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Supplement of

Spatial patterns of ectoenzymatic kinetics in relation to biogeochemical properties in the Mediterranean Sea and the concentration of the fluorogenic substrate used

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Figure S1. a) Distribution of total aminoacids (TAAs, bars, lef scale) and TAA-N/DON ratio (dots, right scale). b) Distribution of total combined carbohydrates (TCHOs, bars, left scale) and TCHO-C/DOC ratio (dots, right scale). At each station four data are presented, corresponding to, from left to right, SURF, DCM, LIW and MDW layers, respectively. At stations ST10, ST1 and ST2, DON data at MDW and LIW layers were not available.

Figure S2. a, b, c: Non linear least squares regression fits of Michaelis-Menten kinetics plotted for incremental range of substrate concentrations from 0.25 corresponding to a 0.025-0.25 µM substrate concentration set to 50 corresponding to a 0.025-50 µM substrate concentration set for a) LAP, b) βGLU and c) AP). Dots correspond to the field measurements. The data set is the same as in Figure 3: (DCM atstation FAST) . d, e f: Corresponding distribution of the Vm and Km parameters plotted according to the maximum concentration added.

Figure S3. Distribution of heterotrophic prokaryotic production (BP, a) and bacterial abundance (BA, b). At each station four data are presented, corresponding to, from left to right, SURF, DCM, LIW and MDW layers, respectively. BP data are not available for LIW layer at stations ST2 and ST4, and MDW layer at station FAST, ST2, ST4, ST6.

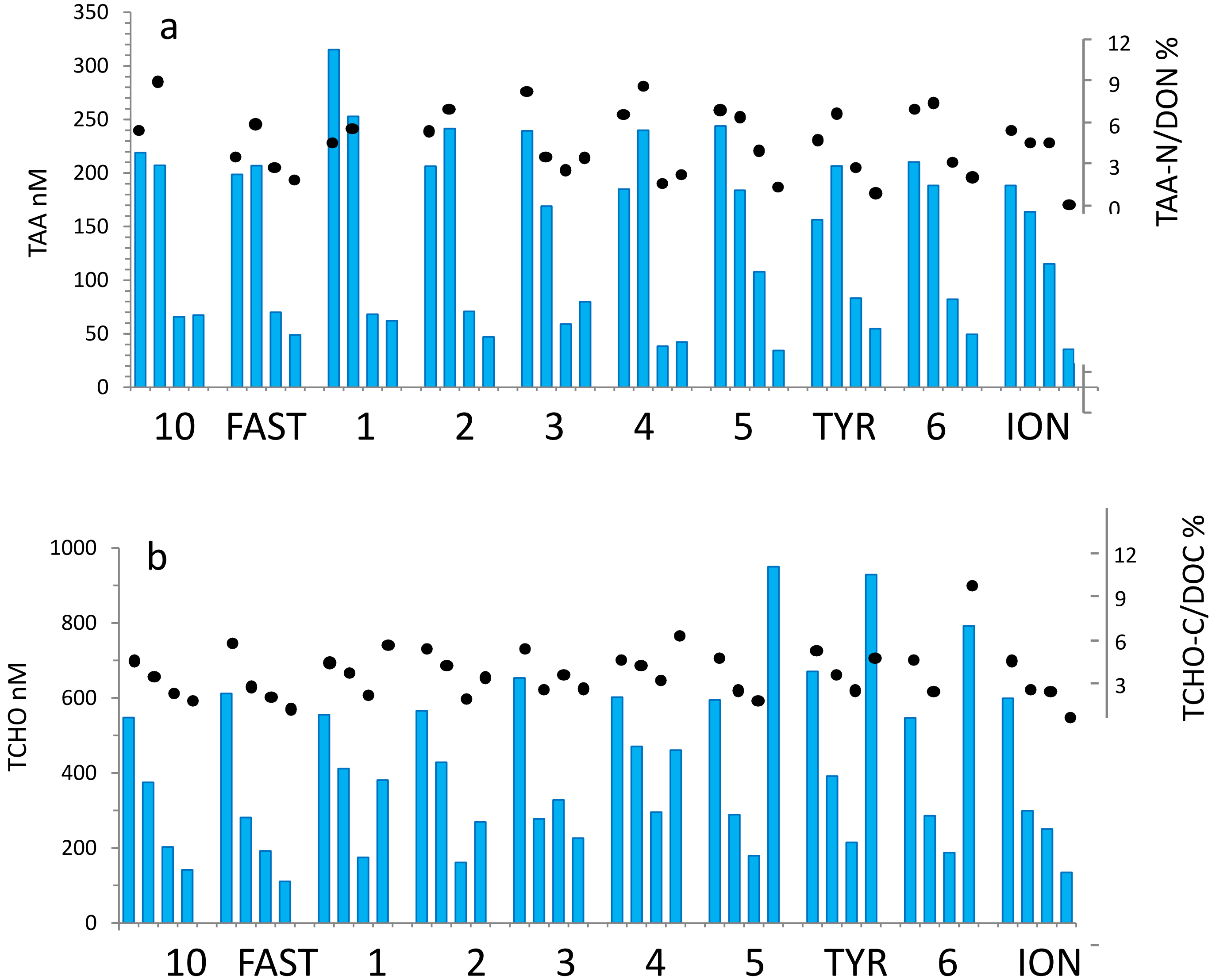
Figure S4. Distribution of ectoenzyme activity ratios AP/LAP (a) and LAP/βGLU (b). Ratios calculated using Vm data from the global model (Vm_{all}) or the model 1 (Vm_1).

