
Supplementary information

Upper environmental $p\text{CO}_2$ drives sensitivity to ocean acidification in marine invertebrates

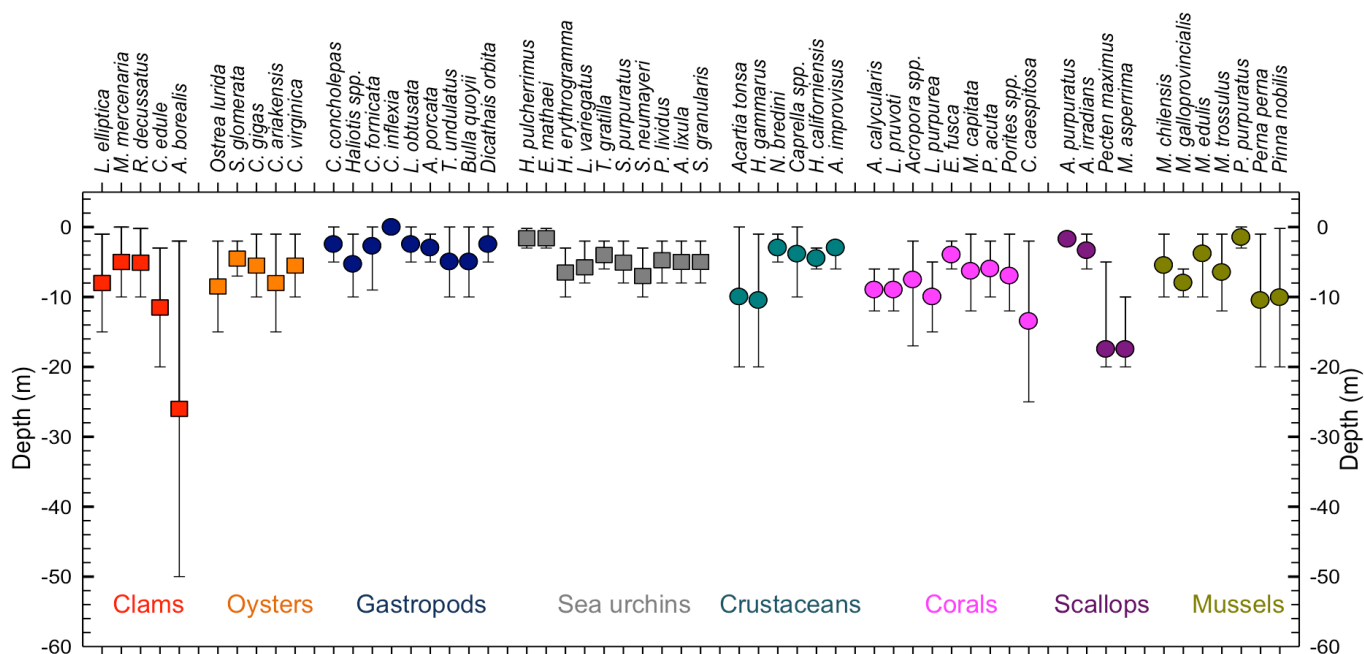
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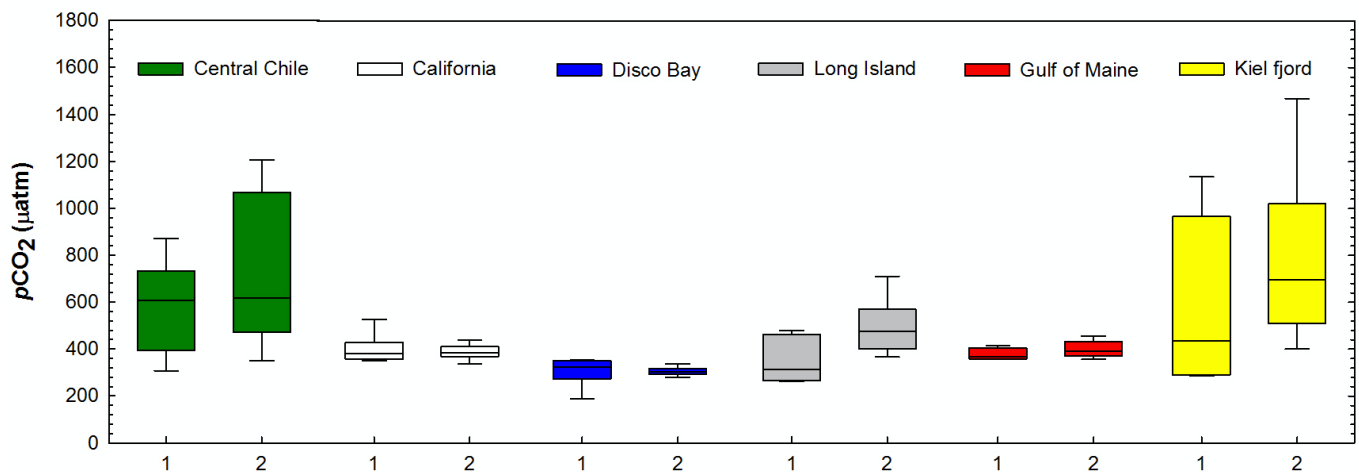
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Content:

