

EFFECTS OF SALINITY AND LIGHT ON THE MICROBIAL COMMUNITY IN ANTARCTIC SEA ICE

K G Ryan¹, S K Davy¹, R O'Toole¹, P J Ralph², A Martin¹

¹*Victoria University of Wellington, Wellington, New Zealand,* ²*University of Technology, Sydney, Australia*

The algae that grow within sea ice are exposed to high salinity brine during sea ice formation, and to low salinity water when the ice melts. Pulse Amplitude Modulation (PAM) fluorometry was used to monitor the photosynthetic responses of the sea ice microbial community to changes in salinity.

PAM measurements of cultured ice algal cells showed that both high and low salinities had adverse effects on photosynthetic efficiency. In order to simulate the melting process at the ice edge, bottom ice samples were melting over a period of 2 hours and monitored with PAM. Samples melted into normal strength seawater were not stressed during the melt, while samples melted into low salinity water showed considerable photosynthetic stress. Subsequently, those samples maintained at normal salinity acclimated well to a new light environment, while those at lowest salinities did not recover and died within 2 days. Microscopy PAM of individual cells revealed that some species of bottom ice algae were more tolerant of salinity stress than others.

The response of ice algal cells was dependant on the light environment during incubation, and the location of the algae within the sea ice. Bottom ice algae were more stressed by high or low salinity in the presence of relatively strong irradiances, while those algae growing within 20cm of the surface of the sea ice were more stressed by changes in salinity if they were incubated in the dark. These responses reflect the original habitats of the algae. Bottom ice algae are adapted to shade and were stressed by salinity changes under strong irradiances. Surface algae are adapted to high light levels and salinity stress was more predominant in the dark.

Decreased salinity and increased irradiance during melting at the ice edge, may negatively impact productivity in the Southern Ocean