

## **Catalogue of living polycystine radiolarians in surface waters in the East China Sea around Sesoko Island, Okinawa Prefecture, Japan**

Atsushi MATSUOKA\*

### **Abstract**

This catalogue contains 14 spumellarian and 15 nassellarian species commonly occurring in surface waters in the East China Sea around Sesoko Island, Okinawa Prefecture, Japan. Each panel consists of live and skeleton images with transmitted light microscopy and skeleton images with scanning electron microscopy of each species. The fauna is composed of shallow dwellers in subtropical waters.

*Key words:* living radiolaria, light microscopy, scanning electron microscopy, East China Sea, Kuroshio, Sesoko Island, Okinawa.

### **Introduction**

The Okinawa plankton workshops known as “Okinawa Radiolarian Tours” have been held since 1997 at the Sesoko Station of the Tropical Biosphere Research Center, the University of the Ryukyus on Sesoko Island, Motobu Town, Okinawa Prefecture, Japan. More than 200 radiolarian specialists and students participated in the tours to enjoy marine plankton. This activity includes sampling by a research boat, microscopic observations, and an introduction to a wide variety of techniques for living plankton research. The brief guides for participants were published in Japanese (Matsuoka, 2002) and in English (Matsuoka, 2007). One of the most frequently asked questions from the participants in observing a living radiolarian under a microscope is on taxonomic name of radiolarian species. Participants are generally familiar with light microscopy (LM) or scanning electron

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\* Department of Geology, Faculty of Science, Niigata University, Niigata 950-2181, Japan  
Corresponding author: A. Matsuoka,  
amatsuoka@geo.sc.niigata-u.ac.jp

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microscopy (SEM) images of radiolarian skeletons. On the other hand, they may not be so familiar with a living radiolarian individual. This catalogue provides a quick reference of live and skeleton images and includes 14 spumellarian and 15 nassellarian species commonly occurring in surface waters in the East China Sea. Each panel in the catalogue consists of three kinds of photomicrographs of a single species; LM images of living specimens, LM and SEM images of skeletons. This can be used as a pictorial guidebook for “Okinawa Radiolarian Tours” along with other pictorial publications showing LM images of living radiolarians (Matsuoka, 1993) and SEM images of radiolarian skeletons (Matsuoka, 2009).

### Materials and methods

Sesoko Island ( $26^{\circ} 38' 46''$  N,  $127^{\circ} 51' 54''$  E) is located 600 m west off the Motobu Peninsula of Okinawa Island (Fig. 1). Okinawa belongs to subtropical climates. Marine organisms around Sesoko Island are affected by the Kuroshio Current, characterized by warm, high salinity, and low nutrient. As a consequence the radiolarians around Sesoko Island represent a subtropical fauna.

Living radiolarians were collected using a  $44\ \mu\text{m}$  opening plankton net from a research vessel near Sesoko Island (Fig. 1). Samples were taken in short durations (ca. 3 min.) tow from surface waters in the East China Sea. Plankton samplings have been carried out since 1992.

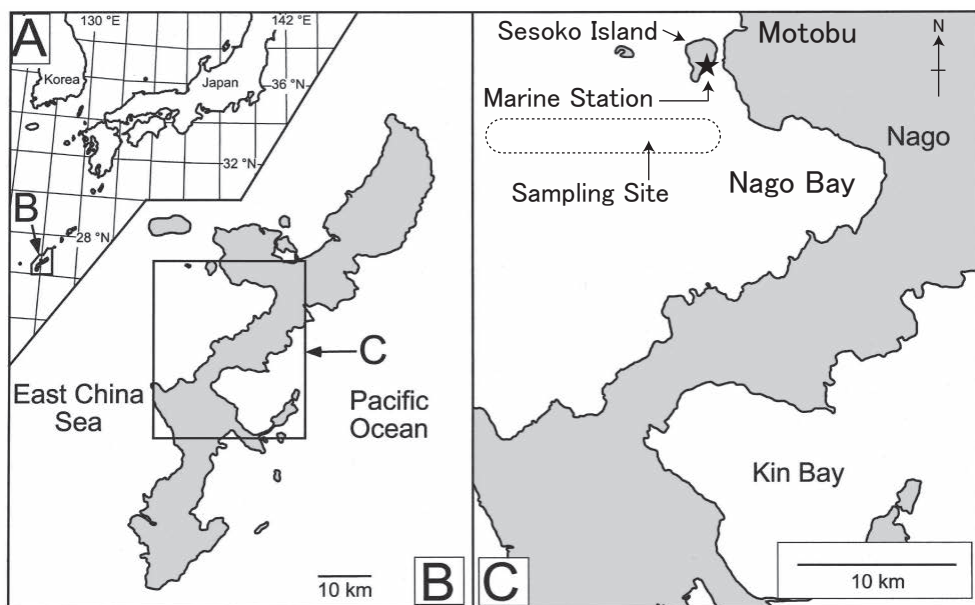


Fig. 1. Index map showing the sampling site.