Table S1. Average standard deviations and ranges of biogeochemical parameters, nitrate (NO3), nitrite (NO2), dissolved inorganic phosphate (DIP), total chlorophyll a (TChl-a), dissolved organic carbon (DOC), dissolved organic nitrogen (DON), dissolved organic phosphorus (DOP), total combined amino acids (TAAs), total combined carbohydrates (TCHOs), at the four layers sampled.*LWCC technique, ** classical method. < ld: Below detection limit, nd: Not sampled.

		SURF	DCM	LIW	MDW
NO3	mean ± sd	0.013 ± 0.018	0.88 ± 0.59	7.38 ± 2.57	8.29 ± 1.30
µM	range	<ld – 0.056	0.27 – 1.75	2.5 – 9.7	4.94 – 9.15
NO2	mean ± sd	<ld	106 ± 76	10 ± 4	<ld
nM	range	<ld	<ld – 216	<ld - 15	<ld
DIP	mean ± sd	10 ± 4*	35 ± 30*	0.29 ± 0.13**	0.36 ± 0.07**
nM*, µM**	range	4 – 17	9 – 107	0.05 – 0.43	0.17 – 0.41
TChl-a	mean ± sd	0.08 ± 0.04	0.54 ± 0.15	nd	nd
µg l^{-1}	range	0.06 – 0.19	0.31 – 0.82		
DOC	mean ± sd	71 ± 4	62 ± 3	51 ± 4	45± 3
µM	range	60 –75	58 – 66	45 – 58	39 – 49
DON	mean ± sd	5.7 ± 1.8	5.1 ± 1.2	3.6 ± 0.3	3.2 ± 0.4
µM	range	4.4 – 10.4	3.5 – 7.4	3.1 – 4.0	2.5 – 3.4
DOP	mean ± sd	0.05 ± 0.03	0.05 ± 0.04	0.04 ± 0.01	0.04 ± 0.01
µM	range	0.01 – 0.09	<ld – 0.12	0.02 – 0.05	0.03 – 0.05
TAAs	mean ± sd	216 ± 43	206 ± 31	76 ± 23	52 ± 14
nM	range	156 – 315	164 – 253	38 – 115	35 – 80
TCHOs	mean ± sd	595 ± 43	351 ± 73	219 ± 55	427 ± 315
nM	range	547 – 671	278 – 471	162 – 328	111 – 950

