

Distribution and accumulation of metals and metalloids in planktonic food webs of the Mediterranean Sea (MERITE-HIPPOCAMPE campaign)

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APPENDIX 1

Data processing: determination of biotic metal concentrations

Metals and metalloids concentrations in samples can be expressed using the mass balance formula (equation 1):

$$[M]_{sample} = a \cdot [Ti]_a + b \cdot [POP]_b \quad (1)$$

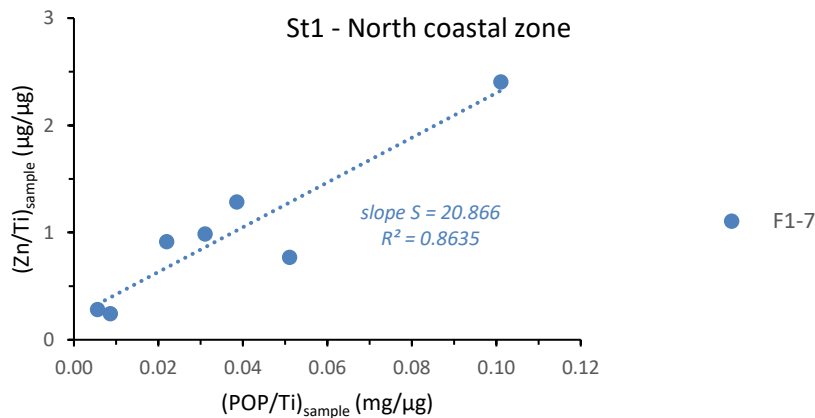
where a is the Ti-normalized elemental ratio in geogenic component; b is the P-normalized elemental ratio in biotic component; $[M]_{sample}$ is the elemental concentration in the sample; $[Ti]_a$ is the Ti concentration in geogenic component and $[POP]_b$ is the particulate organic phosphorus concentration in the biotic component. Assuming that P and Ti concentrations in samples are mainly due to the biotic and geogenic components, respectively ($[POP]_{sample} \equiv [POP]_b$; $[Ti]_{sample} \equiv [Ti]_a$), we can turn the mass balance formula into the first-order equation 2:

$$\frac{[M]_{sample}}{[Ti]_{sample}} \equiv S \cdot \frac{[POP]_{sample}}{[Ti]_{sample}} + C \quad (2)$$

where S is the slope of the regression line between M/Ti and POP/Ti in the sample; C is a constant value. Following this basic model, metals and metalloids concentrations in biotic component were evaluated from equation 3:

$$[bM] \equiv b \cdot [POP]_{sample} \quad (3)$$

The slope S was calculated for each station and for each element using the samples in the 7 particle size classes F1-7 (Fig. S1). Detailed of $[M]_{sample}$ and $[POP]_{sample}$ were presented in Table S3.



