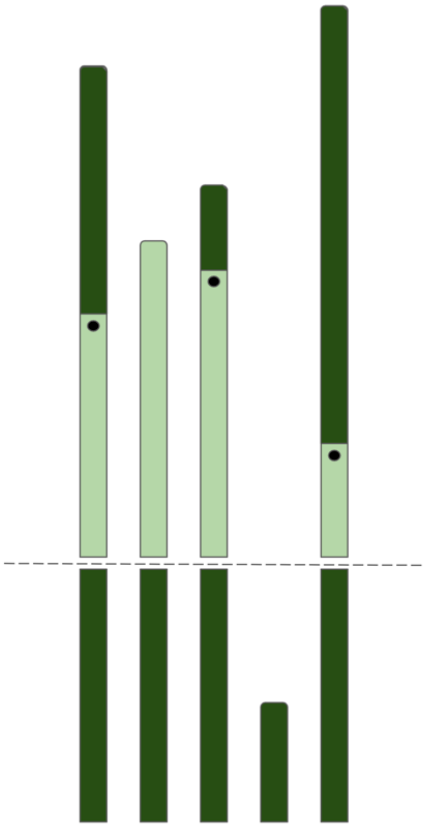

Figure S1 Schematic of growth tissue partitioning on an eelgrass shoot. Dotted line represents the location of sheath scar from pin prick at the start of the experiment. Black dots indicate the location of the scar on each individual leaf. Initial growth tissue is indicated in dark green and new growth tissue is indicated in light green.

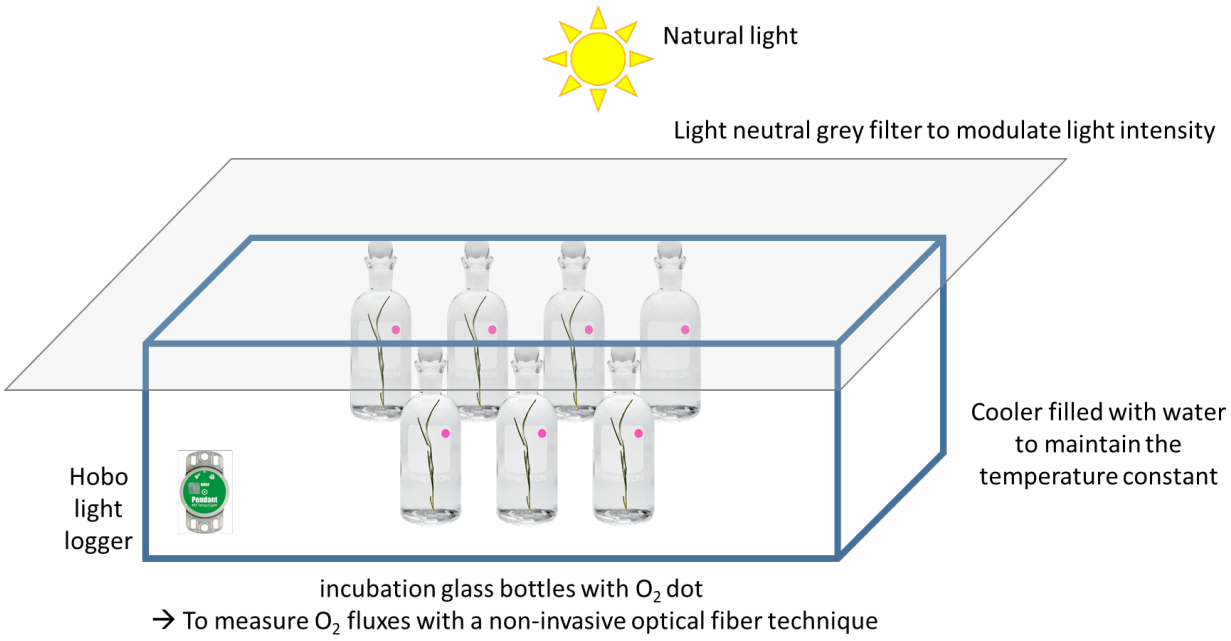

Figure S2 Methodological diagram for measuring photosynthesis-irradiance curves. Filters were applied in order of darkness to lightness.

