

Supplementary Information for

Sinking particles promote vertical connectivity in the ocean microbiome

Mireia Mestre, Clara Ruiz-González, Ramiro Logares, Carlos M. Duarte, Josep M. Gasol, M. Montserrat Sala

Mireia Mestre
Email: mireia@icm.csic.es

This PDF file includes:

Figs. S1 to S7
Tables S1 to S2

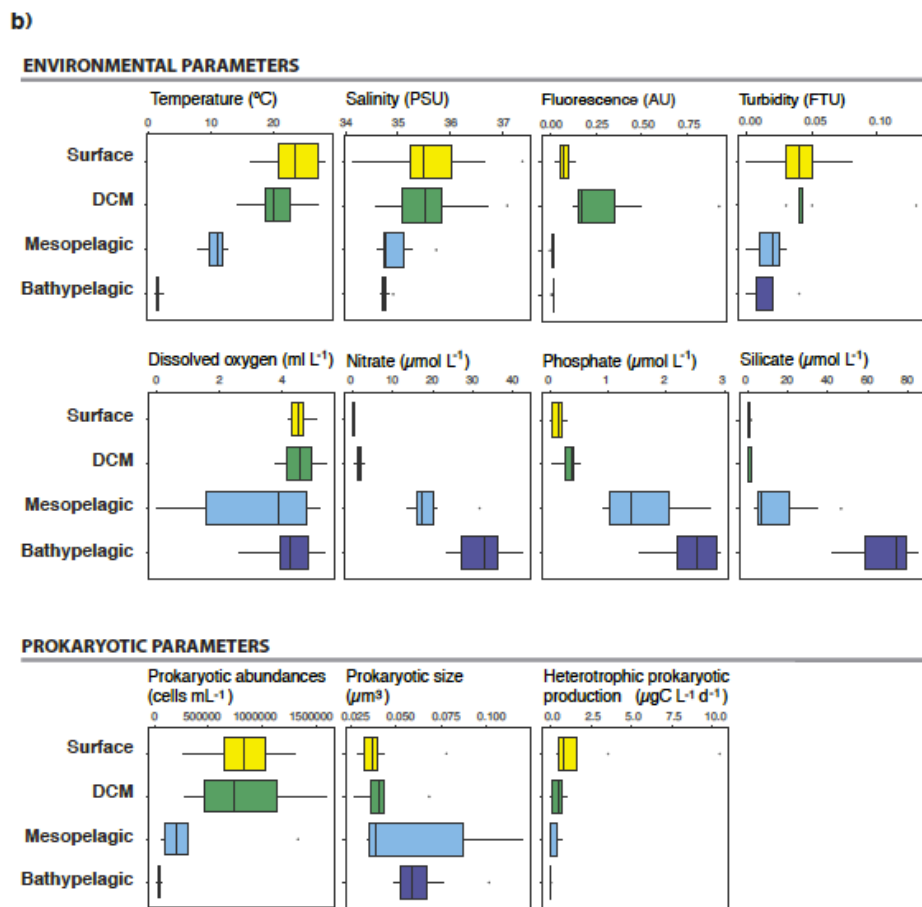
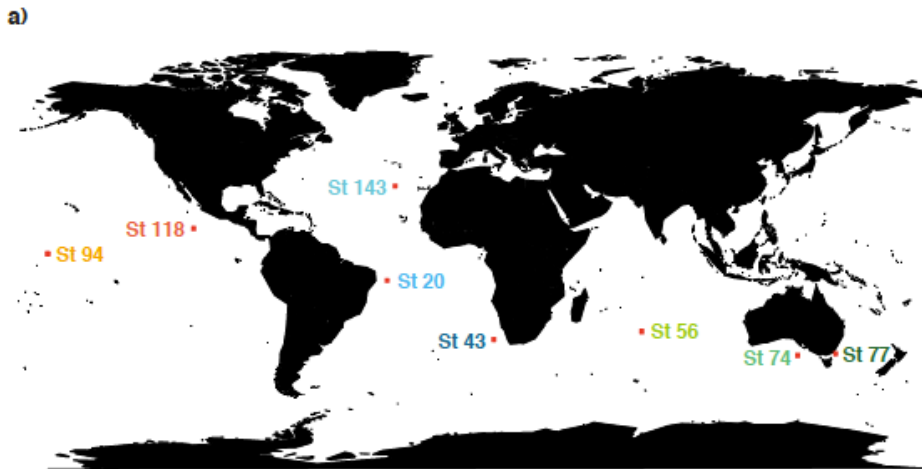


Fig. S1. Oceanographic context. **a)** World map showing the sampled Malaspina cruise stations. **b)** An overview of environmental and prokaryotic data at each depth in the 8 sampled stations. The boxplots are constructed with the first and third quartiles of the distribution of values, and the medians. The lines extending from the boxes (whiskers) indicate the variability outside the first and third quartiles.