Table S2. Summary of statistics in the 3 series of Michaelis-Menten non linear regression fits. (Model 1: range of substrate concentrations 0.025 – 1 µM, Model 50: range of concentrations 2.5 – 50 µM), global model (the entire range of concentration 0.025 – 50 µM) for the 3 ectoenzymes (leucine aminopeptidase: LAP, beta glucosidase: βGLU, and alkaline phosphatase: AP). n: Number of significant fits, SE%: percentage of standard error estimated as ratio of standard error to fitted values for Km and Vm data. Biphasic cases: number of significant biphasic systems based on the Fisher test at $p < 0.1$ (see methods) compared to the number of samples where applying this test was possible (i.e. when the 3 fits where significant for the same sample). Biphasic indicator: $(Vm_1/Km_1) / (Vm_{50}/Km_{50})$ ratio.

	variable	SURF	DCM	LIW	MDW	All data
LAP Model 1	n	10	10	10	10	40
	SE% Vm_1	23%	14%	19%	16%	
	SE% Km_1	47%	33%	54%	53%	
LAP Model 50	n	10	10	10	10	40
	SE% Vm_{50}	16%	10%	16%	17%	
	SE% Km_{50}	50%	38%	44%	40%	
LAP gobal model	n	10	10	10	10	40
	SE% Vm_{all}	10%	7%	11%	12%	
	SE% Km_{all}	33%	24%	31%	26%	
LAP biphasic cases		6/10	5/10	2/10	4/10	17/40
LAP range of biphasic indicator		4-12	3-31	8-25	11-19	
βGLU Model 1	n	10	10	0	0	20
	SE% Vm_1	12%	12%			
	SE% Km_1	29%	22%			
βGLU Model 50	n	10	10	0	0	20
	SE% Vm_{50}	10%	8%			
	SE% Km_{50}	64%	48%			
βGLU gobal model	n	10	10	0	0	20
	SE% Vm_{all}	11%	9%			
	SE% Km_{all}	30%	29%			
βGLU biphasic cases		9/10	9/10			18/20
βGLU range of biphasic indicator		10-173	6-160			
AP Model 1	n	10	10	10	9	39
	SE% Vm_1	6%	7%	14%	15%	
	SE% Km_1	20%	19%	32%	34%	
AP Model 50	n	6	9	5	5	25
	SE% Vm_{50}	9%	6%	12%	17%	
	SE% Km_{50}	43%	44%	45%	54%	
AP gobal model	n	10	10	10	9	39
	SE% Vm_{all}	6%	6%	8%	11%	
	SE% Km_{all}	29%	26%	27%	36%	
AP biphasic cases		6/6	6/9	4/5	2/4	18/24
AP range of biphasic indicator		5-16	2-11	0.5-9	3-13	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TAA nM
350
300
250
200
150
100
50
0
TAA-N/DON %
12
9
6
3
0
10
FAST
1
2
3
4
5
TYR
6
ION
b
TCHO nM
1000
800
600
400
200
0
TCHO-C/DOC %
12
9
6
3
10
FAST
1
2
3
4
5
TYR
6
ION

