

## SI\_1 Relation between respiration and temperature of Mediterranean *Lophelia pertusa*

The respiration rate of ectothermic poikilotherms is expected to increase with increasing temperature within the normal range of temperatures experienced by an organism (Barnes, 2001; Hochachka and Somero, 2002). In a preliminary experiment, coral fragments of *L. pertusa* were incubated at ambient or increased (1000 µatm pCO<sub>2</sub>). Respiration measurements were made (using methods described in the manuscript) at each of three temperatures (10.2, 13.0 and 16.7°C) over the course of three days (one temperature per day). Values of Q<sub>10</sub> for respiration were calculated according to:  $Q_{10} = (R_2/R_1)^{10/(T_2-T_1)}$  where R<sub>1</sub> and R<sub>2</sub> as respiration rates at temperatures T<sub>1</sub> and T<sub>2</sub>, respectively (Table SI\_1). Three coral fragments were used at each pCO<sub>2</sub> level and temperature.

**Table SI\_1** Respiration rates (R), respiratory coefficient (Q<sub>10</sub>) and skeletal dry weight (SDW) of three *L. pertusa* fragments (coral ID) at ambient and high pCO<sub>2</sub> and at three temperatures (T), with lower (10.2), ambient (13°C) and higher temperatures (16.7°C).

pCO <sub>2</sub> treatment	Coral ID	SDW [g]	R [µmol g <sup>-1</sup> kg <sup>-1</sup> ]			Q <sub>10</sub>		
			T <sub>1</sub> (10.2°C)	T <sub>2</sub> (13.0°C)	T <sub>3</sub> (16.7°C)	R <sub>2</sub> :R <sub>1</sub>	R <sub>3</sub> :R <sub>2</sub>	R <sub>3</sub> :R <sub>1</sub>
ambient	A1	1.774	0.078	0.116	0.191	4.13	3.85	3.97
ambient	A2	9.297	0.030	0.042	0.077	3.33	5.15	4.26
ambient	A3	0.776	0.013	0.102	0.365	1567.5	31.4	169.1
ambient	A	3.949	0.040	0.087	0.211	15.36	11.08	17.34
1000 µatm	D1	1.909	0.157	0.237	0.386	4.35	3.74	3.99
1000 µatm	D2	9.038	0.051	0.045	0.062	0.64	2.38	1.35
1000 µatm	D3	4.752	0.071	0.096	0.184	2.94	5.80	4.33
1000 µatm	D	5.233	0.093	0.126	0.211	2.96	4.01	4.10

Respiration rates were between 0.013 and 0.365 µmol O<sub>2</sub> (g skeletal weight)<sup>-1</sup> h<sup>-1</sup> (Table SI\_RT\_1). Except for coral fragment D1 between 10.2 and 13°C, all respiration rates increased with increasing temperature. There was no significant effect of pCO<sub>2</sub> on respiration rate but temperature had a significant effect (Repeated measures ANOVA, p = 0.683 and 0.020, respectively) (Table SI\_RT\_2 and SR\_RT\_3). The mean (±SD) Q<sub>10</sub> value was 3.96 (± 0.71) and values ranged from 2.38 to 5.8 (outliers excluded for mean calculation, italic in Table SI\_RT\_1). The Q<sub>10</sub> values between the two temperature steps (10.2 to 13.0°C and 13.0 to 16.7°C) were not significantly different (paired t-test, p = 0.34, N = 4). At temperatures between 7-9°C and 9-11°C, Dodds et al. (2005) reported Q<sub>10</sub> values of 5.43 and 8.28, respectively, for corals collected from the North Atlantic. These Q<sub>10</sub> values are almost twofold higher than those calculated here for *L. pertusa* in the Mediterranean Sea. When acclimated, Q<sub>10</sub> values tend to decrease with time of adjustment and for perfect acclimation would tend to 1 (Barnes, 2001). The lower Q<sub>10</sub> values suggest that Mediterranean *L. pertusa* is well acclimated to 13°C of the Mediterranean Sea. Furthermore, the similar increase in respiration rates from 10.2 to 13.0 and 13.0 to 16.7°C suggest that *L. pertusa* is not experiencing thermal stress at the warmest temperature. Temperatures between 10.2 and 16.7°C are within the normal thermal

distributional range of this species in the Mediterranean Sea. These preliminary measurements point towards population differences in the response of respiration rates to temperature between North Atlantic and Mediterranean Sea specimens of *L. pertusa* but more measurements (on a greater number of specimens) are needed to clarify potential population differences in thermal physiology.

**Table SI\_2** Results of repeated measures ANOVA with temperature as repeated ( $T_R$ ) and pCO<sub>2</sub> as independent grouping variable.

	SS	Degr. of Freedom	MS	F	p
Intercept	0.295	1	0.2947	13.56	<b>0.021</b>
pCO <sub>2</sub>	0.004	1	0.0042	0.19	0.683
Error	0.087	4	0.0217		
$T_R$	0.067	2	0.0333	6.63	<b>0.020</b>
$T_R * pCO_2$	0.002	2	0.0011	0.23	0.802
Error	0.040	8	0.0050		

**Table SI\_3** Results of post-hoc comparison using the Fisher least significance difference (LSD) Test. Significant results highlighted with probability  $p < 0.05$  (red) and  $p < 0.1$  are highlighted.

pCO <sub>2</sub> $T_R$ [°C]	ambient		1000			
	13.0	16.7	10.2	13.0	16.7	
ambient	10	0.446	<b>0.018</b>	0.684	0.339	<b>0.078</b>
	13		<b>0.064</b>	0.942	0.760	0.180
	17			0.199	0.342	0.998
1000	10			0.584	<b>0.076</b>	
	13				0.182	