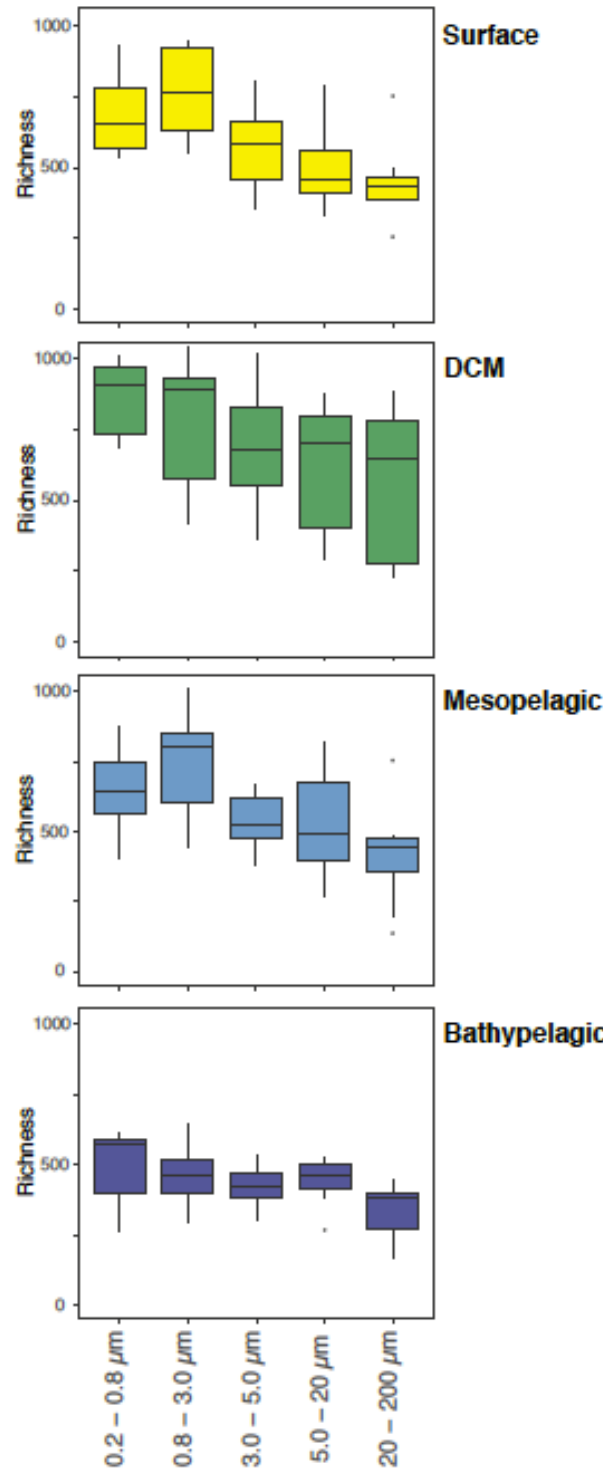


Fig. S2. OTU richness (number of OTUs) for each size-fraction and depth. Boxplots summarize the data from the 8 stations. The boxplots are constructed with the first and third quartiles of the distribution of values, and the medians. The lines extending from the boxes (whiskers) indicate the variability outside the first and third quartiles.

