Workshop on *Phaeocystis* blooms: causes and consequences: Recommended practices and future directions

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Abstract

Dark and cold survival of *Phaeocystis antarctica*

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The colony-forming haptophyte *Phaeocystis antarctica* often dominates the phytoplankton assemblages in the Ross Sea and McMurdo Sound, Antarctica, where it must survive long darkness and freezing temperatures during austral winter. We simulated austral winter conditions in the laboratory to study the survival and adaptation of the solitary form vs. colonial form of *P. antarctica* to prolonged darkness and freezing. When *P. antarctica* assemblages were incubated in darkness for 20 days, the <20 μm chlorophyll decreased by >50%, whereas the >20 μm chlorophyll increased 2-fold; solitary cell abundance decreased noticeably but colony abundance and colony size remained relatively stable. The assemblages retained near optimal photosynthetic capacity at the end of the incubation. The particulate C:N in the dark treatment was higher than that in the light treatment, indicating reduced metabolism, carbon immobilization and/or protein degradation. In another experiment, the large size-fraction chlorophyll decreased less than the small size-fraction after up to 15 days of freezing. After the freezing period, colony abundance and size recovered faster than solitary cell abundance. Overall our results suggest that colony formation provide a refuge for *P. antarctica* to survive austral winter in sea ice and allow it to subsequently seed the water column population in the spring.