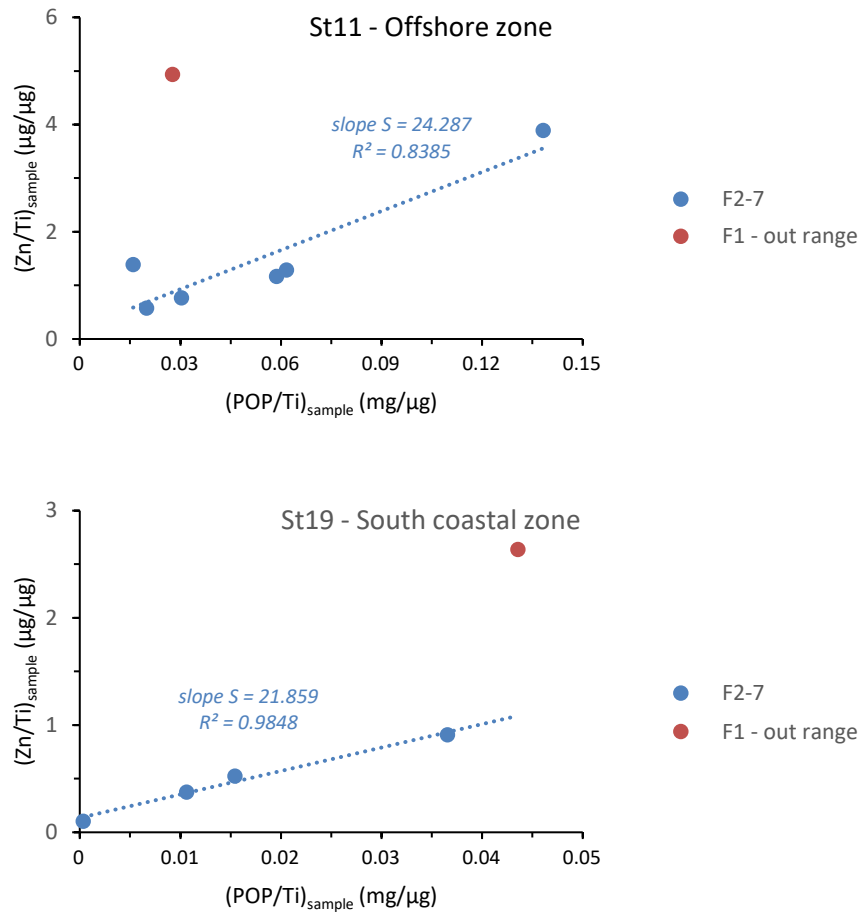


Figure S1. Linear regressions between $(\text{Zn}/\text{Ti})_{\text{sample}}$ and $(\text{POP}/\text{Ti})_{\text{sample}}$ in St1 (northern coastal zone), St11 (offshore zone) and St19 (southern coastal zone). Data were from particulate size classes (F1: 0.8-3; F2: 3-20; F3: 60-200; F4: 200-500; F5: 500-1000; F6: 1000-2000 and F7 > 2000 μm) collected at the deep chlorophyll maximum. Concentrations were expressed in $\mu\text{g}/\text{g}$ for Zn and Ti, and in mg/g for POP. At St19, data for F6 and F7 were not available. $\text{Zn}_{\text{sample}}$ concentrations in F1 at St11 and St19 (red point) were higher than expected and were not included in the linear regression.

APPENDIX 2

Data processing: determination of trophic magnification factors

Due to the complexity and variability of taxonomic groups, planktonic marine food webs were structured in trophic level (TL) according to the following equation (Kidd et al, 2018):

$$TL_{Fn} = 1.0 + \frac{(\delta^{15}N_{Fn} - \delta^{15}N_{baseline})}{\Delta^{15}N} \quad (1)$$

where TL_{Fn} is the TL of the sample corresponding to the fraction F_n , $\delta^{15}N_{Fn}$ and $\delta^{15}N_{baseline}$ are the $\delta^{15}N$ values of fractions F_n and a baseline, respectively. The fraction F_1 (0.8-3 μm) is assumed to be the baseline fraction with a TL_{F_1} defined to 1.0 as TL corresponding to the phytoplankton communities. $\Delta^{15}N$ ($= \delta^{15}N_{prey} - \delta^{15}N_{predator}$) is the isotopic ^{15}N fractionation between prey and predator. For marine food webs, $\Delta^{15}N$ vary from +3.3 to +3.8‰ (Liu et al., 2019) and a value of +3.4‰ is recommend without precise knowledge on the composition of the trophic structure (Post, 2002). TL determination were detailed in a companion study (Tésan-Onrubia et al., 2022) and results shown in Table S4.

Trophic magnification factor (TMF) is most often derived from the slope of the regression of log-transformed element against their corresponding trophic level (TL) and, N isotope ($\delta^{15}N$) is used as proxy to assess the relative trophic position of an organism in marine food webs.

$$\text{Log}_{10}(bM) = S \cdot (TL) + C \quad (2)$$

$$TMF = 10^S \quad (3)$$

where bM is the biotic metal concentration, S is the slope of the linear equation 2 and, TL is the trophic level corresponding to the sample (Fig. S2). Specific TMF (equation 3) were calculated for each geographical area (the northern coastal zone, the offshore zone and the southern coastal zone) from their respective data (stations and fractions).