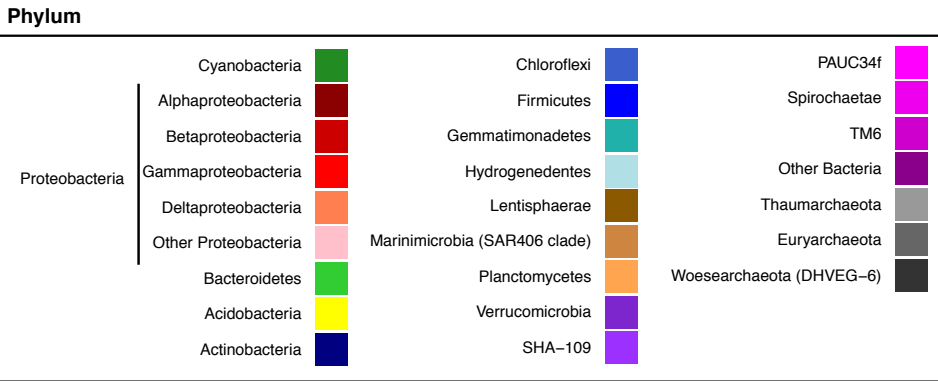
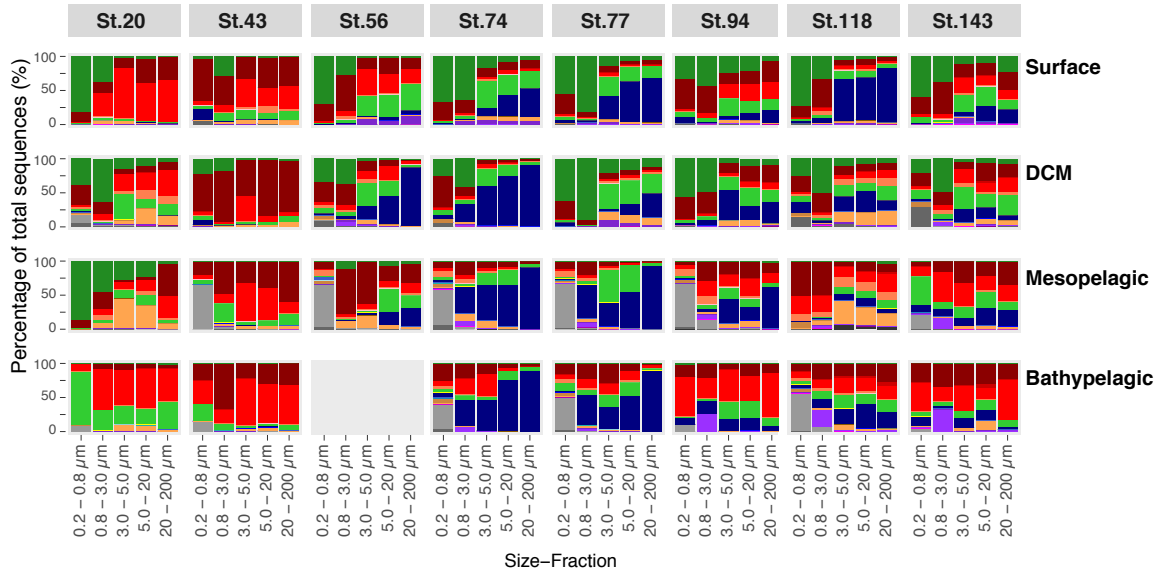


Fig. S3. Taxonomic composition, at the phylum level, for each station, depth and size fraction. Phylum Proteobacteria is separated into the five different main classes. Values represent the percentage over the total sequences.

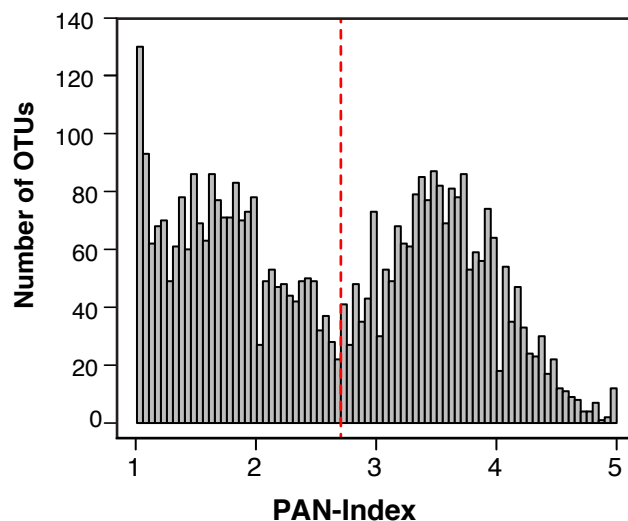


Fig. S4. Histogram of the distribution of the Particle Association Niche values (PAN Index) for all the OTUs observed with more than 10 reads (N=4105 OTUs). The PAN-Index takes values from 1 to 5, relative to the 5 size-fractions. OTUs were assigned values from 1 to 5 depending on the size fraction where they were enriched (see Materials and Methods for details). The red line indicates the value we took as the middle point, PAN-Index=2.7, which we used to distinguish two main groups of OTUs: those mainly enriched in small size-fractions (PAN-Index<2.7), and those mainly enriched in large size-fractions (PAN-Index≥2.7).

