Electronic supplements to: "Stable oxygen isotope composition is biased by shell calcification intensity in planktonic Foraminifera"

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1 Material and methods

Table S1. Sample metadata for material from sediment trap Kiel 276-25.

Sample	Start date	End date	Sampling dur. (d)	SST (°C)	SSS
1	2005-05-01	2005-07-01	61	20.95	36.63
3	2005-09-01	2005-11-01	61	22.93	36.76
5	2006-01-01	2006-02-01	31	18.25	36.65
7	2006-03-01	2006-04-01	31	18.23	36.58

SST: Sea surface temperature after Reynolds et al. (2002); SSS: Sea surface salinity after Good et al. (2013)

Table S2. Number of specimens of three species of planktonic Foraminifera from sediment trap Kiel 276-25 used for shell calcification intensity (calci.) and stable isotope composition (geochem.) analyses.

Species	Sample 1	Sample 3	Sample 5	Sample 7
Globigerinoides ruber (pink) calci.	27	55	2	0
Globigerinoides ruber (pink) geochem.	19	21	2	0
Globigerinoides ruber (white) calci.	60	92	70	34
Globigerinoides ruber (white) geochem.	11	7	12	12
Globigerinoides elongatus calci.	38	75	34	41
Globigerinoides elongatus geochem.	13	12	13	14

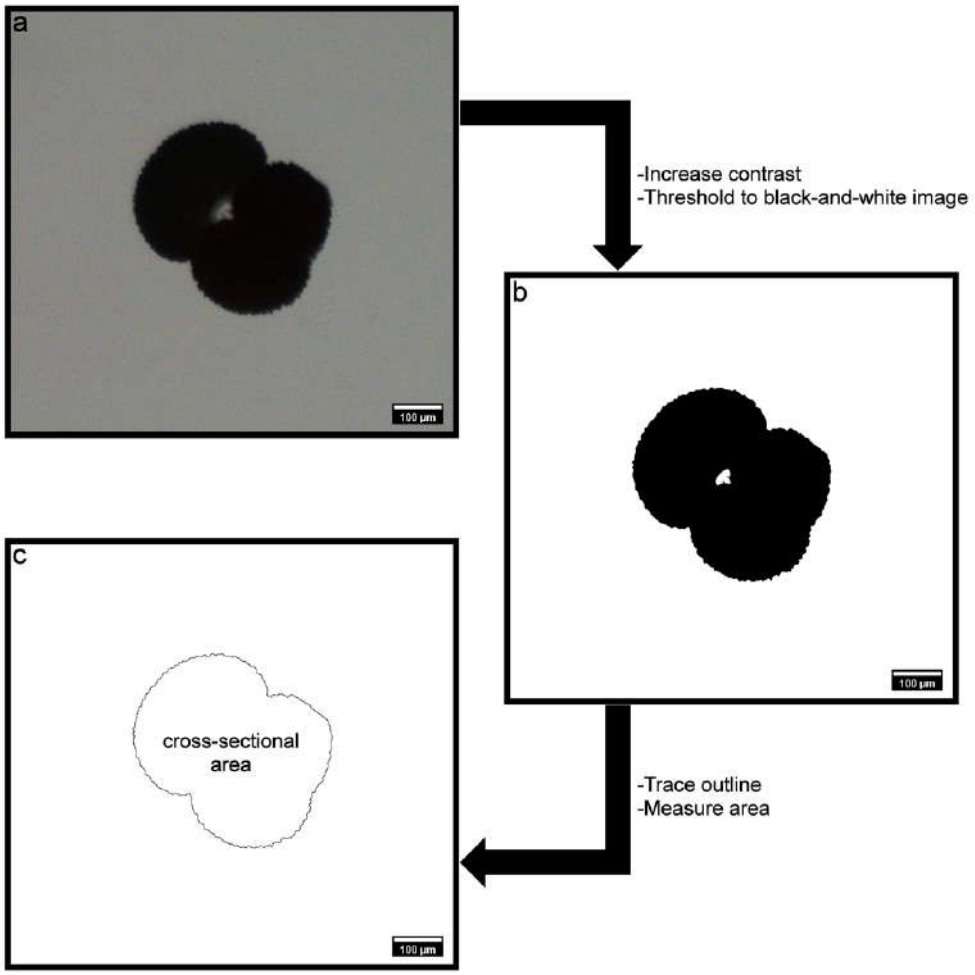

Fig. S1. Flowchart of size measurements of planktonic foraminiferal shells for shell calcification intensity analyses. The contrast in the raw image (a) with a planktonic foraminifer in apertural standard view is increased and the image is converted into a black-and-white threshold image (b). Within this image, the shell is automatically traced and its size measured as cross-sectional area (c).

2 Results

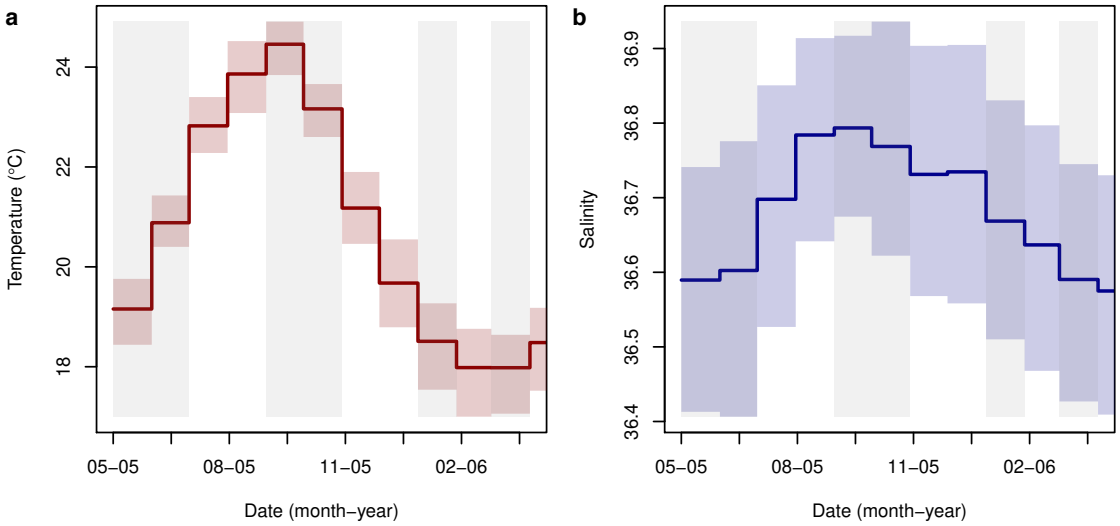

Fig. S2. Sea surface temperature Reynolds et al. (2002, a) and sea surface salinity Good et al. (2013, b) in the catchment area of sediment trap Kiel 276-25 during the sampling period. The range of values across the catchment area is indicated as shaded area, the sampling intervals are indicated as grey rectangles.

