THE ROLE OF SYMPAGIC MICROALGAE IN SEEDING PHYTOPLANKTON BLOOMS IN TERRA NOVA BAY (ROSS SEA, ANTARCTICA)

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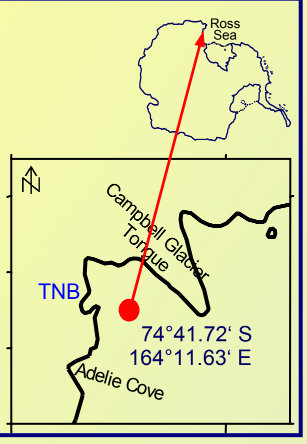
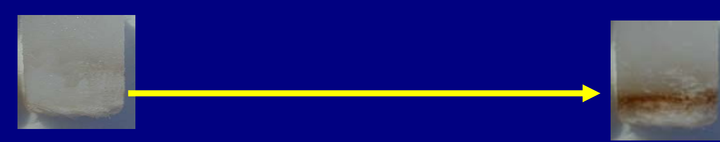
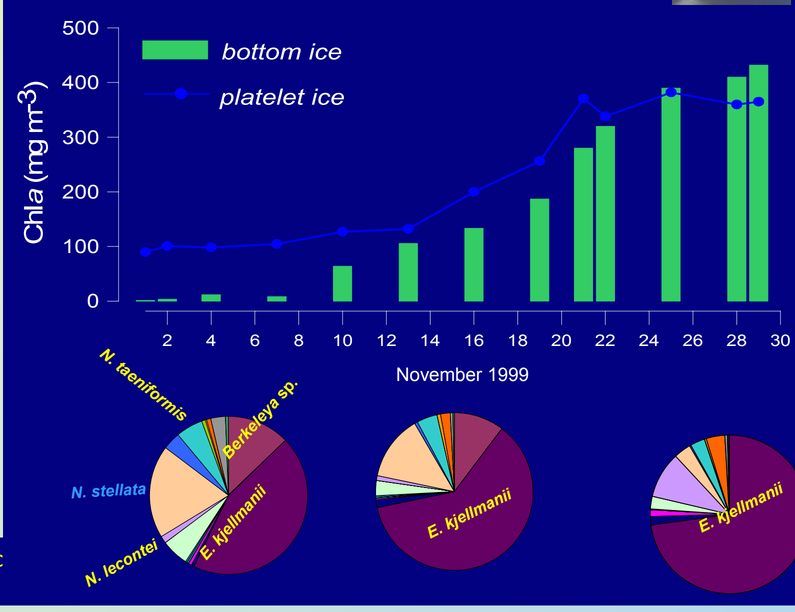
Antarctic pack ice may reach a surface of $2 \cdot 10^7$ km^2 at its peak extension, representing a large and very dynamic ecosystem. Ice melting plays a pivotal role in phytoplankton bloom development by increasing water column stability and by releasing phytoplankton cells that may seed pelagic blooms. In coastal areas, a loose structure of flat, discoidal ice platelets may develop under the pack ice. This platelet ice layer ranges from a few cm up to ten m thickness.

During the XV Italian Antarctic Expedition (October-December 1999), a study was carried out on the role of bottom and platelet sea ice flora in seeding pelagic blooms at Terra Nova Bay (TNB), Ross Sea. Samples of consolidated pack ice and platelet ice were collected every three days. Photosynthetic experiments, HPLC pigment analyses and light and electron microscopy analyses were performed on ice samples and on samples from mesocosm experiments



