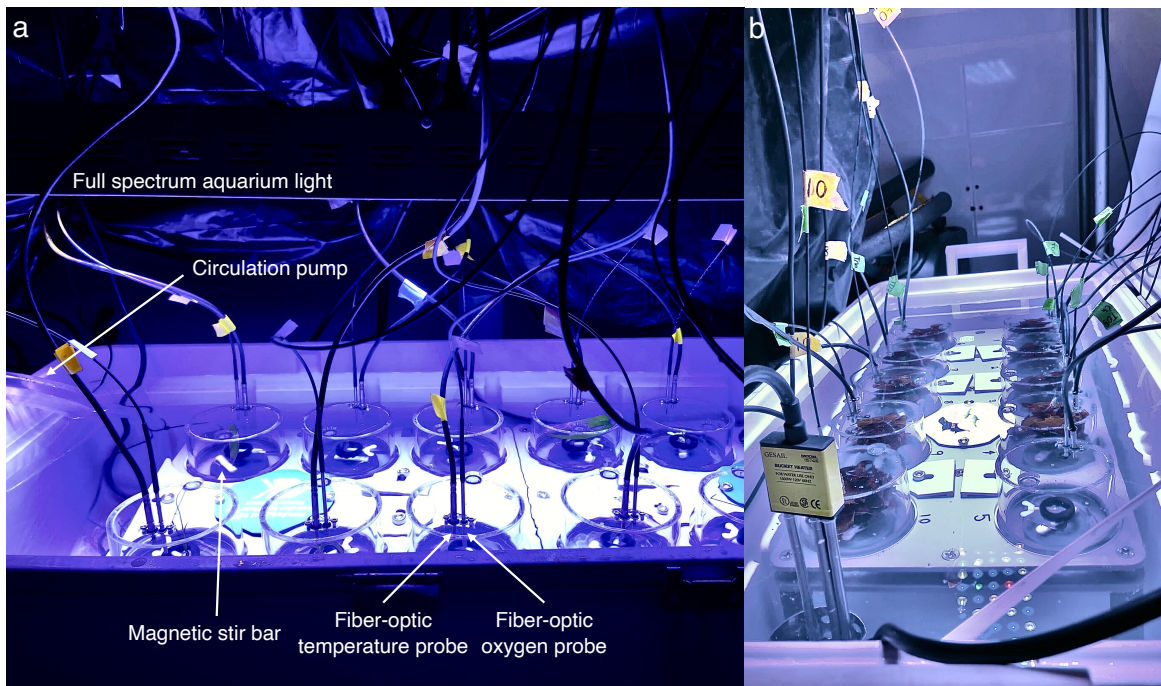


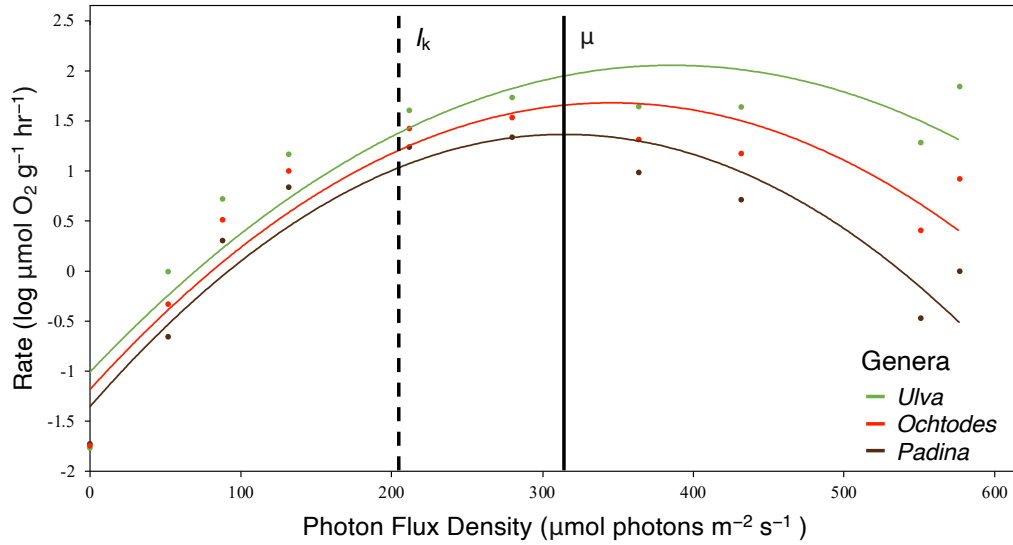
## Supplementary material

**Table S1.** Seaweed collection site locations and descriptions on San Cristóbal Island

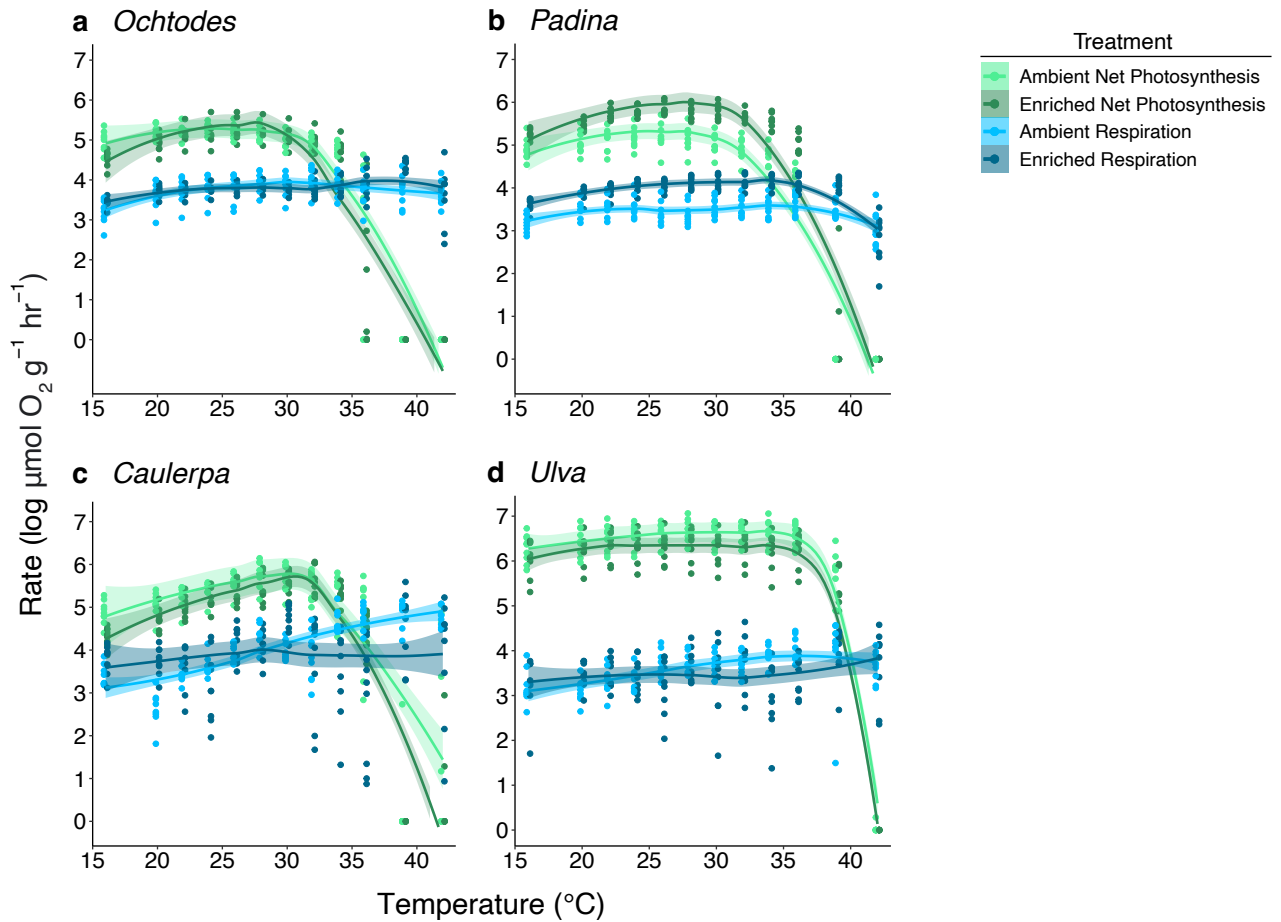
Site	Lat., Long.	Description	Seaweeds Collected (depth)
Playa Mann	0°53'43"S, 89°36'36"W	Exposed, short, wide sand beach with a condensed rocky subtidal, moderate sediment stir up	<i>Padina</i> spp. (2–3 m)
Punta Carola	0°53'24"S, 89°36'47"W	Inlet, long sand beach with a wide rocky subtidal, high sediment stir up	<i>Ulva</i> spp. ( $\leq$ 1 m) and <i>Ochtodes</i> spp. (1–2 m)
Bahía Rosa Blanca	0°49'08"S, 89°20'49"W	Inland, remote sand bottom coastal lagoon with a mangrove perimeter, low sediment stir up	<i>Caulerpa racemosa</i> (1–2 m)



