



Supplement of

Drought recorded by Ba/Ca in coastal benthic foraminifera

Inda Brinkmann et al.

Correspondence to: Inda Brinkmann (inda.brinkmann@geol.lu.se)

The copyright of individual parts of the supplement might differ from the article licence.

Supplementary Information: Tables

Table S1 Compilation of trace-elemental concentrations of standards (NIST 610, 612, MACS3, Jcp-1, Jct-1) by LA ICP MS analyses.

NIST610						
	Average	2SD ¹	2RSD%	Ref conc. ppm	NORM	number of analyses
Mg(24)	465.1	7.6	2%	432	1.08	107
Mg(25)	465.1	5.0	1%	432	1.08	108
Mg(26)	465.1	6.1	1%	432	1.08	215
Al	10798	177	2%	10320	1.05	215
Mn	485.2	7.5	2%	444	1.09	215
Zn	456.1	10.0	2%	460	0.99	215
Sr	515.5	11.0	2%	516	1.00	215
Ba	435.2	6.8	2%	452	0.96	215
U	461.9	13.1	3%	462	1.00	207

NIST612						
	Average	2SD ²	2RSD%	Ref conc. ppm	NORM ³	number of analyses
Mg(24)	60.5	2.90	5%	68	0.89	45
Mg(25)	59.7	1.69	3%	68	0.88	74
Mg(26)	59.3	3.13	5%	68	0.87	119
Al	11235	363	3%	10744	1.05	119
Mn	41.5	1.90	5%	38.7	1.07	119
Zn	38.6	1.99	5%	39.1	0.99	119
Sr	78.2	4.32	6%	78.4	1.00	118
Ba	38.2	1.68	4%	39.3	0.97	119
U	37.4	1.24	3%	37.38	1.00	115

MACS3						
	Average	2SD ²	2RSD%	Ref conc. ppm	NORM ³	number of analyses
Mg(24)	1727	150	9%	1720	1.00	98
Mg(25)	1769	189	11%	1720	0.97	107
Mg(26)	1755	179	10%	1720	0.98	205
Al	413	69	17%	396	0.96	205
Mn	583	41	7%	512	0.88	205
Zn	70	32	46%	124	1.76	204
Sr	6884	545	8%	6640	0.96	205
Ba	60.9	4.3	7%	59.6	0.98	205
U	1.48	1.30	88%	1.41	0.96	196

Jcp-1						
	Average	2SD ²	2RSD%	Ref conc. ppm	NORM ³	number of analyses
Mg(24)	906	137	15%	855	1.06	44
Mg(25)	937	233	25%	855	1.10	86
Mg(26)	925	207	22%	855	1.08	130
Al	486	81	17%	379	1.28	130
Mn	1.13	0.49	43%	1.13	1.00	69
Zn	1.56	9.31	595%	2.2	0.71	78
Sr	7460	272	4%	6890	1.08	130
Ba	11.78	2.98	25%	9.21	1.28	130
U	2.61	0.23	9%	2.64	0.99	126

Jct-1

	Average	2SD²	2RSD%	Ref conc. ppm	NORM³	number of analyses
Mg(24)	303	39	13%	281	1.1	99
Mg(25)	290	30	10%	281	1.0	63
Mg(26)	295	36	12%	281	1.0	162
Al	268	76	28%	200	1.3	162
Mn	0.91	2.25	248%	0.54	1.7	28
Zn	0.93	0.46	50%	0.34	2.7	63
Sr	1440	49	3%	1410	1.0	162
Ba	9.59	4.61	48%	5.5	1.7	162
U	0.05	0.03	58%	0.0646	0.8	107

¹Analytical precision of primary standard NIST610 reported as 2 relative standard deviations

²External reproducibility of secondary standard reported as 2 relative standard deviations

³Average of measured concentrations normalised to reference concentration of the same standard

Table S2 Results of Welch ANOVA analysis testing if Ba/Ca significantly differs between the two studied sediment intervals 0.0–0.5 cm and 0.5–1.0 cm (significant results in bold).

