

Late Miocene polycystine radiolarians of the Japan Sea (IODP Exp. 346 Site U1425)

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Abstract: In this study, we have illustrated the 84 species/species group of polycystine radiolarians, which were commonly encountered in the upper Miocene sediments at the Site U1425 of the Integrated Ocean Drilling Program (IODP) in the Japan Sea. The micro-photographs of these species/species group are illustrated in 9 plates.

Keywords: Integrated Ocean Drilling Program, late Miocene, Japan Sea, Polycystine radiolarians

1. Introduction

The Integrated Ocean Drilling Program (IODP) Expedition 346 retrieved seven sites covering a wide latitudinal and depth range in the Japan Sea and the East China Sea. The sediment cores collected in the Japan Sea cover the Holocene to the middle Miocene (e.g. Tada *et al.*, 2015; Kamikuri *et al.*, 2017). Polycystine radiolarians are Protista bearing skeletons of amorphous silica and they are the unique microfossil group, which can inhabit intermediate and deep-water (Suzuki and Not, 2015). They are also usually used as a biostratigraphic and paleoceanographical index in the North Pacific, where the preservation of carbonates is low in the deep-sea sediments. In the deep-sea sediment of the Japan Sea, the preservation of carbonates is lower than those recorded in the North Pacific because of a calcite compensation depth about 2,000 m (e.g. Ujiie and Ichikura, 1973), whereas radiolarians are usually well-preserved in such carbonate-poor sediments in the Japan Sea. Therefore, polycystine radiolarians were examined at all sites recovered in the Japan Sea during the expedition 346 to define their local biostratigraphy and establish a preliminary depth-age model at each drilled site (Kamikuri *et al.*, 2017). In this study, we propose to show micro-photographs of the radiolarian species and/or species group, which often occurred from the upper Miocene of IODP Exp. 346 Site U1425.

2. Material and methods

In this study, we have analyzed radiolarians from 88 sediment core samples covering the late Miocene collected from Sites U1425 drilled during IODP Expedition 346. The Site U1425 is located at 39°29.44' N and 134°26.55' E (Fig. 1), in the central Japan Sea, at the middle of the Yamato Bank, where the water depths is 1,909 m water depth. The 88 samples were freeze-dried, and treated with diluted hydrogen peroxide (H₂O₂) (15%) (50 ml of H₂O₂ at concentration of 30% diluted in 100 ml of water) and hydrochloric acid (15%) (40 ml of HCl at concentration of 35–37% diluted in 100 ml of water) to remove organic and calcareous matter. The undissolved residue in each sample was sieved over a 45- μ m screen following the method proposed in Tada *et al.* (2015). The examination of polycystine radiolarians was carried out under an optical microscope Nikon Eclipse E 200 at magnifications of 100 \times to 400 \times . The photomicrographs were taken under an optical microscope at magnifications of 400 \times using a digital camera Olympus SP-600UZ, with an optical zoom of 5.0–75.0 mm, which is set on the used optical microscope.

3. Radiolarian fauna

Totally 84 species and species group, including 1 collodarian, 44 spumellarians and 39 nassellarians were encountered during the late Miocene in the Japan Sea.

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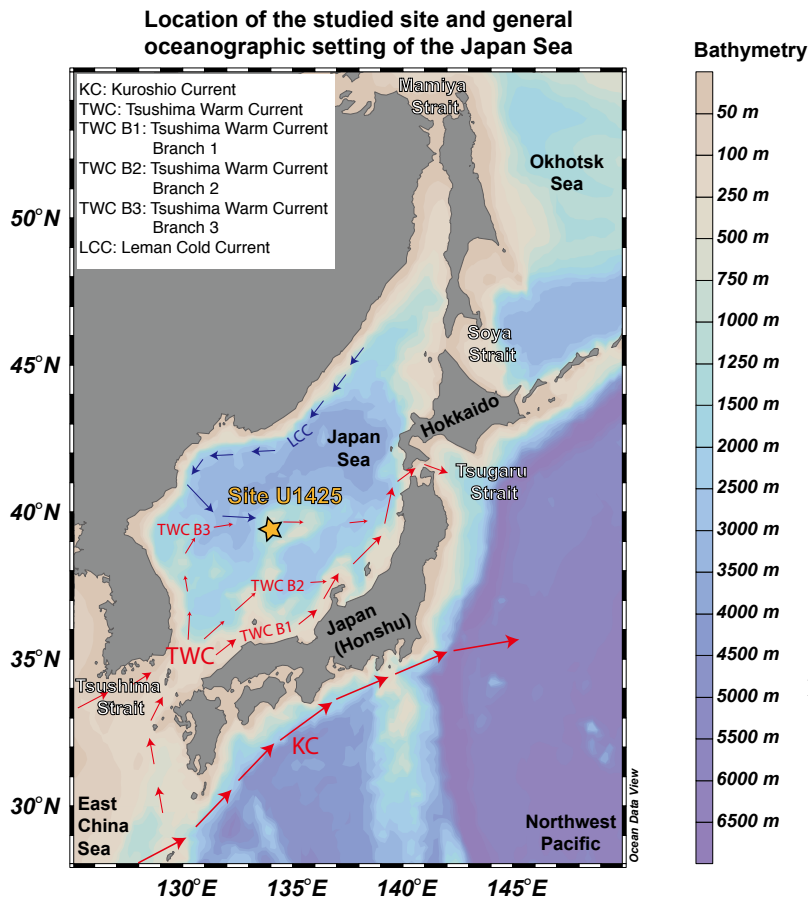


Fig. 1 This map has been modified from Matsuzaki *et al.* (2018) and shows the location of Integrated Ocean Drilling Program (IODP) Expedition 346 Site U1425 and the majors paleoceanographic setting of the Japan Sea. The base map is from Ocean Data View 4 (Schlitzer, 2016).

Photomicrographs of all forms are shown from plate 1 to plate 9. For all these taxa, we have provided taxonomic names and its related taxonomic references (Tables 1 and 2).

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IODP Exp. 346 Site U1425 から産出した日本海の後期中新世放散虫

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要 旨

本研究では、日本海で実施された国際深海掘削計画 (IODP) Expedition 346の掘削サイトU1425で頻繁に産出した上部中新統の放散虫化石84種/種群について報告している。これらの顕微鏡写真を9図版に図示した。