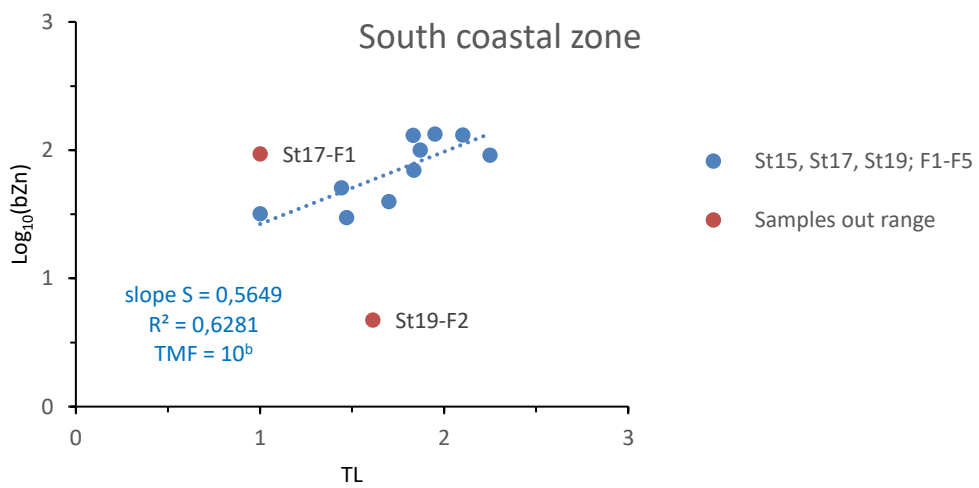
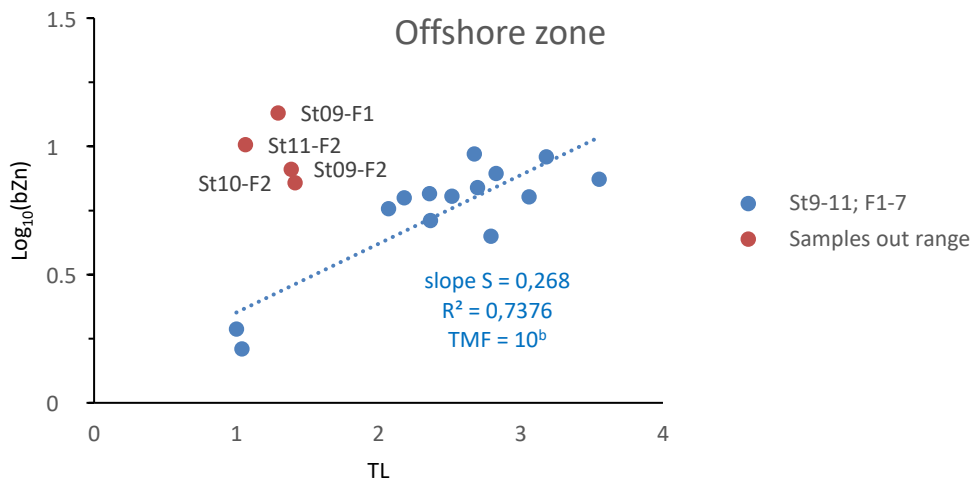
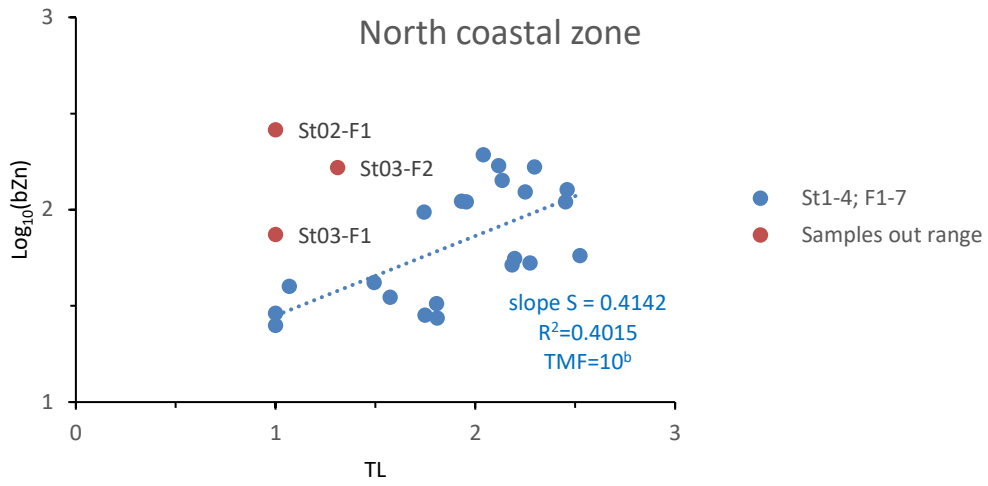


Figure S2. Determination of the linear regressions between the log-transformed of bZn concentrations in relation to the trophic level (TL) in the 3 geographical areas (the northern coastal zone, the offshore zone and the southern coastal zone). The northern coastal, offshore and southern coastal zones included 25, 18 and 12 data from available stations and fractions. Detailed values were presented in Table S4.

References:

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Table S1. GPS position of sampling stations

<i>Station</i>	Latitude (North)	Longitude (East)
<i>St01</i>	43°3.819'	5°59.080'
<i>St02</i>	42°56.020'	5°58.041'
<i>St03</i>	43°8.150'	5°15.280'
<i>St04</i>	43°14.500'	5°17.500'
<i>St09</i>	41°53.508'	6°19.998'
<i>St10</i>	40°18.632'	7°14.753'
<i>St11</i>	39°7.998'	7°41.010'
<i>St15</i>	36°12.883'	11°7.641'
<i>St17</i>	34°30.113'	11°43.573'
<i>St19</i>	33°51.659'	11°18.509'

Table S2. Detail of the quality control of metals metalloids analyses (certified material for marine plankton, BCR 414; blank filters, MCE; limit of detection, LOD). Mean metals and metalloids concentrations and standard deviation (σ) associated are expressed in $\mu\text{g/g}$. The limit of detection (LOD) are expressed in $\mu\text{g/L}$.

	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	Ti	V	Zn
<i>CMR BCR 414</i>											
<i>Mean (n = 3)</i>	8.03	0.36	21.97	29.08	1702.68	-	19.27	-	-	8.71	121.70
<i>σ (n = 3)</i>	0.07	0.04	2.62	0.96	160.79	-	0.10	-	-	0.34	19.31
<i>Recovery (%)</i>	117.7	93.9	92.3	98.6	92.0	-	102.5	-	-	107.6	109.1
<i>BLANK MCE filter, 47mm</i>											
<i>Mean 0.8μm (n = 6)</i>	0.03	0.05	2.21	0.41	10.57	0.33	0.31	0.01	2.65	0.06	8.16
<i>σ 0.8μm (n = 6)</i>	0.01	0.01	0.64	0.3	3.94	0.09	0.05	0.00	0.29	0.01	5.14
<i>Mean 3μm (n = 3)</i>	0.03	0.05	1.48	0.48	10.02	0.49	0.34	0.02	2.43	0.06	3.44
<i>σ 3μm (n = 3)</i>	0.01	0.01	0.07	0.16	2.16	0.01	0.03	0.00	0.01	0.01	0.08
<i>LOD ($\mu\text{g/L}$)</i>	0.01	0.005	0.008	0.01	0.2	0.008	0.2	0.005	0.02	0.008	0.1

