

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 pCO₂). 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 Q₁₀ for respiration were calculated according to: $Q_{10} = (R_2/R_1)^{10/(T_2-T_1)}$ where R₁ and R₂ as respiration rates at temperatures T₁ and T₂, respectively (Table SI_1). Three coral fragments were used at each pCO₂ level and temperature.

Table SI_1 Respiration rates (R), respiratory coefficient (Q₁₀) and skeletal dry weight (SDW) of three *L. pertusa* fragments (coral ID) at ambient and high pCO₂ and at three temperatures (T), with lower (10.2), ambient (13°C) and higher temperatures (16.7°C).

pCO ₂ treatment	Coral ID	SDW [g]	R [$\mu\text{mol g}^{-1} \text{kg}^{-1}$]			Q ₁₀		
			T ₁ (10.2°C)	T ₂ (13.0°C)	T ₃ (16.7°C)	R ₂ :R ₁	R ₃ :R ₂	R ₃ :R ₁
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	<i>1567.5</i>	<i>31.4</i>	<i>169.1</i>
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	<i>0.64</i>	2.38	<i>1.35</i>
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 $\mu\text{mol O}_2$ (g skeletal weight)⁻¹ h⁻¹ (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 pCO₂ 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 (\pm SD) Q₁₀ value was 3.96 (\pm 0.71) and values ranged from 2.38 to 5.8 (outliers excluded for mean calculation, italic in Table SI_RT_1). The Q₁₀ 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 Q₁₀ values of 5.43 and 8.28, respectively, for corals collected from the North Atlantic. These Q₁₀ values are almost twofold higher than those calculated here for *L. pertusa* in the Mediterranean Sea. When acclimated, Q₁₀ values tend to decrease with time of adjustment and for perfect acclimation would tend to 1 (Barnes, 2001). The lower Q₁₀ 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 pCO₂ as independent grouping variable.

	SS	Degr. of Freedom	MS	F	p
Intercept	0.295	1	0.2947	13.56	0.021
pCO ₂	0.004	1	0.0042	0.19	0.683
Error	0.087	4	0.0217		
T_R	0.067	2	0.0333	6.63	0.020
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 ₂	T_R [°C]	ambient		1000		
		13.0	16.7	10.2	13.0	16.7
ambient	10	0.446	0.018	0.684	0.339	0.078
	13		0.064	0.942	0.760	0.180
	17			0.199	0.342	0.998
1000	10				0.584	0.076
	13					0.182