Table S3. Measured mean foraminiferal shell parameters of three species of planktonic Foraminifera from sediment trap Kiel 276-25.

Species	Diam. (µm)	Weight (µg)	ρ_A (1×10^4 µg µm^{-2})	δ^{13}C (‰)	δ^{18}O (‰)
G. ruber (pink)	334.2	10.15	1.31	0.334	−0.533
G. ruber (white)	240.8	4.90	1.26	−0.588	−0.363
G. elongatus	273.5	6.89	1.43	−0.215	−0.206

Diam: Shell Feret diameter; ρ_A: Shell calcification intensity; stable isotopes measured on the Vienna Pee Dee Belemnite scale normalized against NBS-19

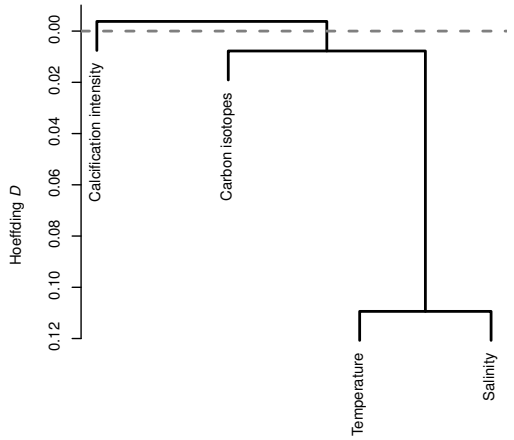

Fig. S3. Complete linkage clustering on the Hoeffding D-similarity Hoeffding (1948) of sea surface temperature Reynolds et al. (2002), sea surface salinity Good et al. (2013), photosynthetic activity (approximated by shell $\delta^{13}C$), and shell calcification intensity of planktonic Foraminifera from sediment trap Kiel 276-25. A similarity value of 0 (values >0 imply collinearity) is indicated by the dashed grey line.

3 Discussion

Table S4. Estimated carbonate system parameters of the ambient sea water in the region of sediment trap Kiel 276-25, based on data from the ESTOC time series (González-Dávila, 2016a, 2016b).

Date	Depth (m)	T (°C)	S	TA (µmol kg^{-1})	pH	CO_3^{2-} (µmol kg^{-1})	Ω_{Ca}
2005-03-19	10.0	18.0	36.7	2401.90	8.00	171.86	4.05
2005-03-19	1976.9	4.5	35.1	2340.99	7.75	60.93	1.40
2005-04-13	0.3	19.1	36.7	2402.38	8.01	181.67	4.29
2005-04-13	200.1	16.9	36.4	2392.03	7.94	146.00	3.44
2005-09-28	5.0	23.9	36.9	2418.41	8.03	220.98	5.22
2005-09-28	199.9	16.6	36.4	2387.05	7.92	140.08	3.30
2005-11-22	11.6	22.0	36.9	2412.60	8.03	207.44	4.90
2005-11-22	1800.0	4.4	35.1	2343.95	7.76	61.94	1.43
2006-03-04	12.7	17.9	36.7	2405.59	8.00	172.41	4.06
2006-03-04	2002.2	4.4	35.1	2342.17	7.74	60.17	1.38

T: Water temperature; S: Water salinity; TA: Total alkalinity; pH measured on the total scale; CO_3^{2-}: Carbonate concentration; Ω_{Ca}: Calcite saturation state

4 Scanning electron micrographs

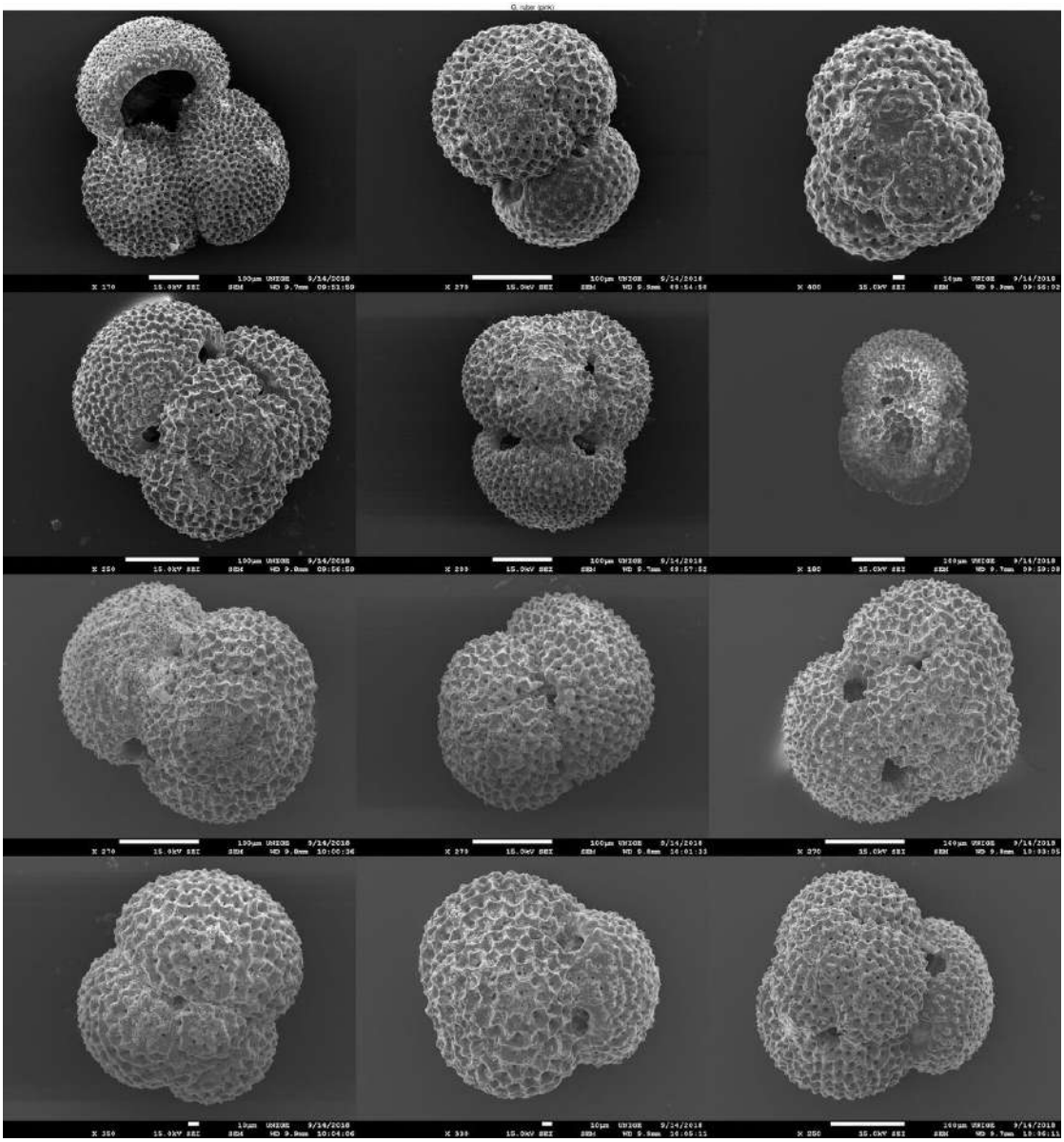

Fig. S4. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (pink) from sediment trap Kiel 276-25.