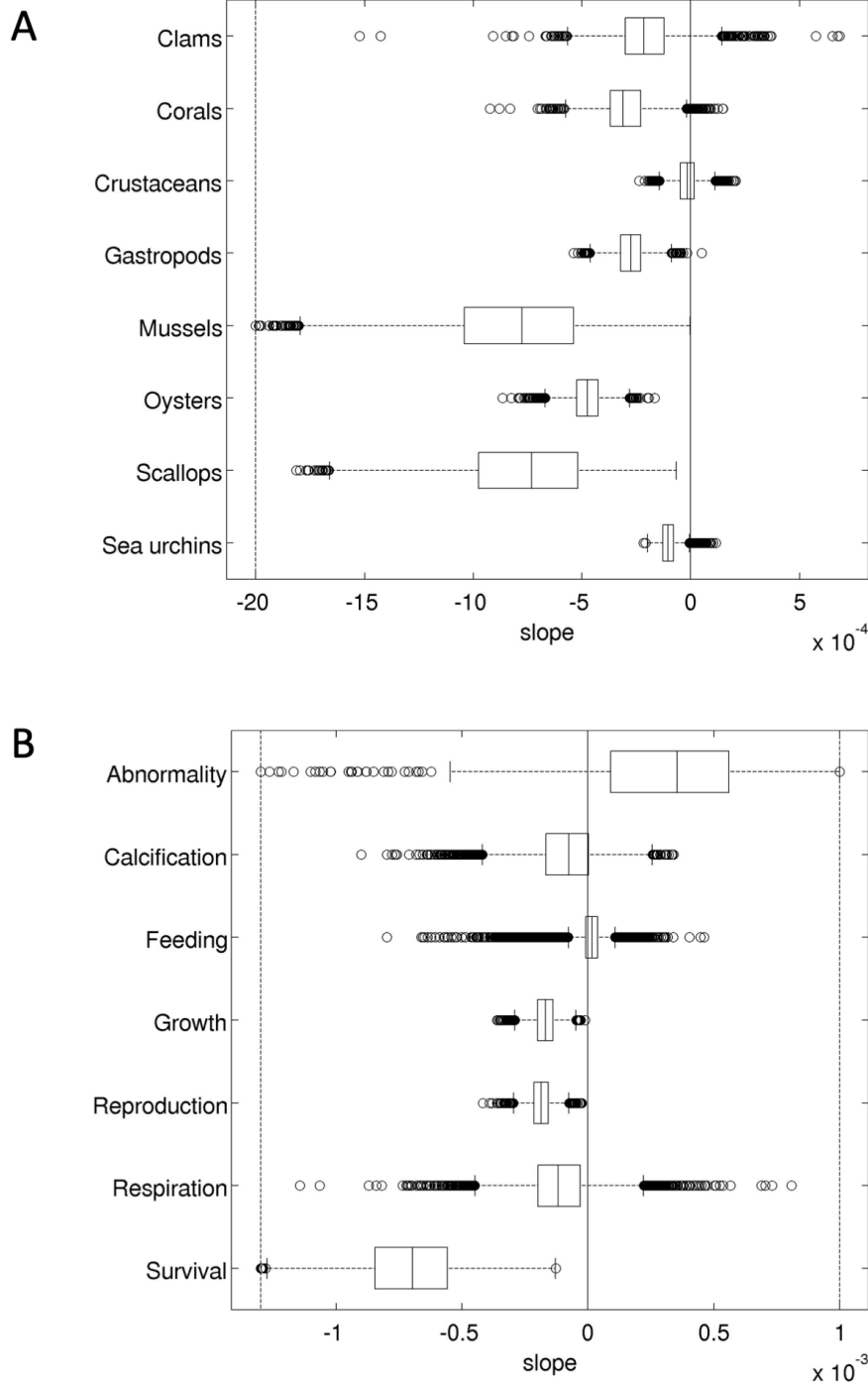
- Supplementary Figures 1, 2, 3, 4 and 5
- Supplementary Table 1 included in this file.