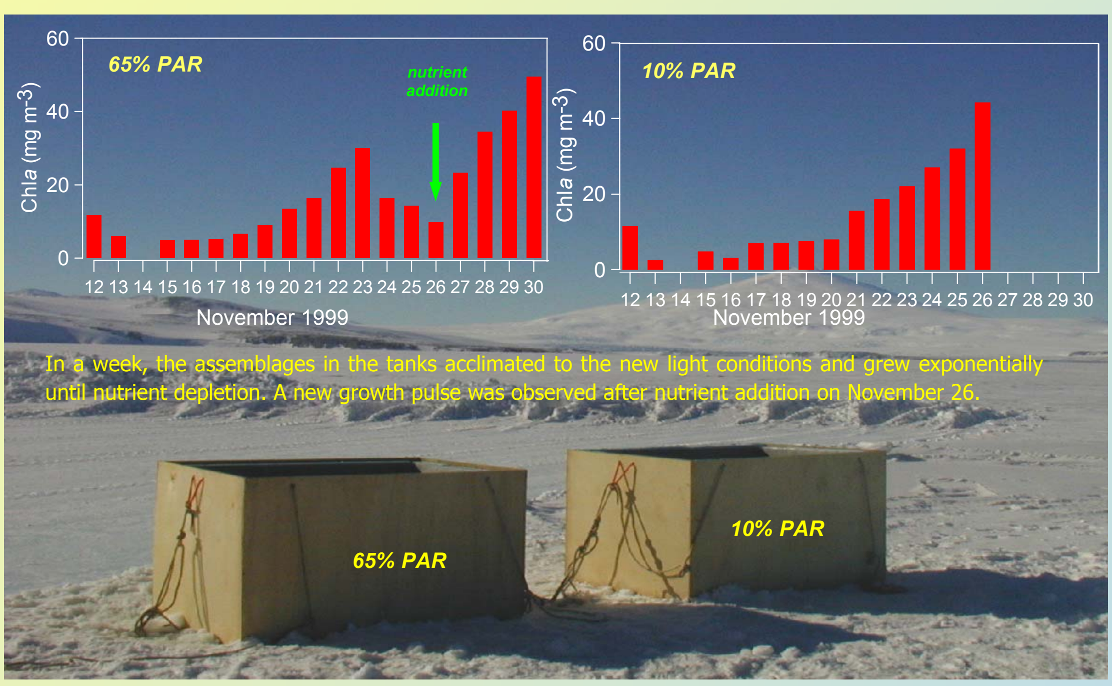
During the austral spring, autotrophic biomass accumulates in the platelet ice and in the lowest part of the pack ice, the bottom ice.





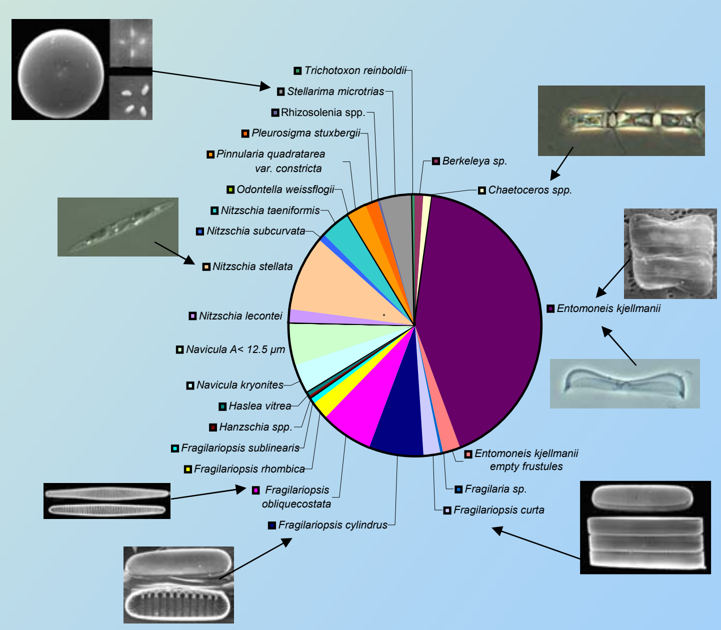
During spring, the bottom ice becomes porous and more intensely coloured due to the presence of large amounts of autotrophic biomass, which is largely dominated by benthic species, such as *E. kjellmanii, Nitzschia stellata, Berkeleya* sp., etc.

