

Is a constitutive red-shift an advantage for oxygenic photosynthesis under M dwarf starlight? Insights from *Acaryochloris marina* sp. str. Moss Beach

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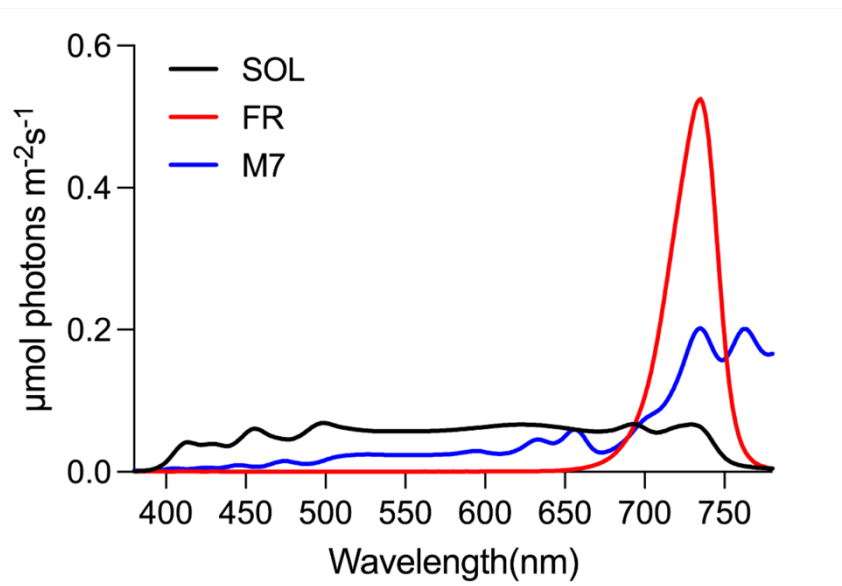
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Supplementary material

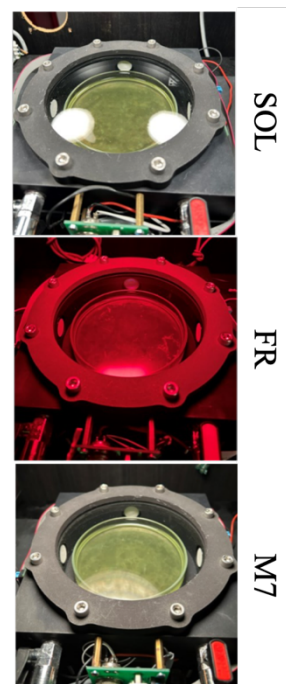
	ASNIH	MBG11
Components	concentration	concentration
NaCl	25 g L ⁻¹	
Instant Ocean [®] Sea Salt		35 g L ⁻¹
MgSO ₄ • 7H ₂ O	3.5 g L ⁻¹	0.075 g L ⁻¹
MgCl ₂ • 6H ₂ O	2 g L ⁻¹	
KCl	0.5 g L ⁻¹	
CaCl ₂ • 2H ₂ O	0.5 g L ⁻¹	0.036 g L ⁻¹
NaNO ₃	0.75 g L ⁻¹	1.5 g L ⁻¹
K ₂ HPO ₄ • 3H ₂ O	0.02 g L ⁻¹	0.0305 g L ⁻¹
Ferric (III) Ammonium Citrate	0.003 g L ⁻¹	0.006 g L ⁻¹
Citric Acid • 1H ₂ O	0.003 g L ⁻¹	0.006 g L ⁻¹
K ₂ MgEDTA • 2H ₂ O	0.0005 g L ⁻¹	
Na ₂ CO ₃	0.04 g L ⁻¹	0.02 g L ⁻¹
Fe-EDTA		0.0104 g L ⁻¹
Na-EDTA pH 8.0		2.8 µM
TES pH 8.2		10 mM
Trace elements		
H ₃ BO ₃	2.86 mg L ⁻¹	2.86 mg L ⁻¹
MnCl ₂ • 4H ₂ O	1.81 mg L ⁻¹	1.81 mg L ⁻¹
ZnSO ₄ • 5H ₂ O	0.222 mg L ⁻¹	0.222 mg L ⁻¹
CuSO ₄ • 5H ₂ O	0.079 mg L ⁻¹	0.079 mg L ⁻¹
Co(NO ₃) ₂ • 6H ₂ O	0.0494 mg L ⁻¹	0.0494 mg L ⁻¹
Na ₂ MoO ₄ • 2H ₂ O	0.391 mg L ⁻¹	0.391 mg L ⁻¹

Table S1. Composition of the media ASNIH and MBG11 used in this study.