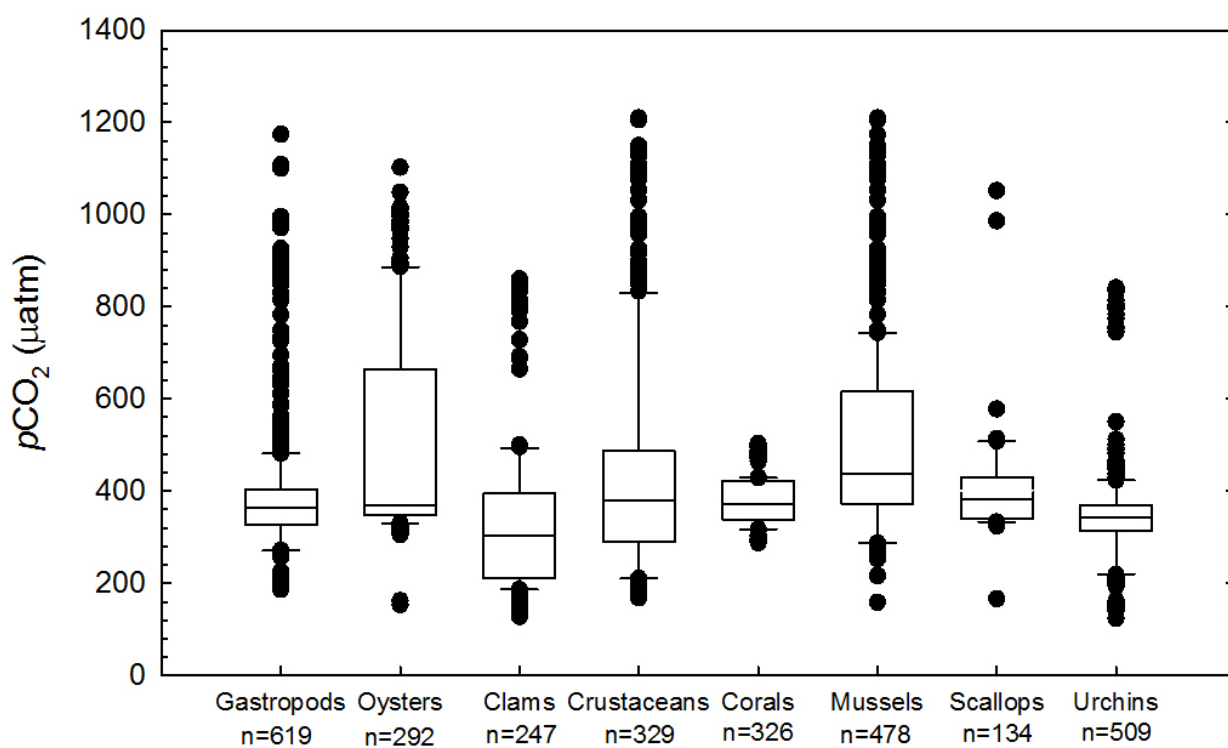
Supplementary Figure 1 | Mean vertical distribution (m) of marine invertebrate species considered in our analysis. The dots represent the depth at the site of animal collection reported in ~40% of the selected studies. Vertical line represent the range of vertical distribution reported in the literature for each geographic area. When the depth of collection was not reported, the dots represent the mean depth based on the range of vertical distribution.