Microscopic images of living radiolarians were taken during our activities at the Sesoko Station. Photomicrographs using negative color films were taken with a camera attached to an inverted microscope in early stages of our activities (1992–1999). After 2000, images of living radiolarians were captured with a digital camera system by using the same microscope.

Radiolarian skeletons were prepared by the methods mentioned below. The plankton samples were placed in ca. 50% sulfuric acid for a day to eliminate the organic matter. Following this, residues were rinsed with distilled water and dried. Radiolarian specimens were picked from the dried residues and mounted on aluminum stubs for SEM observations. For LM images of radiolarian skeletons, the residues were mounted on slide glass using synthetic medium “Entellan New” without picking.

### Catalogue

This catalogue contains 14 spumellarian and 15 nassellarian species (Table 1, Figs. 2–30). All of scales put at the right-upper margin of each photograph are 0.1 mm. A simple synonymy is prepared for each species. It includes the article in which the species was described as a new species. Several papers which reported the occurrence of the species from subtropical realms in the Pacific (Nishimura and Yamauchi, 1984; Takahashi, 1991; Cheng and Yeh, 1999; Sashida and Kurihara, 1999) are included. Articles of which scientific results were obtained during the tours (Suzuki and Sugiyama, 2001; Takahashi et al., 2003; Suzuki, 2005; Sugiyama et al., 2008; Suzuki et al., 2009) are also added in the synonymy. Further complete synonymy to some species is referred to Matsuzaki et al. (2015).

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**Table 1.** A list of radiolarian species treated in the catalogue, composed of 14 spumellarians and 15 nassellarians.

SPUMELLARIA	
<i>Diplosphaera hexagonalis</i> Haeckel	Fig. 2
<i>Cladococcus cervicornis</i> Haeckel	Fig. 3
<i>Rhizosphaera trigonacantha</i> Haeckel	Fig. 4
<i>Haliomilla capillaceum</i> (Haeckel)	Fig. 5
<i>Spongosphaera streptacantha</i> Haeckel	Fig. 6
<i>Hexacontium hostile</i> Cleve	Fig. 7
<i>Stylosphaera melpomene</i> Haeckel	Fig. 8
<i>Didymocyrtis tetrathalamus tetrathalamus</i> (Haeckel)	Fig. 9
<i>Spongaster tetras tetras</i> Ehrenberg	Fig. 10
<i>Spongodiscus biconcavus</i> Haeckel	Fig. 11
<i>Myelastrum trinibrachium</i> Takahashi	Fig. 12
<i>Dictyocoryne truncatum</i> (Ehrenberg)	Fig. 13
<i>Dictyocoryne profunda</i> Ehrenberg	Fig. 14
<i>Euchitonia elegans</i> (Ehrenberg)	Fig. 15
NASSELLARIA	
<i>Acanthodesmia vinculata</i> (Müller)	Fig. 16
<i>Neosemantis distephanus</i> Popofsky	Fig. 17
<i>Lophospyris pentagona pentagona</i> (Ehrenberg)	Fig. 18
<i>Pseudocubus obeliscus</i> Haeckel	Fig. 19
<i>Callimitra emmae</i> Haeckel	Fig. 20
<i>Peromelissa phalacra</i> Haeckel	Fig. 21
<i>Lophophaena hispida</i> (Ehrenberg)	Fig. 22
<i>Pterocanium praetextum praetextum</i> (Ehrenberg)	Fig. 23
<i>Eucyrtidium hexagonatum</i> Haeckel	Fig. 24
<i>Eucyrtidium hexastichum</i> (Haeckel)	Fig. 25
<i>Pterocorys zancleus</i> Müller	Fig. 26
<i>Pterocorys campanula</i> Haeckel	Fig. 27
<i>Theocorythium trachelium trachelium</i> (Ehrenberg)	Fig. 28
<i>Spirocyrts scalaris</i> Haeckel	Fig. 29
<i>Botryocyrtis scutum</i> (Harting)	Fig. 30

## *Diplosphaera hexagonalis* Haeckel

*Diplosphaera hexagonalis* Haeckel, 1887, p. 246, pl. 19, fig. 3.