Table 1 Taxonomic references of the encountered Collodarians and Spumellarians

Species name	plate(s)-Figure(S)	Taxonomic references
<i>Rhizosphaera</i> aff. <i>variabilium</i> (Nakaseko)	1.1-1.2	Gladenkov and Devyatkin, 1992, pl. 32, fig. 2
<i>Hexacanthium minerva</i> Kamikuri	1.3	Kamikuri, 2010, p. 97-98, figs. 12a-12b; 16a-16b
<i>Rhizosphaera urumica</i> Vituchin	1.4	Vitukhin, 1993, p. 87-88, pl. 30, fig. 5
<i>Hexastylus</i> spp. sensu Nigrini and Lombardi	1.5	Nigrini, and Lombardi, 1984, S 17, Pl. 3, figs. 1a-1c
<i>Acrosphaera muse</i> Kamikuri	1.6	Kamikuri, 2010, p. 96-97, figs. 4a-6
<i>Rhizosphaera</i> sp. A	1.7	this study
<i>Cenosphaera</i> cf. <i>compacta</i> Haeckel	1.8	Blueford, 1982, p. 193-194, pl. 1, figs. 3, 4
<i>Actinomma robusta</i> (Kling) juvenile form	1.9, 1.11	Suzuki, 2006, p. 863-865, figs. 11.1-11.28
<i>Actinomma</i> aff. <i>okurai</i> Nakaseko and Nishimura	1.10, 1.12	Nakaseko and Nishimura, 1971, p. 68, pl. 1, figs. 1-8
<i>Axoprunum bispiculum</i> (Popofsky)	1.13	Popofsky, 1912, p. 91, pl. 2, fig. 2
<i>Drupptractus irregularis</i> Popofsky	1.14	Blueford, 1982, p. 204, 206, pl. 6, figs. 7a, 7b
<i>Stylosphaera pyriformis</i> (Bailey)	1.15	Matsuzaki <i>et al.</i> , 2015, p. 12, Figs. 5.10
<i>Perichlamyidium scutaeforme</i> Campbell and Clark	2.1	Campbell and Clark, 1944, Pl. 3, Fig. 15 only
<i>Perichlamyidium</i> cf. <i>praetextum</i> (Ehrenberg)	2.2	Petrushevskaya, 1975, p. 575, pl. 6, fig. 10
<i>Stylochlamyidium</i> cf. <i>venustum</i> (Bailey)	2.3-2.4	Matsuzaki <i>et al.</i> , 2015, p. 28, Figs. 4.2-4.4
<i>Spongotrochus</i> sp. A	2.5	This study
<i>Spongodiscus cauletti</i> group Kamikuri	2.6-2.7	Kamikuri, 2010, p. 94, Pl. 4, Figs. 1-4
<i>Spongopyle osculosa</i> Dreyer	2.9	Matsuzaki <i>et al.</i> , 2015, p. 23, Figs. 4.12-4.13
<i>Flustrella</i> spp. (young forms)	2.10-2.11	This study
<i>Spongodiscus</i> sp. A	2.14	This study
<i>Flustrella</i> sp. A	2.8, 2.12- 2.13, 2.15-2.19	This study
Spongodiscidae juveniles spp.	2.20-2.21	This study
<i>Stylodictya tenuispina</i> Jørgensen group	2.22-2.27	Matsuzaki <i>et al.</i> , 2015, p. 27-28, Figs. 4.20
<i>Tetrapyle</i> cf. <i>circularis</i> Haeckel	3.1	Zhang and Suzuki, 2017, p. 15-18, Figs. 8-9
<i>Tetrapyle</i> cf. <i>fruticosa</i> (Tan and Chen)	3.2	Zhang and Suzuki, 2017, p. 18-19, Fig. 10
<i>Phortidium</i> cf. <i>polycladum</i> Tan and Tchang	3.3-3.4, 3.8	Zhang and Suzuki, 2017, p. 43-45, Fig. 12
<i>Prunulum coccymelia</i> Haeckel group	3.5-3.6, 3.11, 3.14-3.18	Haeckel, 1887, p. 313, pl. 39, fig. 4
<i>Phortidium</i> sp. A	3.7	This study
<i>Phortidium</i> aff. <i>scitulum</i> Zhang and Suzuki	3.9-3.10, 3.12-3.13	Zhang and Suzuki, 2017, p. 45-47, Fig. 26
<i>Sphaerolarnacillum</i> sp. A	3.19-3.26	This study
<i>Larcopyle</i> aff. <i>polyacantha</i> (Campbell and Clark)	4.1-4.4	Motoyama <i>et al.</i> , 2017, Fig. 9.12 only
<i>Larcopyle weddellium</i> Lazarus, Faust and Popova-Goll group	4.5-4.14	Lazarus <i>et al.</i> , 2005, p. 117, 119, pl. 10, figs. 1-14
<i>Larcopyle</i> sp. A	4.15	This study
<i>Larcopyle labyrinthosa</i> Lazarus, Faust and Popova-Goll	4.16-4.17	Lazarus <i>et al.</i> , 2005, p. 111, 119, pl. 5, figs. 14-24
<i>Larcopyle</i> sp. B	4.18	This study
<i>Lithelius</i> sp. A	4.19	This study
<i>Lithelius</i> cf. <i>nautiloides</i> (Popofsky)	4.20	Matsuzaki <i>et al.</i> , 2015, p. 37, Fig. 6.29
<i>Lithelius</i> sp. B	4.21	This study
<i>Lithelius</i> sp. C	4.22-4.23	This study
<i>Lithelius barbatus</i> Motoyama	5.1-5.4, 5.7	Motoyama, 1996, p. 243, pl. 3, figs. 11-14
<i>Spiremaria</i> cf. <i>decens</i> Kozlova	5.5-5.6, 5.8-5.11	Kozlova, 1960, p. 315-316, pl. 4, fig. 3
Lithelidae gen et sp. indet	5.12, 5.16-5.17	This study
<i>Lithelius</i> aff. <i>spiralis</i> (Ehrenberg) group	5.13-5.15	Matsuzaki <i>et al.</i> , 2015, p. 38, Fig. 6.31
<i>Phacodiscus</i> aff. <i>calvertense</i> (Martin)	5.18-5.19	Martin, 1904, p. 456, pl. 30, fig. 17
<i>Lithelius klingi</i> Kamikuri	5.20-5.21	Kamikuri, 2010, p. 95-96, pl. 4, figs. 9-14

Table 2 Taxonomic references of the encountered Nassellarians

Species name	Plate (s)-Figure (s)	Taxonomic references
<i>Dendrospyrís</i> sp. A	6.1	This study
<i>Dendrospyrís</i> sp. B	6.2-6.3	This study
<i>Dendrospyrís</i> sp. C	6.4, 6.6	This study
<i>Dendrospyrís</i> sp. D	6.5	This study
Undet. Triospyridae	6.7	This study
<i>Dendrospyrís</i> sp. E	6.8	This study
<i>Dendrospyrís</i> cf. <i>eurus</i> Kamikuri	6.9-6.10	Kamikuri, 2010, p.100, Pl. 5, figs. 19-22 only
<i>Zygocircus archircircus</i> Popofsky	6.11-6.12	Popofsky, 1913, p. 285-286, text-fig. 13
<i>Zygocircus</i> ? sp. A	6.13	This study
<i>Steganocubus</i> sp. A	6.14-6.16	This study
<i>Peridium sphaerum</i> Funakawa	6.17-6.19	Funakawa, 1995, p. 21-22, pl. 2, figs. 1a-4b
<i>Steganocubus</i> ? sp.	6.20	This study
<i>Cryptogyrus</i> aff. <i>trachylobus</i> Sugiyama	6.21-6.22	Sugiyama, 1993, p. 65, 67-68, fig. 19.1a-19.5, 20.1a-20.2b
Lophophaenidae gen. et sp. indet.	6.23	This study
<i>Botryopera</i> ? <i>gibbera</i> Renaudie and Lazarus	6.24-6.27	Renaudie and Lazarus, 2012, p. 47, pl. 7, figs. 3A-6B
<i>Pseudodictyophimus</i> cf. <i>elegans</i> Dogiel and Reshetnyak	6.28	Dogiel and Reshetnyak, 1952, p. 14-15, fig. 7
<i>Pseudodictyophimus</i> sp. A	6.29	This study
<i>Siphocampe arachnea/lineata</i> (Ehrenberg) group	6.30-6.31	Nigrini, 1977, p. 256, pl.3, figs. 7-8
<i>Botryostrobus bramlettei</i> Campbell and Clark) group	6.32-6.33	Nigrini and Lombardi, 1984, N 175-N 176, Pl. 31, figs. 2a-2c
<i>Botryocampe</i> aff. <i>robusta</i> (Kruglikova)	6.34-6.35	Kruglikova, 1974, p. 194, pl. 2, figs. 15-19
<i>Botryopera</i> ? <i>daleki</i>	6.36	Renaudie and Lazarus, 2013, p. 68, pl. 6, figs. 1A-1C, 4A-4B
<i>Cycladophora nakasekoi</i> Motoyama	7.1-7.14	Motoyama, 1996, p. 243-246, Pl. 4, figs. 1-3
<i>Cycladophora</i> cf. <i>nakasekoi</i> Motoyama	7.15-7.22	Motoyama, 1996, p. 243-246, Pl. 4, figs. 1-3
<i>Cycladophora</i> cf. <i>sphaeris</i> (Popova)	7.23	Popova 1989, p. 73, pl. 11, fig. 17, pl. 12, fig. 3
<i>Cycladophora sphaeris</i> (Popova)	7.24-7.26	Popova 1989, p. 73, pl. 11, fig. 17, pl. 12, fig. 3
<i>Cycladophora cosma cosma</i> Lombardi and Lazarus	7.27-7.28	Morley and Nigrini, 1995, p. 81, pl. 4, fig. 2
<i>Cycladophora</i> aff. <i>cornuta</i> (Bailey)	7.29	Kruglikova, 1974, p. 193-194, pl. 2, figs. 12-14
<i>Stichocorys delmontensis</i> (Campbell and Clark)	8.1	Kamikuri, 2012, Pl. 1, figs. 4, 8 only
<i>Stichocorys peregrina</i> (Riedel) "equatorial form"	8.2-8.8, 8.11	Kamikuri, 2012, Pl. 2, figs. 1-9
<i>Stichocorys peregrina</i> (Riedel) "North Pacific form"	8.9-10, 8.12-8.21	Kamikuri, 2012, Pl. 3, figs. 1-12
<i>Stichocorys</i> sp. A	8.22-8.23	This study
<i>Lychnocanoma magnacornuta</i> Sakai	9.1	Motoyama, 1996, p. 248, pl. 5, figs. 10-11
<i>Lychnocanoma parallelipes</i> Motoyama	9.2	Motoyama, 1996, p. 248, 250, pl. 5, figs. 12a-14

