

1 SUPPLEMENT FIGURES

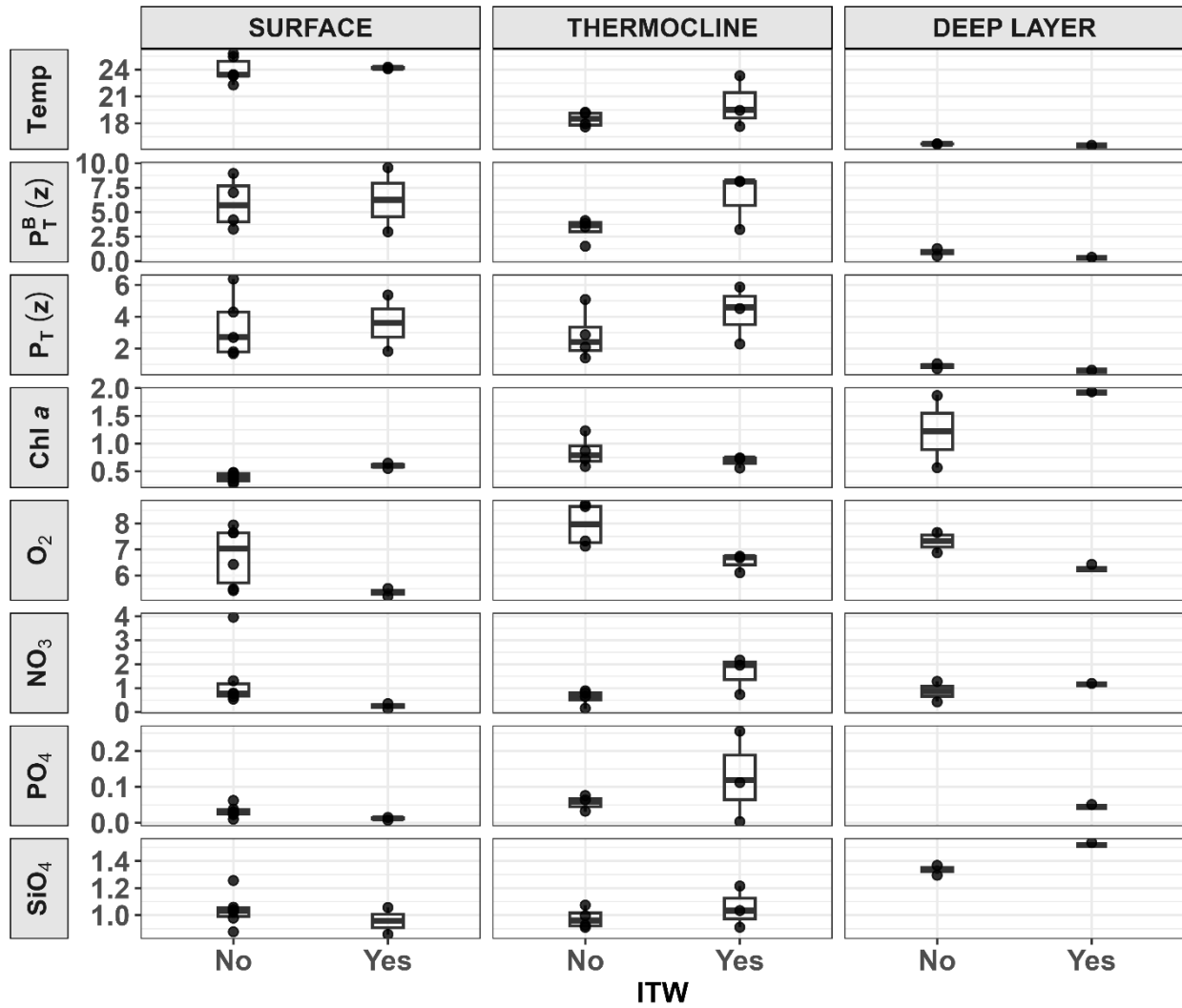


Figure S1. Depth-resolved distribution of variables measured in July 2023 at station S0 under ITW and no-ITW conditions, shown as boxplots with overlaid data points. Variables include daily normalized net primary production at depth ($P_T^B(z)$ [mg C (mg Chl)⁻¹]) and daily net primary production at depth ($P_T(z)$ [mg C m⁻³]), together with simultaneously measured environmental variables: temperature (Temp [°C]), Chlorophyll *a* (Chl *a* [mg m⁻³]), oxygen (O_2 [mg L⁻¹]) and nutrients [μmol L⁻¹], including phosphate (PO_4), nitrate (NO_3), and silicic acid (SiO_4).

