Supplementary Table 1 | Summary of statistical analyses on pH-temperature treatment replicate comparisons; pH, temperature, partial pressure of carbon dioxide (pCO_2), and aragonite saturation level (Ω_a) data for 28 days.

Kruskal-Wallis

pH					**Temperature**				
	N	df	Chi - squared	p-value		n	df	Chi - squared	p-value
C	255	2	3.52	0.1723	C	8064	2	4.9748	0.0831
OA	255	2	1.40	0.4957	OA	8064	2	1.8568	0.3952
T	255	2	0.29	0.8637	T	8064	2	5.9050	0.0522
OAT	255	2	5.01	0.0816	OAT	8064	2	1.6787	0.432

One-way ANOVA

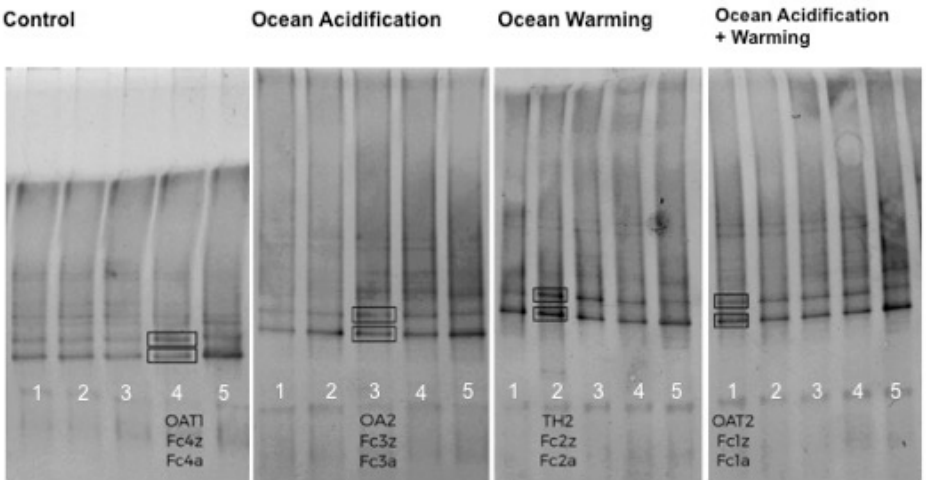
pCO_2							**Ω_a**						
	N	df	SS	MS	F	Pr(>F)		n	df	SS	MS	F	Pr(>F)
C	15	2	2131	1066	0.490	0.620	C	15	2	0.0215	0.0108	0.724	0.505
OA	15	2	57401	28701	0.674	0.528	OA	15	2	0.0981	0.0491	2.151	0.159
T	15	2	37841	18920	3.524	0.063	T	15	2	0.0345	0.0173	1.177	0.341
OAT	15	2	53165	26582	0.822	0.463	OAT	15	2	0.0163	0.0082	0.162	0.853
Res		12	26032	2169			Res		12	0.178	0.0148		

Supplementary Table 2 | Physiological response (mean ± SD) of *Favites colemani* after 28day exposure to pH-temperature stress. Surviving explants were measured for growth rate, zooxanthellae density, and maximum photosynthetic efficiency.

Treatment	n	Survival (%)	n	Growth Rate (%d^{-1})	Zooxanthellae Density (x10^6 cells/cm^2)	Maximum Photosynthetic Efficiency (Fv/Fm)
C	15	100 ± 0	15	0.071 ± 0.031	4.211 ± 2.743	0.713 ± 0.058
OA	15	100 ± 0	15	0.038 ± 0.036	3.208 ± 2.146	0.735 ± 0.045
T	15	66.7 ± 12.2	10	0.047 ± 0.015	0.492 ± 1.122	0.642 ± 0.079
OAT	15	66.7 ± 12.2	10	0.010 ± 0.051	0.476 ± 0.280	0.517 ± 0.129

Supplementary Table 3 | Summary of *posteriori* pairwise tests on *Favites colemani* physiological response under pH-temperature treatments for 28 days.

Growth Rate			
Pairwise		t	p(perm)
8.0pH, 28C	7.6pH, 28C	0.91391	0.312
8.0pH, 28C	8.0pH, 32C	4.9335	0.001
8.0pH, 28C	7.6pH, 32C	4.8468	0.001
7.6pH, 28C	8.0pH, 32C	4.3968	0.002
7.6pH, 28C	7.6pH, 32C	4.2887	0.001
8.0pH, 32C	7.6pH, 32C	0.80826	0.493
Zooxanthellae Density			
Pairwise		t	p(perm)
8.0pH, 28C	7.6pH, 28C	0.91391	0.312
8.0pH, 28C	8.0pH, 32C	4.9335	0.001
8.0pH, 28C	7.6pH, 32C	4.8468	0.001
7.6pH, 28C	8.0pH, 32C	4.3968	0.002
7.6pH, 28C	7.6pH, 32C	4.2887	0.001
8.0pH, 32C	7.6pH, 32C	0.80826	0.493
Maximum Photosynthetic Efficiency			
Pairwise		t	p(perm)
Week 0			
8.0pH, 28C	7.6pH, 28C	0.16984	0.879
8.0pH, 28C	8.0pH, 32C	1.0816	0.273
8.0pH, 28C	7.6pH, 32C	0.65814	0.554
7.6pH, 28C	8.0pH, 32C	1.2243	0.215
7.6pH, 28C	7.6pH, 32C	0.82755	0.464
8.0pH, 32C	7.6pH, 32C	0.52876	0.609
Week 1			
8.0pH, 28C	7.6pH, 28C	0.19767	0.849
8.0pH, 28C	8.0pH, 32C	0.9508	0.343
8.0pH, 28C	7.6pH, 32C	1.5489	0.1
7.6pH, 28C	8.0pH, 32C	0.61298	0.548
7.6pH, 28C	7.6pH, 32C	1.3676	0.206
8.0pH, 32C	7.6pH, 32C	0.95049	0.412
Week 2			
8.0pH, 28C	7.6pH, 28C	1.655	0.12
8.0pH, 28C	8.0pH, 32C	6.0719	0.001
8.0pH, 28C	7.6pH, 32C	4.0322	0.001
7.6pH, 28C	8.0pH, 32C	2.5246	0.015
7.6pH, 28C	7.6pH, 32C	1.0359	0.296
8.0pH, 32C	7.6pH, 32C	2.1263	0.048
Week 3			
8.0pH, 28C	7.6pH, 28C	2.0052	0.046
8.0pH, 28C	8.0pH, 32C	7.1283	0.001
8.0pH, 28C	7.6pH, 32C	4.627	0.001
7.6pH, 28C	8.0pH, 32C	4.1069	0.001
7.6pH, 28C	7.6pH, 32C	2.8753	0.008
8.0pH, 32C	7.6pH, 32C	0.25542	0.812
Week 4			
8.0pH, 28C	7.6pH, 28C	1.1813	0.261
8.0pH, 28C	8.0pH, 32C	2.5775	0.02
8.0pH, 28C	7.6pH, 32C	5.0847	0.001
7.6pH, 28C	8.0pH, 32C	3.7746	0.003
7.6pH, 28C	7.6pH, 32C	5.8766	0.001
8.0pH, 32C	7.6pH, 32C	2.6689	0.018



Supplementary Figure 1 | PCR-DGGE profiles of zooxanthellae ITS2 from *Favites colemani* samples. Prominent bands (boxed) were excised for re-amplification and sequencing.