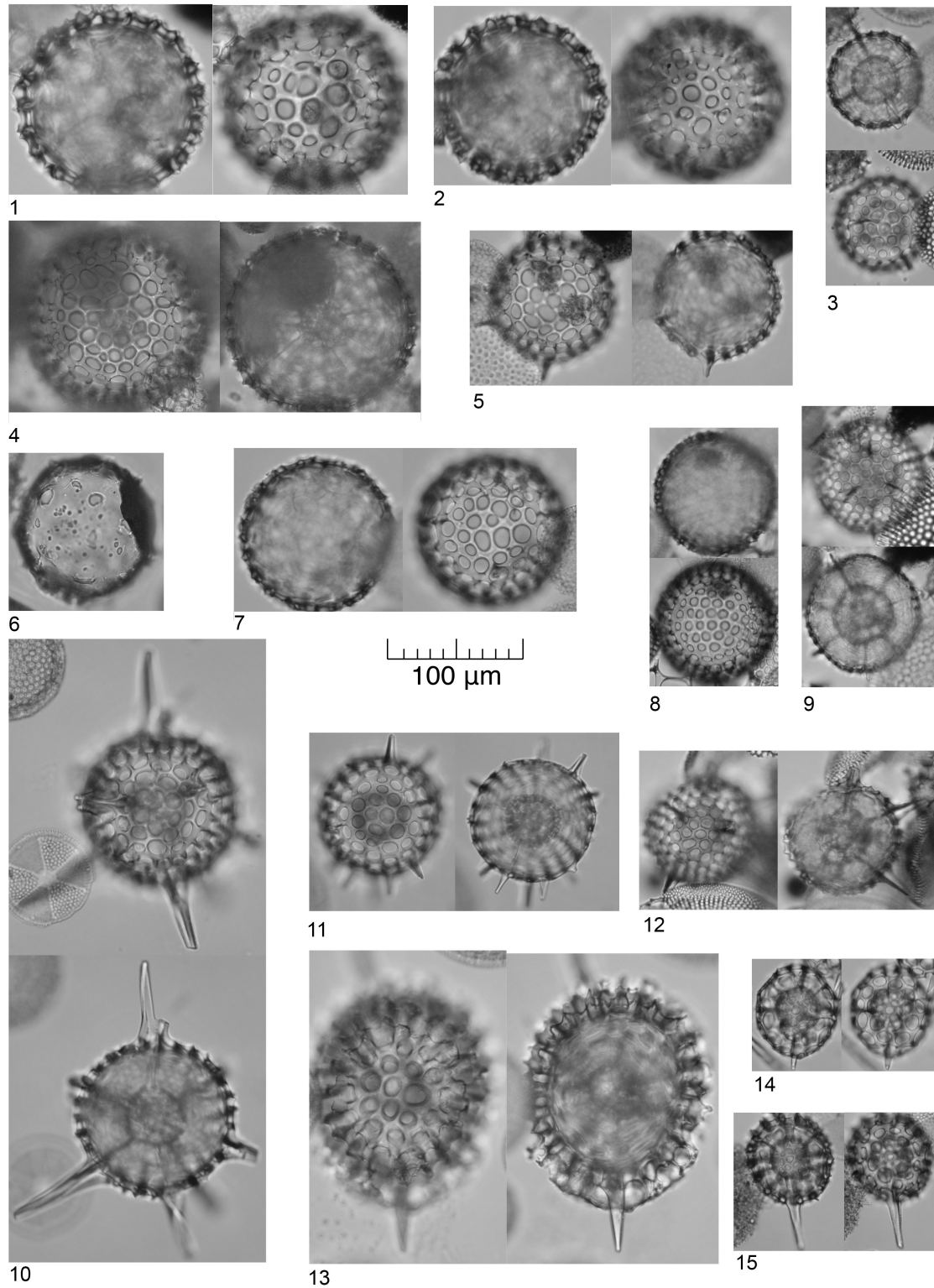


Plate 1 **1-2:** *Rhizosphaera* aff. *variabilium* (Nakaseko) (346-U1425B-34H4-46-48 cm); **3:** *Hexacanthium minerva* Kamikuri (346-U1425B-28H3-149-147 cm); **4:** *Rhizosphaera urumica* Vituchin (346-U1425B-CC-12-17 cm); **5:** *Hexastylus* spp. sensu Nigrini and Lombardi (346-U1425B-34H4-46-48 cm); **6:** *Acrosphaera muse* Kamikuri (346-U1425B-CC-12-17 cm); **7:** *Rhizosphaera* sp. A (346-U1425B-34H4-46-48 cm); **8:** *Cenosphaera* cf. *compacta* Haeckel (346-U1425B-47H1-91-93 cm); **9,** **11:** *Actinomma robusta* (Kling) juvenile form (9. 346-U1425B-47H1-91-93 cm; 11. 346-U1425B-28H3-147-149 cm); **10, 12:** *Actinomma* aff. *okurai* Nakaseko and Nishimura (10. 346-U1425B-34H4-46-48 cm; 12. 346-U1425B-47H1-91-93 cm); **13:** *Axoprunum bispiculum* (Popofsky) (346-U1425B-34H4-46-48 cm); **14:** *Drupptractus irregularis* Popofsky (346-U1425B-47H1-91-93 cm); **15:** *Stylosphaera pyriformis* (Bailey) (346-U1425B-47H1-91-93 cm).

