

## Electronic Supplementary Information

**Table S1.** Brine volumes (%), calculated from the ice temperatures measured at 5 cm intervals and bulk salinities of the samples (data not shown), in the untreated ice during the experiment.

Layer	0 d	7 d	14 d	21 d
0-5 cm	0.8	2.8	4.0	3.3
5-10 cm	1.2	1.3	5.0	2.2
middle	1.9	3.1	8.6	2.7
bottom	4.0	5.8	9.1	6.4

**Table S2.** Carbon specific  $a_{\text{CDOM}}(\lambda=320)$  ( $\text{L mg}^{-1} \text{m}^{-1}$ ) in the treatments from 0 d to 14 d.

Treatment	Layer	0 d	7 d	14 d
UNT	0-5 cm	0.74	0.99	0.90
	5-10 cm	0.94	1.01	0.96
	middle	0.83	1.24	1.25
	bottom	1.32	1.77	1.65
PAR	0-5 cm	0.90	1.11	1.24
	5-10 cm	0.76	0.92	0.85
	middle	0.65	1.05	1.03
	bottom	1.38	1.69	1.66
PAR+UVR	0-5 cm	1.00	0.94	0.79
	5-10 cm	0.47	0.88	0.87
	middle	0.70	1.12	1.10
	bottom	1.08	1.69	1.46

## Multiple regression analyses

Following linear regression models were fitted to each layer separately and the insignificant variables were removed by stepwise method

$$y = a + \beta_1x + \beta_2d_1 + \beta_3d_2 + \beta_4d_1*x + \beta_5d_2*x, \text{ where}$$

y= MAA : chl-a ratio normalised to value on 0 d

a = constant

x = day

d<sub>1</sub> and d<sub>2</sub> = dummy variables coding for treatments

d<sub>1</sub>=1 for UNT, d<sub>1</sub>= 0 for PAR and PAR+UVR

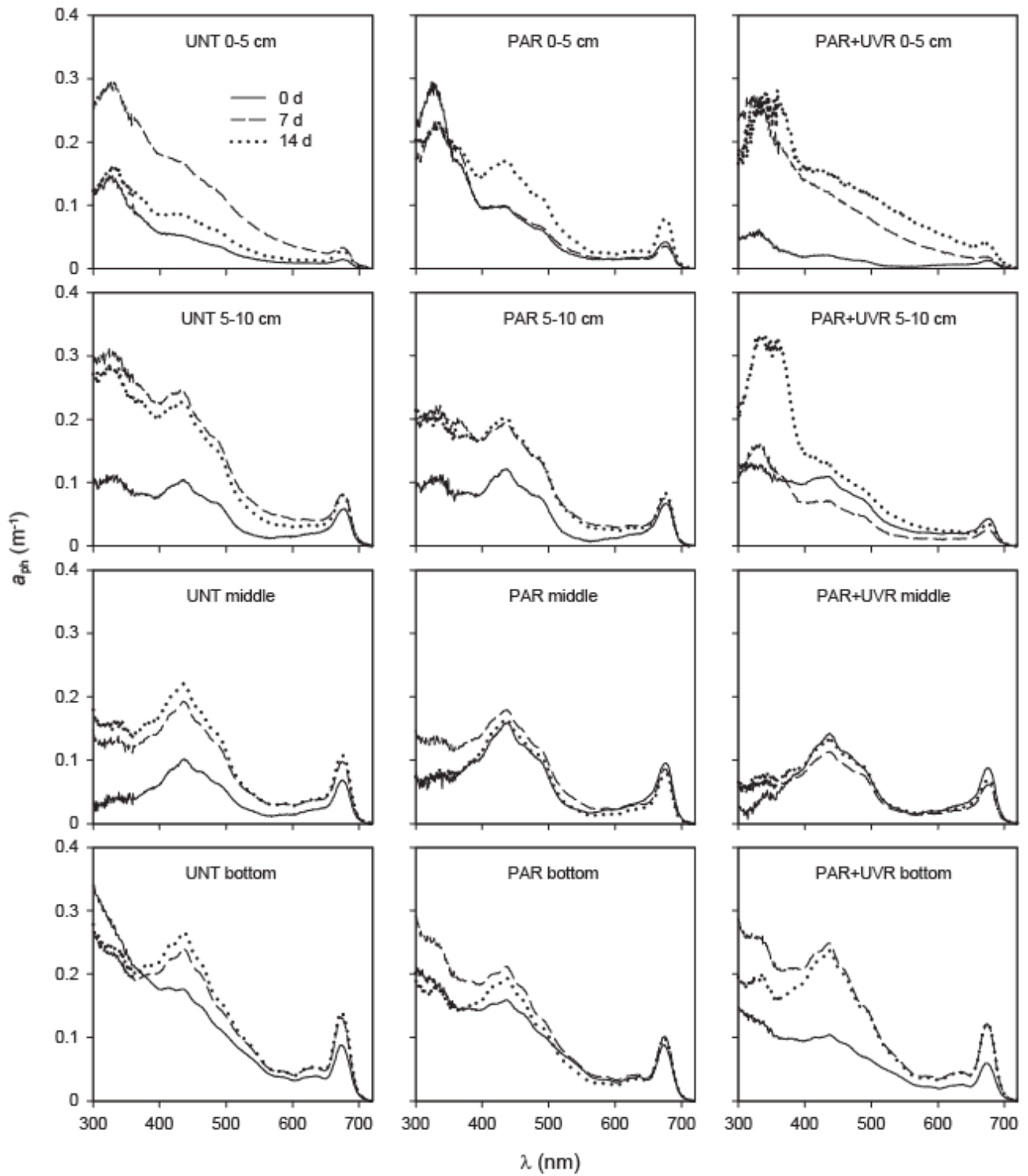
d<sub>2</sub> =1 for PAR, d<sub>2</sub> = 0 for UNT and PAR+UVR