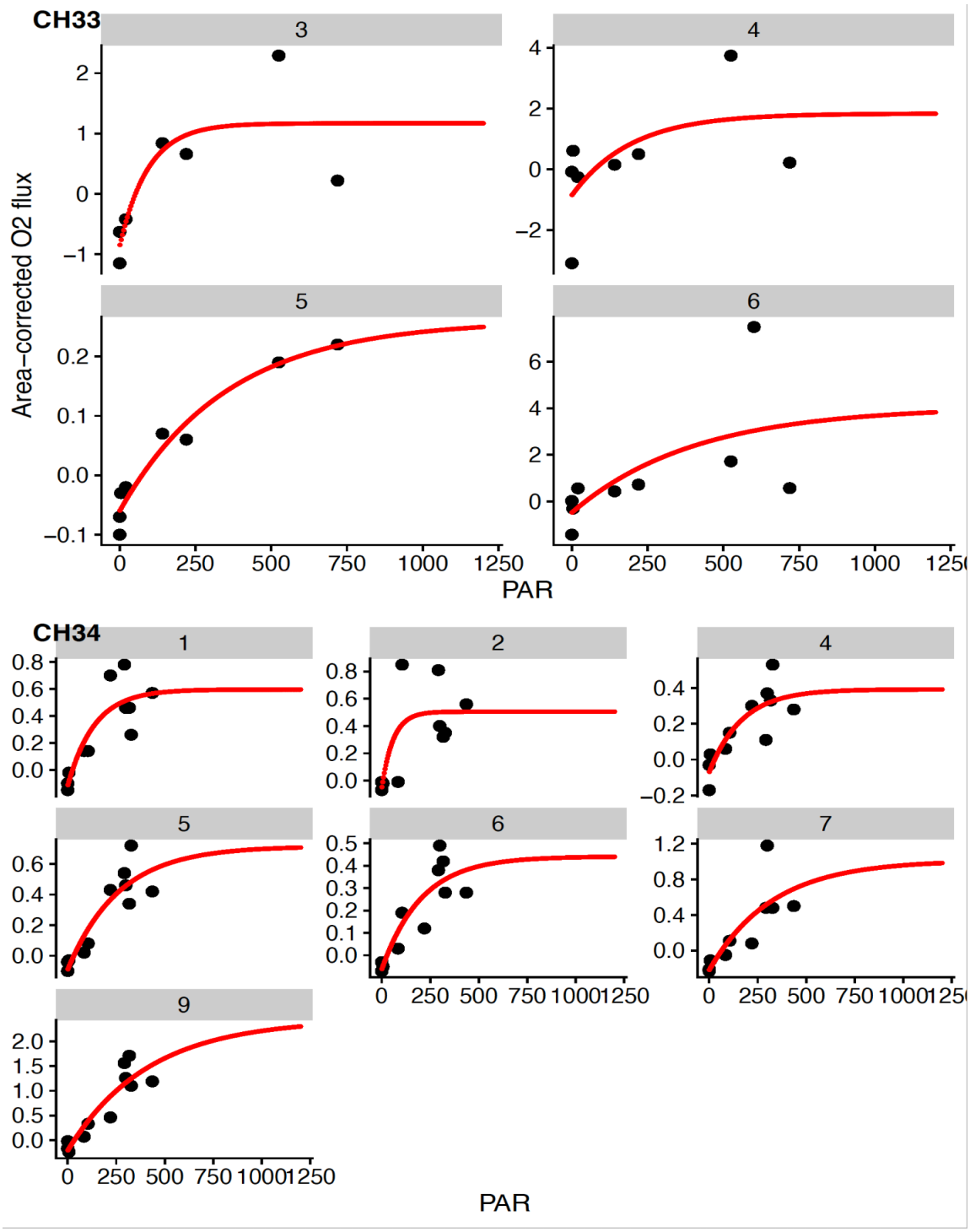

Figure S3 PI curve model fits for individual eelgrass shoots at CH33 and CH34.