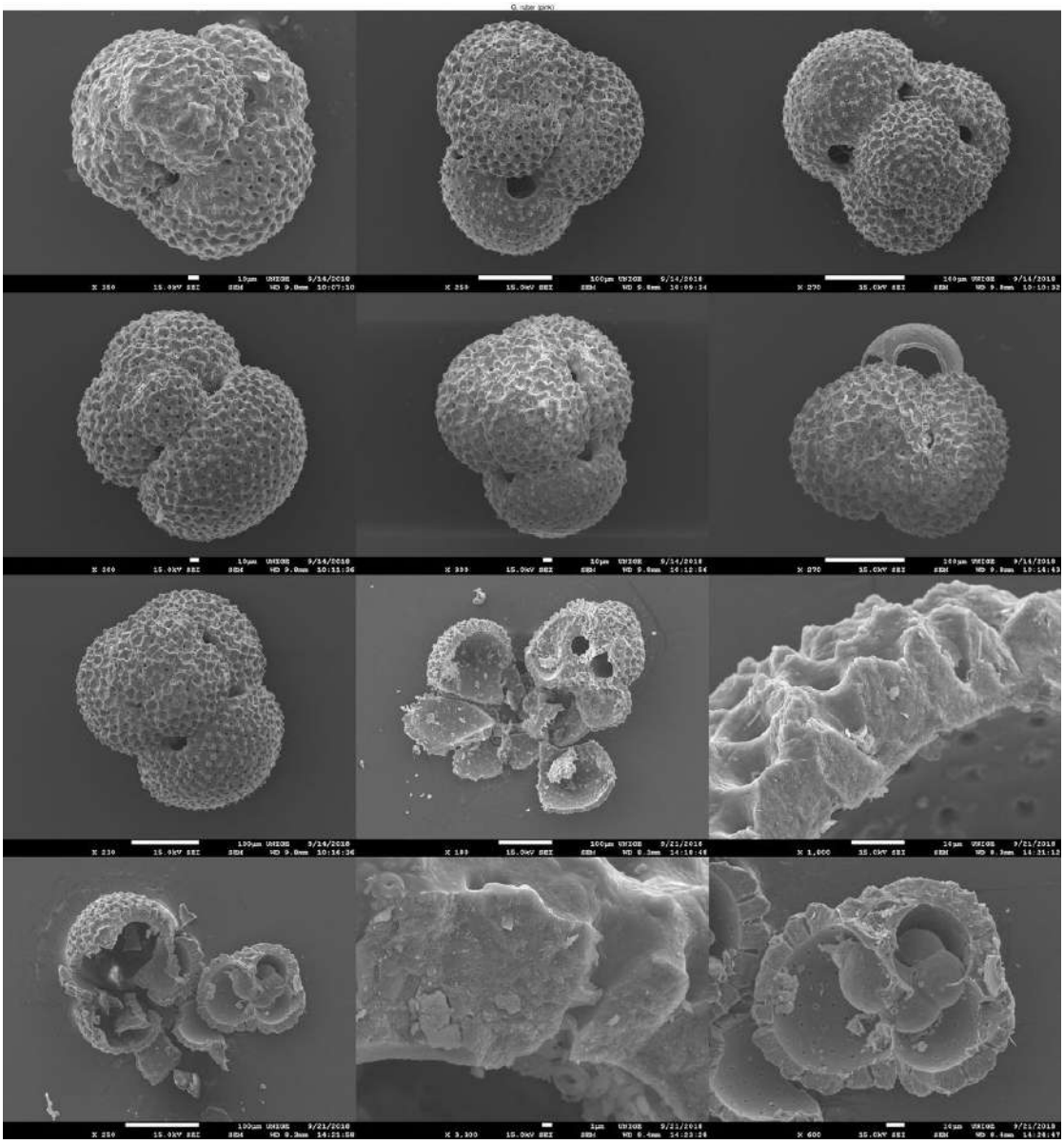

Fig. S4. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (pink) from sediment trap Kiel 276-25 (continued).

