

Supplementary Material

Seasonality of amino acid enantiomers and microbial community at MOLA time series in the NW Mediterranean

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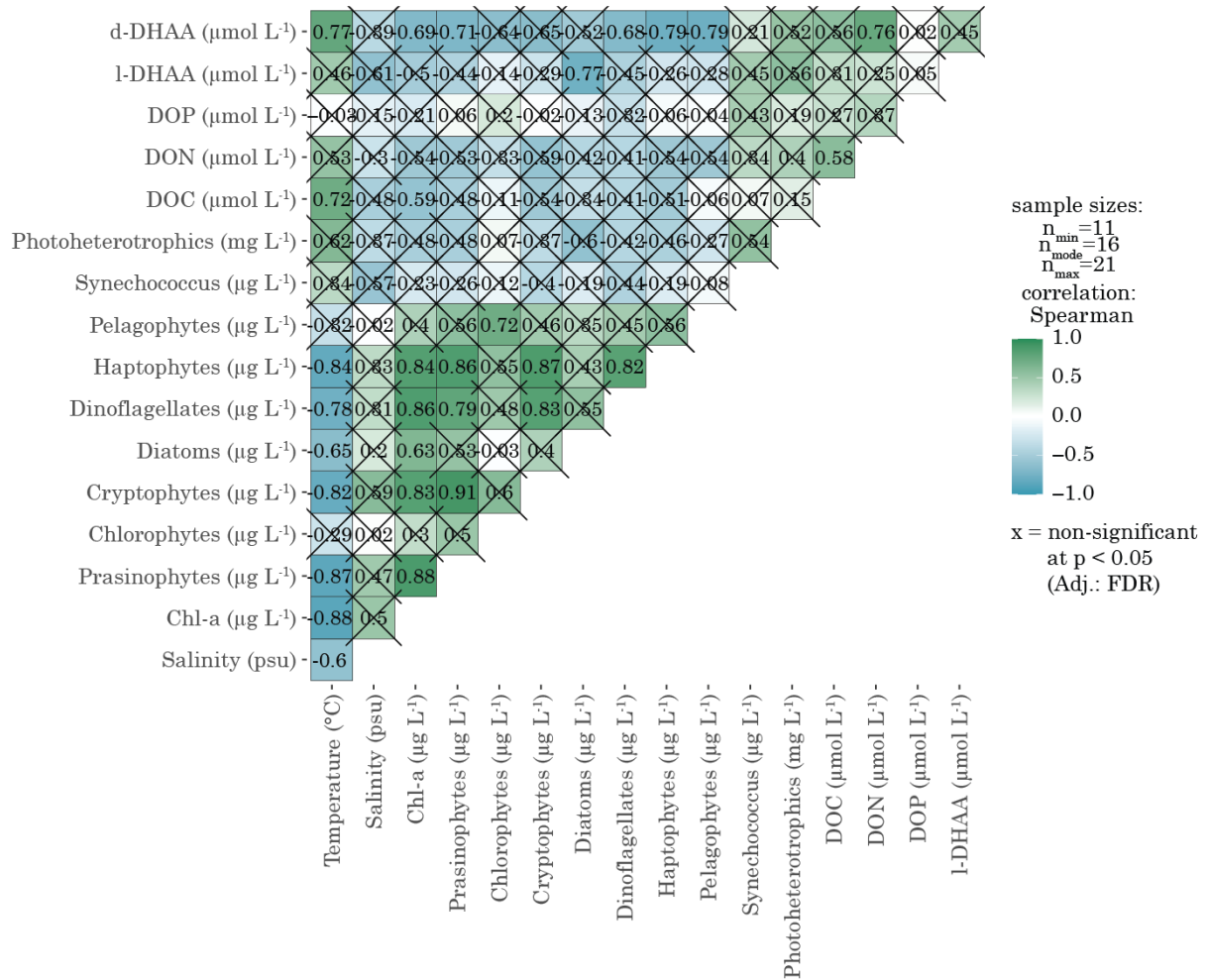
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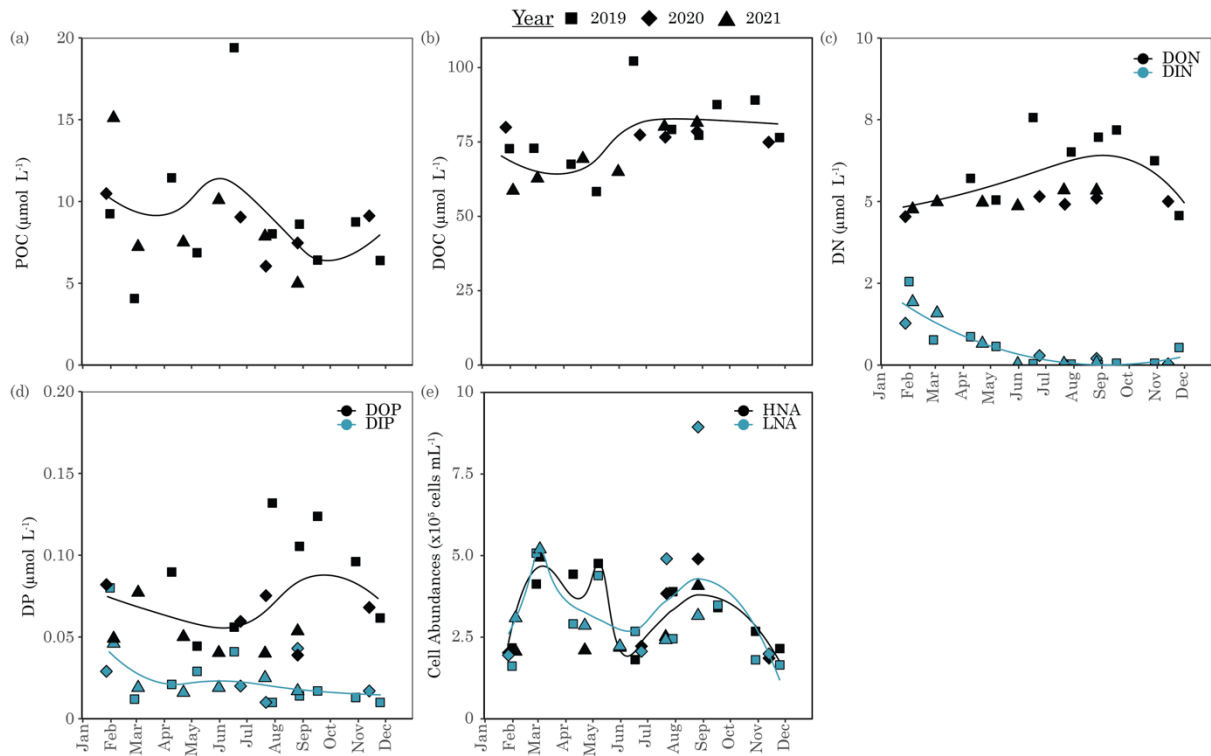
