Microfossil evidence for trophic changes during the Eocene-Oligocene transition in the South Atlantic (ODP Site 1263, Walvis Ridge)

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Microfossil evidence for trophic changes during the Eocene–Oligocene transition in the South Atlantic (ODP Site 1263, Walvis Ridge)

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Table S1. Planktonic foraminifer marker species at Site 1263 from 93.42 to 107.29 mcd. A: absent; P: present.

Sample ID	Depth (mcd)	*Turborotalia cerroazulensis*	*Turborotalia cunialensis*	*Turborotalia cocoaensis*	*Hantkenina* spp. tubulospines	*Hantkenina* spp. specimens	250< >150 µm fraction			150< >125 µm fraction		
							Pseudohastigerina micra	*Pseudohastigerina naguewichiensis*	Total planktonic specimens	*Pseudohastigerina micra*	*Pseudohastigerina naguewichiensis*	Total planktonic specimens
1263A, 10H-3, 33-35 cm	93.42	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-3, 78-80 cm	93.87	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-3, 133-135 cm	94.42	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-4, 33-35 cm	94.92	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-4, 78-80 cm	95.37	A	A	A	A	A	0	0	300	0	2	300
1263A, 10H-4, 123-125 cm	95.82	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-5, 18-20 cm	96.27	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-5, 32-34 cm	96.41	A	A	A	A	A	0	0	300	0	0	300
1263B, 4H-CC	97.14	A	A	A	A	A	0	0	300	0	0	300
1263A, 10H-6, 32-34 cm	97.91	P	P	P	P	P	3	0	300	29	6	300
1263A, 10H-7, 32-34 cm	99.41	P	P	P	P	P	1	0	300	19	0	300
1263A, 10H-CC	99.97	A	P	A	P	P	0	0	300	61	2	300
1263A, 11H-1, 32-34 cm	101.29	P	A	P	P	P	5	0	300	22	0	300
1263A, 11H-3, 47-49 cm	104.44	A	A	A	P	P	1	0	163	4	0	67
1263A, 11H-4, 32-34 cm	105.79	P	P	P	P	P	0	0	300	11	0	300
1263A, 11H-5, 32-34 cm	107.29	P	P	P	P	P	0	0	300	44	0	207

Table S2. Factor scores obtained in the PCA performed with and without the presence of the marker species for dataset A. The bold numbers are the most important loadings.

	DATASET A			
	Markers		No Markers	
Species	**PC1**	**PC2**	**PC1**	**PC2**
Braarudosphaera bigelowii	-0.02	0.00	-0.02	0.00
Bramlettei serraculoides	0.16	0.09	0.17	0.08
Clausicoccus obrutus	**-0.63**	0.08	**-0.64**	0.12
Clausicoccus subdistichus	0.15	0.04	0.15	0.03
Chiasmolithus spp.	-0.07	-0.07	-0.07	-0.08
Chiasmolithus altus	-0.02	-0.07	-	-
Coccolithus pelagicus (3-7µm)	-0.09	**0.22**	-0.09	**0.24**
Coccolithus pelagicus (7-11µm)	-0.02	**0.19**	-0.02	**0.21**
Coccolithus pelagicus (11-16µm)	-0.16	-0.07	-0.16	-0.07
Coccolithus eopelagicus	0.01	0.08	0.01	0.08
Coccolithus cachaoi	0.10	0.03	0.10	0.03
Coccolithus formosus	-0.10	0.27	-	-
Cyclicargolithus sp. (3-5µm)	-0.13	-0.13	-0.13	-0.14
Cyclicargolithus sp. (5-7µm)	0.03	-0.05	0.02	-0.04
Cyclicargolithus sp. (7-10µm)	-0.13	0.18	-0.13	0.17
C. floridanus (3-5µm)	**-0.29**	-0.03	**-0.29**	-0.03
C. floridanus (5-7µm)	**-0.19**	**-0.21**	**-0.19**	**-0.20**
C. floridanus (7-10µm)	-0.08	0.03	-0.08	0.02
Dictyococcites stavensis	**0.31**	**-0.22**	**0.30**	**-0.23**
Dictyococcites bisectus	**0.22**	-0.15	**0.22**	-0.17
Reticulofenestra daviesii	**0.22**	-0.08	**0.22**	-0.10
Discoaster spp.	0.16	0.13	0.16	0.13
Hayella situliformis	0.12	0.10	0.12	0.10
Isthmolithus recurvus	0.10	**0.20**	0.10	**0.20**
Lanternithus minutus	-0.11	**-0.68**	-0.12	**-0.71**
Reticulofenestra umbilicus	**0.17**	0.06	**0.17**	0.05
Reticulofenestra hillae	-0.04	0.15	-0.03	0.12
Reticulofenestra sp1	0.02	0.04	0.02	0.04
Reticulofenestra scrippsae	0.09	0.03	0.09	0.03
Reticulofenestra samodurovii	0.10	0.03	0.10	0.03
Helicosphaera spp.	0.08	-0.10	0.08	-0.10
Sphenolithus spp.	0.02	**0.20**	0.02	**0.22**
Sphenolithus akropodus	-0.01	-0.04	-	-
Sphenolithus tribulosus	0.00	-0.01	-	-
Zygrhablithus bijugathus	0.08	0.15	0.08	0.16