Species	Site	Season	p value	Species	Site	Season	p value
<i>B. marginata</i>	GF 117	09/2018	0.03	<i>N. labradorica</i>	GF 117	09/2018	0.72
		02/2019	0.48			02/2019	0.41
		06/2019	0.05			06/2019	0.49
	GF 71	09/2018	0.74		GF 71	09/2018	0.60
		02/2019	0.26			02/2019	0.007
		06/2019	0.42			06/2019	0.45

Table S3 Correlation (Pearson's r) of foraminiferal Ba/Ca and average Örekilsälven discharge (non-significant = n.s).

Average Örekilsälven discharge	<i>B. marginata</i>		<i>N. labradorica</i>		total (normalized Ba/Ca)	
	GF 117	GF 71	GF 117	GF 71		
Period directly prior to sampling	30-days	n.s	r = 0.36, p = 0.01	n.s	r = 0.35, p = 0.008	r = 0.26, p < 0.001
	60-days	r = 0.46, p < 0.001	r = 0.36, p = 0.01	n.s	r = 0.53, p < 0.001	r = 0.36, p < 0.001
	90-days	r = 0.47, p < 0.001	r = 0.48, p < 0.001	n.s	r = 0.53, p < 0.001	r = 0.40, p < 0.001
	120-days	n.s	n.s	n.s	r = 0.30, p = 0.02	r = 0.21, p = 0.002
Ba/Ca with one-month lag to period	30-days	r = 0.58, p < 0.001	r = 0.35, p = 0.02	n.s	r = 0.52, p < 0.001	r = 0.37, p < 0.001
	60-days	r = 0.58, p < 0.001	r = 0.45, p = 0.002	n.s	r = 0.63, p < 0.001	r = 0.46, p < 0.001
	90-days	r = 0.55, p < 0.001	r = 0.52, p < 0.001	n.s	r = 0.61, p < 0.001	r = 0.48, p < 0.001
	120-days	r = 0.34, p = 0.01	r = 0.50, p < 0.001	n.s	r = 0.62, p < 0.001	r = 0.40, p < 0.001

Table S4 Results of Welch ANOVA analysis testing if Ba/Ca significantly differs between the investigated species *B. marginata* and *N. labradorica* (significant results in bold).

Site	Season	p value
GF 117	09/2018	0.004
	02/2019	0.03
	06/2019	< 0.001
GF 71	09/2018	< 0.001
	02/2019	0.12
	06/2019	0.009

Table S5 Results of the Mann Whitney and Spearman ranks analyses of chamber-specific differences in Ba/Ca of *B. marginata* and *N. labradorica* per site and season. Significant values marked bold. Spearman ranks only given if Mann Whitney test result significant.

