Journal of Global Biogeochemical Cycles

Supporting Information for

Estimating biogenic silica production of Rhizaria in the global ocean

Natalia Llopis Monferrer[1,2], Demetrio Boltovskoy[3], Paul Tréguer[1], Miguel Méndez Sandin[2], Fabrice Not[2], Aude Leynaert[1]

[1]Univ Brest, CNRS, IRD, Ifremer, LEMAR, F-29280 Plouzane, France
[2]Sorbonne University, CNRS, UMR7144, Ecology of Marine Plankton Team, Station Biologique de Roscoff, Roscoff, France
[3]University of Buenos Aires-CONICET · Institute of Ecology, Genetics and Evolution of Buenos Aires, Argentina

Contents of this file

Additional Supporting Information (Files uploaded separately)

Figure S1. Linear and an exponential regressions using data from Tables S2 and S3. This figure shows the best fit analysis of living cells with depth for Polycystina (a) and Phaeodaria (b) in warm waters and for Polycystina (c) and Phaeodaria (d) in cold waters.

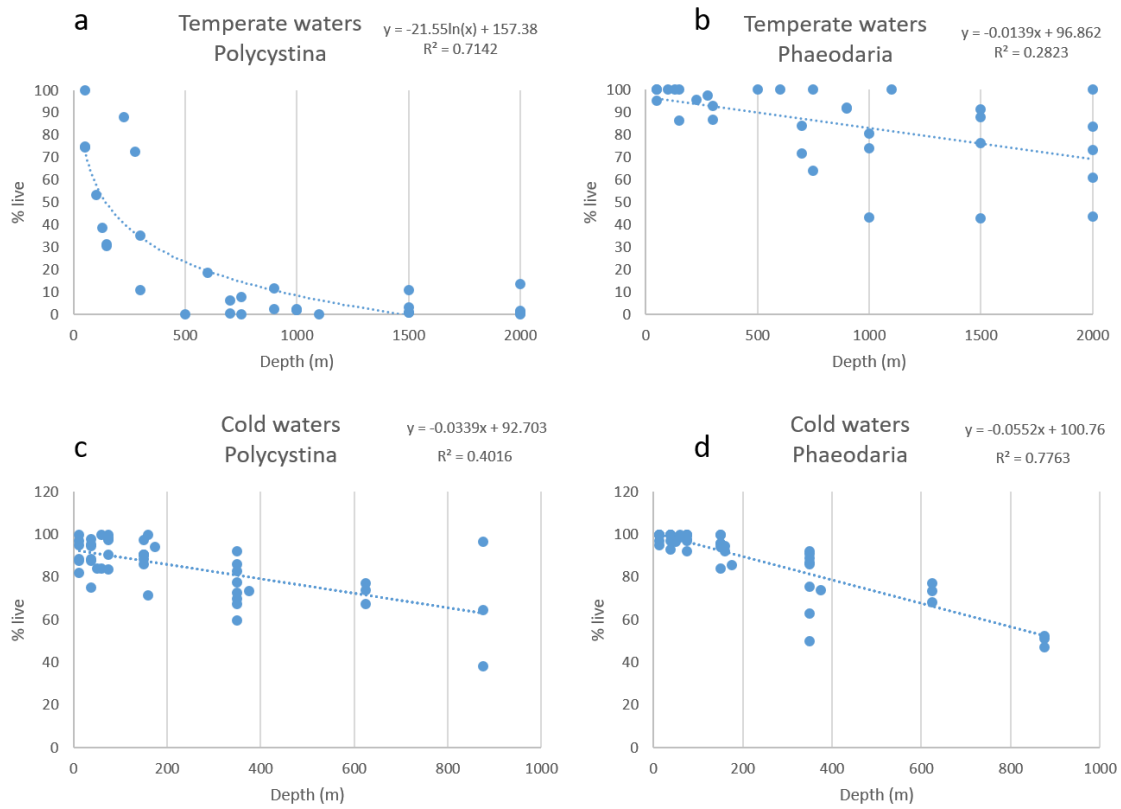

Table S1. Morphometric measurements (obtained for this study, including mostly small-sized Polycystina and larger Phaeodaria) added to the Biard et al. (2018) allometric relationship between cell size and Silica content. This new relationship encompasses a wider size spectrum than that covered by previous studies.