Table S3. Factor scores obtained in the PCA performed without marker species for dataset B. The bold numbers are the most important loadings.

	DATASET B	
	No Markers	
Species	**PC1**	**PC2**
Bicolumnus ovatus	0.06	0.04
Bramlettei serraculoides	0.07	**-0.33**
Chiasmolithus spp.	-0.03	-0.08
Clausicoccus obrutus	**-0.62**	0.04
Clausicoccus subdistichus	-0.05	0.00
Coccolithus pelagicus (<6µm)	-0.03	0.16
Coccolithus pelagicus (6-10µm)	0.03	-0.04
Coccolithus pelagicus (>10µm)	-0.10	**-0.34**
Coccolithus eopelagicus	0.03	-0.07
Cyclicargolithus sp.	**-0.28**	0.08
Cyclicargolithus floridanus	-0.16	0.21
Dictyococcites bisectus	**0.22**	-0.15
Discoaster spp.	**0.41**	0.02
Hayella situliformis	0.15	0.01
Helicosphaera sp.	0.08	0.02
Isthmolithus recurvus	0.13	0.03
Lanternithus minutus	0.12	**0.71**
Micrantolithus sp.	-0.05	-0.04
Reticulofenestra daviesii	0.12	0.14
Reticulofenestra spp. (dissolved)	0.04	-0.01
Reticulofenestra dictyoda	0.03	-0.02
Reticulofenestra hillae	-0.01	-0.01
Reticulofenestra samodurovii	0.11	-0.09
Reticulofenestra scrippsae	0.08	**0.28**
R. scrippsae-bisecta	0.14	-0.10
Reticulofenestra umbilicus	**0.27**	-0.14
Sphenolithus spp.	0.09	0.00
Zygrhablithus bijugathus	0.03	-0.07
Octolithus	-0.03	-0.04
Discorhabdulus	0.03	0.03
Unknown	0.04	0.06
Dissolved shields	**0.27**	0.09