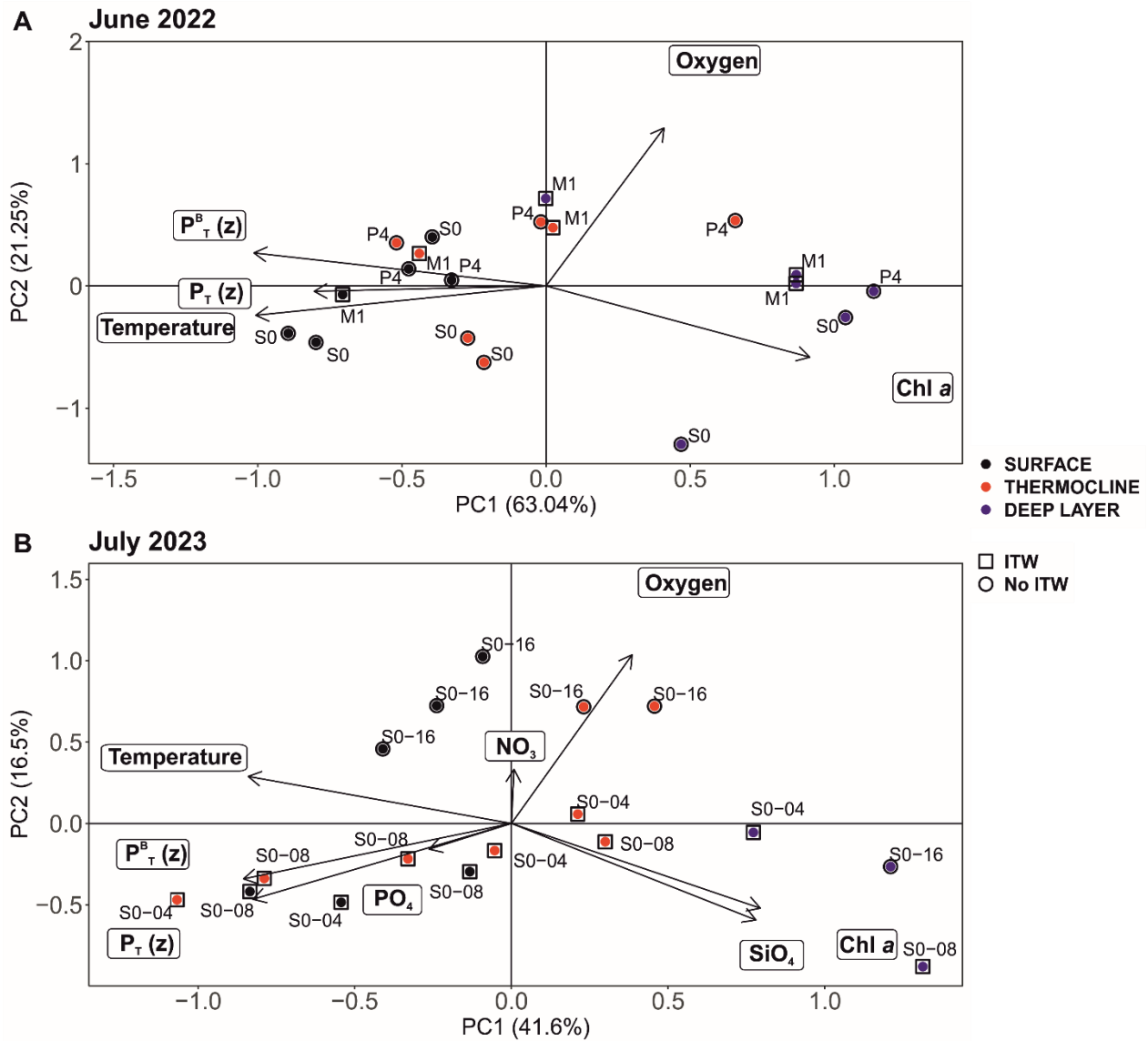


Figure S2. Principal component analysis (PCA) of variables measured in (A) June 2022 (N = 20) at stations M1, P4 and S0, and **(B) July 2023** (N = 17) at station S0. Shown are daily normalized net primary production at depth ($P^B_T(z)$ [mg C (mg Chl)⁻¹]), daily net primary production at depth ($P_T(z)$ [mg C m⁻³]), Chl a [mg m⁻³], temperature [°C], oxygen [mg L⁻¹] and nutrients [μmol L⁻¹], including phosphate (PO_4), silicic acid (SiO_4) and nitrate (NO_3). Depth layers are indicated by color, while stations and ITW occurrence are denoted by symbols. Points in the ordination represent weighted-average sample scores. The percentage of variance explained by each PC axis is shown in the axis titles.