β<sub>1-5</sub> = coefficients

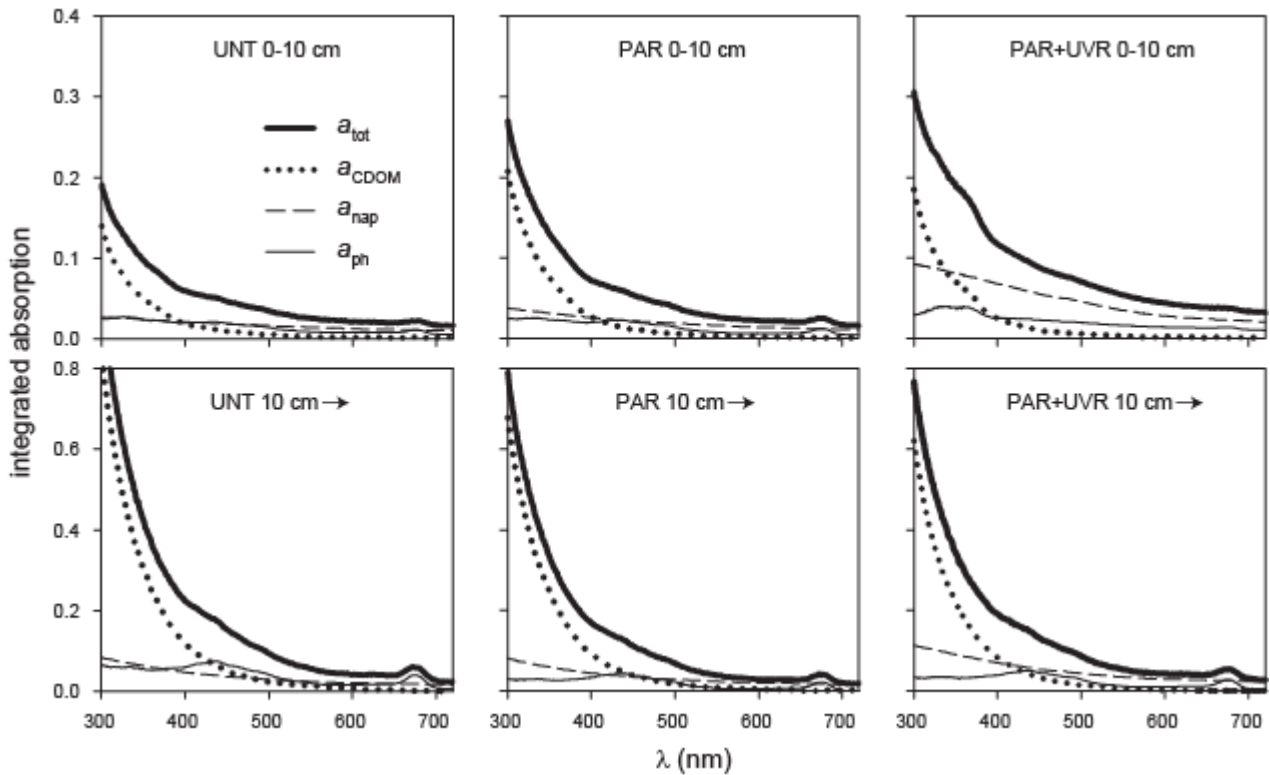
**Table S3.** Multiple regression analyses run for each layer (see above for details).

		ANOVA						
Layer		Sum of Squares	df	Mean Square	F	Sig.	R <sup>2</sup>	Model
0-5 cm	Regression	.674	1	.674	19.281	0.003	.734	y = 1.39 - 0.335*x
	Residual	.245	7	.035				
	Total	.919	8					
5-10 cm	Regression	13.982	3	4.661	11.102	0.012	.869	y = 0.928 + 1.08*x - 1.136*d <sub>1</sub> *x - 1.26*d <sub>2</sub> *x
	Residual	2.099	5	.420				
	Total	16.081	8					
middle	Regression	2.751	3	.917	10.274	0.014	.860	y = 1.03 + 0.377*x - 0.542*d <sub>1</sub> *x - 0.544*d <sub>2</sub> *x
	Residual	.446	5	.089				
	Total	3.197	8					
bottom	Regression	24.438	2	12.219	6.728	0.029	.692	y = 0.551 + 1.434*x - 1.424*d <sub>1</sub> *x
	Residual	10.896	6	1.816				
	Total	35.334	8					

**Fig. S1.** The algal absorption spectra ( $m^{-1}$ ) ( $a_{ph} = 0$  at 720 nm) in the 0-5 cm, 5-10 cm, middle and bottom sections of the untreated ice (UNT) and the PAR and PAR+UVR treatments from 0 d to 14 d.



**Fig. S2.** The integrated absorption (dimensionless) of CDOM and particles ( $a_p$  algal and  $a_{nap}$  non-algal) in the layers above 10 cm (upper row) and below 10 cm (lower row) in the treatments on day 14.



**Fig. S3.** Biomass of the three major algal groups ( $\mu\text{g C L}^{-1}$ ) in the PAR treatment and untreated ice on 14 d (A) and on 21 d (B). The values on 14 d are the means of the three replicates and PAR(+UVR) on 21 d refers to the 7 days re-exposure of PAR treatment.