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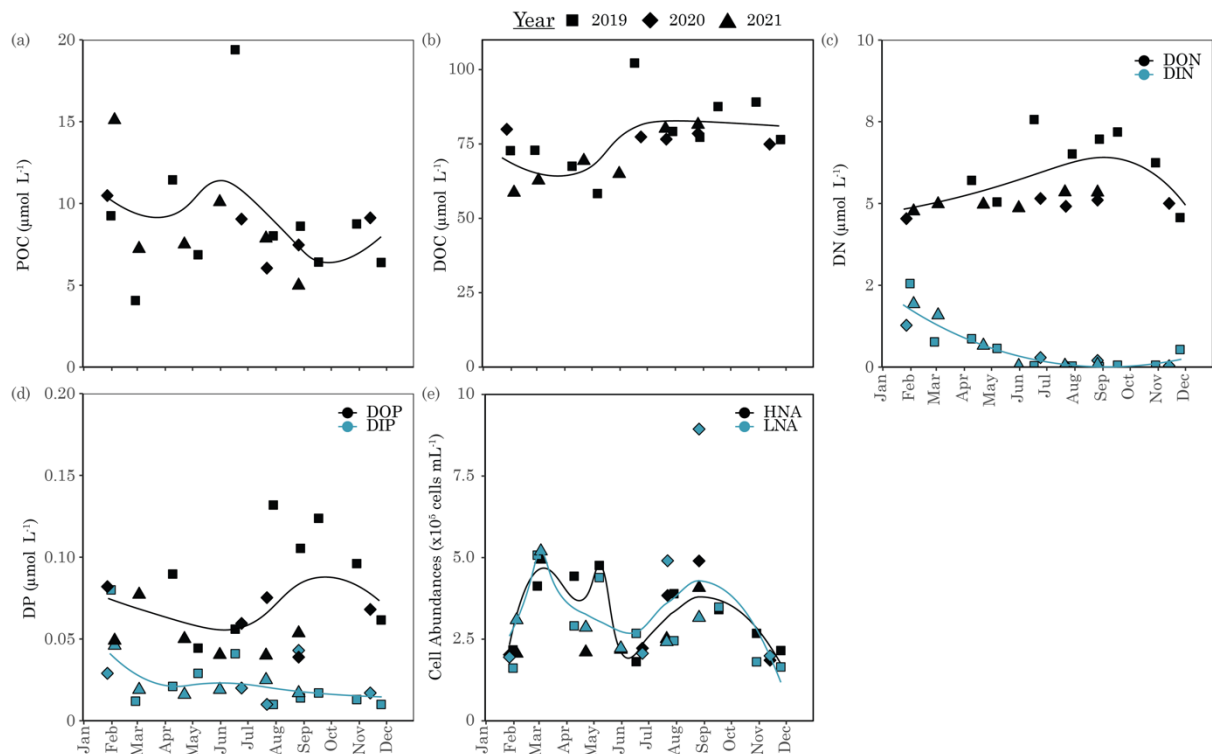
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Supplementary Figure 1. Correlation matrix of environmental parameters at 5-meters depth of the Microbial Observatory Laboratory Arago between 2019 and 2021. Spearman correlation p-values have been adjusted for false discovery rate (FDR).

