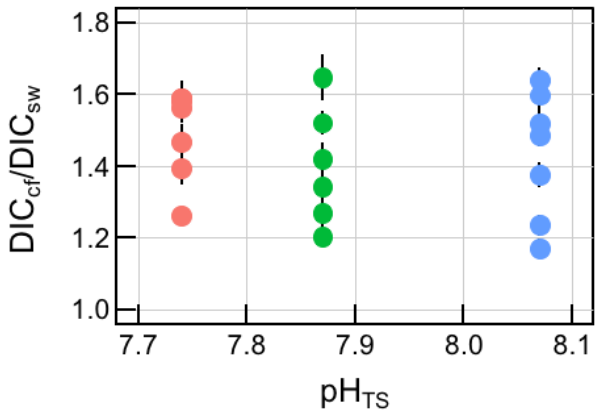
Supplementary Material

Supplementary Figures



Supplementary Figure 1. Internal dissolved inorganic carbon concentration up-regulation (DIC ratio of DIC_{cf}/DIC_{sw}) at the calcification site derived from the skeletal B/Ca concentration of Balanophyllia europaea along the pH_{TS} gradient at Panarea Island, Italy.

Supplementary Tables

Supplementary Table 1: Seawater pH, temperature, salinity and aragonite saturation state at the three sites. Temperature (T; n = 112-115 per site), pH (n = 103-110 per site) and salinity (S; n = 107-110 per site) were measured in July 2010, September 2010, November 2010, March 2011, June 2011, July-August 2011, November-December 2011, April-May 2012, June 2012 and May 2013. Ωarag = aragonite saturation. In brackets the min and max values. Data are taken from Prada et al., 2017 .

Site	pH range (total scale)	T (°C)	S	Ω_{arag}
1	8.07 (7.82-8.45)	20.5 (14.3-26.0)	37 (33-38)	3.6 (1.8-6.3)
2	7.87 (7.54-8.25)	20.7 (14.4-26.0)	37 (33-38)	2.5 (1.1-5.0)
3	7.74 (7.05-8.21)	20.6 (14.4-26.0)	37 (34-38)	2.2 (0.4-3.9)

Supplementary Table 2: Summary of the geochemical proxy values and calcifying conditions for the individual corals per site. Seawater pH is reported as total scale (pH_{TS}), skeletal $\delta^{11}B$ and B/Ca and derived calcifying conditions: pH_{cf}, pH-up-regulation (ΔpH), carbonate ion concentration ($[CO_3^{2-}]_{cf}$), dissolved inorganic carbon concentration DIC up-regulation (DIC_{cf}/DIC_{sw}) and absolute DIC_{cf}. Descriptive statistics related to average values per site is reported as mean ± sem (coefficient of variation) (bold-faced values). NS = not significant; ***p<0.001, Kruskal-Wallis equality-of-populations rank test.

Site	pH_{TS}	$\delta^{11}B$		pH_{cf}		ΔpH		B/Ca		$[CO_3^{2-}]_{cf}$		DIC_{cf}/DIC_{sw}		DIC_{cf}	
		(‰)						µmol mol^{-1}		µmol kg^{-1}				µmol kg^{-1}	
1	8.07	21.2	0.28	8.35	0.02	0.28	0.02	738	17	570	25	1.48	0.03	3211	71
1	8.07	21.1	0.37	8.35	0.03	0.28	0.03	909	19	455	21	1.20	0.03	2596	62
1	8.07	21.2	0.31	8.35	0.02	0.28	0.02	683	12	608	20	1.59	0.03	3444	72
1	8.07	22.6	0.37	8.45	0.03	0.38	0.03	673	17	712	23	1.57	0.05	3403	116
1	8.07	21.9	0.36	8.40	0.03	0.33	0.03	720	23	651	62	1.53	0.08	3311	181
1	8.07	23.4	0.38	8.51	0.03	0.44	0.03	898	18	581	24	1.14	0.02	2477	54
1	8.07	20.6	0.33	8.31	0.02	0.24	0.02	828	19	476	21	1.34	0.03	2907	73
2	7.87	20.8	0.36	8.32	0.03	0.45	0.03	662	22	617	20	1.63	0.07	3759	156
2	7.87	21.8	0.46	8.39	0.04	0.52	0.04	732	17	612	28	1.38	0.04	3176	103
2	7.87	22.3	0.33	8.43	0.02	0.56	0.02	847	15	553	16	1.17	0.03	2692	61
2	7.87	20.9	0.37	8.33	0.03	0.46	0.03	772	22	524	21	1.36	0.06	3118	139
2	7.87	20.8	0.73	8.31	0.05	0.44	0.05	869	28	450	28	1.21	0.06	2793	134
2	7.87	19.7	0.35	8.24	0.03	0.37	0.03	720	15	487	26	1.48	0.03	3396	70
3	7.74	21.2	0.39	8.36	0.03	0.62	0.03	701	14	613	23	1.51	0.04	3455	95
3	7.74	22.3	0.36	8.43	0.02	0.69	0.02	667	10	713	22	1.54	0.04	3515	81
3	7.74	21.0	0.44	8.34	0.04	0.60	0.04	695	13	602	24	1.54	0.05	3515	106
3	7.74	20.9	0.33	8.33	0.02	0.59	0.02	799	19	521	18	1.35	0.04	3081	98
3	7.74	20.0	0.33	8.27	0.03	0.53	0.03	716	10	525	21	1.54	0.03	3507	72