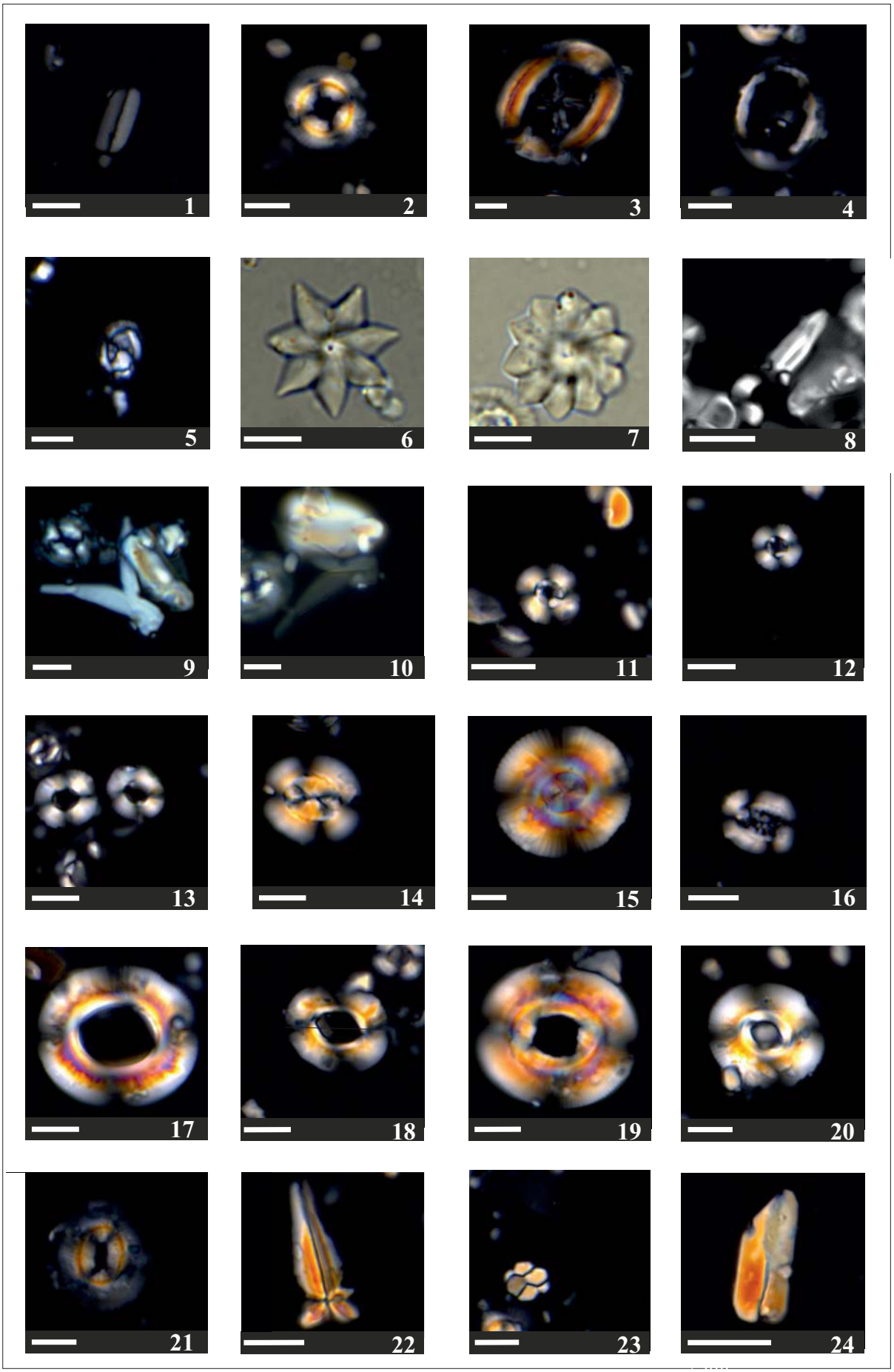
Taxonomic remarks: Taxonomic description of the group *Reticulofenestra circus* cited in the text.

Description: Medium to large round-elliptical placolith with a wide collar around a small central opening (<1/3 of the total length). All the segments are strongly birefringent. Similar to *Reticulofenestra hillae* (size range: >14 µm), but with subcircular outline and smaller in size.

Size: In dataset A, *Reticulofenestra circus* group includes specimens of *R. circus* and *R. circus* var. *lata* (size range: 8-14 µm). In dataset B, these two populations have been counted separately as *R. circus* (size range: 8-9 µm) and *R. hillae* (elliptical to subcircular reticulofenestrids, size range:10-14 µm).

Fig. S1. Most representative calcareous nannofossil species from the ODP Site 1263, light microscope images. Scale bar is = 5 µm. **1.** *Isthmolithus recurvus*, 1263B-5H-2/111-112 cm, 101.13 mcd, cross nicols (XN). **2.** *Coccolithus formosus*, 1263B-5H-2/65-66 cm, 100.67 mcd, XN. **3.** *Chiasmolithus altus*, 1263B-4H-2/131-132 cm, 89.4 mcd, XN. **4.** *Chiasmolithus* sp. (central area dissolved), 1263A-10H-5/131-132 cm, 97.44 mcd, XN. **5.** *Clausicoccus obrutus*, 1263A-10H-4/120-121 cm, 95.79 mcd, XN. **6.** *Discoaster saipanensis*, 1263B-5H-5/50-52 cm, 105.02 mcd, parallel nicols (PN). **7.** *Discoaster barbadiensis*, 1263B-5H-5/50-52 cm, 105.02 mcd, PN. **8.** *Sphenolithus akropodus*, 1263A-9H-4/50-52 cm, 85.58 mcd, XN. **9-10.** *Sphenolithus tribulosus*, 1263A-10H-3/100-101 cm, 94.09 mcd, XN (9) and PN (10). **11.** *Cyclicargolithus floridanus*, 1263B-5H-1/101-102 cm, 99.7 mcd, XN. **12.** *Cyclicargolithus sp.* (signs of dissolution), 1263A-10H-7/25-26 cm, 99.34 mcd, XN. **13.** *Cyclicargolithus sp.* (central area dissolved), 1263B-5H-2/11-12 cm, 100.13 mcd, XN. **14.** *Dictyococcites bisectus*, 1263A-10H-5/11-12 cm, 96.19 mcd, XN. **15.** *Dictyococcites stavensis*, 1263A-10H-5/30-31 cm, 96.39 mcd, XN. **16.** *Reticulofenestra daviesii*, 1263A-10H-4/120-121 cm, 95.79 mcd, XN. **17.** *Reticulofenestra umbilicus*, 1263B-5H-1/55-56 cm, 99.24 mcd, XN. **18.** *Reticulofenestra samodurovii*, 1263A-10H-5/20-21 cm, 96.29 mcd, XN. **19.** *Reticulofenestra hillae*, 1263A-10H-5/0-1 cm, 96.09 mcd, XN. **20.** *Reticulofenestra circus* var. *lata*, 1263A-10H-5/0-1 cm, 96.09 mcd, XN. **21.** *Coccolithus pelagicus*, 126A-10H-4/90-91 cm, 95.5 mcd, XN. **22.** *Sphenolithus pseudoradians*, 1263A-10H-5/131-132 cm, 97.44 mcd, XN. **23.** *Lanternithus minutus*, 1263B-5H-1/71-72 cm, 99.4 mcd, XN. **24.** *Zygrhablithus bijugatus*, 1263B-5H-2/111-112 cm, 101.13 mcd, XN.