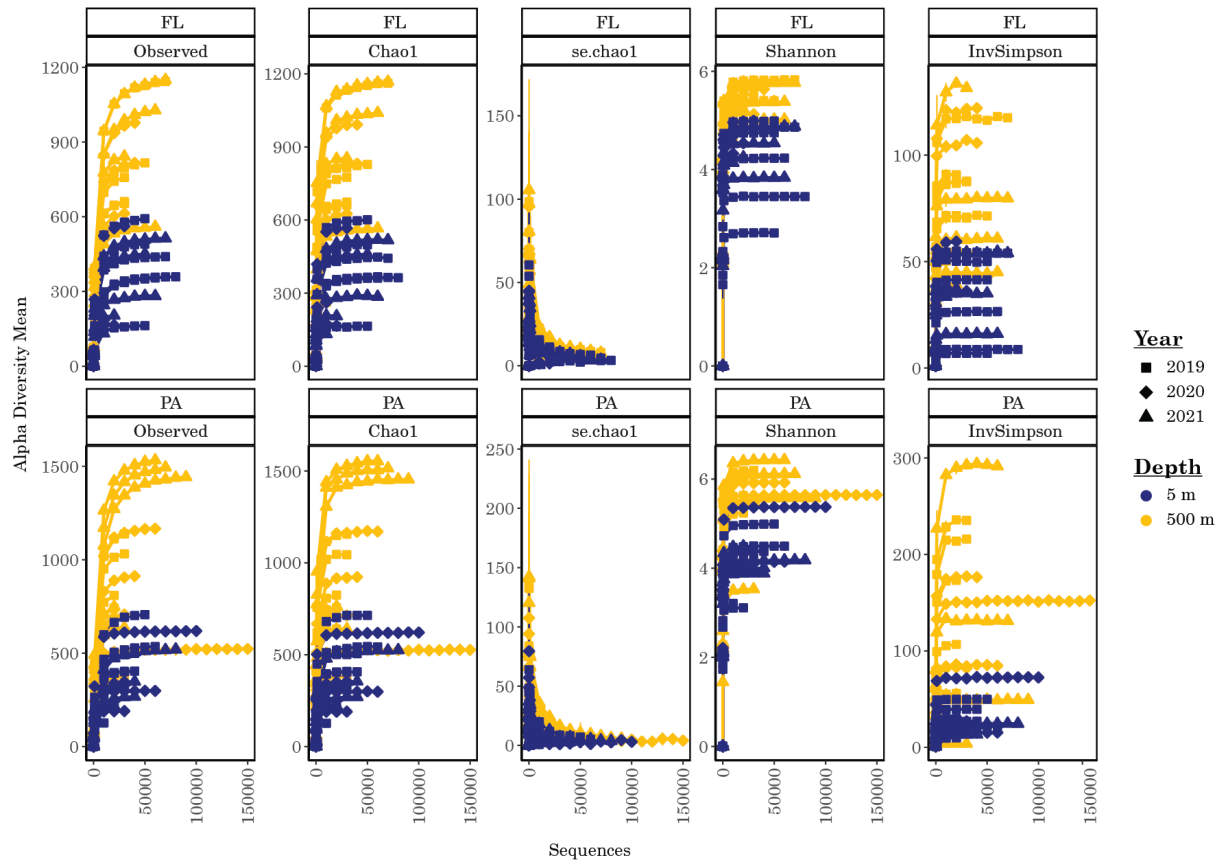


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 33 **Supplementary Figure 2. Seasonal dynamics of organic and inorganic**
 34 **nutrients at 5-meters depth of the Microbial Observatory Laboratory**
 35 **Arago between 2019 and 2021.** The (a) particulate organic carbon (POC), (b)