<i>B. marginata</i>								
Mann Whitney					Spearman ranks (strength and direction of relationship indicated by r value)			
		n-1	n-2	p+	n-1	n-2	p+	
GF 117	09/2018	n	0.04	0.85	< 0.001	r = 0.39, p = 0.06		r = 0.07, p = 0.78
		n-1	-	0.11	< 0.001			r = 0.13, p = 0.61
		n-2	-	-	< 0.001			r = -0.04, p = 0.87
	02/2019	n	0.28	0.76	0.01			r = 0.52, p = 0.16
		n-1	-	0.35	0.003			r = -0.04, p = 0.90
		n-2	-	-	0.04			r = -0.21, p = 0.46
	06/2019	n	0.30	0.43	0.03			r = 0.09, p = 0.7
		n-1	-	0.82	0.17			
		n-2	-	-	0.12			
GF 71	09/2018	n	0.57	0.96	0.17			
		n-1	-	0.23	0.002		r = 0.20, p = 0.52	r = 0.60, p = 0.01
		n-2	-	-	0.08			
	02/2019	n	0.02	0.26	0.07	r = 0.23, p = 0.41		
		n-1	-	0.34	0.80			
		n-2	-	-	0.20			
	06/2019	n	0.38	0.35	0.01			r = -0.15, p = 0.57
		n-1	-	0.83	0.01			r = 0.35, p = 0.15
		n-2	-	-	0.02			r = 0.48, p = 0.03
<i>N. labradorica</i>								
Mann Whitney				Spearman ranks (strength and direction of relationship indicated by r value)				
		n-1	n-2		n-1	n-2		
GF 117	09/2018	n	0.93	0.47				
		n-1	-	0.52				
	02/2019	n	0.71	0.37				
		n-1	-	0.20				
	06/2019	n	0.31	0.006			r = 0.38, p = 0.20	
		n-1	-	0.07				
GF 71	09/2018	n	0.32	0.03			r = 0.49, p = 0.05	
		n-1	-	0.14				
	02/2019	n	0.01	< 0.001		r = 0.64, p = 0.004	r = 0.50, p = 0.04	
		n-1	-	0.42				
	06/2019	n	< 0.001	< 0.001		r = 0.41, p = 0.06	r = -0.02, p = 0.92	
		n-1	-	0.08				

Supplementary Information: Figures

Fig. S1 Median Ba/Ca with MAD per chamber type for the investigated species and sites.