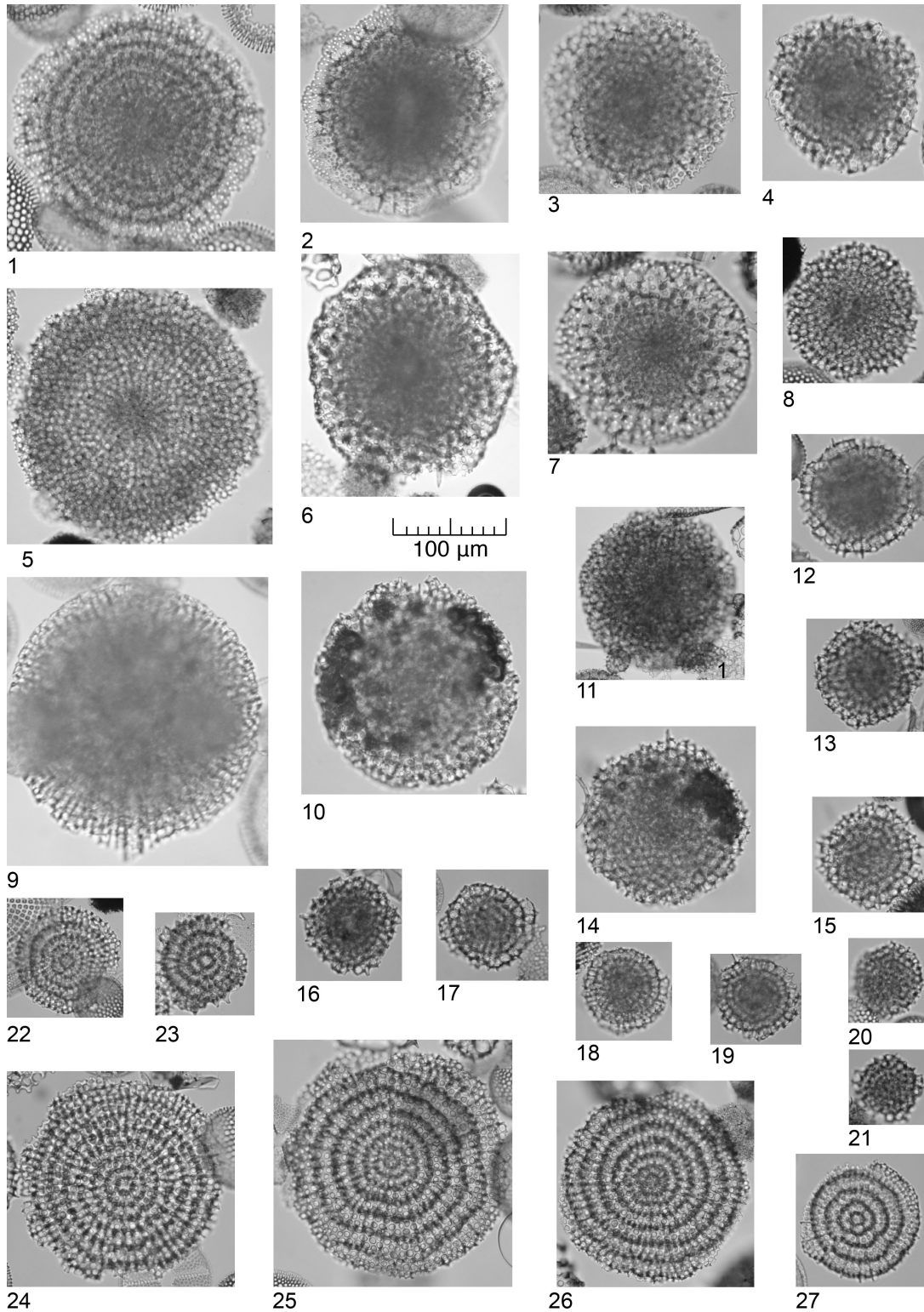


Plate 2 **1:** *Perichlamyidium scutaeforme* Campbell and Clark (346-U1425B-28H3-147-149 cm); **2:** *Perichlamyidium* cf. *praetextum* (Ehrenberg) (346-U1425B-28H3-147-149 cm); **3-4:** *Stylochlamyidium* cf. *venustum* (Bailey) (346-U1425B-34H4-46-48 cm); **5:** *Spongotrochus* sp. A (346-U1425B-47H1-91-93 cm); **6-7:** *Spongodiscus cauletti* group Kamikuri (6: 346-U1425B-47H1-91-93 cm; 7: 346-U1425B-34H4-46-48 cm); **8, 12-13, 15-19:** *Flustrella* sp. A (8: 346-U1425B-47H1-91-93 cm; 12,15-18: 346-U1425B-34H4-46-48 cm); **9:** *Spongopyle osculosa* Dreyer (346-U1425B-28H3-147-149 cm); **10-11:** *Flustrella* spp. (young forms) (10: 346-U1425B-28H3-147-149 cm; 11: 346-U1425B-47H1-91-93 cm); **14:** *Spongodiscus* sp. A (14: 346-U1425B-34H4-46-48 cm); **20-21:** *Spongodiscidae juveniles* spp. (346-U1425B-47H1-91-93 cm); **22-27:** *Stylodictya tenuispina* Jørgensen group (23-24: 346-U1425B-34H4-46-48 cm; 22, 25-27: 346-U1425B-47H1-91-93 cm).