 36 dissolved organic carbon (DOC), (c) dissolved organic nitrogen (DON) and
 37 dissolved inorganic nitrogen (DIN), (d) dissolved organic phosphorus (DOP) and
 38 dissolved inorganic phosphorus (DIP), (e) cell abundances of high- and low nucleic
 39 acid bacteria.

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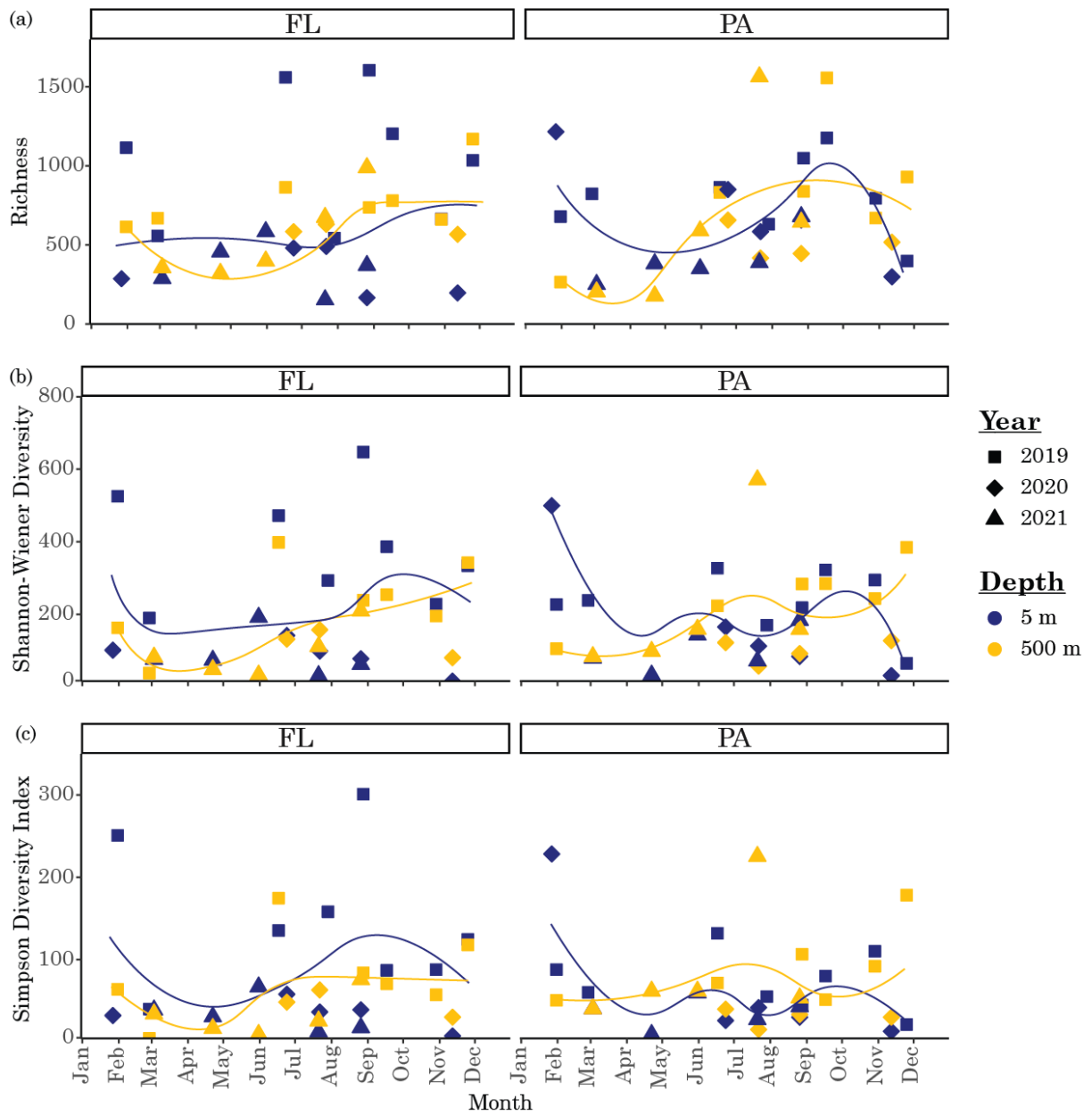