Table S3. Detail of total metals and metalloids (M_{sample}) concentrations ($\mu\text{g/g}$) and particulate organic phosphorus ($\text{POP}_{\text{sample}}$) concentrations (mg/g) in samples from the MERITE-HIPPOCAMPE campaign. Particles were collected in the deep chlorophyll maximum, at 10 stations (St1-4, St9-11, St15, St1, St19) and sieved into 7 size fractions (F1: 0.8-3 μm ; F2: 3-20 μm ; F3: 60-200 μm ; F4: 200-500 μm ; F5: 500-1000 μm ; F6: 1000-2000 μm ; F7 > 2000 μm).

<i>Station</i>	<i>Fraction</i>	POP	Ti	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	V	Zn
<i>St01</i>	<i>F1</i>	1.20	54.75	1.85	0.65	0.08	6.80	35.39	0.84	1.22	-	0.27	50.01
<i>St01</i>	<i>F2</i>	1.92	222.40	12.59	1.04	2.98	21.10	2046.29	155.80	13.54	0.28	9.62	54.16
<i>St01</i>	<i>F3</i>	4.67	150.25	14.88	1.40	4.93	8.63	964.05	23.85	6.85	1.24	4.35	148.10
<i>St01</i>	<i>F4</i>	5.32	52.66	10.48	1.15	2.39	8.95	303.00	6.85	4.41	0.99	1.38	126.70
<i>St01</i>	<i>F5</i>	5.94	153.94	20.28	1.10	7.82	10.85	940.75	20.17	8.73	4.28	4.05	197.97
<i>St01</i>	<i>F6</i>	2.48	445.09	23.40	0.53	8.91	11.60	2243.06	66.28	11.13	14.61	12.12	125.54
<i>St01</i>	<i>F7</i>	3.84	75.24	5.19	0.38	0.78	4.76	261.46	4.96	2.73	0.29	0.96	57.85
<i>St02</i>	<i>F1</i>	5.81	178.12	14.04	3.45	14.69	72.41	1151.66	96.98	22.61	0.32	5.67	702.33
<i>St02</i>	<i>F2</i>	1.56	164.06	2.31	0.10	-	10.63	311.84	20.39	5.44	0.33	1.02	35.16
<i>St02</i>	<i>F3</i>	2.45	59.07	10.22	1.18	18.63	20.57	630.02	7.72	9.09	0.94	1.42	216.00
<i>St02</i>	<i>F4</i>	4.31	36.71	13.02	1.24	8.12	13.49	498.32	6.47	6.43	0.70	0.74	193.30
<i>St02</i>	<i>F5</i>	3.78	93.59	10.67	0.64	39.55	13.58	1404.05	13.11	18.07	1.94	1.36	214.78
<i>St02</i>	<i>F6</i>	3.16	132.60	6.38	0.39	78.14	12.81	5336.71	32.82	25.22	1.96	1.54	160.32
<i>St02</i>	<i>F7</i>	3.72	204.53	6.31	1.44	41.74	8.21	1207.48	13.19	13.47	3.43	1.51	242.53
<i>St03</i>	<i>F1</i>	3.05	281.64	7.63	1.51	2.80	39.57	671.96	16.39	10.00	0.13	1.81	74.43
<i>St03</i>	<i>F2</i>	5.15	217.47	13.35	2.66	9.47	53.76	1201.47	74.83	26.41	0.62	3.81	278.15
<i>St03</i>	<i>F3</i>	1.64	79.50	6.68	0.58	12.99	9.69	537.55	7.74	8.89	5.10	2.40	165.67
<i>St03</i>	<i>F4</i>	3.97	54.81	5.90	0.60	5.85	10.42	277.98	5.52	7.41	5.99	1.81	530.69
<i>St03</i>	<i>F5</i>	3.71	61.61	5.92	0.40	7.92	6.82	311.61	6.45	8.03	8.61	2.01	110.16
<i>St03</i>	<i>F6</i>	3.17	-	-	-	-	-	-	-	-	-	-	-
<i>St03</i>	<i>F7</i>	1.74	47.76	11.46	0.21	3.00	5.78	202.60	6.31	5.72	10.24	1.32	60.04
<i>St04</i>	<i>F1</i>	1.48	113.04	16.22	1.38	6.88	28.60	975.87	29.86	7.49	0.10	33.25	221.92
<i>St04</i>	<i>F2</i>	2.26	100.38	13.58	0.05	-	1.86	225.40	9.30	5.29	0.16	20.64	41.83
<i>St04</i>	<i>F3</i>	1.40	32.29	17.27	0.08	3.10	4.07	345.98	5.09	2.25	1.16	44.83	33.63
<i>St04</i>	<i>F4</i>	1.67	91.86	55.40	0.27	5.33	8.37	816.25	11.94	4.57	3.78	181.14	70.51
<i>St04</i>	<i>F5</i>	1.45	197.55	8.78	0.21	18.17	12.55	1483.43	20.42	9.78	12.28	40.97	111.47
<i>St04</i>	<i>F6</i>	-	243.14	7.26	0.13	23.03	16.99	1724.68	29.33	18.73	37.75	43.28	149.42
<i>St04</i>	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>St09</i>	<i>F1</i>	4.61	272.74	32.77	9.13	12.67	22.59	837.73	20.41	12.21	0.13	4.30	1406.61
<i>St09</i>	<i>F2</i>	2.79	75.47	24.08	1.61	-	9.38	311.79	16.13	5.29	0.11	2.25	45.59
<i>St09</i>	<i>F3</i>	2.70	59.35	9.61	1.27	2.14	5.14	268.96	4.48	3.66	1.23	1.42	124.11
<i>St09</i>	<i>F4</i>	3.19	16.46	13.63	1.76	0.48	9.65	50.21	3.07	6.47	1.90	0.48	149.54
<i>St09</i>	<i>F5</i>	3.11	37.56	12.98	1.88	1.81	9.36	103.79	3.05	6.92	2.01	0.78	197.92
<i>St09</i>	<i>F6</i>	-	37.78	24.25	0.65	0.62	7.50	151.64	2.80	2.17	1.65	1.39	132.38
<i>St09</i>	<i>F7</i>	-	125.60	1.92	0.75	2.18	11.59	76.35	9.63	3.85	0.03	0.69	63.88
<i>St10</i>	<i>F1</i>	1.30	82.28	11.71	1.16	9.97	11.05	159.17	5.06	3.90	0.01	2.89	419.09
<i>St10</i>	<i>F2</i>	4.82	266.50	59.10	5.26	-	54.68	855.84	73.65	21.62	0.49	9.76	190.45