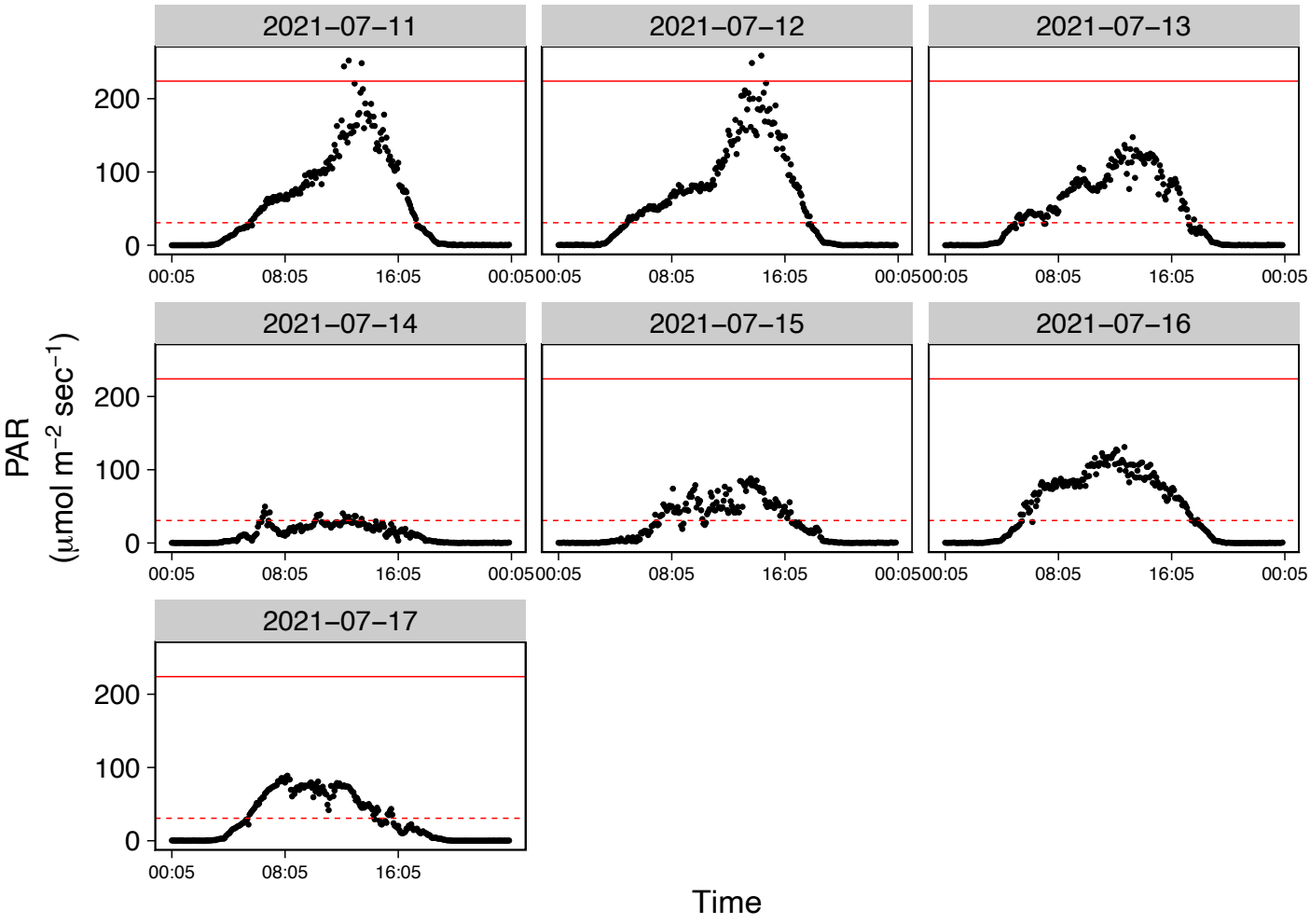

Figure S4. Example comparison of light requirement estimates from PI curves and *in situ* light measurements. The dotted red line indicates the empirically estimated compensation point, and the solid red line indicates the empirically estimated saturation irradiance. All light measurements collected from dawn to dusk (at 5-minute intervals) are displayed, in order to visualize the period when each light threshold was crossed. These periods are often continuous, though not always (e.g. panel for 2021-07-14). In Figure 5, the same data are displayed, but all data points from a single day are collapsed into one column.

Table S1. Results of Wilcoxon rank sum tests for differences in nutrient concentrations between the two experimental sites.

Nutrient	**W**	**P-value**
NO_x	47	0.16
PO_4	1	<0.001
NH_4	63	0.435

Table S2. Untransformed epiphyte load (ug chl-a cm^{-2} day^{-1}) data for each treatment at each site

Site	**Treatment**	**Mean ± SD chl-a**
CH33	Control	0.027 ± 0.017
	Treatment	0.064 ± 0.063
CH34	Control	0.003 ± 0.002
	Treatment	0.002 ± 0.001

Table S3. ANOVA results for treatment effect on biomass-specific growth rate.

Fixed effects	**df**	**F-value**	**P-value**
Treatment	1	0.015	0.90
Site	1	7.58	0.01
Treatment * Site	1	0.034	0.86
Residuals	18		

Table S4. Site differences in PI curve parameter estimates. For alpha and P_{max} we log transformed the data to satisfy the assumption of normality.

Parameter	**Statistical test**	**t or W**	**df**	**P-value**
$\ln(\alpha)$	Welch's two sample t-test	0.755	3.42	0.499
I_k	Welch's two sample t-test	0.446	5.42	0.672
R	Wilcoxon rank sum test	6		0.164
$\ln(P_{max})$	Welch's two sample t-tests	0.872	4.05	0.432
I_c	Welch's two sample t-tests	3.10	7.09	0.017