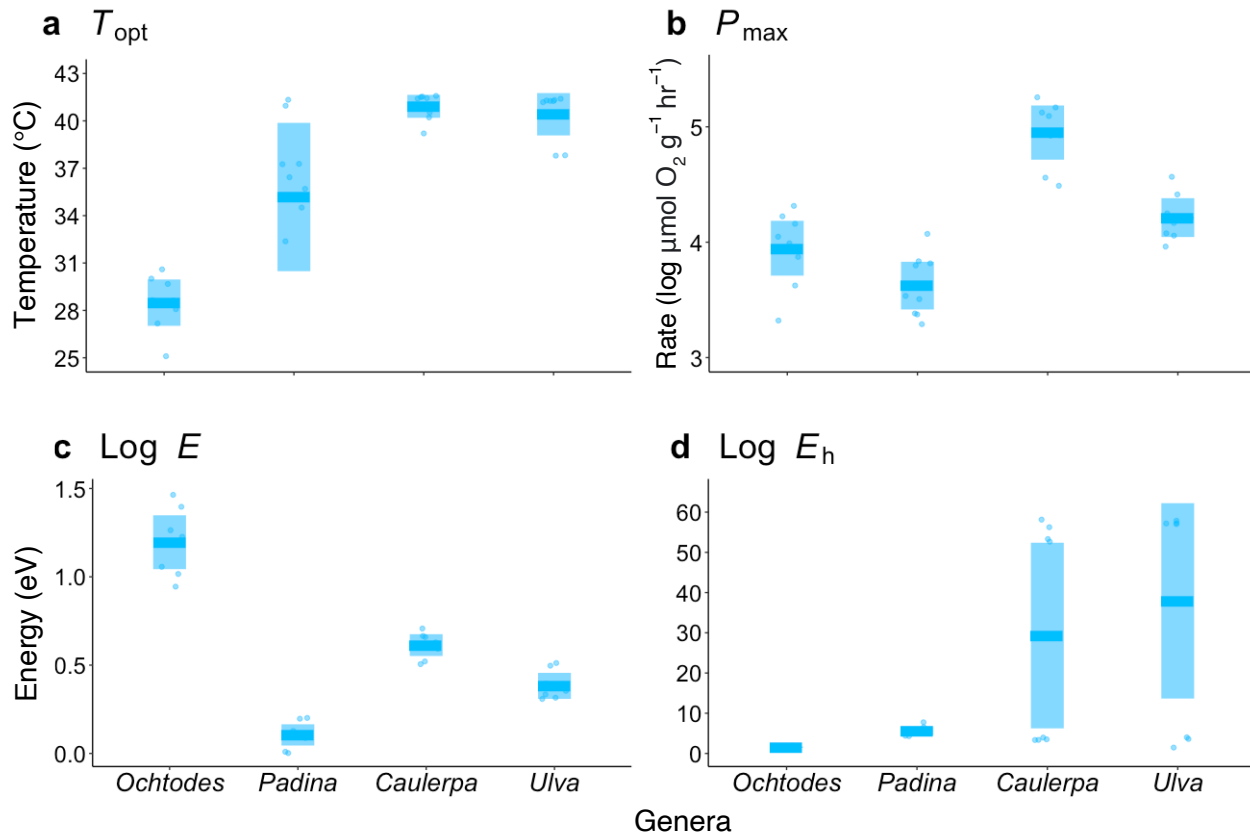
**Fig. S1.** **a** Labeled experimental setup of the motor-powered stirring table and hermetically sealed respirometry chambers containing their respective fiber-optic oxygen and temperature probes and magnetic stir bar. **b** Mid-trial image depicting a net photosynthesis temperature incubation with *Padina* specimens and an empty control chamber.



**Fig. S2.** Net photosynthesis – photon flux density curves characterized across a series of 10 increasing levels of light and fitted to the mean ( $\pm$  SE) photosynthetic rate of irradiance for three algal genera ( $n = 6$ ; *Caulerpa racemosa* was excluded due to limited sampling capacity, see Methods for further information). The dashed and solid vertical bars represent an  $I_k$  (saturating irradiance) of  $206 \mu\text{mol photon m}^{-2} \text{s}^{-1}$  and a mean ( $\mu$ ) light level of  $315 \pm 15 \mu\text{mol m}^{-2} \text{s}^{-1}$ , or the level utilized during net photosynthesis thermal performance trials, respectfully.



**Fig. S3.** Raw, unmodeled log net photosynthesis and respiration rates ( $\mu\text{mol O}_2 \text{ g}^{-1} \text{ hr}^{-1}$ ) plotted as average regression and 95% confidence intervals (CIs) per treatment by genus. Each point represents a single data measurement from 16–42  $^{\circ}\text{C}$ . Note the inclusion of the enriched respiration treatment combination that was excluded from Figure 2 due to the inability of the Sharpe–Schoolfield model equation to accurately estimate the thermal optimum ( $T_{\text{opt}}$ ) for two of the four taxa beyond our study temperature limit of 42  $^{\circ}\text{C}$ .



**Fig. S4.** Thermal performance parameters for ambient respiration displaying measurement points for all individuals. The darker horizontal bands across genera represent the mean response, and the surrounding vertical shaded regions, the 95% confidence intervals (CIs).