The following supplement accompanies the article

Seasonal acclimation of thermal performance in two species of reef-building corals

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SUPPLEMENTARY MATERIAL

Table S1 Mean (and maximum) monthly photosynthetically active irradiance (µmol photons m^{-2} s^{-1}) for April 2015 to March 2016 at Orpheus Island, Davies Reef and in the raceway. Davies Reef is situated at a similar latitude as Orpheus Island (18° S) and included as an indication of the irradiance attenuation at 1.9 m depth. Shaded areas highlight the light environment prior to and during the thermal experiment in winter and summer. Data sourced from the Australian Institute of Marine Science data portal (www.aims.gov.au/docs/data/data.html), specifically at http://data.aims.gov.au/aimsrtds/datatool.xhtml?from=2015-04-01&thru=2016-04-01&period=DAY&aggregations=AVG&channels=72,148,9272.

	Orpheus Island (surface)	Raceway	Davies Reef (surface)	Davies Reef (1.9 m)
Apr 2015	403 (1949)	193 (969)	460 (2244)	88 (471)
May	340 (1714)	141 (776)	351 (1849)	71 (400)
Jun	255 (1563)	138 (666)	313 (1814)	140 (893)
Jul	309 (1600)	145 (728)	352 (1915)	163 (924)
Aug	379 (1781)	117 (839)	418 (2415)	208 (1124)
Sep	NA	213 (928)	497 (2312)	244 (1149)
Oct	552 (1802)	156 (1174)	541 (2422)	248 (1171)
Nov	501 (1848)	262 (938)	586 (2499)	247 (1115)
Dec	458 (1898)	252 (903)	326 (2498)	218 (1020)
Jan 2017	493 (1973)	315 (1176)	325 (2494)	224 (988)
Feb	459 (1874)	286 (1065)	310 (2444)	206 (979)
Mar	344 (1567)	135 (927)	240 (1756)	138 (652)

Table S2 Comparison of thermal performance curves with different combinations of data selection for different physiological responses. Nonlinear regression models were fitted to net photosynthesis rate, F_v/F_m and $rETR_m$ data; linear regression models were fitted to respiration rate data. Models were fitted as follows: 1) no seasonal and species variation (all data); 2) only seasonal variation (winter or summer); 3) only species variation (*Acropora* or *Porites*); 4) species and seasonal variation. N is number of data points, LogLik is loglikelihood value for respective model and AIC value.

Thermal response	Data selection	N	LogLik	AIC
Net photosynthesis rate	All data	531	353.98	-699.95
	Winter	271	166.70	-325.41
	Summer	260	291.81	-575.62
	Acropora	261	132.45	-256.89
	Porites	270	286.15	-564.30
	Acropora Winter	131	71.86	-135.73
	Acropora Summer	130	121.43	-234.87
	Porites Winter	140	129.26	-250.51
	Porites Summer	130	253.09	-498.19
Respiration rate	All data	531	561.20	-1114.40
	Winter	271	263.89	-515.78
	Summer	260	400.45	-788.90
	Acropora	261	274.42	-536.84
	Porites	270	365.46	-718.92
	Acropora Winter	131	108.10	-208.19
	Acropora Summer	130	192.95	-377.90
	Porites Winter	140	162.40	-316.80
	Porites Summer	130	223.61	-439.22
F_v/F_m	All data	530	697.52	-1387.04
	Winter	270	426.08	-844.16
	Summer	260	423.40	-838.81
	Acropora	261	362.62	-717.24
	Porites	269	357.86	-707.72
	Acropora Winter	131	206.56	-405.12
	Acropora Summer	130	240.23	-472.45
	Porites Winter	139	244.62	-481.24
	Porites Summer	130	205.09	-402.17
$rETR_m$	All data	507	-2354.70	4717.40
	Winter	247	-1129.23	2266.46
	Summer	260	-1122.10	2252.21
	Acropora	250	-1129.13	2266.26
	Porites	257	-1205.47	2418.93
	Acropora Winter	120	-523.19	1054.38
	Acropora Summer	130	-521.75	1051.50
	Porites Winter	127	-587.77	1183.53
	Porites Summer	130	-573.82	1155.64

Table S3 Comparison of thermal performance curves with different combinations of data selection for different physiological responses. Nonlinear regression models were fitted to the data for net photosynthesis rate, F_v/F_m and $rETR_m$ data; linear regression models were fitted to respiration rate. Models were fitted as follows: 1) seasonal and species variation pooled together, referred to as "all data"; 2) only seasonal variation; 3) only species variation; 4) species and seasonal variation; 5) species, seasonal and **within-population variability**. K is number of estimated parameters in the model, delta AIC is the difference between the AIC value of the model and the minimum AIC value among all the models of the thermal response and the AIC weight is the weighted average of the model and represent the relative likelihood.