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 43 **Supplementary Figure 3. Seasonal dynamics at 500-meters depth of the**
 44 **Microbial Observatory Laboratory Arago between 2019 and 2021.** The (a)
 45 particulate organic carbon (POC), (b) dissolved organic carbon (DOC), (c) dissolved
 46 organic nitrogen (DON) and dissolved inorganic nitrogen (DIN), (d) dissolved
 47 organic phosphorus (DOP) and dissolved inorganic phosphorus (DIP), (e) l- and
 48 enantiomers of dissolved hydrolyzable amino acids (DHAA), (f) cell abundances of
 49 high- and low nucleic acid bacteria.



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Supplementary Figure 4. Rarefaction curves at the Microbial Observatory Laboratory Arago between 2019 and 2021.

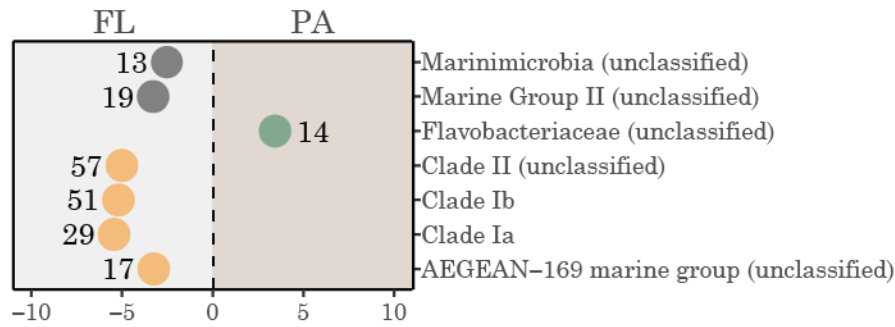


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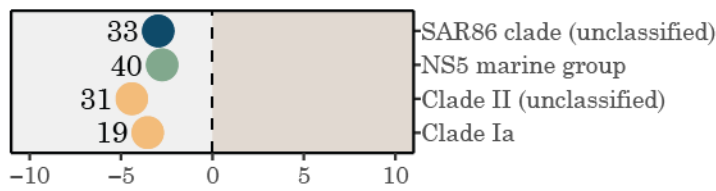
55 **Supplementary Figure 5. Alpha diversity indices at the Microbial**
 56 **Observatory Laboratory Arago between 2019 and 2021.** Alpha-diversity
 57 measures of (a) richness, (b) Shannon-Wiener, and (c) Simpson diversity at 5-
 58 meter (blue) and 500-meter depth (yellow) by year (shape).