a



b



c

	SOL		FR		M7	
Wavebands	$\mu\text{mol of photons m}^{-2}\text{s}^{-1}$	%	$\mu\text{mol of photons m}^{-2}\text{s}^{-1}$	%	$\mu\text{mol of photons m}^{-2}\text{s}^{-1}$	%
UV 380–399 nm	0.08	0.4	0.01	0.05	0.04	0.2
Blue 400–499 nm	4.61	23.05	0.04	0.2	0.87	4.35
Green 500–599 nm	5.95	29.75	0.04	0.2	2.43	12.15
Red 600–699 nm	6.28	31.4	1.38	6.9	4.04	20.2
Far-red 700–780 nm	3.08	15.4	18.53	92.65	12.62	63.1
total VIS 380–699 nm	16.92	84.6	1.47	7.35	7.38	36.9
total light 380–780 nm	20	100	20	100	20	100

Figure S1. Light and ASCs set-up. a) solar (SOL), far-red (FR) and M dwarf (M7) simulated spectra, b) pictures of the organisms inside the ASCs (right), exposed to the respective spectra, c) repartition of light in terms of $\mu\text{mol of photons m}^{-2}\text{s}^{-1}$ and percentage in the wavebands UV, blue, green, red, far-red, total VIS light, total light recorded with a LI-800 spectrometer (LICOR, USA). SOL: solar light, M7: M dwarf simulated light, FR: far-red light, UV: ultraviolet light, VIS: visible light.