Thermal response	Data selection	K	Cumulative AIC	Δ AIC	AIC weight
Net photosynthesis rate	All data	4	-699.95	538.17	<0.0001
	Season	4	-901.03	337.09	<0.0001
	Species	4	-821.19	416.93	<0.0001
	Season * Species	4	-1119.30	118.83	<0.0001
	Season * Species * Colony	4	-1238.12	0.00	~1.00
Respiration rate *(lme, colony as random effect)*	All data	4	561.20	-1114.40	<0.0001
	Season	6	601.74	-1191.48	<0.0001
	Species	6	575.64	-1139.28	<0.0001
	Season * Species	10	622.11	-1224.22	~1.00
	Without colony (gls)	9	601.20	-1184.40	<0.0001
F_v/F_m	All data	4	-1387.039	652.816	<0.0001
	Season	4	-1682.970	356.884	<0.0001
	Species	4	-1424.962	614.893	<0.0001
	Season * Species	4	-1760.978	278.877	<0.0001
	Season * Species * Colony	4	-2039.854	0.000	~1.00
$rETR_m$	All data	4	4717.40	280.72	<0.0001
	Season	4	4518.66	81.98	<0.0001
	Species	4	4685.19	248.51	<0.0001
	Season * Species	4	4445.05	8.37	0.0150
	Season * Species * Colony	4	4436.68	0.00	0.9850