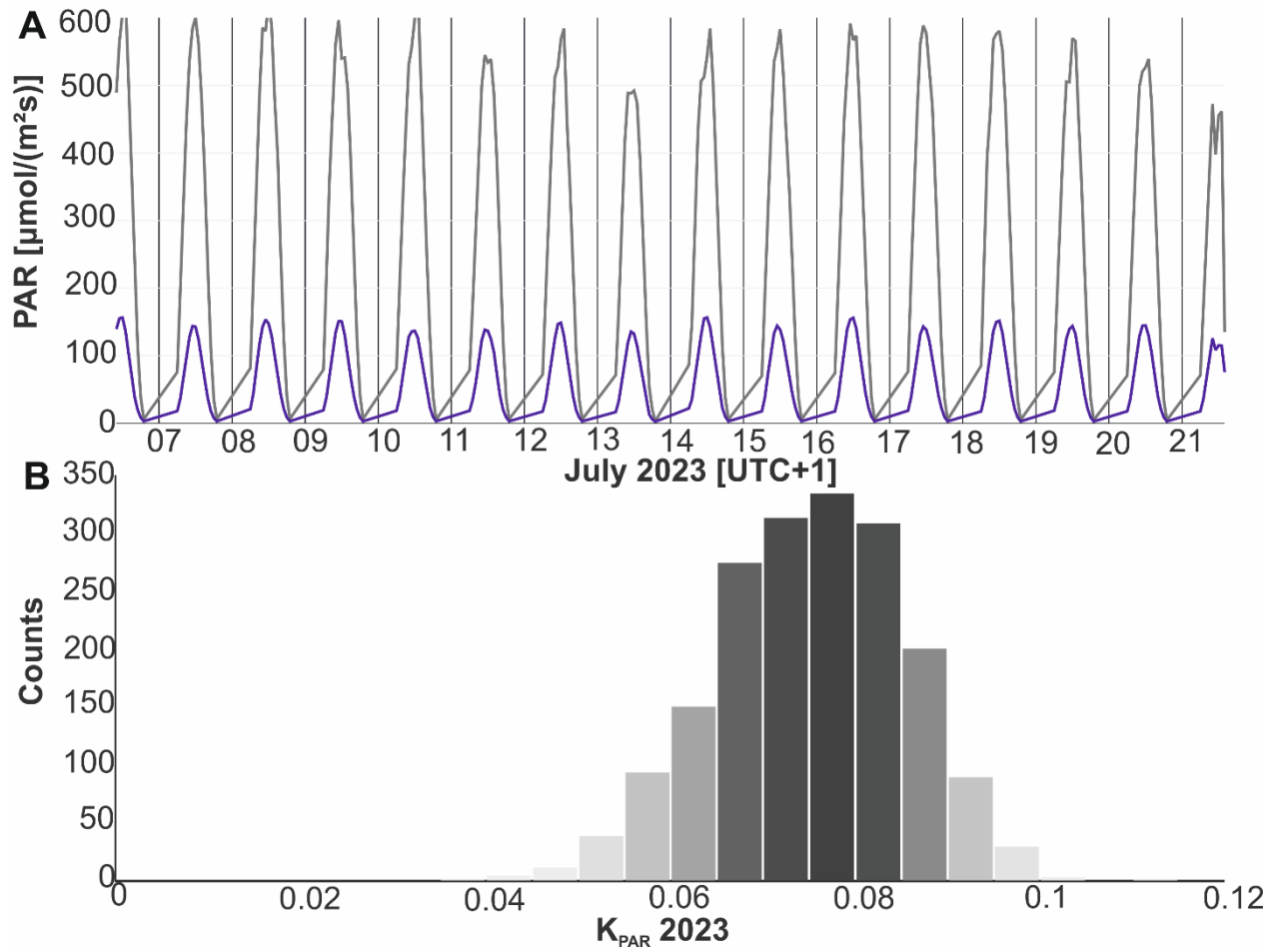


Figure S3. Light properties measured during 7–13 July 2023 at station S1 used as input parameters to the underwater light field model (Fig. 9). Shown are **(A)** PAR time series averaged at 1 hour intervals at 10 m (gray) and 30 m (blue) depths, and **(B)** distribution of estimated attenuation coefficient of PAR (K_{PAR}) values.