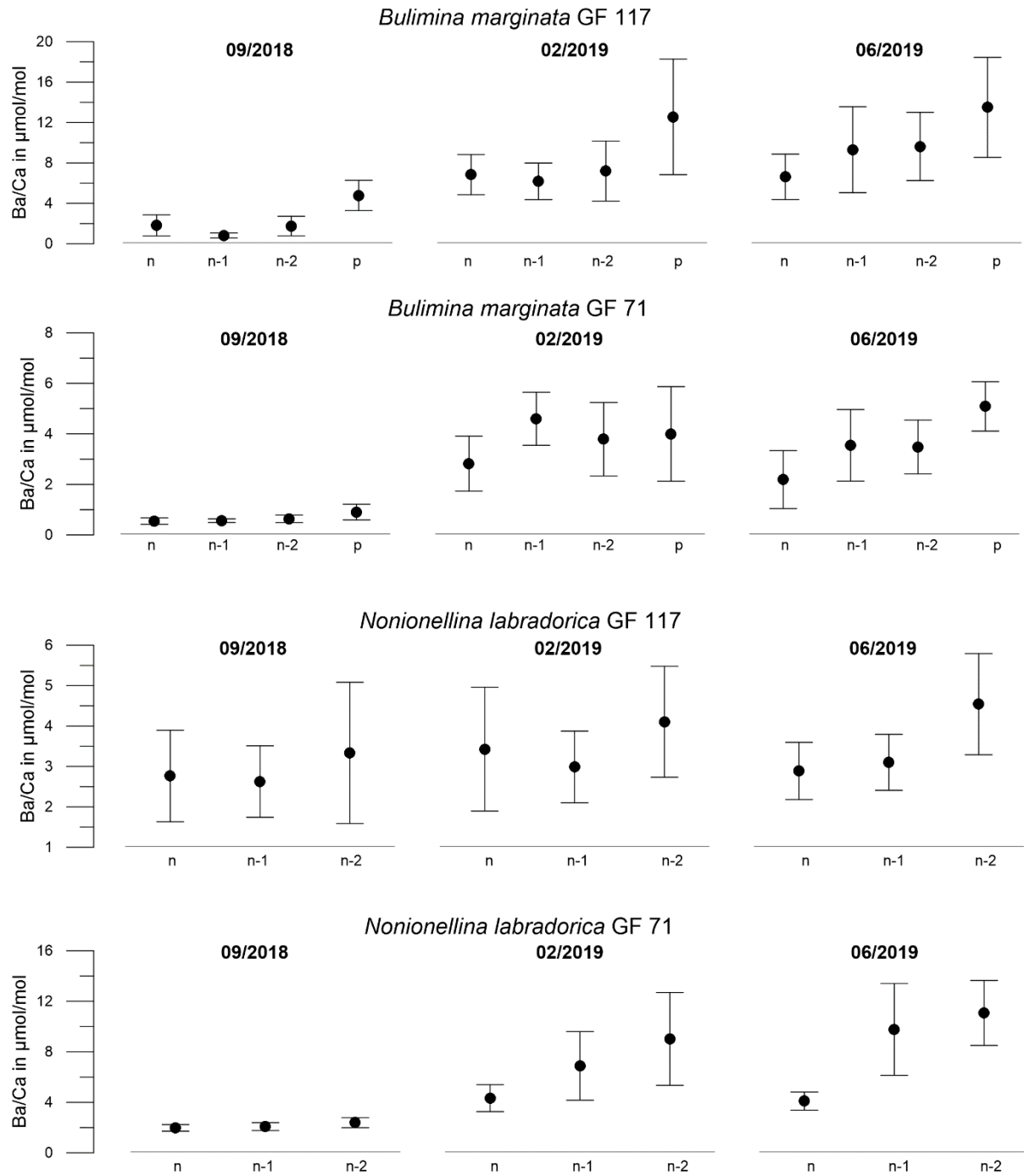


Fig. S2 Seasonal chlorophyll a (in $\mu\text{g/l}$) in monitoring stations Släggö and Alsbäck (SMHI). Sampling months of this study indicated in bold.

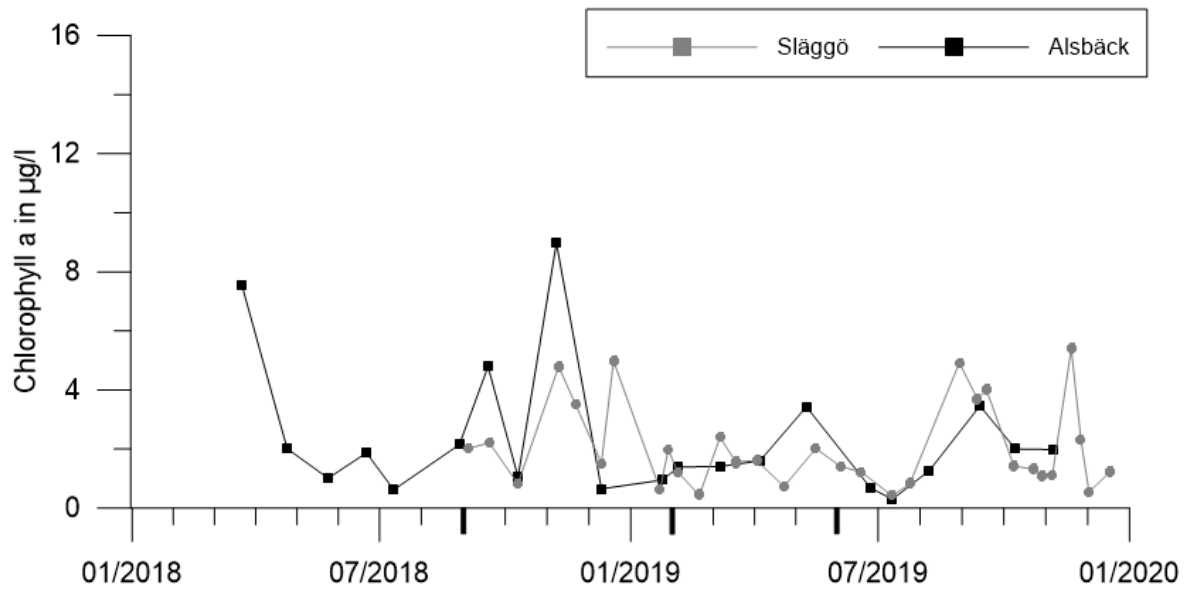


Fig. S3 Bottom-water oxygenation of monitoring sites Släggö and Björkholmen (SMHI) and study sites GF 71 and -117.