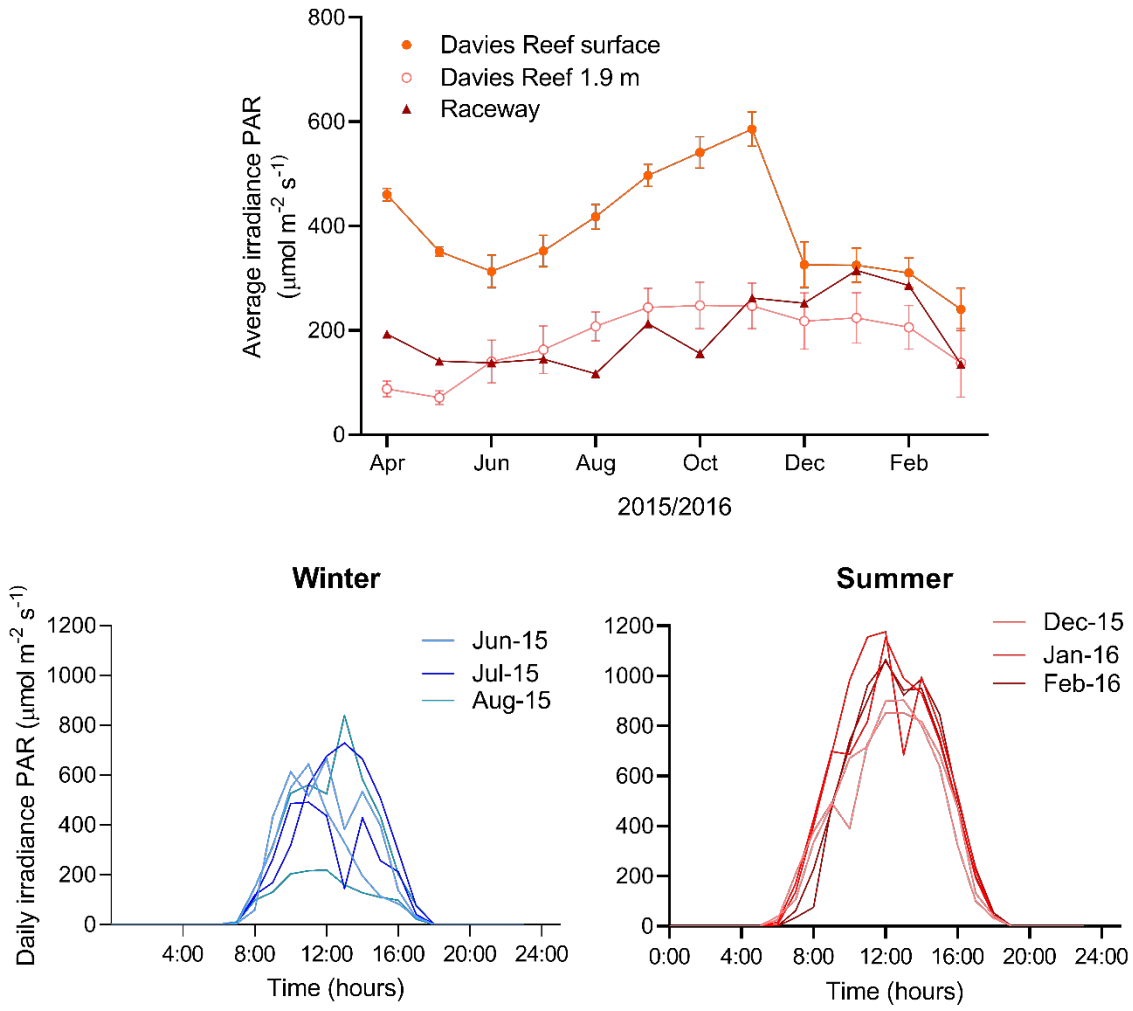

Figure S1 Average monthly irradiance at Davies Reef and in the raceway (top panel). Error bars represent the daily variation in irradiance, which was not available for the raceway because it was measured only two days per month. Irradiance data of Davies Reef was sourced from the Australian Institute of Marine Science data portal (www.aims.gov.au/docs/data/data. html), specifically at http://data.aims.gov.au/aimsrtds/datatool.xhtml?from=2015-04-01&thru=2016-04-01&period=DAY&aggregations=AVG&channels=72,148,9272. Bottom panels show the irradiance evolution in the raceway during three random days in winter (left) and summer (right).

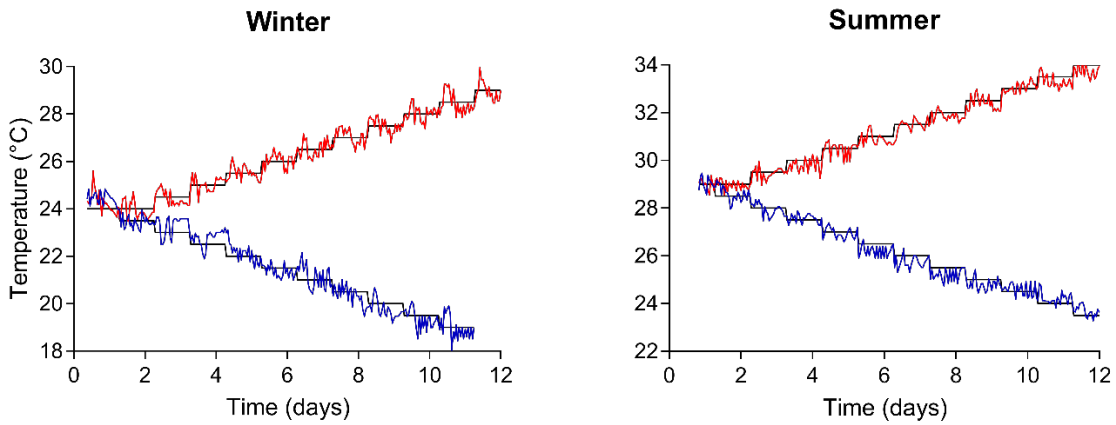

Figure S2 Ramping of the experimental temperature during the winter and summer thermal experiment.