3	7.74	19.9	0.46	8.25	0.04	0.51	0.04	786	19	471	26	1.43	0.05	3258	108
3	7.74	21.8	0.29	8.39	0.02	0.65	0.02	849	12	534	14	1.23	0.02	2805	55
Site 1	**8.07**	**21.70 ± 0.37 (1.72%)**		**8.39 ± 0.03 (0.31%)**		**0.32 ± 0.03 (8.29%)**		**778 ± 38 (4.82%)**		**579 ± 34 (5.95%)**		**1.41 ± 0.07 (4.89%)**		**3050 ± 149 (4.88%)**	
Site 2	**7.87**	**21.05 ± 0.38 (1.82%)**		**8.34 ± 0.03 (0.32%)**		**0.47 ± 0.03 (5.79%)**		**767 ± 32 (4.21%)**		**541 ± 27 (5.06%)**		**1.37 ± 0.07 (5.08%)**		**3156 ± 160 (5.08%)**	
Site 3	**7.74**	**21.00 ± 0.33 (1.56%)**		**8.34 ± 0.02 (0.29%)**		**0.60 ± 0.02 (4.00%)**		**745 ± 25 (3.39%)**		**568 ± 30 (5.35%)**		**1.45 ± 0.05 (3.14%)**		**3305 ± 104 (3.15%)**	
Statistical significance		NS		NS		***		NS		NS		NS		NS	

Supplementary Table 3. Average values of the bio-inorganic calcification model and measured bulk-NCR and micro-NCR for the individual specimens. The model derived relative gross calcification rates based on pH_{cf} and DIC_{cf} from geochemical proxies and we compared them to measured bulk-NCR and micro-NCR for the individual corals (based on the individual data from Fantazzini et al. 2015). For each specimen relative and real values (the latter in brackets expressed in μmol cm^{-2} h^{-1} for GCR and in mg mm^{-2} yr^{-1} for NCR) are reported. Descriptive statistics related to average relative and real (in brackets) values per site is reported as mean ± sem [coefficient of variation]. NS = not significant; *p<0.050, Kruskal-Wallis equality-of-populations rank test.

Site	Ω_{cf}	Relative GCR	Relative micro-NCR	Relative bulk-NCR
1	8.76	0.96 (651)	1.01(3.31)	1.03 (2.35)
1	7.00	0.68 (456)	0.96 (3.15)	0.95 (2.16)
1	9.35	1.06 (718)	0.99 (3.26)	1.01 (2.31)
1	10.95	1.35 (914)	0.94 (3.09)	1.02 (2.33)
1	10.01	1.23 (827)	1.01 (3.33)	1.03 (2.37)
1	8.93	0.99 (670)	1.11 (3.65)	1.08 (2.48)
1	7.32	0.73 (490)	0.98 (3.22)	0.88 (2.02)
2	9.50	1.12 (757)	0.94 (3.08)	0.91 (2.08)
2	9.42	1.12 (754)	0.93 (3.07)	0.94 (2.14)
2	8.51	0.94 (636)	1.08 (3.54)	1.00 (2.30)
2	8.06	0.87 (587)	0.66 (2.17)	0.58 (1.32)
2	6.92	0.69 (465)	1.10 (3.62)	0.99 (2.26)
2	7.49	0.78 (527)	1.12 (3.68)	1.09 (2.48)
3	9.43	1.09 (739)	0.97 (3.18)	0.97 (2.21)
3	10.96	1.38 (930)	0.73 (2.39)	0.71 (1.64)
3	9.26	1.07 (720)	0.80 (2.62)	0.80 (1.83)
3	8.02	0.85 (572)	0.74 (2.45)	0.63 (1.45)
3	8.08	0.86 (581)	0.99 (3.25)	0.95 (2.17)
3	7.24	0.73 (493)	1.05 (3.44)	0.94 (2.14)
3	8.22	0.88 (593)	0.88	0.87 (2.00)
Site 1	**8.90 ± 1.40 [5.94%]**	**1.00 (675) ± 0.09 (63) [9.28%]**	**1.00 (3.29) ± 0.02 (0.07) [2.08%]**	**1.00 (2.29) ± 0.02 (0.06) [2.47%]**
Site 2	**8.31 ± 1.03 [5.08%]**	**0.92 (621) ± 0.07 (49) [7.82%]**	**0.97 (3.19) ± 0.07 (0.23) [7.28%]**	**0.92 (2.10) ± 0.07 (0.16) [7.85%]**
Site 3	**8.74 ± 1.23 [5.34%]**	**0.98 (661) ± 0.08 (55) [8.38%]**	**0.88 (2.89) ± 0.05 (0.19) [6.47%]**	**0.84 (1.92) ± 0.05 (0.11) [5.78%]**
Statistical significance	NS	NS	NS	*