In austral spring 1999, mesocosm experiments were conducted on the microalgal communities that colonise the platelet ice in order to assess the role of these communities in seeding planktonic blooms. Platelet-ice microalgae were incubated in two open tanks filled with 500 l of filtered seawater and exposed to 65 % and 10 % of the incident PAR, respectively, over 20 days.



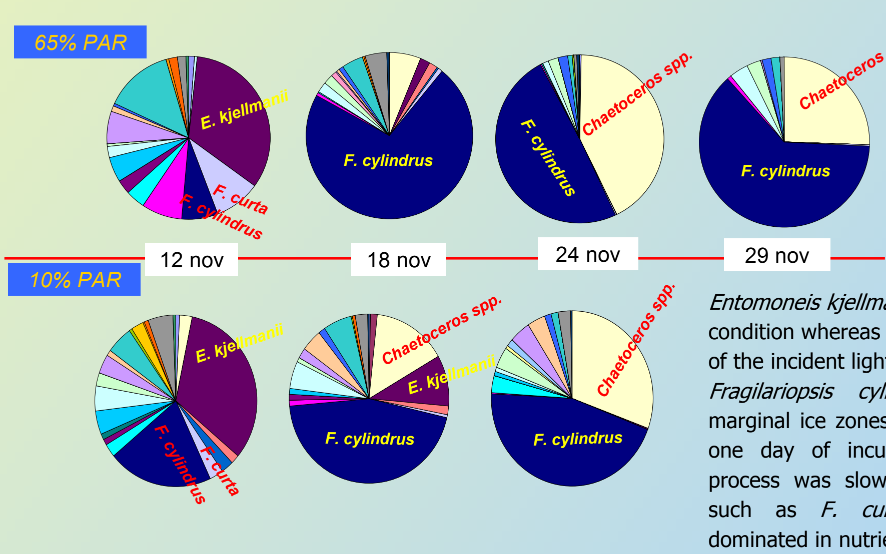
In a week, the assemblages in the tanks acclimated to the new light conditions and grew exponentially until nutrient depletion. A new growth pulse was observed after nutrient addition on November 26.

Platelet-ice microalgal assemblages used in the experiments were dominated (70%) by benthic species.



Microalgae were initially adapted to low irradiance levels, showing a growth potential 10 times lower than that typical of planktonic populations. Photosynthetic efficiency and photoacclimation index (E_k) increased in time, from November 11 to 25. Photosynthetic capacity (P^B_{max}) reached values 20 times higher than the initial ones.

DATA	P^B_{max}	α	β	E_m	E_k
11 nov	0,119	0,0067	0,00006	68	18
13 nov	0,291	0,0069	0,00007	202	42
22 nov	1,413	0,0317	0,00069	190	44
25 nov	0,673	0,0286	0,00018	123	23
27 nov	2,116	0,0546	0,00033	205	39



A compositional shift was observed in the tank assemblages, with a marked decrease of benthic species and an increase of pelagic species, which were responsible for the exponential growth.

Entomoneis kjellmanii did not grow in either light condition whereas *Nitzschia stellata* grew at 10% of the incident light.

Fragilariopsis cylindrus, a common species in marginal ice zones, increased sharply after only one day of incubation. The photoadaptation process was slower in other pelagic diatoms, such as *F. curta*, and *Chaetoceros* spp. dominated in nutrient-depleted conditions.

Concluding remarks

➢ **Benthic species, dominating the bottom ice communities, showed poor adaptation even at relatively low irradiances and, presumably, do not contribute to planktonic blooms.**

➢ **Pelagic species eventually adapted to high irradiance at species-specific rates.**

➢ **The first species to adapt to high irradiance levels was *F. cyilindrus*, a small (~ 5 µm) diatom that probably plays an important role at the onset of planktonic blooms in Terra Nova Bay.**

➢ **Photo-adaptation was slower in the congeneric species *F. curta*, which commonly dominates late-spring blooms in Terra Nova Bay.**

A Sea of Change: JGOFS Accomplishments and the Future of Ocean Biogeochemistry–Final Open Science Conference 5–8 May 2003, Washington, DC, USA