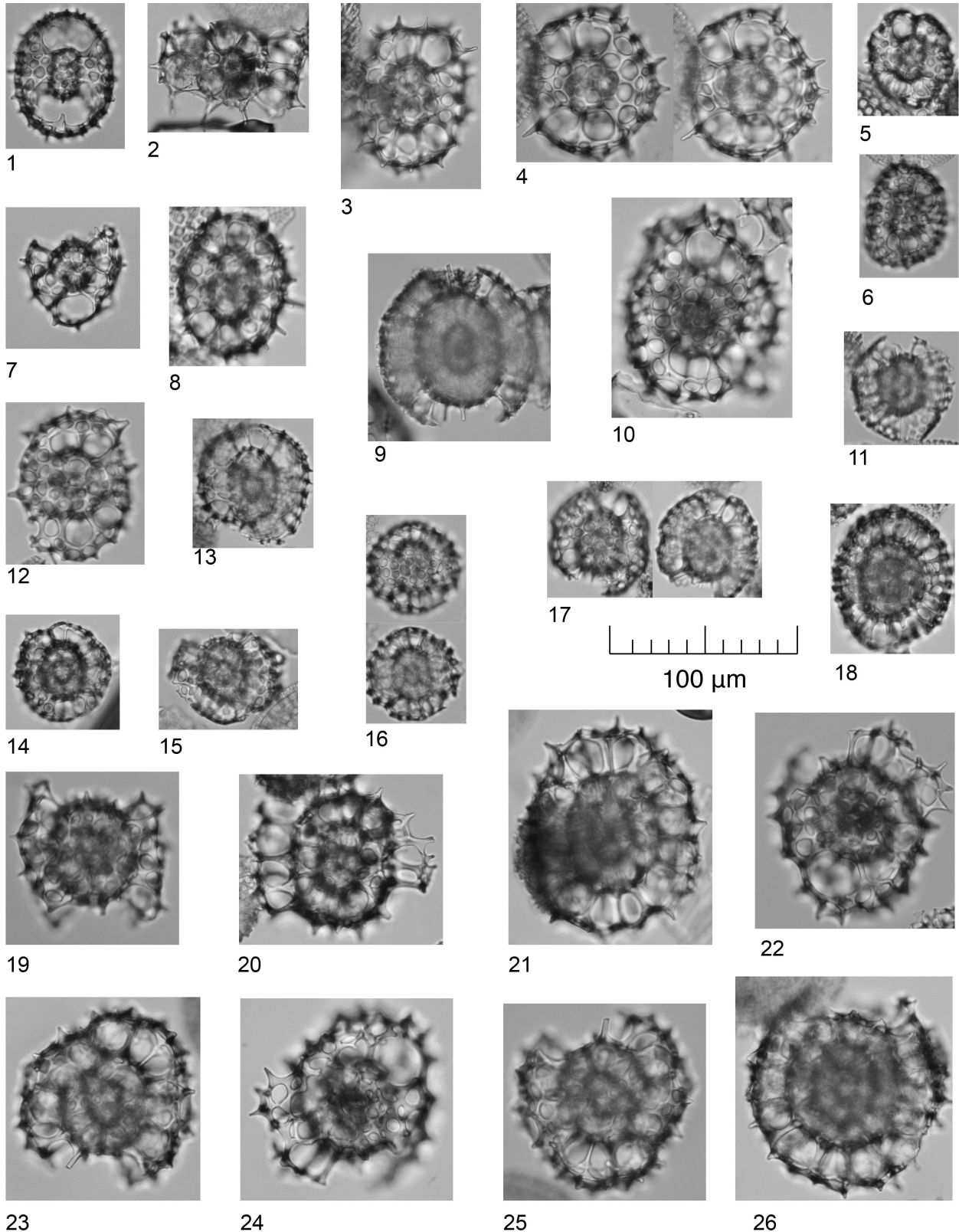


Plate 3 **1:** *Tetrapyle* cf. *circularis* Haekel (346-U1425B-34H4-46-48 cm); **2:** *Tetrapyle* cf. *fruticosa* (Tan and Chen) (346-U1425B-34H4-46-48 cm); **3-4, 8:** *Phortidium* cf. *polycladum* Tan and Tchong (3, 8. 346-U1425B-34H4-46-48 cm; 4. 346-U1425B-28H3-147-149 cm); **5-6, 11, 14-18:** *Prunulum coccymlia* Haekel group (5, 18. 346-U1425B-34H4-46-48 cm; 6, 16, 17. 346-U1425B-47H1-91-93 cm; 11. 346-U1425B-28H3-147-149 cm; 14. 346-U1425B-47H1-91-93 cm; 15. 346-U1425B-28H3-147-149 cm); **7:** *Phortidium* sp. A (346-U1425B-34H4-46-48 cm); **9-10, 12-13:** *Phortidium* aff. *scitulum* Zhang and Suzuki (9, 10, 12. 346-U1425B-34H4-46-48 cm; 13. 346-U1425B-47H1-91-93 cm); **19-26:** *Sphaerolarnacillum* sp. A (346-U1425B-34H4-46-48 cm).

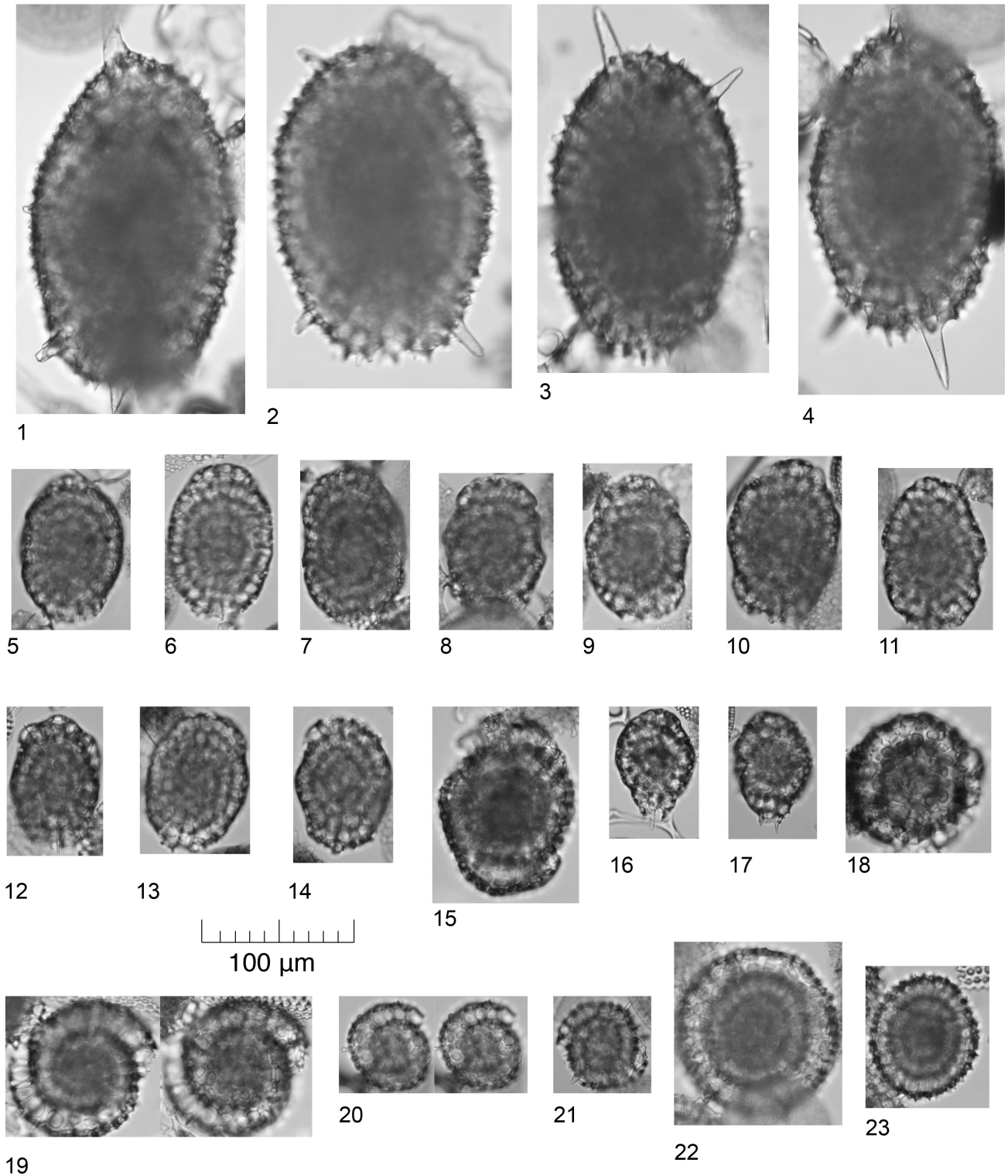


Plate 4 **1-4:** *Larcopyle* aff. *polyacantha* (Campbell and Clark) (346-U1425B-47H1-91-93 cm); **5-14:** *Larcopyle weddellium* Lazarus, Faust and Popova-Goll group (346-U1425B-47H1-91-93 cm); **15:** *Larcopyle* sp. A (346-U1425B-34H4-46-48 cm); **16-17:** *Larcopyle labyrinthosa* Lazarus, Faust and Popova-Goll (16. 346-U1425B-34H4-46-48 cm; 17. 346-U1425B-47H1-91-93 cm); **18:** *Larcopyle* sp. B (346-U1425B-34H4-46-48 cm); **19:** *Lithelius* sp. A (346-U1425B-34H4-46-48 cm); **20:** *Lithelius* cf. *nautiloides* (Popofsky) (346-U1425B-47H1-91-93 cm); **21:** *Lithelius* sp. B (346-U1425B-47H1-91-93 cm); **22-23:** *Lithelius* sp. C (346-U1425B-34H4-46-48 cm).