Fig. S1



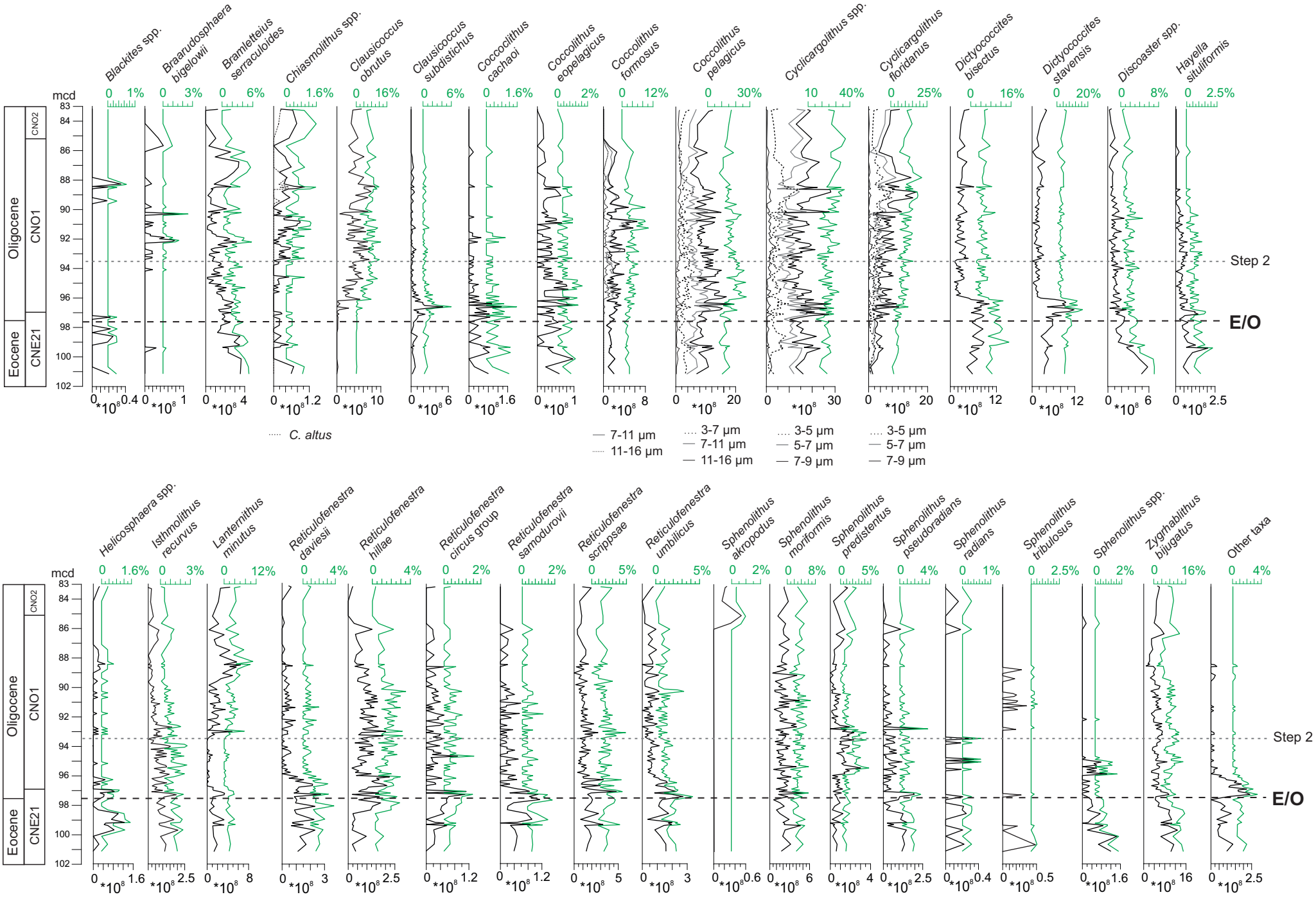


Fig. S2. Distribution curves of absolute (N g^{-1}) and relative (%) abundances of all the species and groups detected in dataset A.