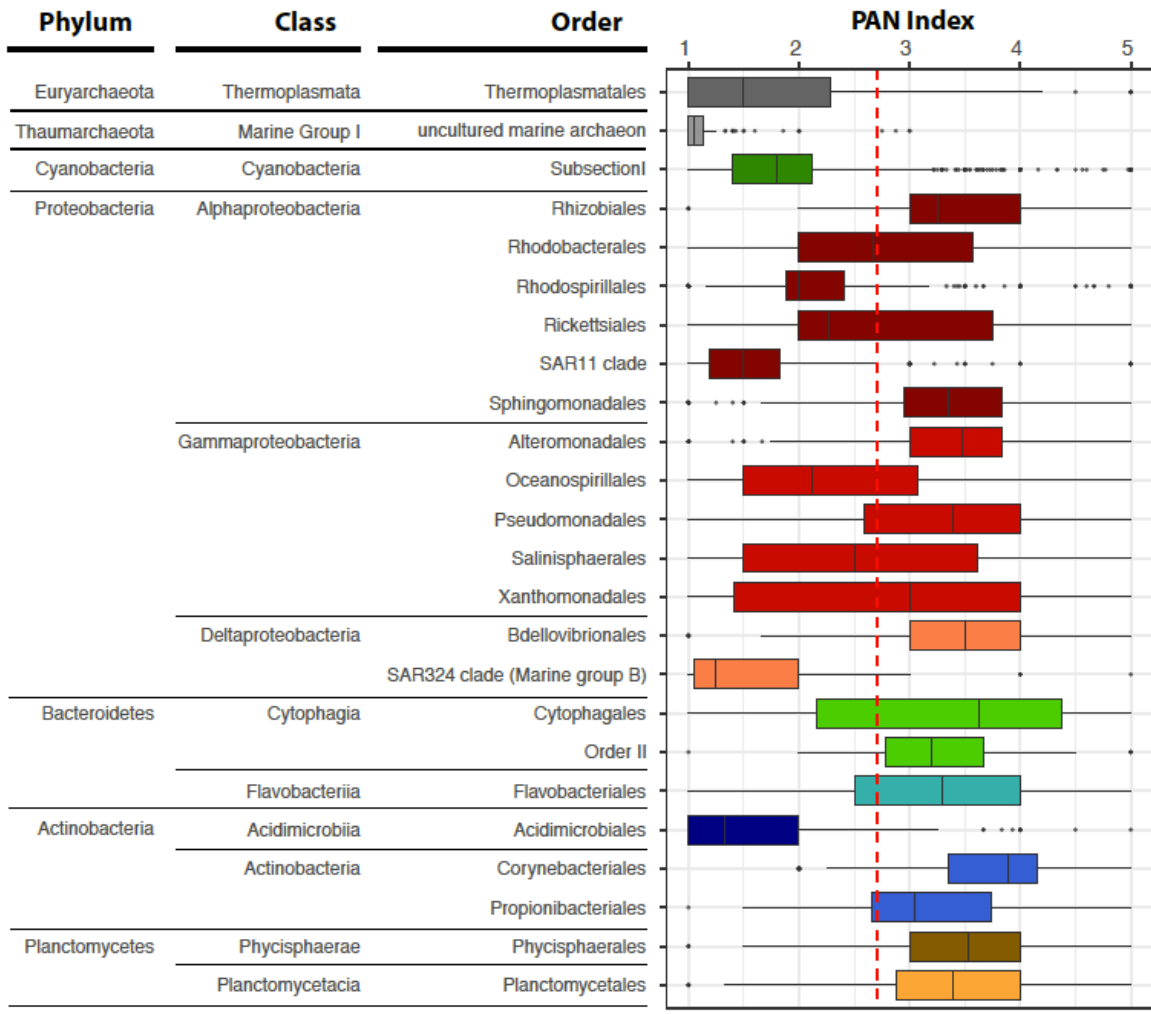


Fig. S5. Particle-association niche index (PAN-Index) values of the 24 most abundant prokaryotic Orders. The red dashed line corresponds to a PAN-Index of 2.7, and separates the groups that are more prevalent in large size-fractions (PAN-Index \geq 2.7) from those that are enriched in the small size fractions (PAN-Index $<$ 2.7), see Fig. S4. Colors indicate the different taxonomic Classes.



Fig. S6. Contribution, in percentage of OTUs and percentage of sequences, of those OTUs categorized as ‘SFC’ (surface, yellow), ‘DCM’ (DCM, green), ‘MESO’ (mesopelagic, blue) and ‘BATHY’ (bathypelagic, dark blue) in each depth and size-fraction and for each station separately. The category of each OTU was defined as the depth where it was first detected, assuming a directionality from surface to bathypelagic waters (see Results for details), and was estimated for each station separately.