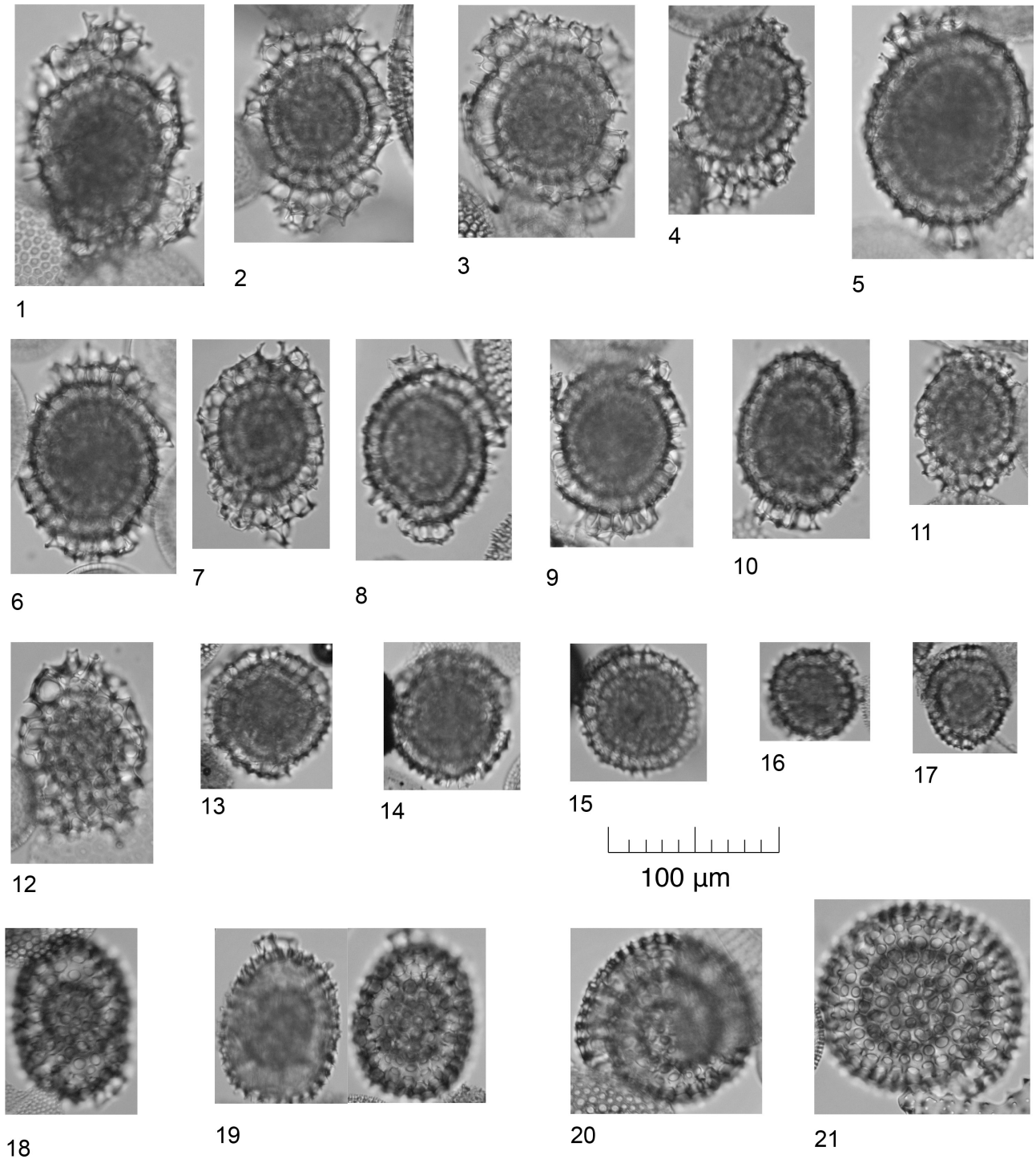


Plate 5 **1-4, 7:** *Lithelius barbatus* Motoyama (346-U1425B-28H3-147-149 cm). **5-6, 7, 8-11:** *Spiremaria* cf. *decens* Kozlova (346-U1425B-28H3-147-149 cm). **12, 16-17:** *Lithelidae* gen et sp. indet. (12. 346-U1425B-28H3-147-149 cm; 16-17. 346-U1425B-47H1-91-93 cm); **13-15:** *Lithelius* aff. *spiralis* group (Ehrenberg) (13, 14. 346-U1425B-47H1-91-93 cm; 15. 346-U1425B-34H4-46-48 cm); **18-19:** *Phacodiscus* aff. *calvertense* (Martin) (346-U1425B-47H1-91-93 cm); **20-21:** *Lithelius* *klingi* Kamikuri (346-U1425B-47H1-91-93 cm).