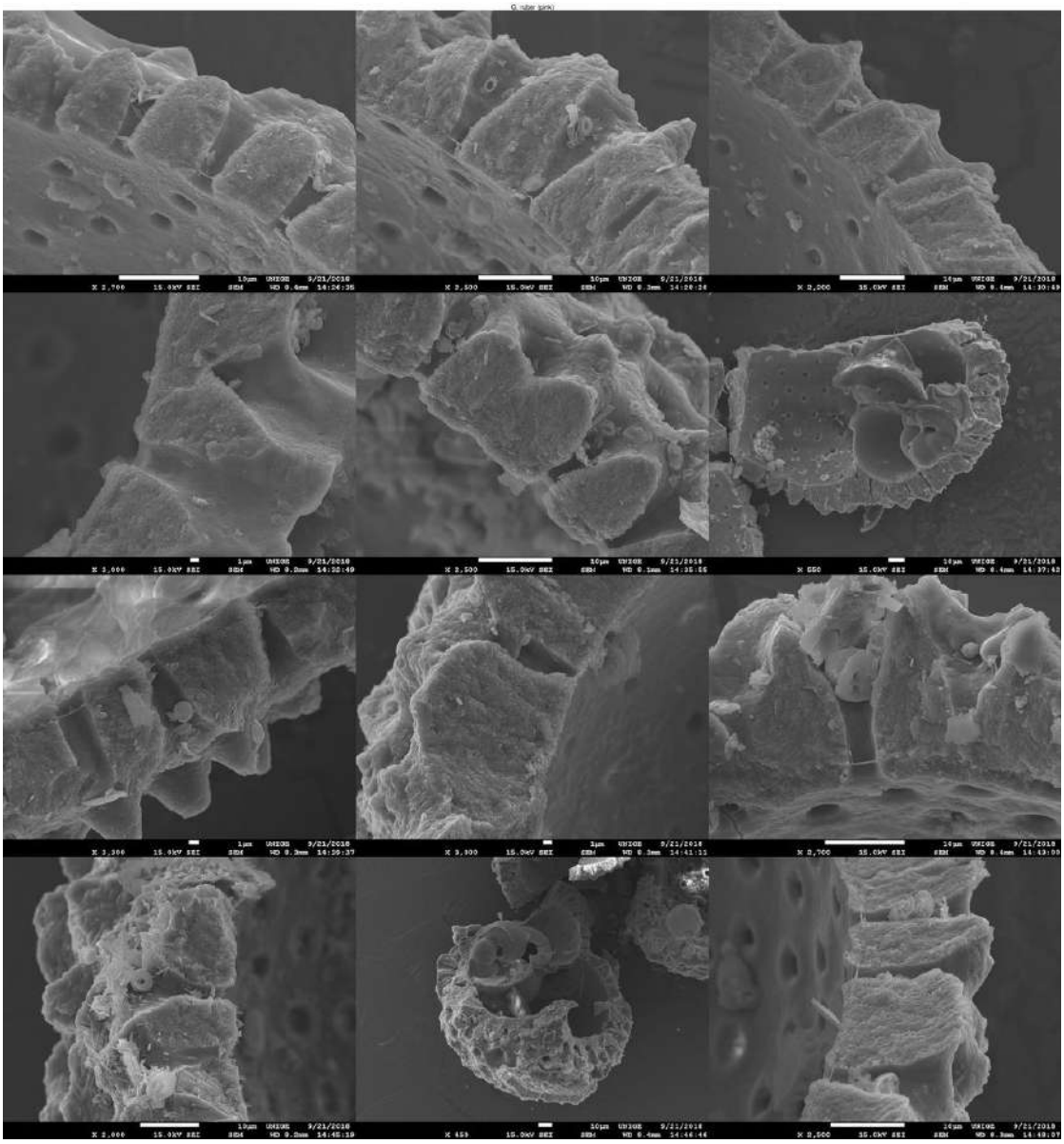

Fig. S4. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (pink) from sediment trap Kiel 276-25 (continued).

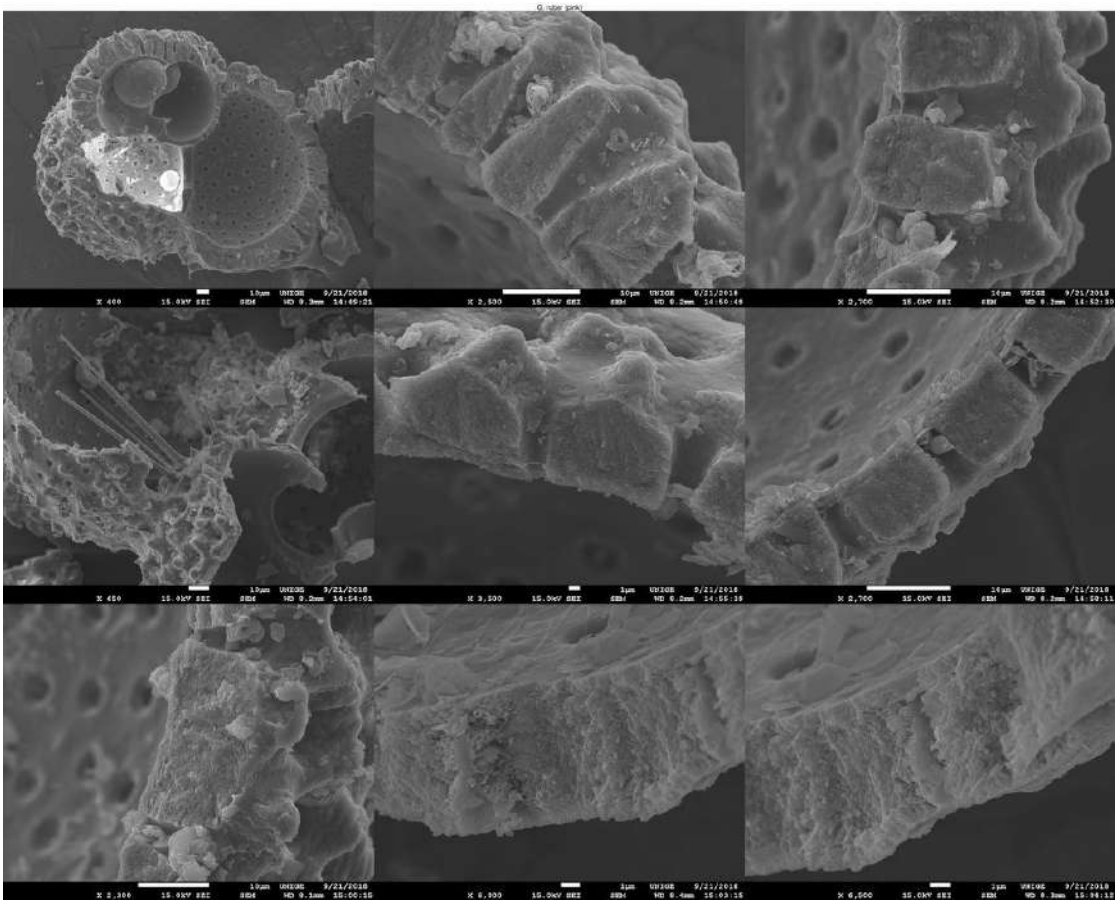

Fig. S4. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (pink) from sediment trap Kiel 276-25 (continued).