Fig S1

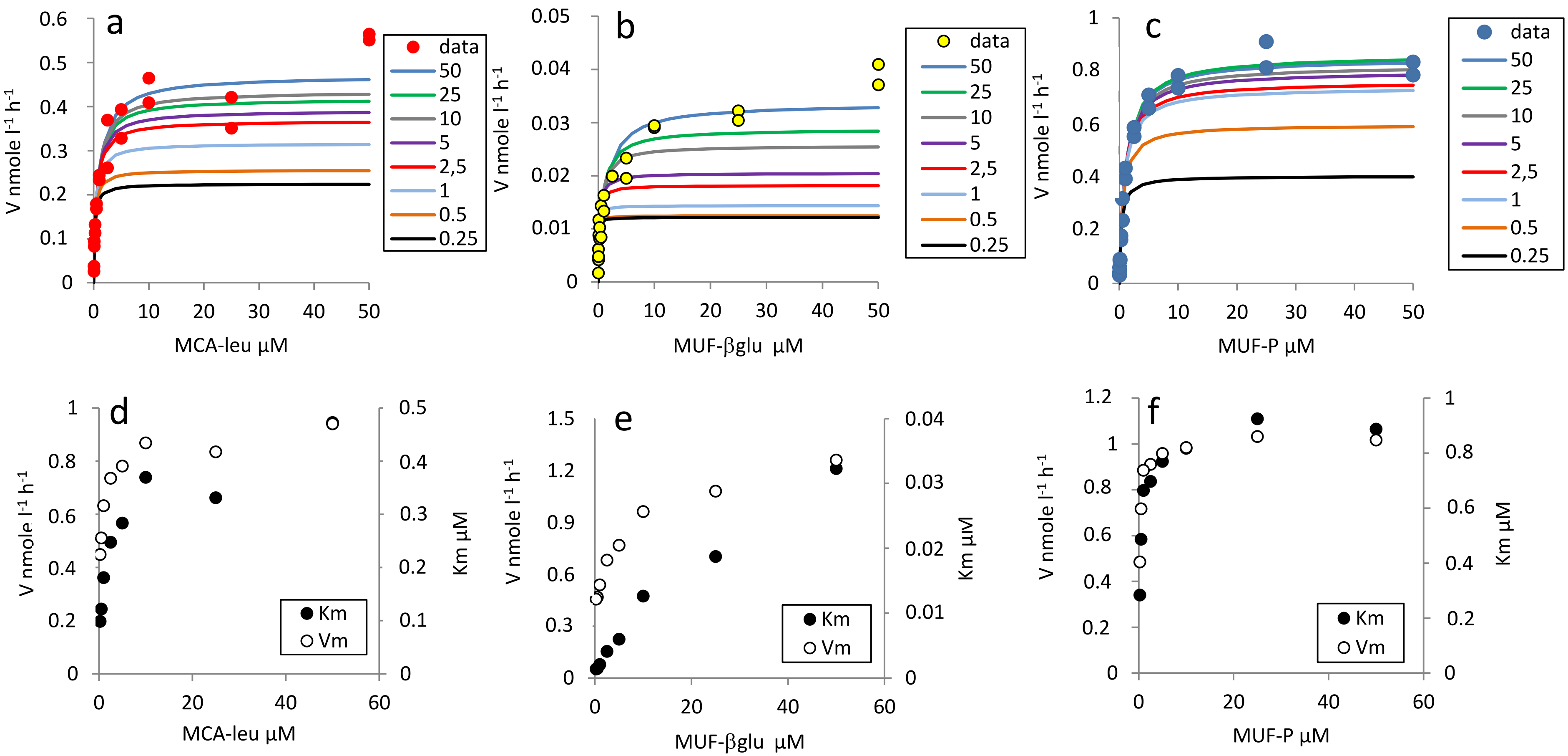

a
b
c
d
e
f
data
50
25
10
5
2,5
1
0.5
0.25
Km
Vm
V nmole l-1 h-1
Km µM
MCA-leu µM
MUF-βglu µM
MUF-P µM