SUPPLEMENT TABLES

Table S1. Incubation depths categorized into three layers: surface, thermocline and deep layer according to CTD-derived temperature. Shown are categories for June 2022 incubations at stations S0, M1 and P4, and for July 2023 incubations at station S0 (experiments S0-04, S0-08 and S0-16).

June 2022			
Station	Surface layer [22.18–23.13 °C]	Thermocline layer [16.5–21.26 °C]	Deep layer [15.19–16.12 °C]
M1	0, 5	10, 20	30, 50, 65
S0	0, 5, 10	20, 30	50, 65
P4	0, 5	10, 20, 30	50
July 2023			
Experiment	Surface layer [23.14–25.77 °C]	Thermocline layer [17.34–22.64 °C]	Deep layer [15.49–15.67 °C]
S0-04	0, 5	10, 20, 30	65
S0-08	0, 5	10, 20, 30	65
S0-16	0, 5, 10	20, 30	65

Table S2. Canonical correspondence analysis (CCA) scores for nano- and microphytoplankton [cells L⁻¹] and picoplankton (*Prochlorococcus*, *Synechococcus* and PPEs) [cells mL⁻¹] data obtained in July 2021 and July 2022. Shown are biplot scores of environmental variables, weighted average scores of species, eigenvalues and proportion of variability explained by each constrained axis (CCA1 and CCA2). Environmental variables include nutrients [μmol L⁻¹] (phosphate (PO₄), nitrate (NO₃), nitrite (NO₂), silicic acid (SiO₄)), temperature [°C] and Chl *a* [mg m⁻³]. Abbreviations: Chl *a* (Chlorophyll *a*), Dino (dinoflagellates), Cocco (coccolithophores), Micro (microphytoplankton), Nano (nanophytoplankton), PPEs (Photosynthetic picoeukaryotes), HB (heterotrophic bacteria).

	July 2021				July 2022			
	Nano- and microphytoplankton		Picoplankton		Nano- and microphytoplankton		Picoplankton	
	CCA1	CCA2	CCA1	CCA2	CCA1	CCA2	CCA1	CCA2
NO ₂	0.466	0.330	0.124	-0.034	0.843	0.212	0.71	-0.591
NO ₃	0.927	0.019	0.852	0.433	0.889	-0.156	0.537	-0.777
PO ₄	-0.223	-0.114	0.143	-0.548	-0.212	-0.098	-0.021	-0.038
SiO ₄	0.920	-0.017	0.777	0.328	0.83	-0.34	0.681	-0.547
Temperature	-0.436	0.790	-0.609	-0.268	-0.772	-0.416	-0.994	-0.099
Chl <i>a</i>	0.792	-0.270	0.936	-0.181	0.6	-0.149	0.432	0.107
Diatoms (micro)	0.178	-0.034			0.216	0.015		
Dino (micro)	-0.076	0.105			-0.219	0.013		
Dino (nano)	-0.017	0.008			-0.02	-0.02		
Cocco (micro)	0.617	0.331			-0.137	-0.163		
Cocco (nano)	-0.258	0.213			0.012	-0.059		
Cryptophyta	-0.301	0.039			-0.093	0.229		
Chlorophyceae	-0.267	-0.329			-0.169	-0.012		
Micro	0.183	-0.033			0.116	-0.007		
Nano	0.021	-0.034			0.015	0.012		
PPEs			-0.043	0.013			-0.031	-0.016
<i>Synechococcus</i>			-0.136	-0.022			-0.054	0.018
<i>Prochlorococcus</i>			0.375	-0.006			0.138	0.002
HB			-0.063	0.011			-0.035	-0.007

Eigenvalues	0.034	0.014	0.031	0.000	0.016	0.007	0.006	0.000
Variability explained [%]	10.30	04.23	44.48	02.87	47.75	20.09	86.41	02.27