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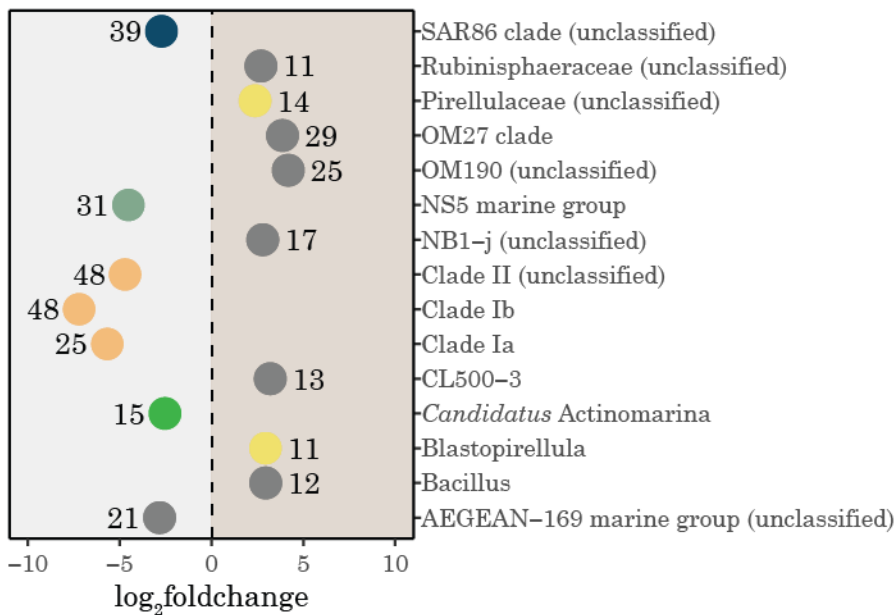
Spring