Fig S2

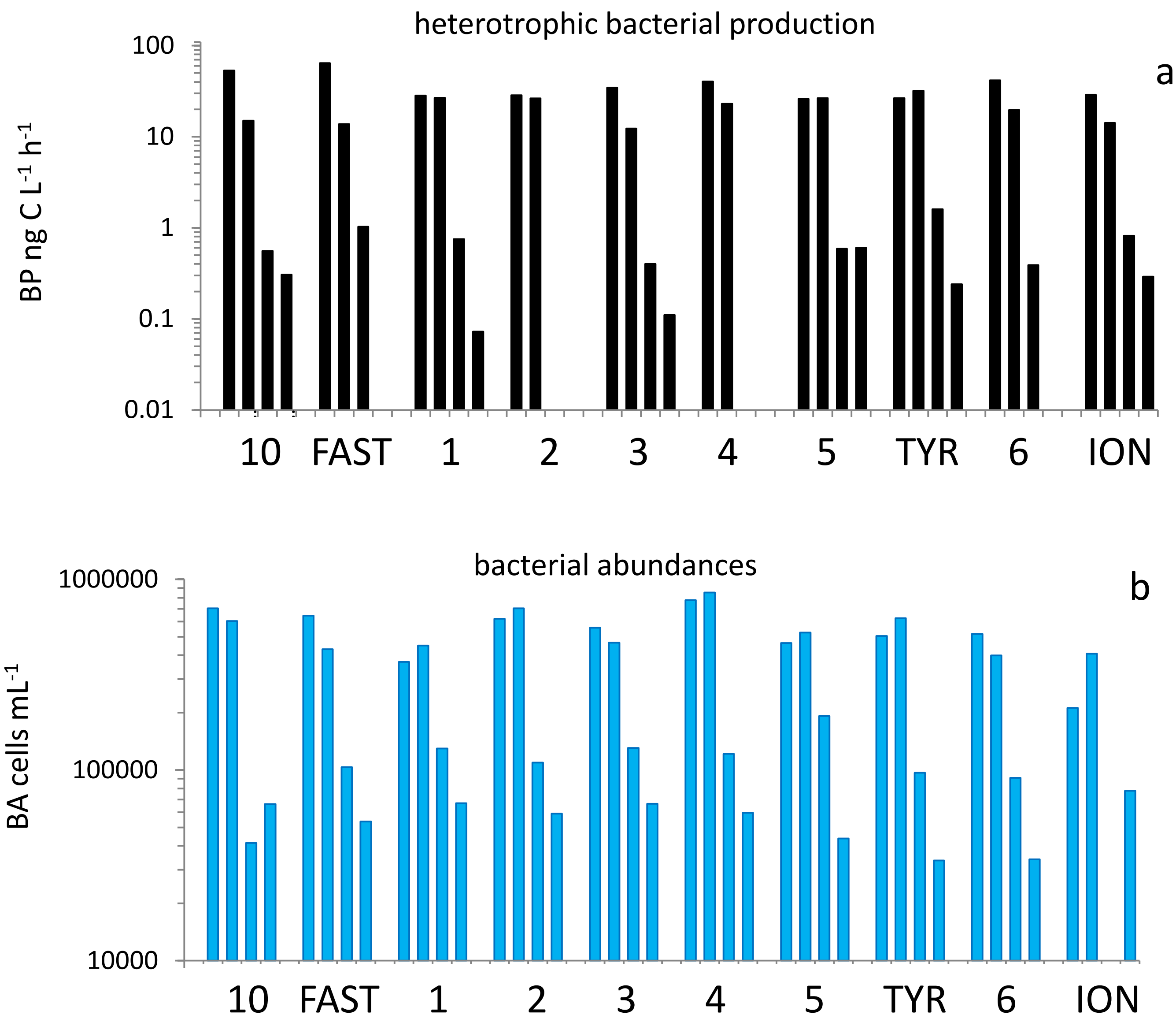
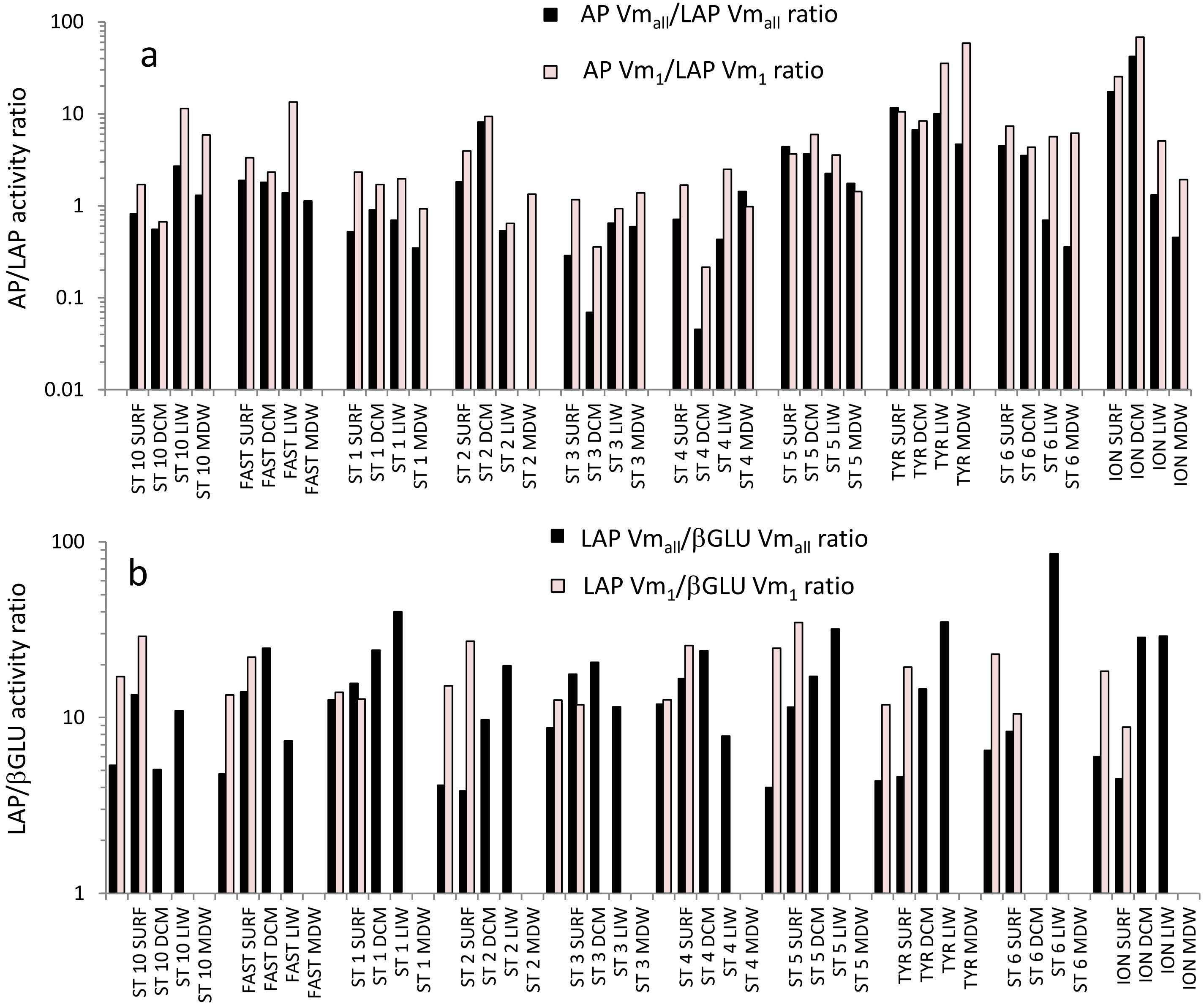