<i>St10</i>	<i>F3</i>	4.61	267.03	12.90	1.64	13.35	9.81	1633.36	31.99	12.47	7.39	7.47	189.76
<i>St10</i>	<i>F4</i>	5.24	133.86	7.40	1.13	4.53	9.14	890.99	15.60	8.66	11.62	4.30	177.28
<i>St10</i>	<i>F5</i>	4.24	186.16	8.87	0.82	5.26	8.76	1151.63	24.55	10.05	22.25	5.91	141.08
<i>St10</i>	<i>F6</i>	4.98	274.68	11.53	0.71	8.39	9.59	1466.68	37.43	14.16	34.95	7.61	139.39
<i>St10</i>	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>St11</i>	<i>F1</i>	1.65	59.70	3.35	0.55	2.01	9.20	185.21	2.98	2.45	0.03	0.78	294.65
<i>St11</i>	<i>F2</i>	10.31	516.78	50.05	4.53	-	71.22	1827.99	154.07	36.26	0.78	13.73	297.99
<i>St11</i>	<i>F3</i>	5.80	191.10	16.74	1.47	5.05	9.32	892.33	16.07	7.50	17.60	6.47	147.16
<i>St11</i>	<i>F4</i>	6.39	103.69	11.07	1.23	1.57	8.17	430.96	7.64	6.12	16.49	9.20	133.56
<i>St11</i>	<i>F5</i>	6.64	417.43	57.16	5.91	11.86	40.09	2013.35	37.76	30.71	82.17	36.96	580.68
<i>St11</i>	<i>F6</i>	6.48	110.36	12.34	1.07	1.88	9.21	508.19	10.11	4.77	16.57	3.94	129.32
<i>St11</i>	<i>F7</i>	4.52	32.72	24.89	1.72	0.27	5.11	51.11	1.72	0.78	1.96	0.55	127.42
<i>St15</i>	<i>F1</i>	0.72	25.49	1.98	1.05	1.24	8.09	22.95	0.14	2.33	-	0.67	176.64
<i>St15</i>	<i>F2</i>	10.52	617.62	42.59	8.37	-	65.05	4624.77	161.33	28.58	0.93	66.75	438.98
<i>St15</i>	<i>F3</i>	3.03	316.03	17.87	0.68	5.98	9.28	1322.87	28.57	8.79	12.65	14.96	148.03
<i>St15</i>	<i>F4</i>	3.83	234.89	9.93	0.84	4.22	7.33	1153.40	15.07	5.80	14.70	10.62	130.82
<i>St15</i>	<i>F5</i>	5.47	146.14	11.45	0.62	2.15	9.14	692.88	13.66	5.03	7.70	7.52	130.38
<i>St15</i>	<i>F6</i>	-	264.53	11.46	0.59	6.16	8.18	1740.47	18.71	5.17	9.72	10.80	108.30
<i>St15</i>	<i>F7</i>	-	59.99	8.77	0.40	1.14	3.26	393.85	5.47	1.47	4.46	3.41	42.61
<i>St17</i>	<i>F1</i>	2.81	240.31	6.42	0.65	2.96	19.25	246.77	1.56	6.30	-	1.18	308.61
<i>St17</i>	<i>F2</i>	2.68	675.56	10.63	0.69	11.71	20.25	4803.63	63.26	11.69	0.32	19.30	50.58
<i>St17</i>	<i>F3</i>	1.14	178.13	31.09	0.16	3.26	5.81	920.72	26.82	6.03	7.76	9.30	29.63
<i>St17</i>	<i>F4</i>	1.52	290.34	34.57	0.28	4.90	5.85	1475.74	34.71	6.74	12.62	11.62	39.70
<i>St17</i>	<i>F5</i>	-	590.41	3.11	0.71	150.45	21.92	2238.08	37.59	158.97	1.90	6.90	192.53
<i>St17</i>	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>St17</i>	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>St19</i>	<i>F1</i>	12.83	294.63	13.09	20.33	-	40.99	1002.86	18.47	17.30	0.33	3.39	777.14
<i>St19</i>	<i>F2</i>	0.20	596.53	9.36	3.41	9.60	14.09	4740.58	119.91	13.42	0.28	16.18	61.76
<i>St19</i>	<i>F3</i>	2.96	278.59	5.83	1.13	8.12	10.08	857.71	20.56	12.57	3.14	3.49	104.96
<i>St19</i>	<i>F4</i>	4.26	116.46	4.30	1.10	2.10	4.52	411.88	8.44	2.12	3.88	1.76	105.83
<i>St19</i>	<i>F5</i>	3.88	251.62	4.79	1.10	13.68	7.02	850.06	17.62	11.90	11.14	3.60	132.35
<i>St19</i>	<i>F6</i>	-	842.93	5.55	0.52	18.68	5.62	3858.54	67.05	8.29	82.28	13.57	67.74
<i>St19</i>	<i>F7</i>	-	542.25	2.35	0.56	118.58	8.92	2170.58	27.20	79.21	1.90	5.48	87.51