Summer



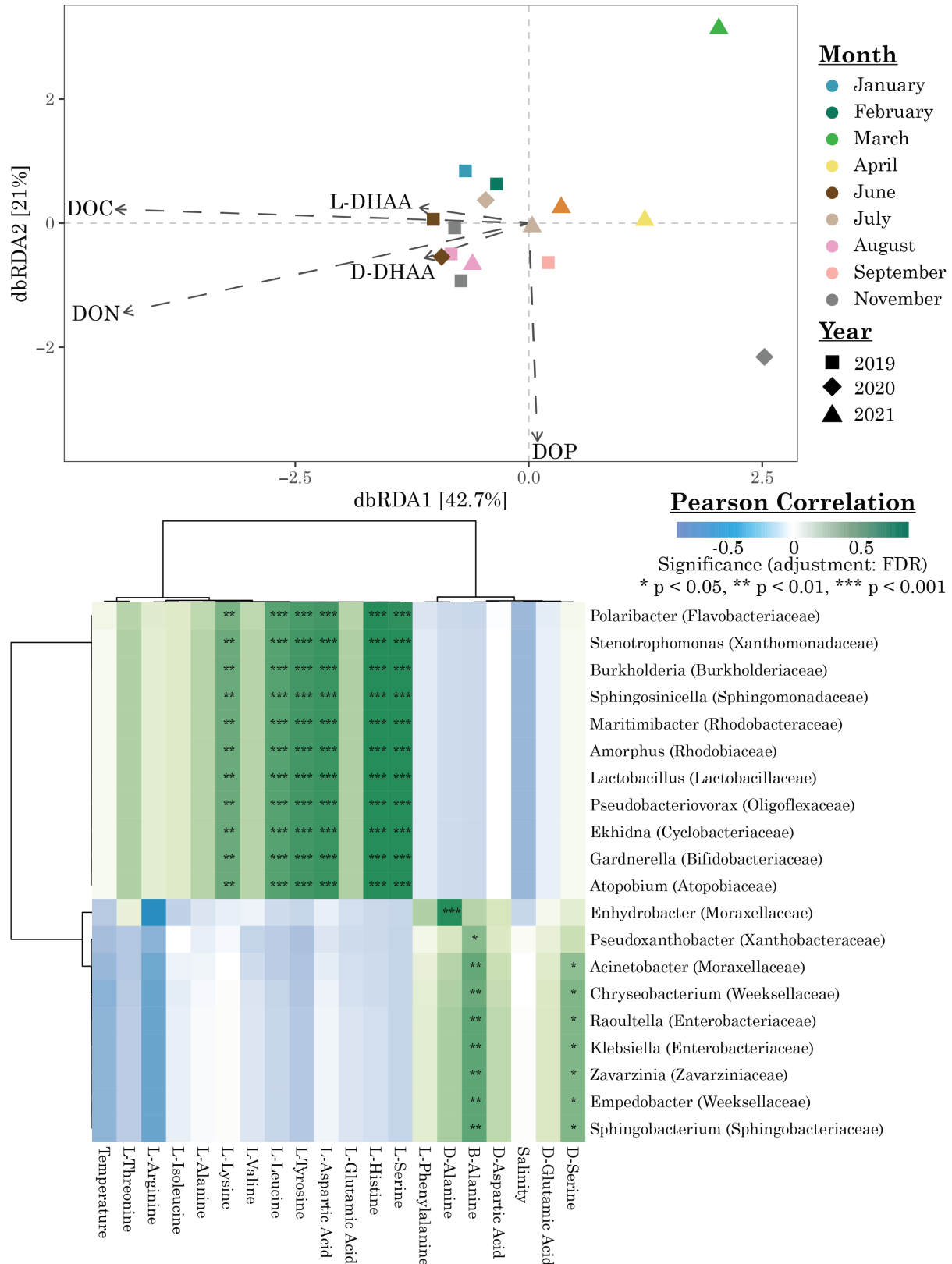
Winter



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61 **Supplementary Figure 6. Seasonal enrichment between the free-living**
 62 **and particle-attached community at 5-m of the Microbial Observatory**
 63 **Laboratory Arago between 2019 and 2021.**

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Supplementary Figure 7. Links between DOM and the bacterioplankton community at 500-meter of the Microbial Observatory Laboratory Arago. The correlations between environmental parameters and the bacterioplankton community at genus level.

72 **Supplementary Table 1. The sampling dates and parameters at the**
73 **Microbial Observatory Laboratory Arago between 2019 and 2021.**
74 Abbreviations: chl-a, chlorophyll-a; cells, heterotrophic cell abundances; DOM,
75 dissolved organic carbon, nitrogen, and phosphorus; DOC, dissolved organic
76 carbon; DHAA, dissolved hydrolyzable amino acids.

Sampling Date (dd.mm.yyyy)	Subsurface Parameters (5 m)	Mesopelagic Parameters (500 m)
31.01.2019	nutrients, chl-a, pigments, cells, DOC	nutrients, chl-a, cells, DOC
27.02.2019	nutrients, chl-a, cells, DOC	nutrients, chl-a, cells, DOC
09.04.2019	nutrients, chl-a, cells, DOM, DHAA	nutrients, chl-a, cells, DOC, DHAA
07.05.2019	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, cells, DOC, DHAA
17.06.2019	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, cells, DOC, DHAA
29.07.2019	nutrients, chl-a, pigments, cells, DOM, DHAA	NA
28.08.2019	nutrients, chl-a, pigments, DOM, DHAA	nutrients, chl-a, cells, DOC, DHAA
17.09.2019	nutrients, chl-a, cells, DOM,	nutrients, chl-a, cells, DOC, DHAA
29.10.2019	nutrients, chl-a, pigments, cells, DOM	nutrients, chl-a, cells, DOC, DHAA
25.11.2019	nutrients, chl-a, pigments, cells, DOM	nutrients, chl-a, DOC, dHAA
27.01.2020	nutrients, chl-a, pigments, cells, DOM, DHAA	NA
23.06.2020	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
21.07.2020	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
25.08.2020	nutrients, chl-a, pigments, cells, DOM, DHAA	NA
12.11.2020	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
04.02.2021	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
03.03.2021	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
22.04.2021	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
31.05.2021	nutrients, chl-a, cells, DOM	nutrients, chl-a, DOC, DHAA
23.07.2021	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA
26.08.2021	nutrients, chl-a, pigments, cells, DOM, DHAA	nutrients, chl-a, DOC, DHAA

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79 **Supplementary Table 2. The pigment-to-chlorophyll ratios used in this study.** The root mean square error (RMSE)
 80 was 0.013 and, in case of re-calculation, this matrix would serve as the Fmat in the r-package phytoclass.
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Groups	Allo- xanthin	19- Butanoyloxy- fucoxanthin	Fuco- xanthin	19- Hexanoyloxy- fucoxanthin	Lutein	Neo- xanthin	Peridinin	Prasino- xanthin	Viola- xanthin	Zea- xanthin	Chlorophyll -b	Total Chlorophyll -a
Chlorophytes	0	0	0	0	0.1073 3807	0.0145	0	0	0.2551	0.0083	0.1741	1
Cryptophytes	0.4506	0	0	0	0	0	0	0	0	0	0	1
Diatoms	0	0	0.3371	0	0	0	0	0	0	0	0	1
Dinoflagellates	0	0	0	0	0	0	0.3422	0	0	0	0	1
Haptophytes	0	0.08203213	0.0758	0.5088878	0	0	0	0	0	0	0	1
Pelagophytes	0	0.7179	0.8333	0	0	0	0	0	0	0	0	1
Prasinophytes	0	0	0	0	0.0250 9094	0.0269 0745	0	0.112	0.0094	0.0164	0.4995522	1
<i>Synechococcus</i>	0	0	0	0	0	0	0	0	0	0.5866	0	1