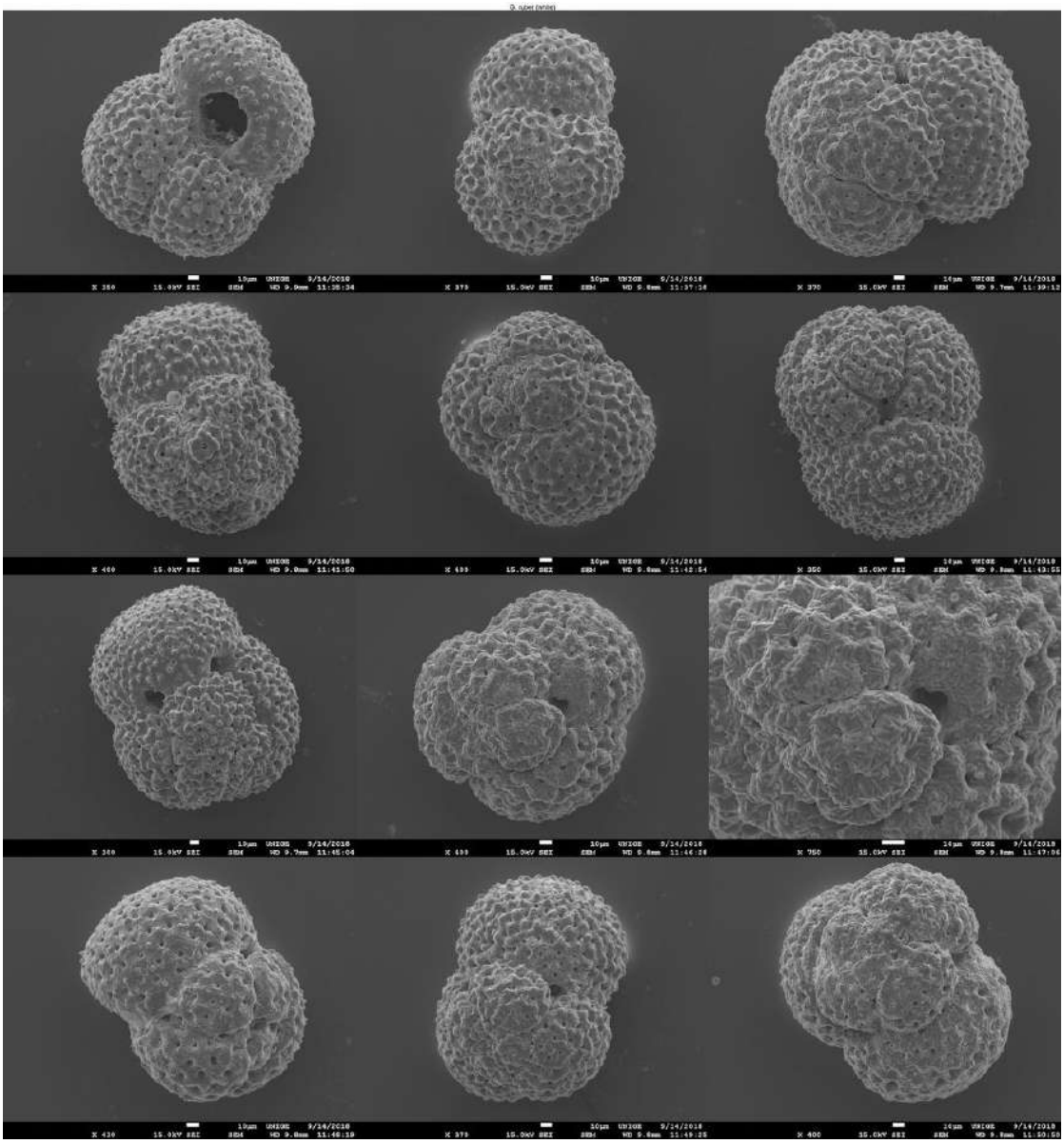

Fig. S5. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (white) from sediment trap Kiel 276-25.

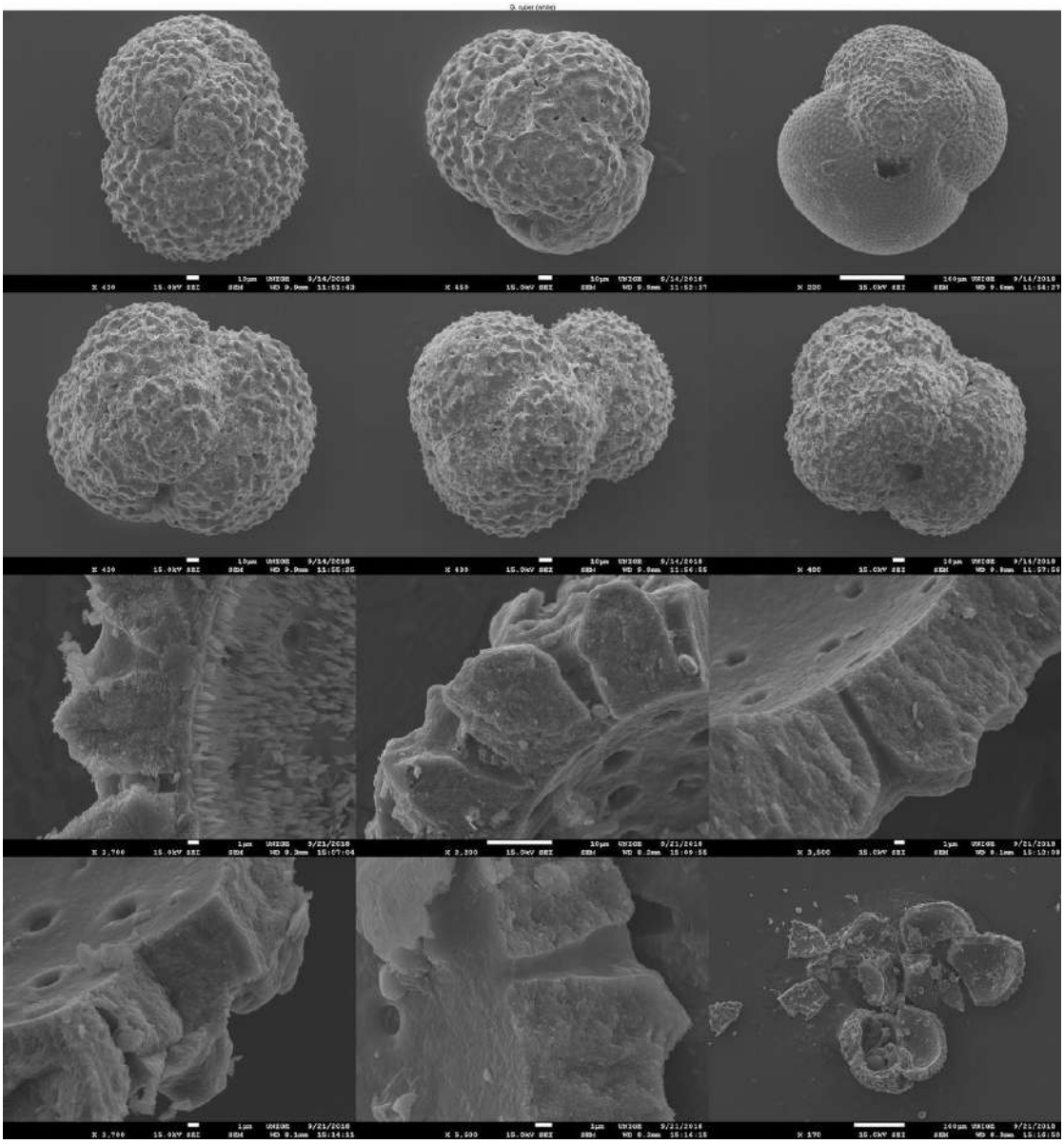

Fig. S5. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (white) from sediment trap Kiel 276-25 (continued).