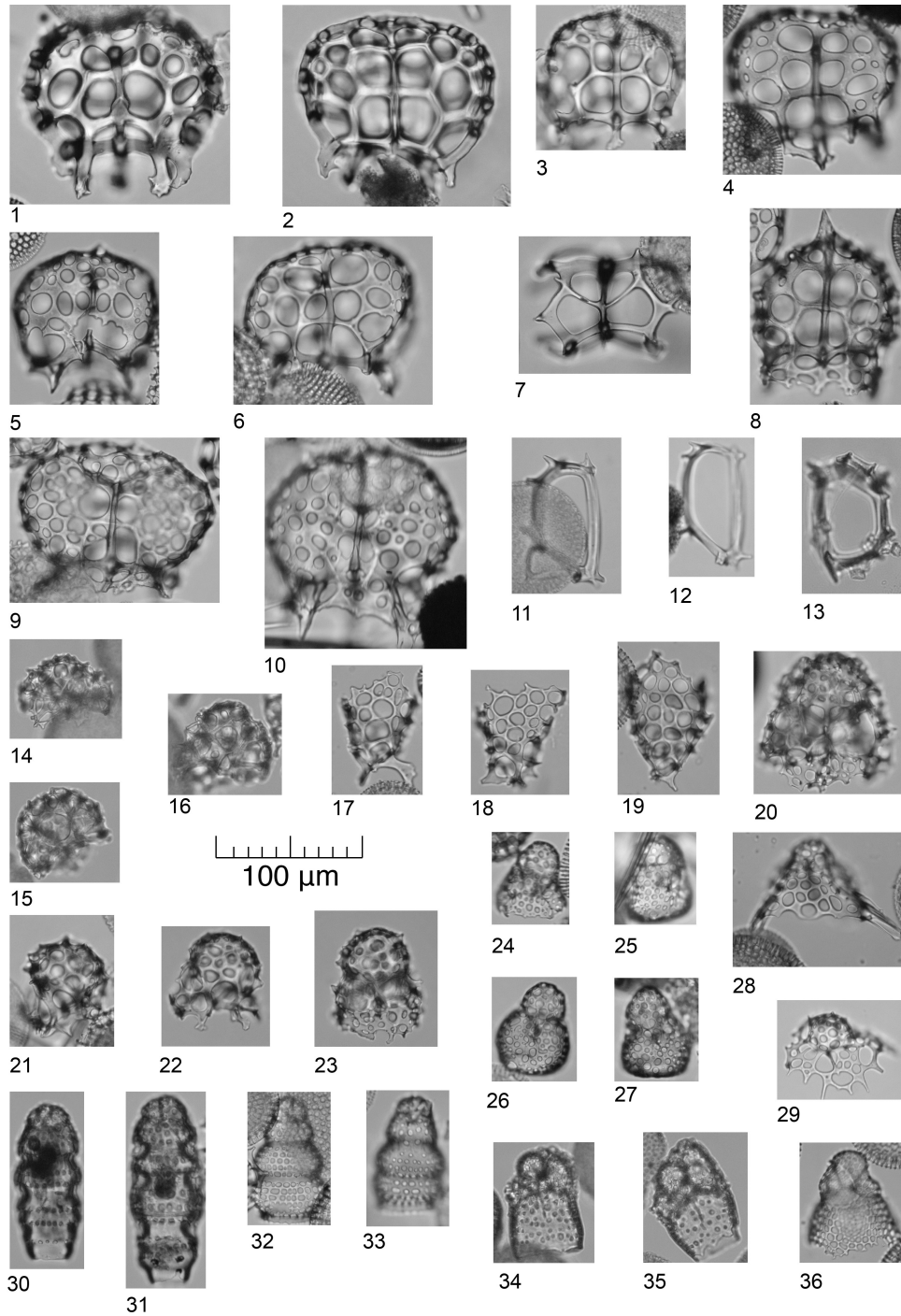


Plate 6 **1:** *Dendrospyras* sp. A (346-U1425B-34H4-46-48 cm); **2-3:** *Dendrospyras* sp. B (2. 346-U1425B-34H4-46-48 cm; 3. 346-U1425B-47H1-91-93 cm); **4, 6:** *Dendrospyras* sp. C (346-U1425B-47H1-91-93 cm); **5:** *Dendrospyras* sp. D (346-U1425B-47H1-91-93 cm); **7:** *Undet. Triospyridae* (346-U1425B-34H4-46-48 cm); **8:** *Dendrospyras* sp. E (346-U1425B-47H1-91-93 cm); **9-10:** *Dendrospyras* cf. *eurus* Kamikuri (346-U1425B-47H1-91-93 cm); **11-12:** *Zygocircus archicircus* Popofsky (11-12. 346-U1425B-34H4-46-48 cm); **13:** *Zygocircus?* sp. A (346-U1425B-34H4-46-48 cm); **14-16:** *Steganocubus* sp. A (346-U1425B-30HCC-12-17 cm; 13. 346-U1425D-29H1-45-47 cm); **17-19:** *Peridium sphaerum* Funakawa (346-U1425B-28H3-147-149 cm); **20:** *Steganocubus?* sp. (346-U1425B-28H3-147-149 cm); **21-22:** *Cryptogyrus* aff. *trachylobus* Sugiyama (21. 346-U1425B-47H1-91-93 cm; 22. 346-U1425B-34H4-46-48 cm); **23:** *Lophophaenidae* gen. et sp. indet. (346-U1425B-34H4-46-48 cm); **24-27:** *Botryopera?* *gibbera* Renaudie and Lazarus (346-U1425B-47H1-91-93 cm); **28:** *Pseudodictyophimus* cf. *elegans* Dogiel and Reshetnyak (346-U1425B-28H3-147-149 cm); **29:** *Pseudodictyophimus* sp. A (346-U1425B-34H4-46-48 cm); **30-31:** *Siphocampe arachnea/lineata* (Ehrenberg) group (346-U1425B-34H4-46-48 cm); **32-33:** *Botrostrobus bramlettei* Campbell and Clark) group (346-U1425B-47H1-91-93 cm); **34-35:** *Botryocampe* aff. *robusta* (Kruglikova) (346-U1425B-30HCC-12-17 cm); **36:** *Botryopera?* *daleki* Renaudie and Lazarus (346-U1425B-28H3-147-149 cm).

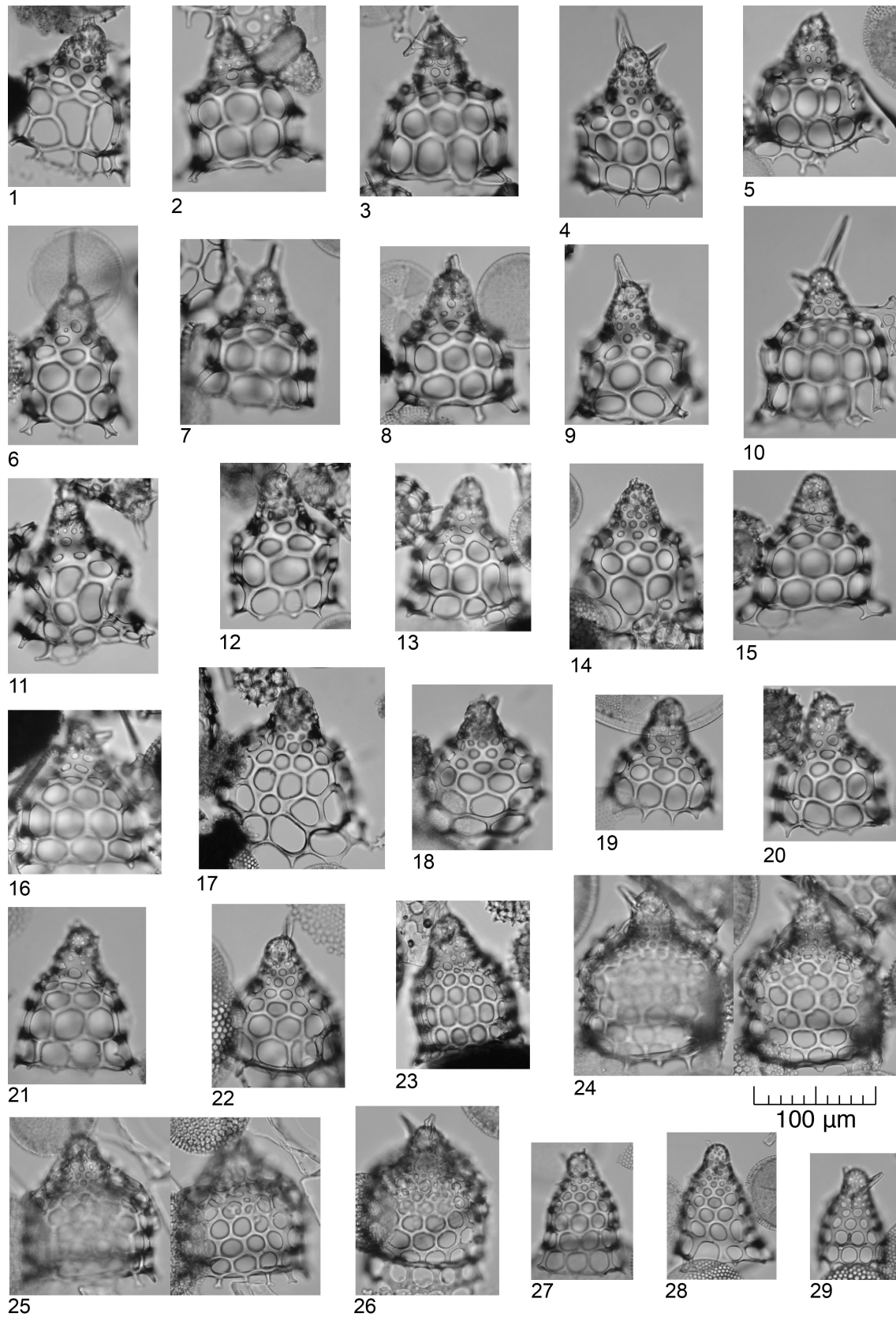


Plate 7 **1-14:** *Cycladophora nakasekoi* Motoyama (346-U1425B-47H1-91-93 cm); **15-22:** *Cycladophora* aff. *nakasekoi* Motoyama (346-U1425B-47H1-91-93 cm); **23:** *Cycladophora* cf. *sphaeris* (Popova) (346-U1425B-34H4-46-48 cm); **24-26:** *Cycladophora sphaeris* (Popova) (346-U1425B-28H3-147-149 cm); **27-28:** *Cycladophora cosma cosma* Lombardi and Lazarus (346-U1425B-47H1-91-93 cm); **29:** *Cycladophora* aff. *cornuta* (Bailey) (346-U1425B-47H1-91-93 cm).

