.303.

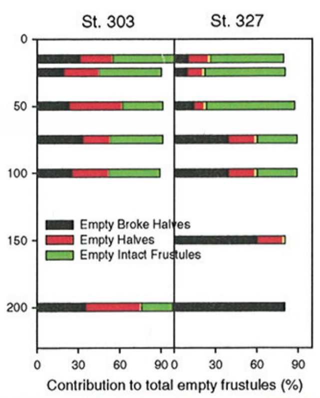


Fig. 4. Relative contributions to empty frustules related to depth and temporal differences

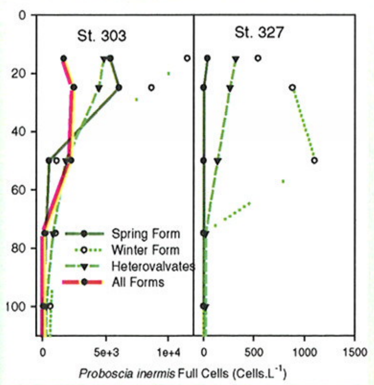


Fig. 7. Cell numbers of the full, 3 most abundant types of *P.inermis*. Red line represents the sum of all full types found in St.327. Note different scales.