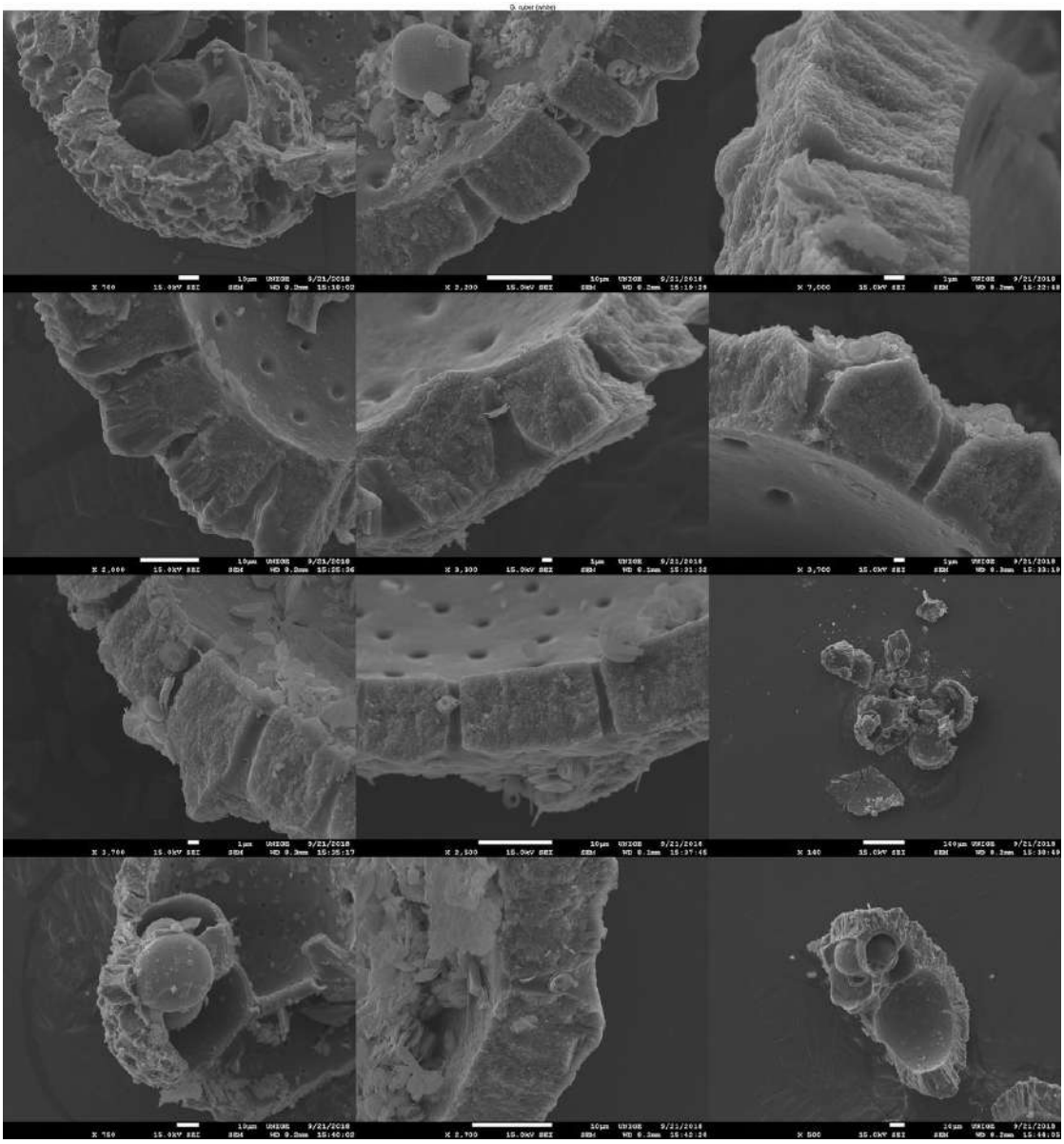

Fig. S5. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (white) from sediment trap Kiel 276-25 (continued).

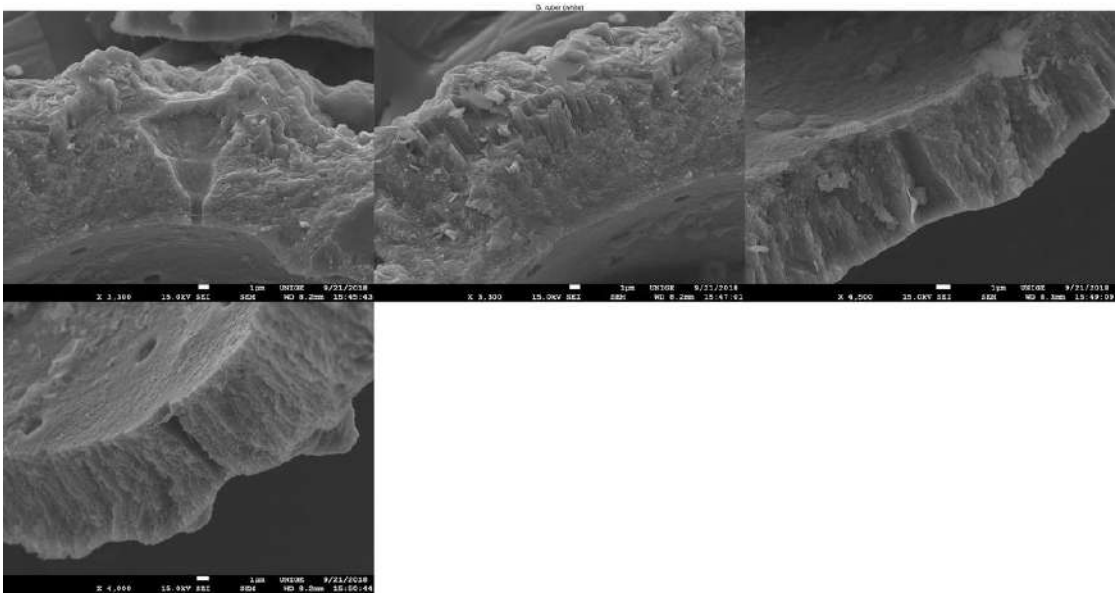

Fig. S5. Scanning electron micrographs of randomly selected specimens of *Globigerinoides ruber* (white) from sediment trap Kiel 276-25 (continued).

