

### **Analytical procedures**

Samples for dissolved nutrients were filtered through Whatman GF/F filters and frozen in acid-washed bottles at  $-80^{\circ}\text{C}$  until analysis. Nitrate, nitrite, ammonium and orthophosphate were measured with a Lachat nutrient autoanalyser. The detection limits of the measurements were  $0.14\ \mu\text{M}$  for  $\text{NO}_3$ ,  $\text{NO}_2$  and  $\text{NH}_4$ , and  $0.06\ \mu\text{M}$   $\text{PO}_4$ . Size-fractionated chlorophyll was determined by filtering known volumes of seawater through Whatman GF/F filters (total chlorophyll) and  $20\text{-}\mu\text{m}$  polycarbonate (Poretics) membranes (to obtain the greater than  $20\ \mu\text{m}$  size fraction). Chlorophyll was extracted by soaking the filters in 90 per cent acetone for 24 hours at  $-20^{\circ}\text{C}$  in darkness, and the fluorescence measured with Turner Designs TD-700 fluorometer before and after acidification. The fluorometer was calibrated initially with standard chlorophyll solution and checked with a secondary standard routinely during the experiments to ensure consistency. Samples of *Phaeocystis antarctica* solitary cells and colonies were preserved (approx. 4% Lugol's solution) and processed according to Jakobsen & Tang (2002). Depending on the cell and colony abundances, 0.3–3 ml aliquots of the preserved samples were drawn with a wide-mouth pipette and added to a 24-well multiplate. The wells were topped off with filtered seawater and were allowed to settle for at least 10 min, after which each well was closed with coverslip to exclude air bubbles. The solitary cells and colonies were allowed to settle for approximately 1 hour before counting with an inverted microscope. Then, 20–30 colonies were randomly selected from each sample and sized with calibrated ocular at  $100\times$  magnification. Colony size was measured as the diameter of the mucous envelope. This simple method was adequate for our purpose, since the majority of the colonies were spherical (cf. Rousseau *et al.* 1990). Most of the samples were processed immediately after preservation. However, due to logistical constraints some of the samples were not processed until one to two months after collection, and by that time most of the colonies had collapsed or degraded in these samples; subsequently, we report results for only those samples that were processed without delay. Cell count or chlorophyll data were fitted to an exponential growth equation

$$r = [\ln(N_t/N_0)]/t \quad (\text{Eq. 1})$$

to estimate the growth rate of *P. antarctica* in the experiments.

$\text{DMSP}_p$  was collected by gravity filtration through Whatman GF/F filters, and frozen at  $-80^{\circ}\text{C}$  in cryovials and kept in the dark until processing.  $\text{DMSP}_p$  in the samples was converted stoichiometrically to DMS by cold-alkaline hydrolysis (Dacey & Blough 1987). The filters were transferred to glass serum vials to which 5 ml of chilled 1 N NaOH was added. The vials were sealed immediately, and the samples were digested overnight. The resultant aqueous DMS was measured with the purge-and-trap technique (Kiene & Service 1991) using a Shimadzu GC-14A gas chromatograph equipped with a Carbowax BHT column (Supelco) and a flame photometric detector (FPD). The FPD was calibrated with standard DMS (Sigma Co.; Tang *et al.* 2000). Samples for POC and PON were filtered through pre-combusted Whatman GF/F filters, rinsed with a few ml of 0.01 N HCl in seawater, dried at  $60^{\circ}\text{C}$ , and pyrolyzed on a Fisons 254 elemental analyzer (Smith *et al.* 2000).

Photosynthetic potential of the cultures was assessed using active fluorescence techniques. Fluorescence measurements were made on specially constructed pulse amplitude modulated fluorometer (PAM; Gademann Instruments, Würzburg, Germany). This unit employs the saturation pulse method to estimate the quantum yield of photochemistry ( $F_v/F_m$ ).