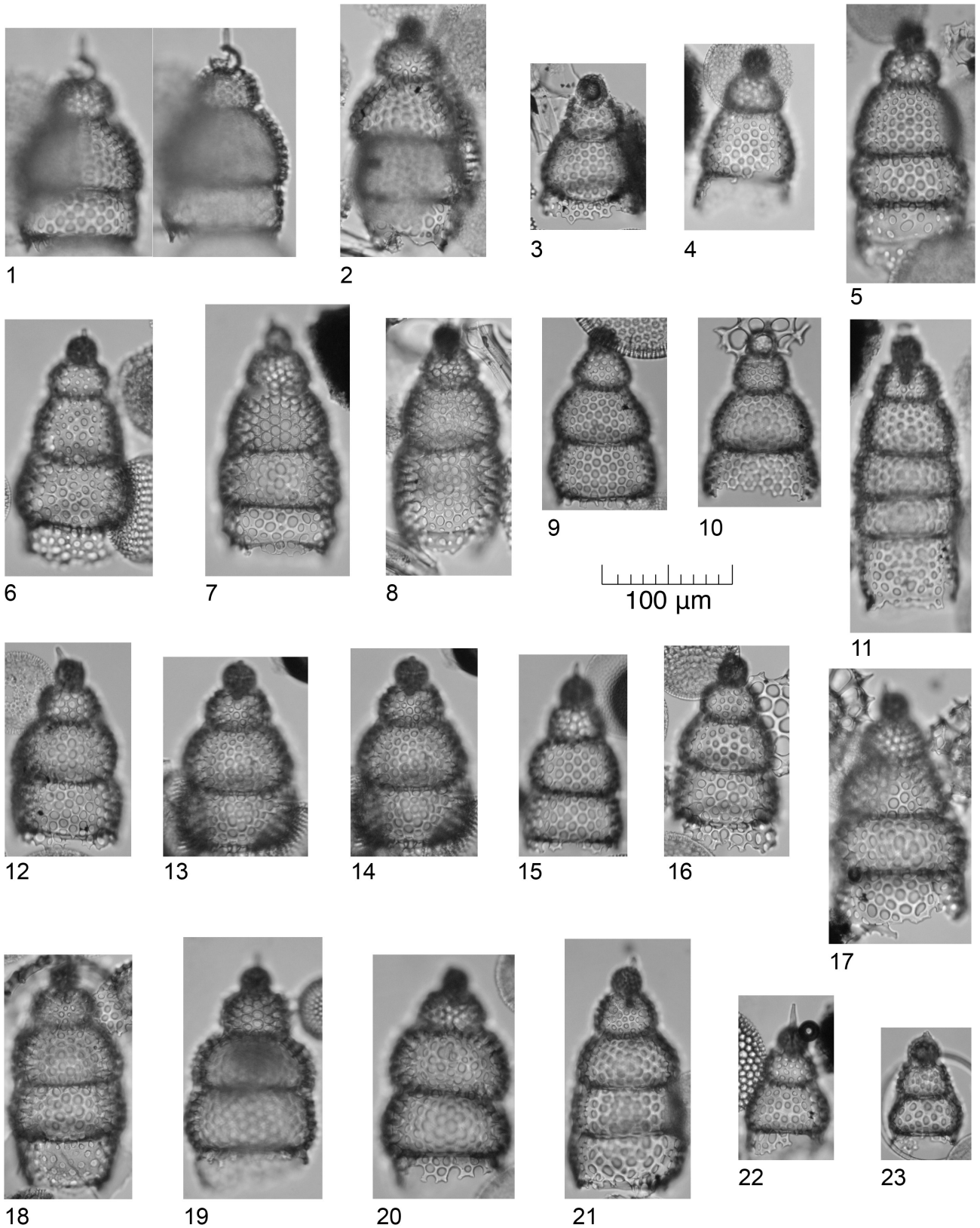


Plate 8 **1:** *Sticocorys delmontensis* (Campbell and Clark) (346-U1425B-34H4-46-48 cm); **2-8, 11:** *Sticocorys peregrina* (Riedel) "equatorial form" (346-U1425B-34H4-46-48 cm); **9-10, 12-21:** *Sticocorys peregrina* (Riedel) "North Pacific form"(); **22-23:** *Sticocorys* sp. A (346-U1425B-34H4-46-48 cm).

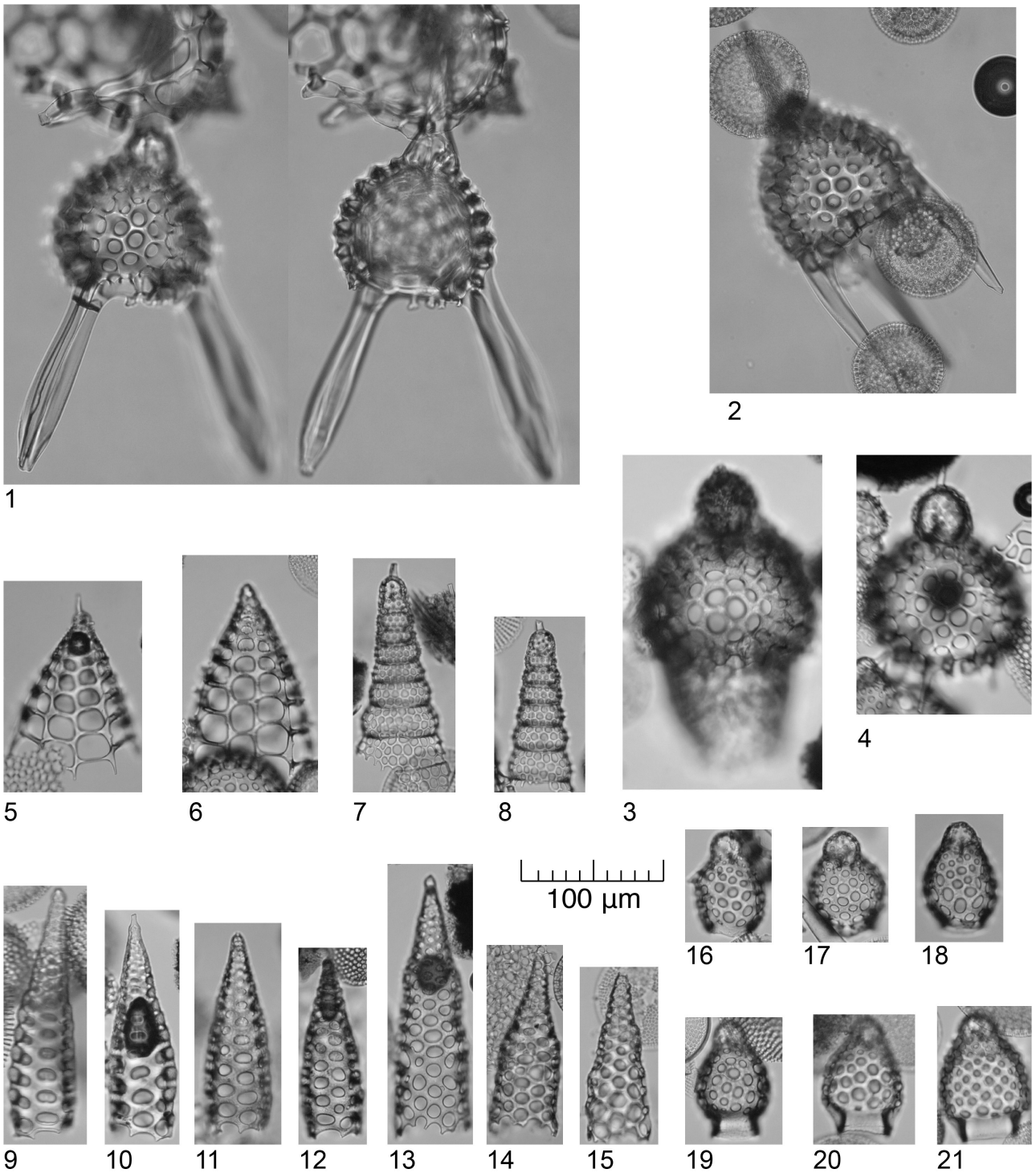


Plate 9 **1:** *Lychnocanoma magnacornuta* Sakai (346-U1425B-51HCC-24-29 cm); **2:** *Lychnocanoma parallelipes* Motoyama (346-U1425D-29H1-45-47 cm); **3-4:** *Lipmanella redondoensis* (Campbell & Clark) (346-U1425B-47H1-91-93 cm); **5-6:** *Cinclopyramis quadrata* (Haeckel) comb. nov. (346-U1425B-47H1-91-93 cm); **7-8:** *Cyrtolagena cuspidata* (Bailey) (346-U1425B-47H1-91-93 cm); **9-12:** *Cornutella bimarginatus* (Haeckel) (9. 346-U1425B-28H3-147-149 cm; 10-12. 346-U1425B-47H1-91-93 cm); **13-15:** *Cornutella trochus* Ehrenberg (346-U1425B-47H1-91-93 cm); **16-21:** *Carpocanarium papillosum* (Ehrenberg) group (346-U1425B-47H1-91-93 cm).