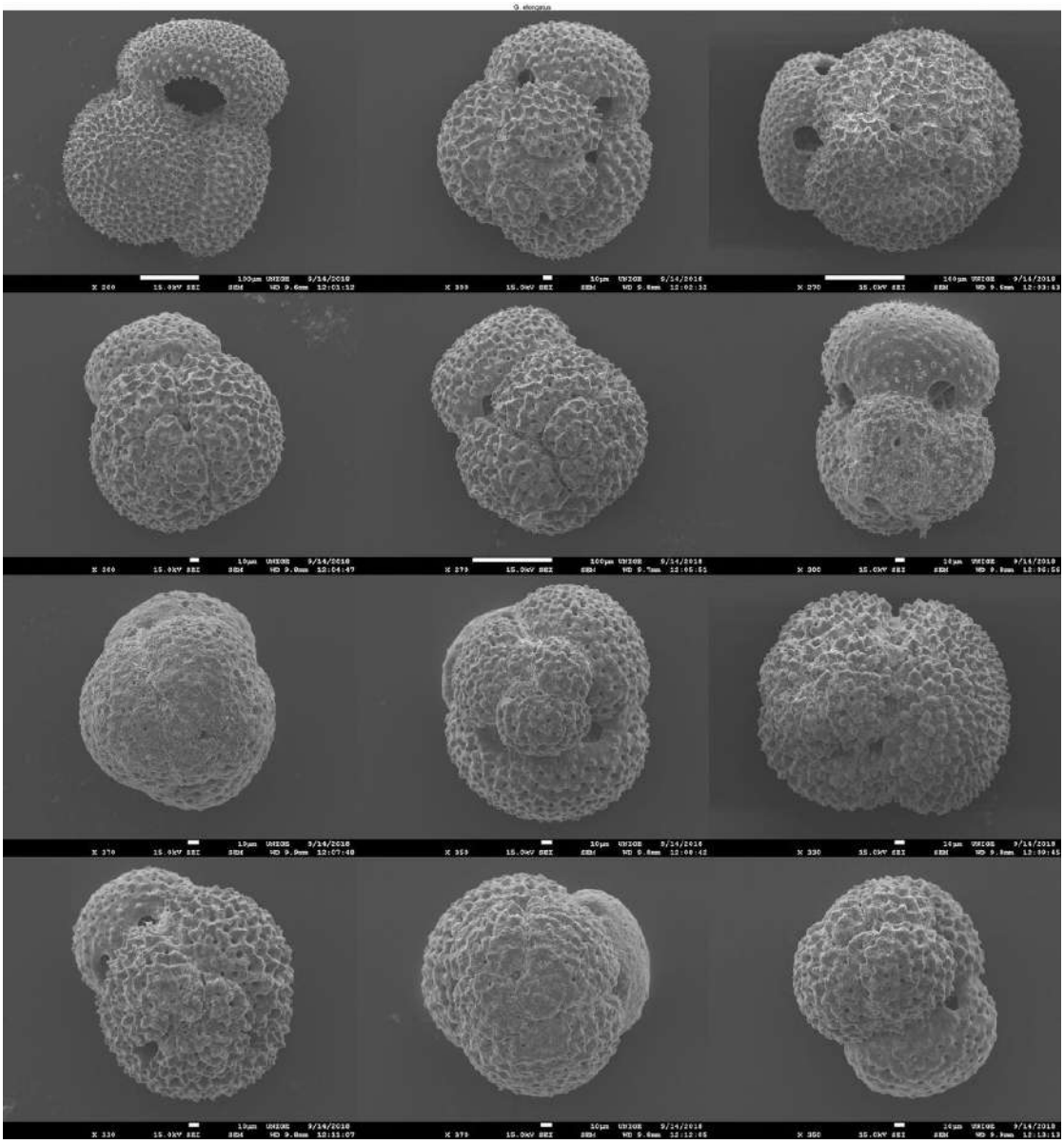

Fig. S6. Scanning electron micrographs of randomly selected specimens of *Globigerinoides elongatus* from sediment trap Kiel 276-25.

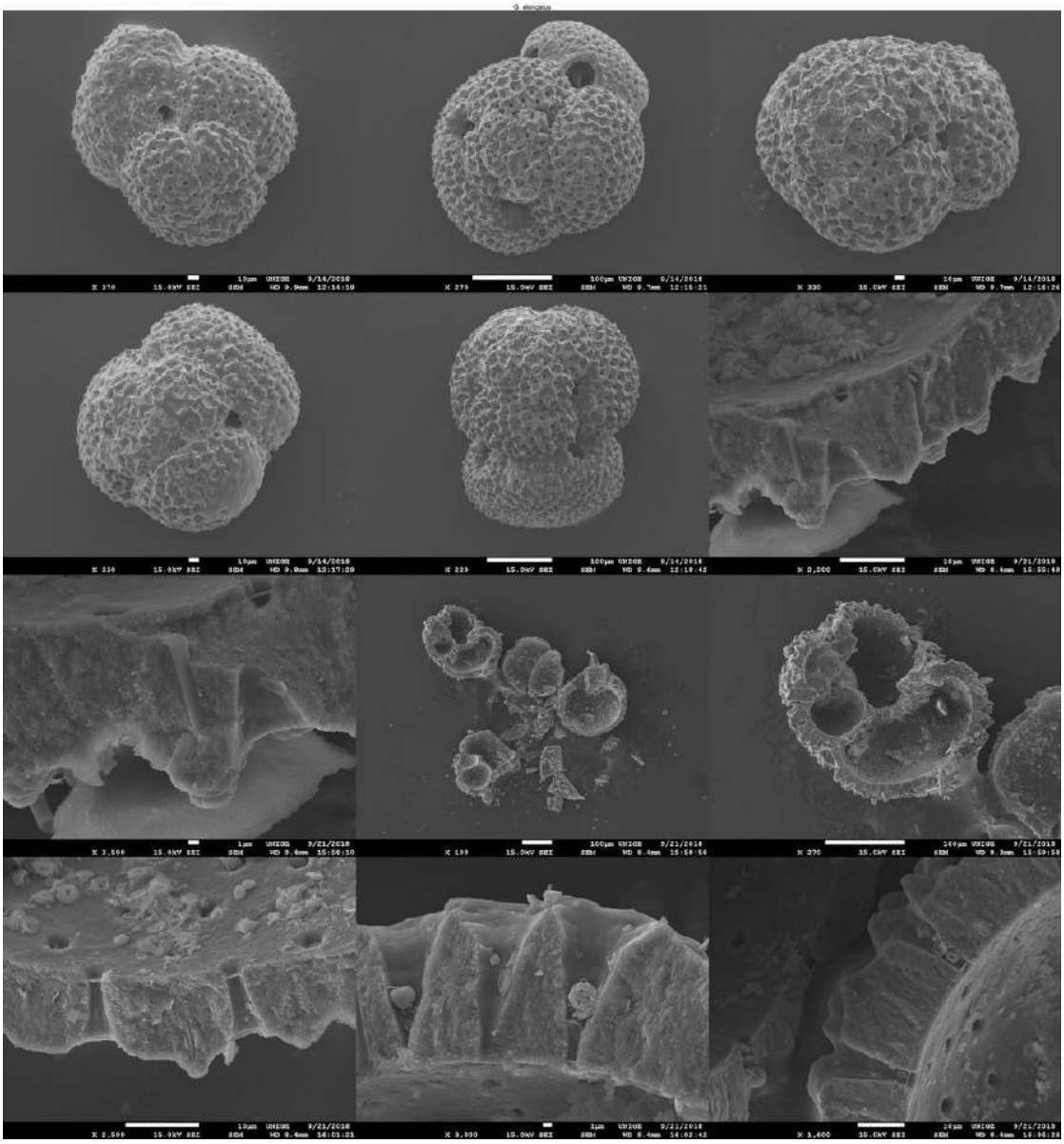

Fig. S6. Scanning electron micrographs of randomly selected specimens of *Globigerinoides elongatus* from sediment trap Kiel 276-25 (continued).