Table S4. Detail of biotic metal (bM) concentrations ($\mu\text{g/g}$) according to the 7 size fractions (F1: 0.8-3 μm ; F2: 3-20 μm ; F3: 60-200 μm ; F4: 200-500 μm ; F5: 500-1000 μm ; F6: 1000-2000 μm ; F7 > 2000 μm) and the 10 stations (St1-4. St9-11. St15. St1. St19) of the MERITE-HIPPOCAMPE campaign. TL determination were discussed in a companion study (Tésan-Onrubia et al., 2022).

<i>Station</i>	<i>Fraction</i>	<i>TL</i>	<i>As</i>	<i>Cd</i>	<i>Cr</i>	<i>Cu</i>	<i>Fe</i>	<i>Mn</i>	<i>Ni</i>	<i>Sb</i>	<i>V</i>	<i>Zn</i>
<i>St01</i>	<i>F1</i>	<i>1.0</i>	1.82	0.21	0.08	1.58	35	0.84	0.55	0.00	0.27	25
	<i>F2</i>	<i>1.1</i>	2.92	0.33	2.98	2.53	120	2.75	0.88	0.28	0.52	40
	<i>F3</i>	<i>1.7</i>	7.09	0.80	4.93	6.15	292	6.68	2.13	0.82	1.26	97
	<i>F4</i>	<i>1.9</i>	8.08	0.91	2.39	7.01	303	6.85	2.43	0.93	1.38	111
	<i>F5</i>	<i>2.2</i>	9.02	1.01	7.82	7.82	371	8.49	2.71	1.04	1.60	124
	<i>F6</i>	<i>2.2</i>	3.77	0.42	7.39	3.27	155	3.55	1.13	0.43	0.67	52
	<i>F7</i>	<i>2.5</i>	5.19	0.38	0.78	4.76	240	4.96	1.75	0.29	0.96	58
<i>St02</i>	<i>F1</i>	<i>1.0</i>	14.04	1.74	14.69	17.32	527	19.81	2.36	0.32	2.64	261
	<i>F2</i>	<i>1.6</i>	2.31	0.10	-	4.65	142	5.31	0.63	0.20	0.71	35
	<i>F3</i>	<i>2.0</i>	7.83	0.73	17.34	7.30	222	7.72	0.99	0.31	1.11	110
	<i>F4</i>	<i>2.0</i>	13.02	1.24	8.12	12.84	391	6.47	1.75	0.54	0.74	193
	<i>F5</i>	<i>2.1</i>	10.67	0.64	26.76	11.26	343	12.88	1.53	0.48	1.36	170
	<i>F6</i>	<i>2.1</i>	6.38	0.39	22.40	9.43	287	10.78	1.28	0.40	1.44	142
	<i>F7</i>	<i>2.3</i>	6.31	1.11	26.36	8.21	338	12.69	1.51	0.47	1.51	167
<i>St03</i>	<i>F1</i>	<i>1.0</i>	3.43	0.51	2.80	4.87	135	8.60	1.16	0.13	1.27	74
	<i>F2</i>	<i>1.3</i>	5.80	0.87	9.47	8.23	228	14.52	1.95	0.62	2.15	166
	<i>F3</i>	<i>2.3</i>	1.85	0.28	3.88	2.63	73	4.64	0.62	0.30	0.69	53
	<i>F4</i>	<i>2.5</i>	4.47	0.60	5.85	6.34	176	5.52	1.51	0.71	1.65	128
	<i>F5</i>	<i>2.5</i>	4.17	0.40	7.92	5.92	164	6.45	1.41	0.67	1.54	110
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	<i>2.2</i>	1.96	0.21	3.00	2.78	77	4.91	0.66	0.31	0.73	56
<i>St04</i>	<i>F1</i>	<i>1.0</i>	8.65	0.04	1.88	2.47	121	2.15	0.89	0.10	33.25	29
	<i>F2</i>	<i>1.5</i>	13.18	0.05	-	1.86	184	3.28	1.36	0.16	20.64	42
	<i>F3</i>	<i>1.8</i>	8.18	0.04	1.78	2.34	114	2.03	0.84	0.11	41.72	27
	<i>F4</i>	<i>1.8</i>	9.71	0.04	2.11	2.78	135	2.41	1.00	0.13	49.51	33
	<i>F5</i>	<i>1.7</i>	8.44	0.04	1.83	2.41	118	2.10	0.87	0.11	40.97	28
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-
<i>St09</i>	<i>F1</i>	<i>1.3</i>	18.18	2.35	12.67	13.49	241	4.39	3.28	0.13	1.36	245
	<i>F2</i>	<i>1.4</i>	10.98	1.42	-	8.15	145	2.65	1.98	0.11	0.82	46
	<i>F3</i>	<i>2.4</i>	9.61	1.27	2.14	5.14	141	2.57	1.92	1.23	0.79	124
	<i>F4</i>	<i>2.7</i>	12.57	1.63	0.48	9.33	50	3.04	2.27	1.90	0.48	150
	<i>F5</i>	<i>3.2</i>	12.26	1.59	1.81	9.10	104	2.96	2.21	2.01	0.78	165
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-
<i>St10</i>	<i>F1</i>	<i>1.0</i>	0.60	0.22	0.27	1.94	159	1.46	0.96	0.01	0.97	41
	<i>F2</i>	<i>1.4</i>	2.25	0.81	N/A	7.21	643	5.45	3.56	0.49	3.60	153
	<i>F3</i>	<i>2.7</i>	2.15	0.78	0.95	6.90	615	5.21	3.41	0.62	3.44	147