To use  $F_v/F_m$  as a proxy for maximum quantum efficiency of PSII, several assumptions are made (Schreiber *et al.* 1995): (i) absorbed light will be used for photochemistry, fluorescence, and heat dissipation, (ii) all the reaction centers are closed prior to a measurement of  $F_v/F_m$ , and (iii) the ratio of the yield of heat dissipation to fluorescence is constant. The maximum quantum yield determined by the PAM fluorometer is the ratio of the difference in the initial and maximal signal ( $F_v$ ) to the maximal signal, or

$$F_v / F_m = (F_m - F_o) / F_m \quad (\text{Eq. 2})$$

The initial fluorescence value ( $F_o$ ; relative units) is determined under low irradiance, followed by a single light pulse at a saturating intensity that rapidly closes all PSII reaction centers and drives fluorescence to maximum ( $F_m$ ; relative units). Light-emitting diodes with peak emission at 458 nm were used for excitation, saturation and measuring irradiance. The emission signal was amplified by a photomultiplier tube equipped with a cut-off filter (greater than 650 nm). Flash duration ranged from 0.6 to 0.8 s; filtered seawater was used as a blank. The samples were kept in the dark for at least 30 min to reduce the impact of non-photochemical quenching.

## References

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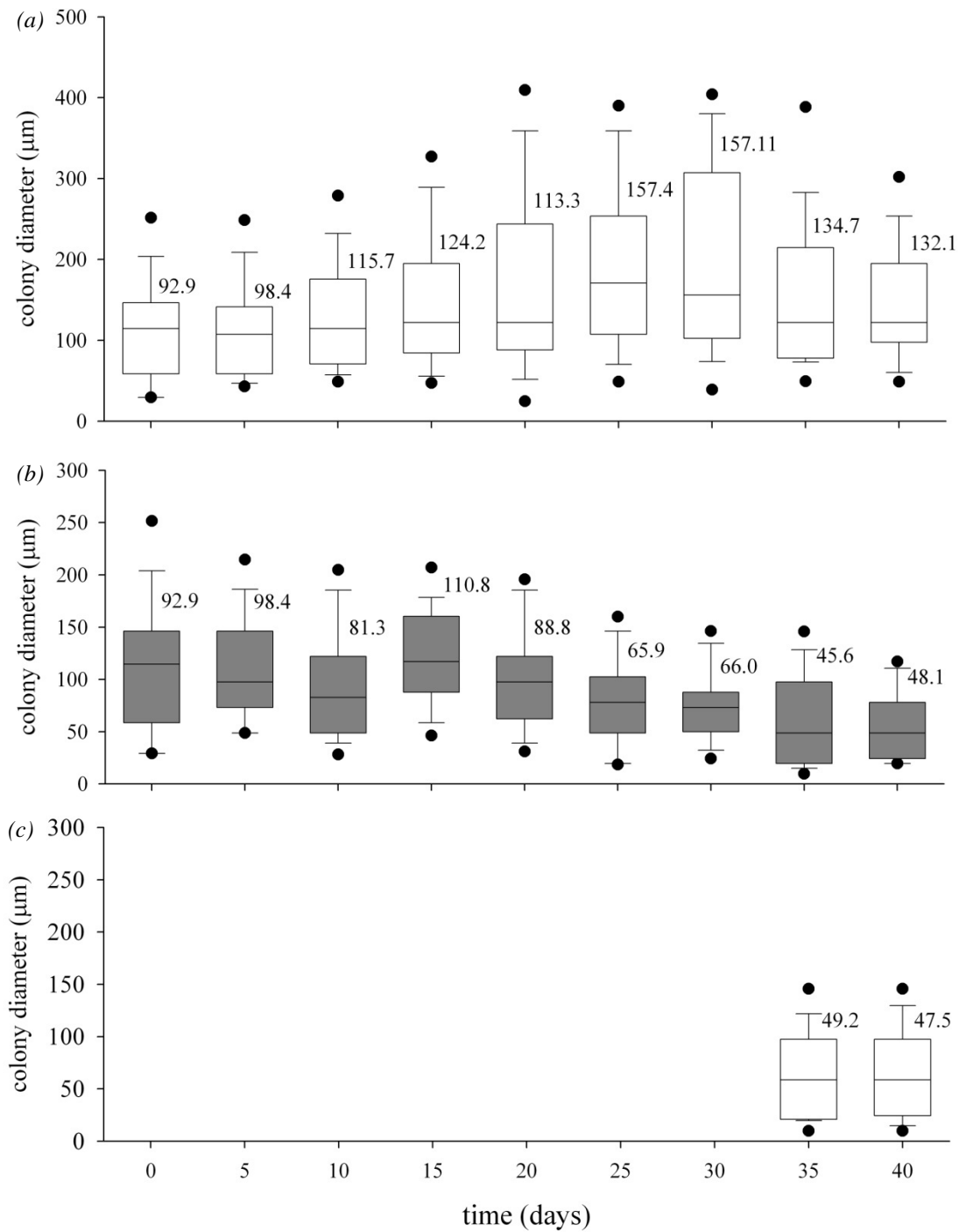