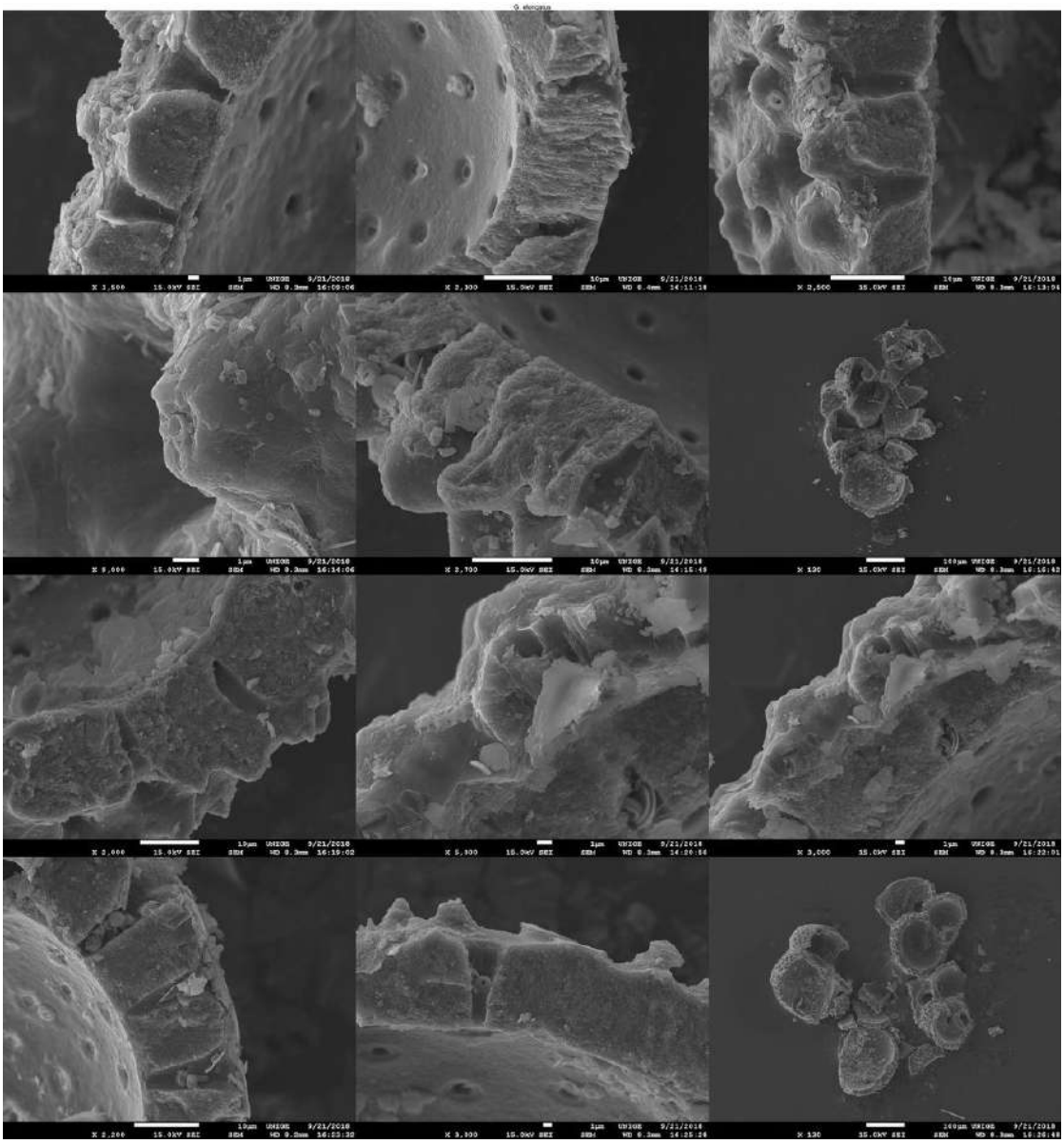

Fig. S6. Scanning electron micrographs of randomly selected specimens of *Globigerinoides elongatus* from sediment trap Kiel 276-25 (continued).

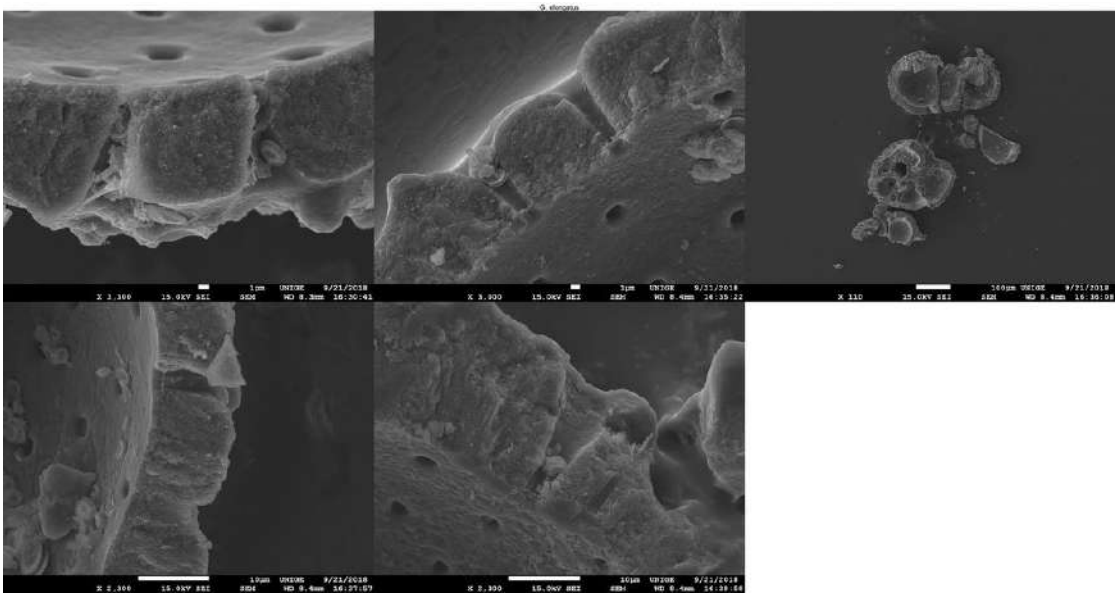

Fig. S6. Scanning electron micrographs of randomly selected specimens of *Globigerinoides elongatus* from sediment trap Kiel 276-25 (continued).

References

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