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85 **Supplementary Table 3. Results of statistical analyses conducted for the**
 86 **dataset of the Microbial Observatory Laboratory Arago between 2019 to**
 87 **2021.** Abbreviations: DoF, degrees of Freedom; JD, Julian Day of the year;
 88 PERMANOVA, Permutational Analysis of Variance.
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PERMANOVA	Variables	DoF	Sum of Squares	F-Value	p-value
5-m FL ~ JD	JD	1	13680	2.604	0.01
	Residual	14	73548		
	Total	15	87228		
5-m PA ~ JD	JD	1	13659	2.0744	0.012
	Residual	16	105353		
	Total	17	119012		
500-m FL ~ JD	JD	1	11571	1.6123	0.057
	Residual	13	93295		
	Total	14	104866		
500-m PA ~ JD	JD	1	10065	0.931	0.619
	Residual	13	140541		
	Total	14	150606		

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 91 **Supplementary Table 4. Links between DOM and the free-living (FL)**
 92 **bacterioplankton community at 5-meters of the Microbial Observatory**
 93 **Laboratory Arago between 2019 to 2021.** Significant environmental
 94 parameters of the redundancy analysis (RDA, see Fig 4) were tested for using the
 95 r-package vegan (function envfit).
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	RDA1	RDA2	r ²	p-value
Temperature	-0.40032	-0.91638	0.8658	0.001
Salinity	0.93554	-0.35321	0.7618	0.009
Chlorophyll-a	0.47654	0.87915	0.5478	0.059
Prasinophytes	0.68257	0.73082	0.4666	0.091
Chlorophytes	0.63021	0.77643	0.4153	0.122
Cryptophytes	0.67506	0.73777	0.2883	0.230
Diatoms	0.22346	0.97471	0.3315	0.255
Dinoflagellates	0.15713	0.98758	0.6744	0.027
Haptophytes	0.32340	0.94626	0.4955	0.085
Pelagophytes	0.41749	0.90868	0.6354	0.021
Synechococcus	-0.98146	0.19168	0.0500	0.847
Photoheterotrophs	-0.42947	-0.90308	0.5403	0.074
DOC	-0.77723	0.62922	0.3829	0.177
DON	-0.96448	0.26417	0.5630	0.045
DOP	-0.72988	-0.68358	0.0423	0.853
LAsx	-0.69987	0.71427	0.5643	0.084
LGlx	-0.48933	0.87210	0.5897	0.057
LSerine	-0.54610	0.83772	0.5586	0.091

LThreonine	-0.83067	0.55677	0.5576	0.078
LArginine	-0.86322	0.50483	0.0576	0.813
LHistidine	-0.43278	0.90150	0.5155	0.082
LAlanine	-0.69237	0.72154	0.5319	0.103
LTyrosine	-0.95013	0.31186	0.5575	0.060
LValine	-0.67015	0.74223	0.5984	0.062
LPhenylalanine	-0.54307	0.83968	0.5657	0.077
LIsoleucine	-0.20202	-0.97938	0.1210	0.645
LLeucine	-0.56464	0.82534	0.4704	0.106
LLysine	-0.45785	0.88903	0.2520	0.356
BAlanine	-0.76144	-0.64823	0.4103	0.165
GABA	-0.16152	-0.98687	0.1876	0.469
Glycine	-0.99971	0.02425	0.2305	0.423
DAsx	-0.51187	-0.85906	0.6513	0.025
DGlx	-0.33879	-0.94086	0.4353	0.132
DSerine	-0.31874	-0.94784	0.1401	0.600
DAlanine	-0.55340	-0.83292	0.4671	0.085
DValine	0.05554	-0.99846	0.1061	0.699
DLeucine	-0.56033	-0.82827	0.2621	0.368
