

Supporting Information. Alfaro-Lucas, J.M., F. Pradillon, D. Zeppilli, L.N. Michel, P. Martínez-Arbizu, H. Tanaka, M. Foviaux, and J. Sarrazin. 2020. High environmental stress and productivity increase functional diversity along a deep-sea hydrothermal vent gradient. *Ecology*.

Appendix S1

Environmental variables

We characterized the environment of each site by recording temperatures for 9 months every 15 minutes using autonomous NKE ST 6000 temperature probes. We obtained 104093 temperature reads in total (~26000 reads per site) from which we estimated the mean, standard deviation, minimum, maximum and range of temperatures at each site (see Table 1 in the manuscript). We further estimated the hydrothermal fluid input (HVF) and pH at each site using the formulas provided in Sarradin et al. (2009) (Table 1). These authors showed that in the Eiffel Tower edifice, pH and temperature can be assumed to follow the relationship $\text{pH} = \exp^{(1.582 + 1.857/T)}$ (R^2 : 0.86) and that the corresponding percentage of hydrothermal fluid (HVF) input can be estimated using the formula $\text{HVF} (\%) = 0.314T - 1.38$ where T = temperature in both equations. Before statistical analyses, a Principal Component Analyses (PCA), after standardizing variables, and Person correlation coefficients (Pearson's r) were used to visualize the relationships and multicollinearity of potential explanatory environmental variables, respectively (Table S1 and Fig. S1A). Both analyses showed that environmental variables were highly correlated positively or negatively (Pearson's r ranging from 0.999 to 0.969 and from -0.996 to -0.982 for positive and negative relationships, respectively) (Table S1) and we selected the mean temperature as main explanatory variable (Figure S1A). After a significant Kruskal-Wallis rank-sum test ($P = 2.2e^{-16}$), a Dunn test with Bonferroni correction showed statistical differences in mean temperatures between all four sites suggesting that the environment at each site was different. We then decided to use the factor "site" as explanatory variable for the multivariate statistical models.

Table S1. Person correlation coefficients for environmental variables. T= temperature in °C; sd= standard deviation; HVF= hydrothermal vent fluid input.

	Mean T	Min T	Max T	T sd	T range	HVF	pH
Mean T	1	0.976	0.996	0.999	0.996	0.999	-0.986
Min T	0.976	1	0.985	0.969	0.984	0.976	-0.992
Max T	0.996	0.985	1	0.994	0.999	0.996	-0.996
T sd	0.999	0.969	0.994	1	0.994	0.999	-0.982
T range	0.996	0.984	0.999	0.994	1	0.996	-0.996
HVF	0.999	0.976	0.996	0.999	0.996	1	-0.986
pH	-0.986	-0.992	-0.996	-0.982	-0.996	-0.986	1

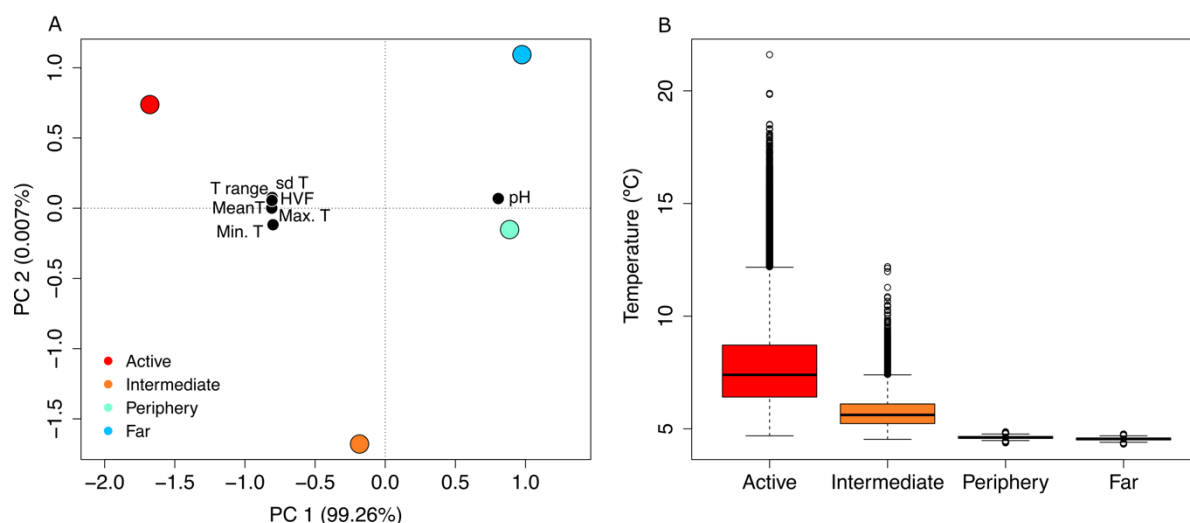


Figure S1. (A) Principal Component Analyses (PCA) of standardized environmental explanatory variables characterizing the four study sites and (B) boxplots of mean temperature at each site.

References

- Sarradin, P.M., Waeles, M., Bernagout, S., Le Gall, C., Sarrazin, J., Riso, R. (2009). Speciation of dissolved copper within an active hydrothermal edifice on the Lucky Strike vent field (MAR, 37°N). *Science of the Total Environment*, 407, 869–878.