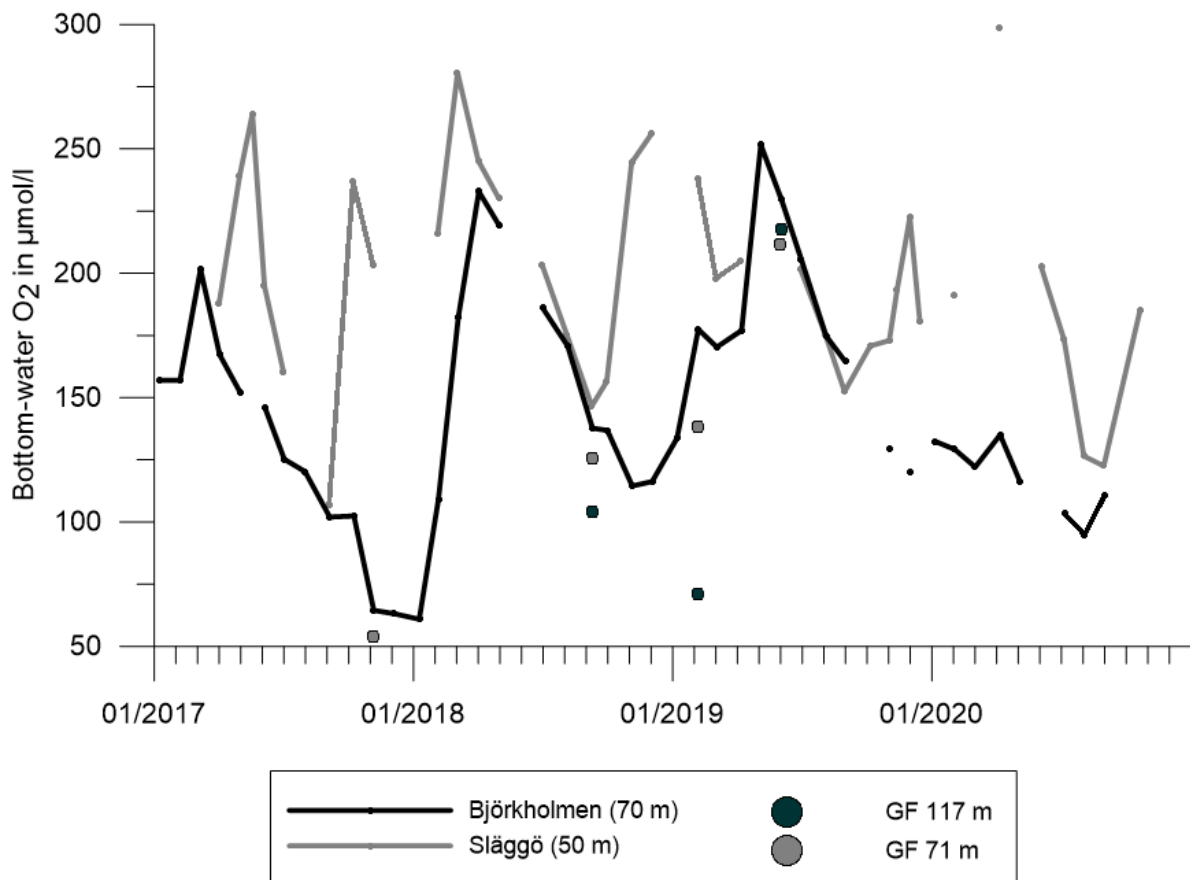


Fig. S4 Correlation plots of (a) dissolved Ba-Mn concentrations and (b) dissolved Ba-Fe concentrations over top 15–21 cm sediment column (Pearson's r results given if significant).