ID	Group	Length (µm)	Biovolume ($µm^3$)	ESD (µm)	Silica (µg Si $cell^{-1}$)
MOOSEGE17	Aulacantha	803	272991090.3	804.85	2.88
MOOSEGE17	Aulacantha	901	382977266.7	901.00	1.56
MOOSEGE17	Aulacantha	725	145324999.6	652.30	1.65
MOOSEGE17	Aulacantha	981	494317111.5	981.00	2.38
MOOSEGE17	Aulacantha	840	310339088.7	840.00	1.11
MOOSEGE17	Aulacantha	1031	573818595.5	1031.00	2.01
MOOSEGE17	Aulacantha	980	492806978.8	980.00	1.11
MOOSEGE17	Aulacantha	958	460357422.2	958.00	1.13
MOOSEGE17	Aulacantha	760	172412053.8	690.54	3.99
MOOSEGE17	Aulacantha	760	172412053.8	690.54	1.09
MOOSEGE17	Aulacantha	760	172412053.8	690.54	1.49
MOOSEGE17	Aulacantha	760	172412053.8	690.54	0.63
MOOSEGE17	Aulacantha	921	409984710.4	921.70	1.69
MOOSEGE17	Aulacantha	834	311525152.9	841.07	1.65
MOOSEGE17	Aulacantha	834	311525152.9	841.07	1.45
MOOSEGE17	Aulacantha	834	311525152.9	841.07	2.12
MOOSEGE17	Aulacantha	834	311525152.9	841.07	1.77
MOOSEGE17	Collodaria	190	4222516.662	200.54	0.11
MOOSEGE17	Collodaria	171	2317265.835	164.18	0.07
MOOSEGE17	Collodaria	103	571228.3216	102.94	0.02
MOOSEGE17	Collodaria	165	2363884.292	165.28	0.05
MOOSEGE17	Collodaria	138	1179034.683	131.07	0.06
MOOSEGE17	Collodaria	138	1281858.128	134.78	0.18
MOOSEGE17	Nassellaria	131	267587.4123	79.95	0.14
MOOSEGE17	Nassellaria	115	278585.8094	81.03	0.22
MOOSEGE17	Nassellaria	128	266264.7429	79.82	0.07
MOOSEGE17	Challengeria	258	7245191.541	240.08	0.61
MOOSEGE17	Challengeria	202	677169.4026	108.95	0.11
MOOSEGE17	Challengeria	146	244479.3621	77.58	0.14
MOOSEGE17	Challengeria	186	468032.8609	96.33	0.07
MOOSEGE17	Challengeria	186	468032.8609	96.33	0.12
MOOSEGE17	Spumellaria	195	3072241.535	180.36	0.85
MOOSEGE17	Spumellaria	199	3742163.018	192.62	0.62
MOOSEGE17	Spumellaria	108	632439.2531	106.50	0.05
MOOSEGE17	Spumellaria	145	420514.3667	92.95	0.11

Table S2. Data used to estimate the proportions of living cells as function of depth in temperate waters based on studies that used the more reliable techniques (nuclear stains) to determine living cells.

Temperate waters					
Source	Depth (m)	% Poly live	% Ph live	% Poly live (equation)	% Ph live (equation)
Gowing 89	50	100.0	100.0	73.1	96.2
Gowing 86	50	75.1	95.1	73.1	96.2
Gowing 86	50	74.7	100.0	73.1	96.2
Gowing 89	100	53.5	100.0	58.1	95.6
Gowing 89	130	38.7	100.0	52.5	95.2
Gowing 89	150	30.8	100.0	49.4	94.9
Gowing 86	150	31.5	86.3	49.4	94.9
Gowing 89	225	88.0	95.4	40.7	93.9
Gowing 89	275	72.7	97.3	36.3	93.3
Gowing 89	300	35.1	86.6	34.5	93.0
Gowing 86	300	11.0	92.7	34.5	93.0
Gowing 86	500	0.0	100.0	23.5	90.4
Gowing 89	600	18.8	100.0	19.5	89.1
Gowing 86	700	6.3	71.5	16.2	87.8
Gowing 86	700	0.7	84.1	16.2	87.8
Gowing 89	750	0.0	64.0	14.7	87.1
Gowing 89	750	7.7	100.0	14.7	87.1
Gowing 89	900	11.8	91.8	10.8	85.2
Gowing 86	900	2.6	92.0	10.8	85.2
Gowing 89	1000	2.2	80.4	8.5	83.9
Gowing 89	1000	2.0	43.2	8.5	83.9
Gowing 86	1000	2.6	73.9	8.5	83.9
Gowing 86	1100	0.0	100.0	6.5	82.6
Gowing 89	1500	0.8	76.2	-0.2	77.4
Gowing 89	1500	3.3	42.8	-0.2	77.4
Gowing 89	1500	10.9	91.3	-0.2	77.4
Gowing 86	1500	1.1	87.9	-0.2	77.4
Gowing 89	2000	1.4	83.7	-6.4	70.9
Gowing 89	2000	0.2	43.6	-6.4	70.9
Gowing 89	2000	13.8	73.1	-6.4	70.9
Gowing 86	2000	1.7	60.8	-6.4	70.9
Gowing 86	2000	0.6	100.0	-6.4	70.9
Gowing 89	600	98.3	76.7	Outlier,eliminated	
Mean % live 0-200 m				**61**	**96**
Mean % live >200 m				**11**	**83**