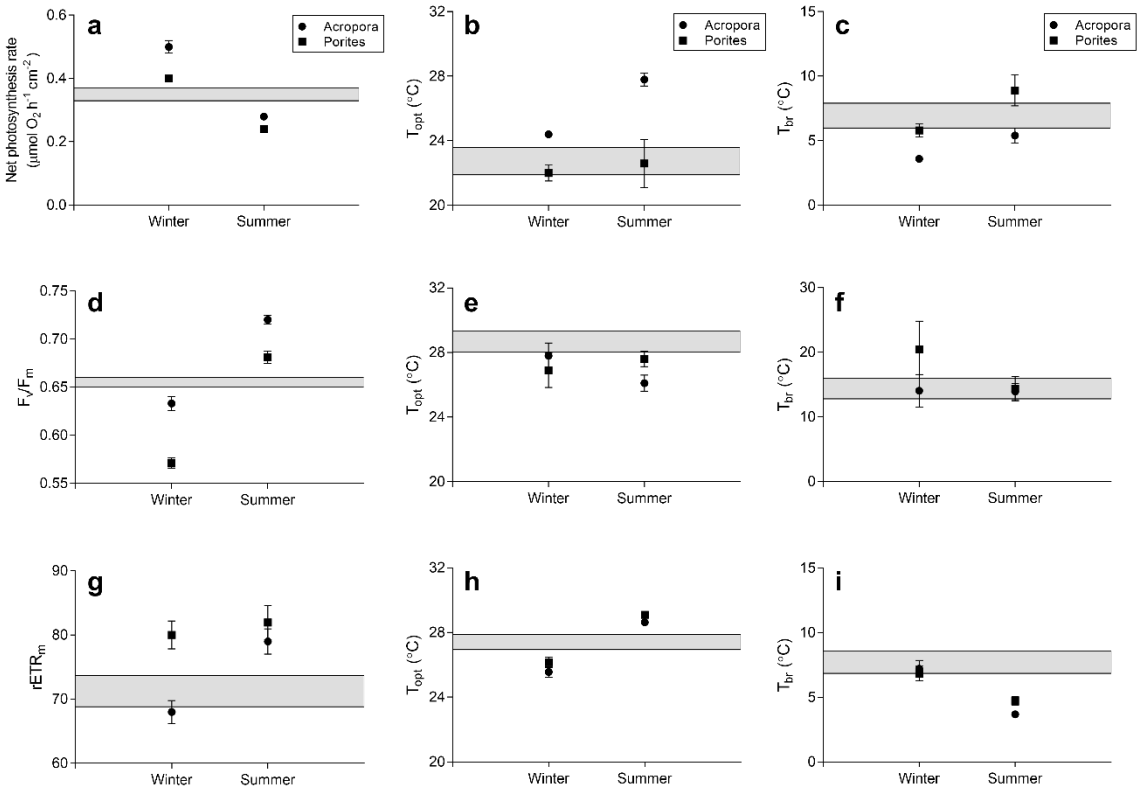

Figure S3 Variation in thermal performance according to summer and winter temperature in *Acropora valenciennesi* (circles) and *Porites cylindrica* (squares). Data points are the parameter estimates of the performance curves with in the left panels maximum performance (Pf_{max}), in the middle panels thermal optimum (T_{opt}) and in the right panels thermal breadth (T_{br}) for the net photosynthesis rate (a-c), maximum PSII quantum yield (d-f) and maximum electron transport rate (g-i). The shaded regions show the 95% confidence interval for each estimated parameter when data were pooled across species and season.

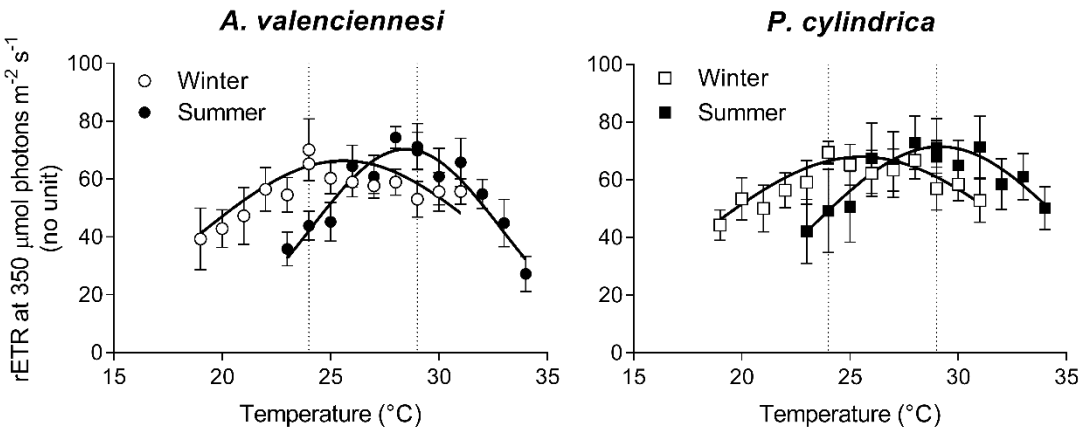

Figure S4 Thermal performance curves of relative electron transport rate at the experimental irradiance of 350 µmol photons m^{-1} s^{-1} measured on *Acropora valenciennesi* (left) and *Porites cylindrica* (right) during summer (closed) and winter (open). Point are the mean values ± s.d, n = 10. Vertical dotted lines show the environmental winter and summer temperature. Curves are fitted using least square non-linear regressions.