	<i>F4</i>	2.8	2.44	0.88	1.08	7.83	697	5.91	3.86	0.70	3.91	166
	<i>F5</i>	3.1	1.98	0.72	0.88	6.35	565	4.79	3.13	0.57	3.17	135
	<i>F6</i>	3.6	2.32	0.71	1.03	7.44	663	5.62	3.67	0.67	3.71	139
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-
<i>St11</i>	<i>F1</i>	1.0	3.35	0.10	0.73	1.62	134	2.21	0.94	0.03	0.56	42
	<i>F2</i>	1.1	50.05	0.64	-	10.15	838	13.83	5.87	0.78	3.48	260
	<i>F3</i>	2.1	16.74	0.36	2.57	5.72	472	7.79	3.31	17.60	1.96	147
	<i>F4</i>	2.2	11.07	0.40	1.57	6.30	431	7.64	3.64	16.49	2.16	134
	<i>F5</i>	2.4	35.55	0.41	2.93	6.54	540	8.90	3.78	25.51	2.24	167
	<i>F6</i>	2.5	12.34	0.40	1.88	6.38	508	8.70	3.69	16.57	2.19	129
	<i>F7</i>	2.8	24.24	0.28	0.27	4.46	51	1.72	0.78	1.96	0.55	114
<i>St15</i>	<i>F1</i>	1.0	0.60	0.39	1.23	0.91	23	0.14	0.67	-	0.12	32
	<i>F2</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F3</i>	2.0	2.53	0.68	5.15	3.82	289	4.19	2.81	6.53	0.50	133
	<i>F4</i>	2.1	3.20	0.84	6.52	4.83	366	5.30	3.56	8.26	0.63	131
	<i>F5</i>	1.8	4.58	0.62	9.32	6.90	523	7.58	5.03	7.70	0.90	130
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-
<i>St17</i>	<i>F1</i>	1.0	3.66	0.65	3.42	2.99	205	1.56	2.22	-	1.18	93
	<i>F2</i>	1.4	3.49	0.62	3.26	2.86	196	55.31	2.12	0.32	19.30	51
	<i>F3</i>	1.5	1.49	0.16	1.39	1.22	84	23.63	0.91	7.76	9.22	30
	<i>F4</i>	1.7	1.99	0.28	1.86	1.62	111	31.45	1.21	12.62	11.62	40
	<i>F5</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-
<i>St19</i>	<i>F1</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F2</i>	1.6	0.14	0.03	0.39	0.36	13	0.02	0.08	0.07	0.08	5
	<i>F3</i>	1.8	2.07	0.51	5.79	5.36	185	0.34	1.22	0.96	1.12	70
	<i>F4</i>	1.9	2.97	0.74	2.10	4.52	266	0.48	1.75	1.38	1.61	100
	<i>F5</i>	2.2	2.71	0.67	7.58	7.02	243	0.44	1.59	1.26	1.47	91
	<i>F6</i>	-	-	-	-	-	-	-	-	-	-	-
	<i>F7</i>	-	-	-	-	-	-	-	-	-	-	-

Table S5: Results of ANOVA (A) or Kruskal-Wallis (KW) tests per element to examine the potential variations of bM concentrations across all stations and fractions (n = 55). Significant differences (p < 0.05) are in bold.