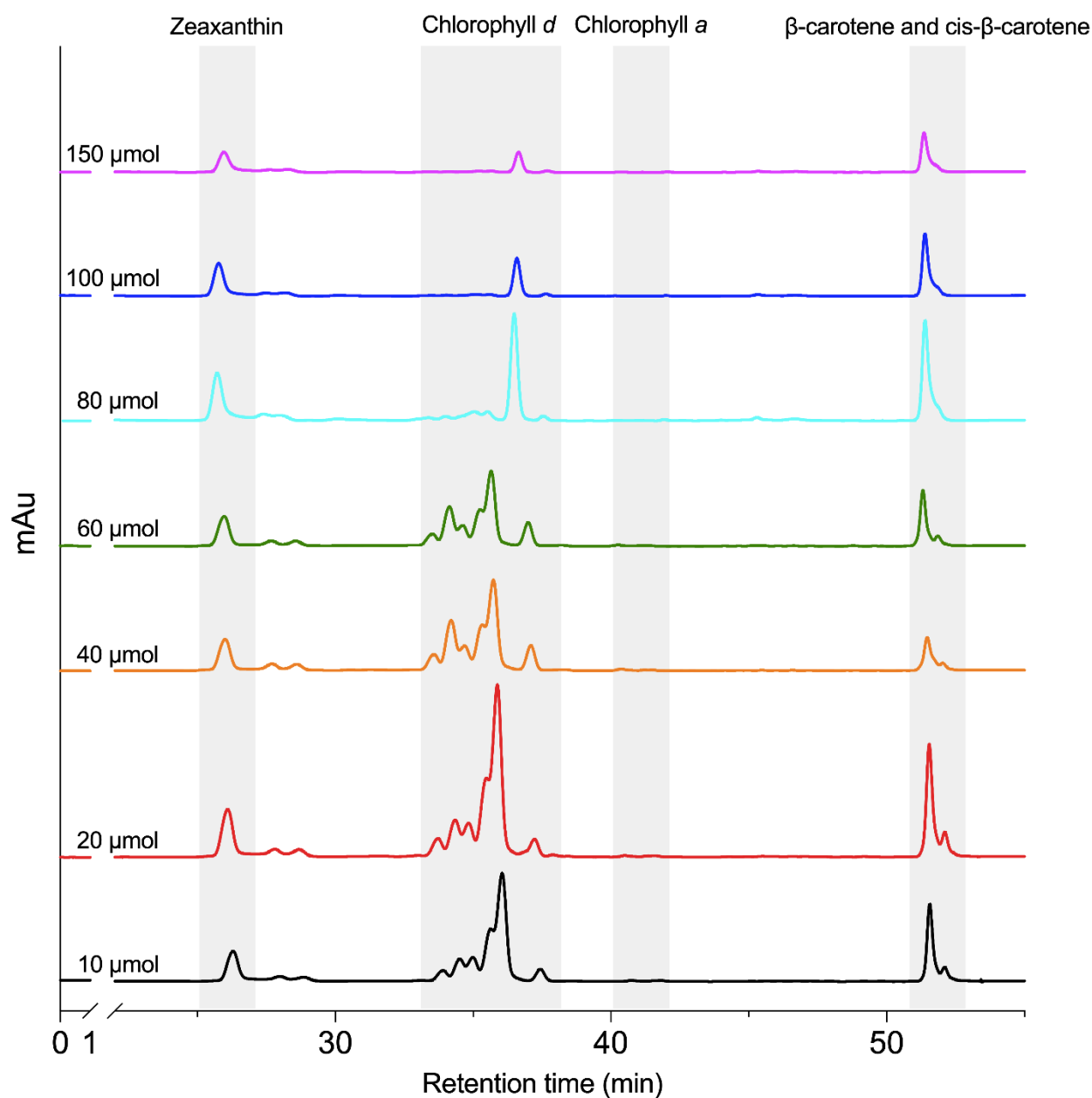


Figure S2. Chromatograms at 440 nm of 100% methanol extracts of *A. marina* str. Moss Beach after exposure to 10 (black), 20 (red), 40 (orange), 60 (green), 80 (cyan), 100 (blue), 150 (pink) μmol of photons $\text{m}^{-2}\text{s}^{-1}$. Grey bands indicate elution of respectively zeaxanthin, chlorophyll *d*, chlorophyll *a*, β -carotene and cis- β -carotene.

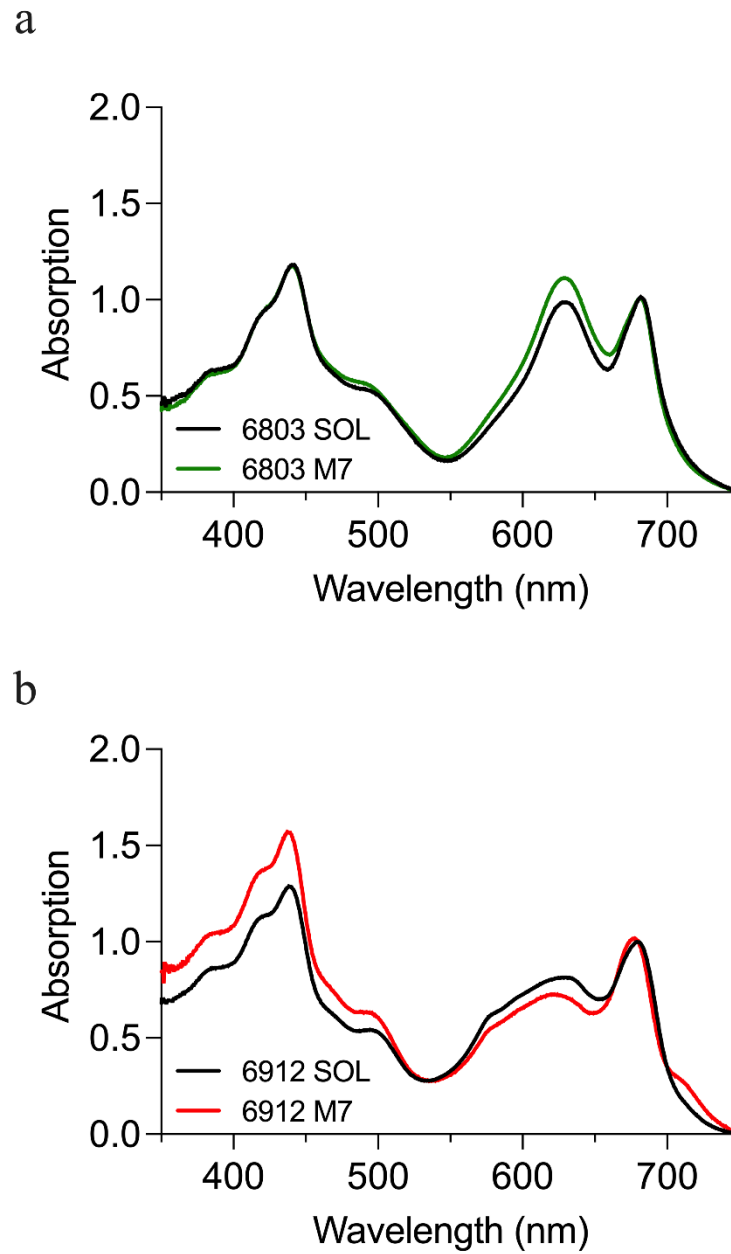


Figure S3. *In vivo* absorption spectra of (a) *Synechococcus* sp. PCC6803 acclimated to SOL (black line) and M7 (green line) light, and (b) *Chlorogleopsis fritschii* PCC6912 acclimated to SOL (black line) and M7 (red line) light. 6803: *Synechococcus* sp. PCC6803; 6912: *Chlorogleopsis fritschii* PCC6912; SOL: simulated solar light; M7: simulated M-dwarf starlight.