Supplementary Figure 2 | Comparison of $p\text{CO}_2$ variability reported by the (1) LDEO Database V2019 and (2) high-frequency data from autonomous $p\text{CO}_2$ sensors placed within a mean radius of 50 km from LDEO Database. Central line represents the “median” ($p\text{CO}_2$ value in the central position of total data set), the lower and upper part of the boxes are the first quartile (25% of the data), and the third quartile (75% of the data), respectively. Upper and lower error lines ranges represent 1.5 times the range between first and third quartile.

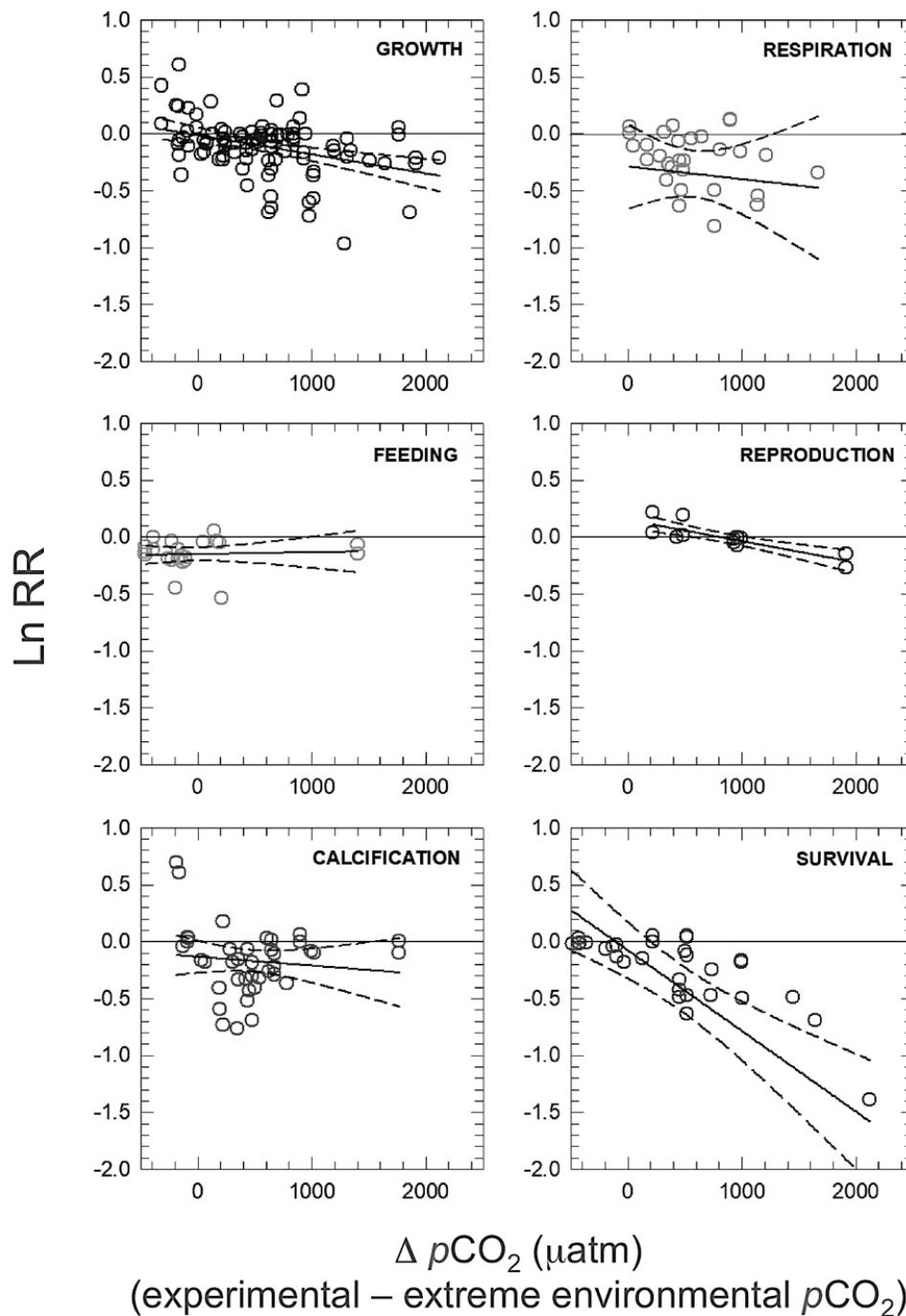


Supplementary Figure 3 | Box-plots summarizing the distribution of slope estimates presented in Table 1 between the log-response ratio and the $\Delta p\text{CO}_2$ exposure index for (A) different taxa and (B) biological traits. The line in the center of the box corresponds to the median value of the slope, the boxes bound the 25% and 75% of the data and slope values in circles beyond the whiskers correspond to extreme outliers. When the whiskers do not cross the reference line at zero, the bootstrapped estimate of the slopes are significantly different from zero.



Supplementary Figure 4 | Mean surface $p\text{CO}_2$ variability conditions for different taxa.

Box-plot displaying data distribution through quartiles. Central line represents the “median” ($p\text{CO}_2$ value in the central position of total data set), the lower and upper part of the boxes are the first quartile (25% of the data), and the third quartile (75% of the data), respectively. Upper and lower error