	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	V	Zn
<i>Test</i>	A	KW	A	A	A	KW	A	A	KW	A
<i>p-Value</i>	0.003	0.008	0.015	0.026	0.005	0.038	< 0.0001	0.012	0.086	0.009

Table S6. Detail of bM/POP ratios in planktonic food webs per elements and stations.

	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	V	Zn
<i>North coastal zone</i>										
St01	0.62	0.04	0.79	0.64	31.98	0.74	0.24	0.03	0.16	9.54
St02	0.96	0.06	2.96	1.41	50.34	1.77	0.21	0.03	0.25	19.64
St03	0.47	0.04	1.09	0.78	24.58	1.39	0.20	0.03	0.26	13.96
St04	2.41	0.01	0.63	0.74	45.11	0.82	0.32	0.02	12.74	9.17
<i>Offshore zone</i>										
St09	1.60	0.13	0.72	1.34	23.83	0.54	0.37	0.08	0.16	17.88
St10	0.19	0.05	0.11	0.73	73.03	0.64	0.39	0.02	0.46	13.53
St11	1.37	0.02	0.18	0.48	39.08	0.68	0.27	0.40	0.19	10.56
<i>South coastal zone</i>										
St15	0.35	0.08	1.01	0.61	45.90	0.65	0.49	0.29	0.10	15.02
St17	0.54	0.05	0.73	0.52	40.51	9.37	0.42	0.78	3.84	11.87
St19	0.29	0.05	0.99	0.81	34.70	0.06	0.22	0.07	0.23	10.53

Table S7: Results of ANOVA (A) or Kruskal-Wallis (KW) tests per element to examine the potential variations of bM/POP ratios across all stations and fractions (n = 55). Significant differences ($p < 0.05$) are in bold.

	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	V	Zn
<i>Test</i>	A	KW	A	KW	A	A	A	A	A	A
<i>p-Value</i>	0.014	0.038	0.035	0.022	0.298	0.018	< 0.0001	< 0.0001	0.112	0.579

Table S8: Results of Student (t) or Mann-Whitney-Wilcoxon (MW) tests per element to examine the potential differences in bM concentrations between geographical areas (n = 25 in the northern coastal zone; n = 18 in the offshore zone; n = 12 in the southern coastal zone). Significant differences ($p < 0.05$) are in bold.

	As	Cd	Cr	Cu	Fe	Mn	Ni	Sb	V	Zn
<i>Differences between the northern coastal zone and the offshore zone</i>										
<i>Test</i>	MW	MW	MW	MW	t	MW	t	MW	MW	MW
<i>p-Value</i>	0.207	0.066	< 0.001	0.190	0.040	0.428	< 0.001	0.015	0.724	0.014
<i>Differences between the northern coastal zone and the southern coastal zone</i>										
<i>Test</i>	t	MW	MW	MW	t	MW	t	MW	MW	MW
<i>p-Value</i>	< 0.001	0.713	0.221	0.049	0.956	0.227	0.082	0.010	0.327	0.554
<i>Differences between the offshore zone and the southern coastal zone</i>										
<i>Test</i>	MW	MW	MW	t	t	MW	t	MW	MW	MW
<i>p-Value</i>	0.015	0.158	0.021	0.002	0.037	0.346	0.005	0.408	0.573	0.001

Table S6: Elemental stoichiometry (bM/POP ratio, mmol/mol) in planktonic food webs including the 7 size fractions (F1-7) from the MERITE-HIPPOCAMPE campaign (Mediterranean Sea) detailed for the 10 stations (St1-4, St9-11, St15, St1, St19).

	As	Cd	Cu	Cr	Fe	Mn	Ni	Sb	V	Zn
<i>Northern coastal zone</i>										
<i>St01</i>	0.62	0.04	0.64	0.79	31.98	0.74	0.24	0.03	0.16	9.54
<i>St02</i>	0.96	0.06	1.41	2.96	50.34	1.77	0.21	0.03	0.25	19.64
<i>St03</i>	0.47	0.04	0.78	1.09	24.58	1.39	0.20	0.03	0.26	13.96
<i>St04</i>	2.41	0.01	0.74	0.63	45.11	0.82	0.32	0.02	12.74	9.17
<i>Offshore zone</i>										
<i>St09</i>	1.60	0.13	1.34	0.72	23.83	0.54	0.37	0.08	0.16	17.88
<i>St10</i>	0.19	0.05	0.73	0.11	73.03	0.64	0.39	0.02	0.46	13.53
<i>St11</i>	1.37	0.02	0.48	0.18	39.08	0.68	0.27	0.40	0.19	10.56
<i>Southern coastal zone</i>										
<i>St15</i>	0.35	0.08	0.61	1.01	45.90	0.65	0.49	0.29	0.10	15.02
<i>St17</i>	0.54	0.05	0.52	0.73	40.51	9.37	0.42	0.78	3.84	11.87
<i>St19</i>	0.29	0.05	0.81	0.99	34.70	0.06	0.22	0.07	0.23	10.53