Table S3. Multiple regression analyses of July 2023 dataset relating daily net primary production at depth ($P_T(z)$ [mg C m⁻³]) and daily normalized net primary production at depth ($P^B_T(z)$ [mg C (mg Chl)⁻¹]) to simultaneously measured physical and biogeochemical variables: temperature (Temp [°C]), chlorophyll *a* (Chl *a* [mg m⁻³]), oxygen (O₂, [mg L⁻¹]) and nutrients [μmol L⁻¹], including phosphate (PO₄), nitrate (NO₃) and silicic acid (SiO₄). Model with the highest R² value is noted in *italics*. Statistically significant models (*p*-value < 0.05) are indicated by * and their corresponding values are **bolded**.

Model	P^B_T(z)				P_T(z)			
	N	R²	F₂	<i>p</i>-value	N	R²	F₂	<i>p</i>-value
Temp + Chl <i>a</i> + O ₂ + PO ₄ + NO ₃ + SiO ₄	13	0.58	1.39	0.521	14	0.25	1.55	0.744
Temp + Chl <i>a</i> + PO ₄ + NO ₃	13	0.36	1.15	0.401	14	0.09	0.23	0.912
*Temp + Chl <i>a</i> + NO ₃	16	0.47	3.59	0.047	17	0.18	0.96	0.442
*Temp + NO ₃	16	0.46	5.43	0.019	17	0.18	1.51	0.256
*Temp	16	0.45	11.62	0.004	17	0.17	3.08	0.100
*Temp + Chl <i>a</i>	16	0.47	5.83	0.016	17	0.18	1.51	0.255
*Chl <i>a</i>	16	0.33	6.99	0.019	17	0.13	2.15	0.163
NO ₃ + PO ₄ + SiO ₄	13	0.33	1.47	0.288	14	0.20	0.86	0.494
O ₂	16	0.19	3.20	0.095	17	0.16	2.91	0.109
O ₂ + Temp + Chl <i>a</i> + PO ₄ + NO ₃	13	0.48	1.31	0.359	14	0.23	0.49	0.776
*O ₂ + Temp + Chl <i>a</i> + NO ₃	16	0.56	3.43	0.047	17	0.28	1.18	0.367
*O ₂ + Temp + NO ₃	16	0.52	4.36	0.027	17	0.27	1.61	0.236
*O ₂ + Temp	16	0.52	6.95	0.009	17	0.26	2.42	0.125
*O ₂ + Chl <i>a</i>	16	0.49	6.26	0.012	17	0.26	2.51	0.117

Table S4. Principal component analysis (PCA) results for (A) June 2022 and (B) July 2023 (Fig. S2). Shown are the weighted-average scores for daily net primary production at depth ($P_T(z)$ [mg C m^{-3}]), daily normalized net primary production at depth ($P^B_T(z)$ [$\text{mg C (mg Chl)}^{-1}$]), temperature [$^{\circ}\text{C}$], Chl a [mg m^{-3}], oxygen [mg L^{-1}] and nutrients [$\mu\text{mol L}^{-1}$], including phosphate (PO_4), nitrate (NO_3) and silicic acid (SiO_4). Eigenvalues of the first two principal components (PC1 and PC2) and the proportion of variance explained by each axis are also reported.

	June 2022		July 2023	
	PC1	PC2	PC1	PC2
$P_T(z)$ [$\text{mg C m}^{-3} \text{ d}^{-1}$]	-1.024	-0.043	-0.947	-0.424
$P^B_T(z)$ [$\text{mg C (mg Chl)}^{-1} \text{ d}^{-1}$]	-1.290	0.262	-0.981	-0.310
Chl a [mg m^{-3}]	1.164	-0.565	0.911	-0.474
Temperature [$^{\circ}\text{C}$]	-1.281	-0.233	-0.964	0.263
Oxygen [mg L^{-1}]	0.521	1.254	0.442	0.944
PO_4 [$\mu\text{mol L}^{-1}$]			-0.301	-0.144
SiO_4 [$\mu\text{mol L}^{-1}$]			0.895	-0.540
NO_3 [$\mu\text{mol L}^{-1}$]			-0.009	0.303
Eigenvalues	3.152	1.063	3.328	1.320
Proportion explained [%]	63.04	21.25	41.60	16.50