Table S3. Data used to estimate the proportions of living cells as function of depth in cold waters based on studies that used the more reliable techniques (nuclear stains) to determine living cells.

Cold waters					
Source	Depth (m)	% Poly live	% Ph live	% Poly live (equation)	% Ph live (equation)
Klaas 2001	12.5	100.0	100.0	92.3	100.1
Klaas 2001	12.5	97.0	100.0	92.3	100.1
Klaas 2001	12.5	88.5	95.0	92.3	100.1
Klaas 2001	12.5	82.0	100.0	92.3	100.1
Klaas 2001	12.5	87.5	97.0	92.3	100.1
Klaas 2001	12.5	95.0	100.0	92.3	100.1
Klaas 2001	37.5	94.5	97.0	91.4	98.7
Klaas 2001	37.5	88.5	93.0	91.4	98.7
Klaas 2001	37.5	95.5	100.0	91.4	98.7
Klaas 2001	37.5	75.0	100.0	91.4	98.7
Klaas 2001	37.5	87.5	100.0	91.4	98.7
Klaas 2001	37.5	98.0	100.0	91.4	98.7
Nothig91	50	84.0	96.5	91.0	98.0
Nothig91	60	100.0	99.8	90.7	97.4
Nothig91	60	84.0	98.7	90.7	97.4
Klaas 2001	75	97.5	97.0	90.2	96.6
Klaas 2001	75	98.0	100.0	90.2	96.6
Klaas 2001	75	98.5	100.0	90.2	96.6
Klaas 2001	75	100.0	100.0	90.2	96.6
Klaas 2001	75	90.5	98.0	90.2	96.6
Klaas 2001	75	83.5	92.0	90.2	96.6
Klaas 2001	150	90.5	84.0	87.6	92.5
Klaas 2001	150	97.5	100.0	87.6	92.5
Klaas 2001	150	90.5	100.0	87.6	92.5
Klaas 2001	150	90.5	96.0	87.6	92.5
Klaas 2001	150	86.0	96.0	87.6	92.5
Klaas 2001	150	88.5	94.0	87.6	92.5
Nothig91	160	100.0	92.2	87.3	91.9
Nothig91	160	71.5	94.6	87.3	91.9
Nothig91	175	94.0	85.6	86.8	91.1
Nothig91	350	92.0	62.8	80.8	81.4
Nothig91	350	72.5	75.4	80.8	81.4
Klaas 2001	350	83.0	50.0	80.8	81.4
Klaas 2001	350	86.0	91.0	80.8	81.4
Klaas 2001	350	77.5	86.0	80.8	81.4
Klaas 2001	350	67.5	87.0	80.8	81.4

Klaas 2001	350	59.5	92.0	80.8	81.4
Klaas 2001	350	70.0	89.0	80.8	81.4
Nothig91	375	73.5	74.0	80.0	80.1
Nothig91	625	67.5	68.3	71.5	66.3
Nothig91	625	77.0	77.0	71.5	66.3
Nothig91	625	74.0	73.5	71.5	66.3
Nothig91	875	96.5	47.0	63.0	52.5
Nothig91	875	64.5	51.0	63.0	52.5
Nothig91	875	38.0	52.5	63.0	52.5
Mean % live 0-200 m				**90**	**97**
Mean % live >200 m				**75**	**73**

Data Set S1. Detail of the silica content of the rhizarians analysed per sample. ESD: equivalent spherical diameter.

Data Set S2. Detail of the particulate organic carbon (POC) and particulate organic nitrogen (PON) content of the rhizarians analysed per sample. ESD: equivalent spherical diameter.

Data Set S3. Database containing Polycystina and Phaeodaria densities (cells m^{-3}) from 1191 data points from 22 publications. This compilation, mainly based on Boltovskoy et al. (2010) was supplemented with more recent studies. These data were used to perform an estimate of rhizarians abundances worldwide.