lines ranges represent 1.5 times the range between first and third quartile. Black dots represent the outliers exceeding 1.5 times the inter-quartile range). “n” represents the number of $p\text{CO}_2$ observations considered for each taxon analyzed.



Supplementary Figure 5 | Mean response (Ln RR) of most studied biological traits in relation to the $\Delta p\text{CO}_2$ exposure index. $\Delta p\text{CO}_2$ (μatm) is represented as the difference between the experimental high $p\text{CO}_2$ levels used in the corresponding mesocosms experiments minus the *extreme* $p\text{CO}_2$ level recorded at each coastal area. The black line is the linear regression fit with dark blue dotted lines representing the 95% confidence interval.

Supplementary Table 1. Position and depth of the six different buoys used to compare surface $p\text{CO}_2$ data from the LDEO database

Site	Buoy position	Buoy Depth (m)	Number of data	
			points at the LDEO dataset near $p\text{CO}_2$ buoys	Max distance from buoy (km)
Central Chile ¹	-36.400, -72.900	Surface	43	21
California ²	34.324, -120.814	Surface	61	1.5
Disco Bay ³	64.000, -51.000	0 – 5	73	48
Long Island ⁴	46.400, -124.000	Surface	46	25
Gulf of Maine ⁵	43.020, -70.543	Surface	89	5
Kiel fjord ⁶	54.330, 10.149	Surface	47	32

¹ <https://www.cr2.cl/posar/>

² <https://www.pmel.noaa.gov/co2/story/CCE2>

³ <https://digital.csic.es/handle/10261/140497>

⁴ http://nvs.nanoos.org/Explorer?action=oiw:fixed_platform:PSI_Nahcotta:observations:H1_Oxygen

⁵ <https://www.pmel.noaa.gov/co2/story/GOMLong>

⁶ <https://doi.pangaea.de/10.1594/PANGAEA.859407>