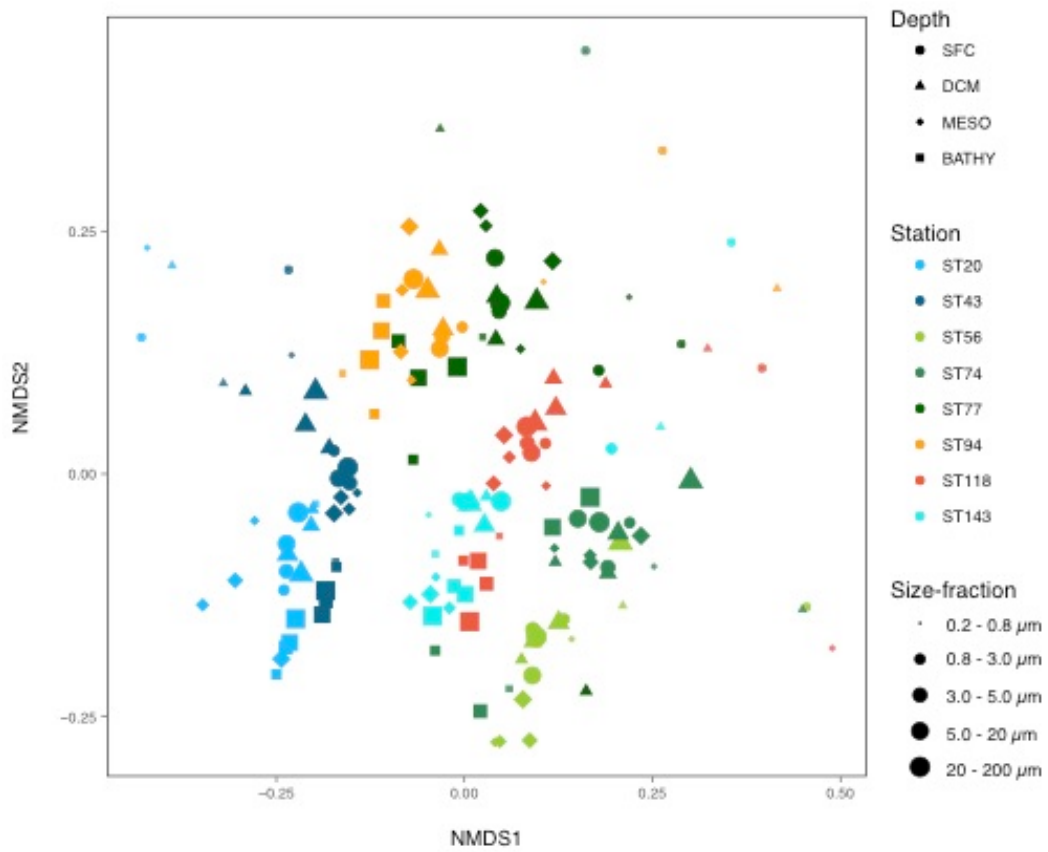


Fig. S7. nMDS ordinations representing the Bray-Curtis distance between prokaryotic communities considering only the OTUs identified as ‘Seeds’ at each station.

Table S1. Permutational multivariate analysis of variance (PERMANOVA) examining the effects of the factors station, depth and size-fraction on prokaryotic community structure. Key to abbreviations and column headings: D.f, degrees of freedom; SS, sum of squares; MS, mean square; F, F ratio; R², coefficient of determination; P, p-value. Significance was stated as follows: ‘***’ p<0.001; ‘**’ p<0.01; ‘*’ p<0.05.

	D.f.	SS	MS	F	R²	p-value
Size-fraction	4	5.37	1.34	5.26	0.08	***
Station	7	14.73	2.1	8.24	0.24	***
Depth	3	5.5	1.83	7.18	0.08	***
Residuals	140	35.71	0.25	0.58		
Total	154	61.32	1			

Table S2. Summary of the coefficient of determination (R^2) from the Permutational multivariate analysis of variance (PERMANOVA) examining the effects of the factors station and depth for each of the five size-fractions. Significance was stated as follows: ‘***’ $p < 0.001$; ‘**’ $p < 0.01$; ‘*’ $p < 0.05$.

	by Station		by Depth	
	R^2	p-value	R^2	p-value
0.2-0.8 μm	0.21	0.753	0.37	***
0.8-3.0 μm	0.36	***	0.24	***
3.0-5.0 μm	0.47	***	0.11	0.144
5.0-20 μm	0.54	***	0.09	0.602
20-200 μm	0.54	***	0.09	0.597