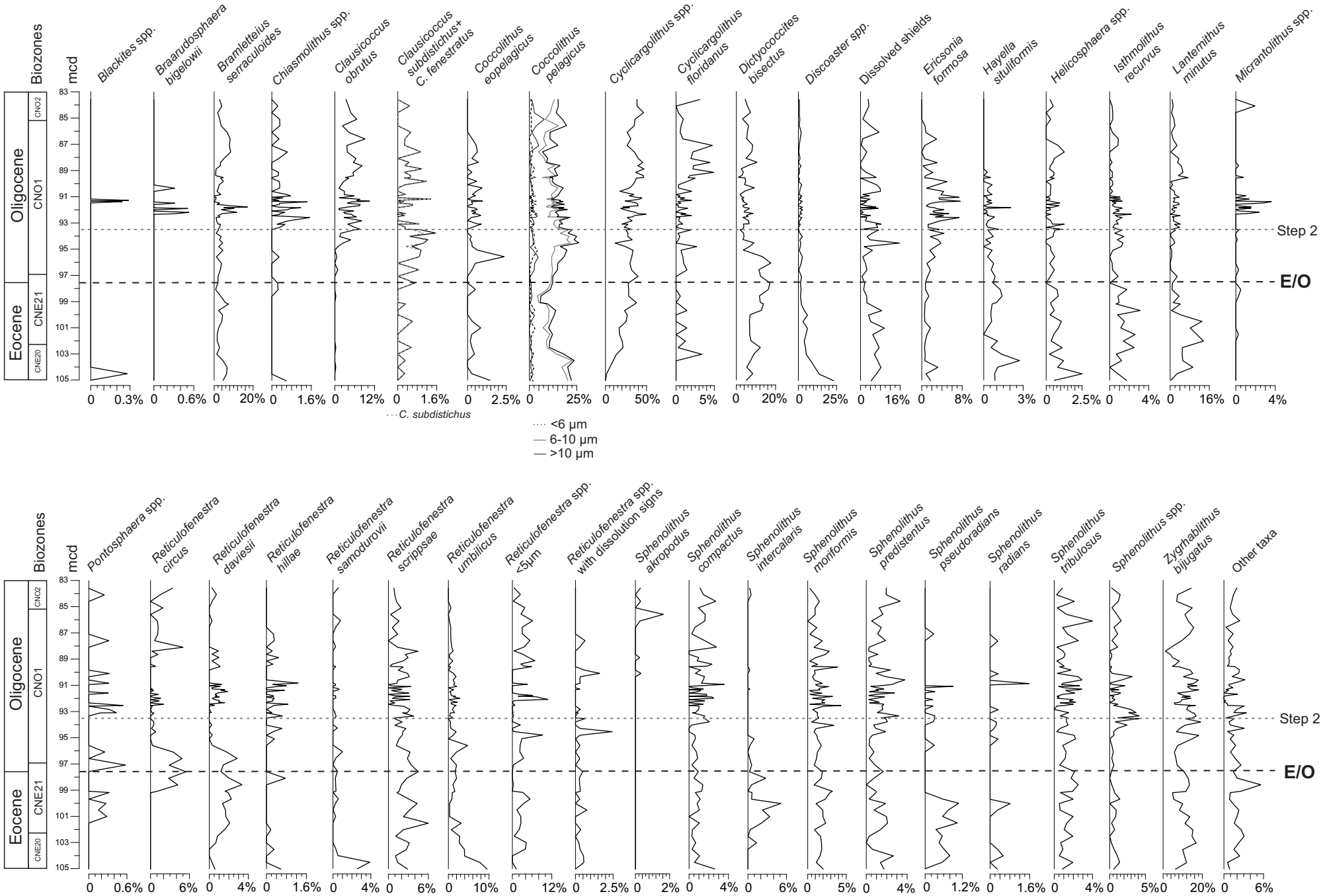


Fig. S3. Distribution curves of relative (%) abundances of all the species detected in dataset B.