heterotrophic bacterial production
BP ng C L^{-1} h^{-1}
100
10
1
0.1
0.01
a
10
FAST
1
2
3
4
5
TYR
6
ION
bacterial abundances
BA cells mL^{-1}
1000000
100000
10000
b
10
FAST
1
2
3
4
5
TYR
6
ION

Fig S3



a
AP Vmall/LAP Vmall ratio
AP Vm1/LAP Vm1 ratio
AP/LAP activity ratio
100
10
1
0.1
0.01
ST 10 SURF
ST 10 DCM
ST 10 LIW
ST 10 MDW
FAST SURF
FAST DCM
FAST LIW
FAST MDW
ST 1 SURF
ST 1 DCM
ST 1 LIW
ST 1 MDW
ST 2 SURF
ST 2 DCM
ST 2 LIW
ST 2 MDW
ST 3 SURF
ST 3 DCM
ST 3 LIW
ST 3 MDW
ST 4 SURF
ST 4 DCM
ST 4 LIW
ST 4 MDW
ST 5 SURF
ST 5 DCM
ST 5 LIW
ST 5 MDW
TYR SURF
TYR DCM
TYR LIW
TYR MDW
ST 6 SURF
ST 6 DCM
ST 6 LIW
ST 6 MDW
ION SURF
ION DCM
ION LIW
ION MDW
b
LAP Vmall/βGLU Vmall ratio
LAP Vm1/βGLU Vm1 ratio
LAP/βGLU activity ratio
100
10
1

Fig S4