Figure. S1. *Phaeocystis antarctica* colony diameter in the (a) light treatment, (b) dark treatment and (c) recovery treatment (beginning on day 30). Colony diameters are presented in box plots showing 5, 10, 25, 50, 75, 90 and 95 percentiles. Number next to each box indicates the geometric mean of the pooled data of three replicates.

Table S1. Dissolved nutrient concentrations ( $\mu\text{M}$ ), POC/N ( $\mu\text{mol l}^{-1}$ ) and DMSP<sub>p</sub> ( $\text{nmol l}^{-1}$ ) levels in the light, dark and recovery treatments. (Recovery started on day 30; s.d. are given in parentheses.)

time (days)	light treatment							dark treatment					recovery treatment				
	dissolved nutrients				POC	PON	DMSP <sub>p</sub>	dissolved nutrients				POC	PON	DMSP <sub>p</sub>	POC	PON	DMSP <sub>p</sub>
NO <sub>3</sub>	NO <sub>2</sub>	NH <sub>4</sub>	PO <sub>4</sub>	NO <sub>3</sub>				NO <sub>2</sub>	NH <sub>4</sub>	PO <sub>4</sub>							
0	153	0.2	0	8.7	22.7 (5.1)	1.8 (0.7)	65.3 (19.8)	153	0.2	0	8.7	22.7 (5.1)	1.8 (0.7)	65.3 (19.8)			
5					59.8 (0.6)	9.0 (0.1)						19.3 (1.6)	2.8 (1.0)				
10	139	0.3	0.2	6.0	174 (23.0)	30.8 (3.2)	68.5 (4.4)	153	0.2	0.3	8.7	15.8 (3.1)	2.0 (0.5)	15.9 (0.4)			
15					416 (27.1)	72.0 (6.4)						23.5 (1.8)	2.1 (0.4)				
20	77.9	0.9	0.7	0.6	624 (59.0)	106 (9.4)	265 (20.8)	152	0.2	0.0	8.2	30.7 (12.1)	3.2 (1.1)	13.7 (0.6)			
25					787 (17.8)	120 (2.6)						64.1 (4.9)	10.7 (0.8)				
30	64.4	1.0	1.0	0.7	760 (59.2)	113 (9.6)	259 (154)	192	0	6.0	7.8	48.7 (2.5)	9.1 (0.6)	8.7 (3.9)			
35					731 (32.6)	111 (6.3)						55.2 (10.8)	9.4 (1.6)		44.8 (6.3)	7.7 (1.1)	8.7 (3.9)
40	54.3	0	16.0	1.3	681 (24.5)	97.0 (3.5)	175.2 (226)	200	0	6.9	8.0	30.8 (3.4)	4.8 (0.5)	15.7 (2.1)	30.7 (6.4)	5.3 (1.1)	
50					674 (65.2)	99.3 (9.2)	249 (11.0)					19.8 (2.4)	2.5 (0.8)	19.1 (1.1)	194 (54.9)	34.9 (13.0)	15.4 (3.5)
55					696 (23.2)	104 (3.5)						15.9 (0.3)	1.9 (0.2)		424 (48.1)	73.9 (9.8)	27.6 (6.9)
60					632 (71.4)	99.0 (12.4)	286 (15.0)					11.4 (2.3)	1.6 (0.8)	11.7 (0.9)	667 (91.6)	108 (11.0)	18.1 (7.2)