*Astrosphaera hexagonalis* Haeckel, 1887, p. 250, pl. 19, fig. 4.

*Astrosphaera hexagonalis* Haeckel: Nishimura and Yamauchi, 1984, p. 24, pl. 14, figs. 1-2.

*Astrosphaera hexagonalis* Haeckel: Cheng and Yeh, 1989, p. 183, pl. 8, fig. 13.

*Astrosphaera hexagonalis* Haeckel: Takahashi, 1991, p. 69, pl. 11, figs. 1-3.

*Diplosphaera hexagonalis* Haeckel: Suzuki and Sugiyama, 2001, p. 138-139, figs. 2-3.

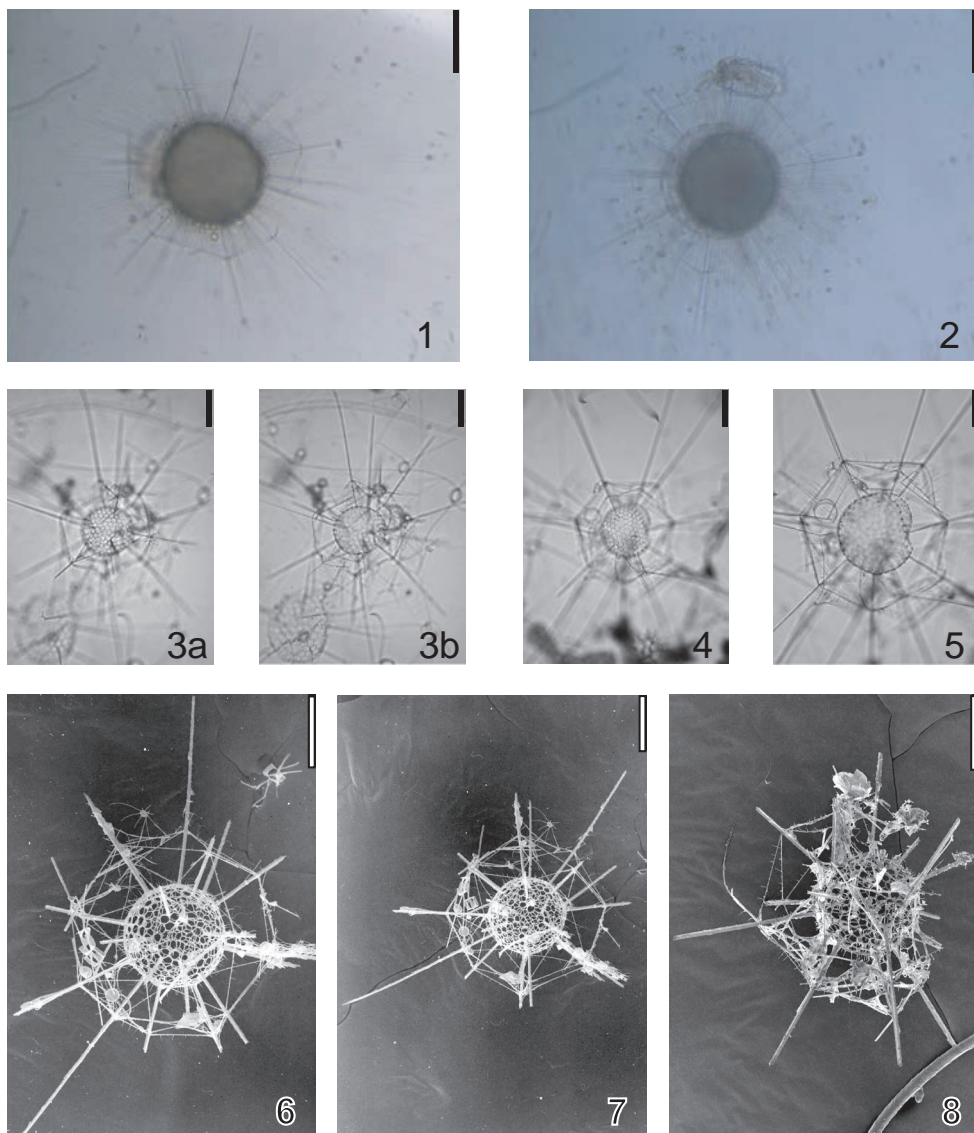


Fig. 2. Photomicrographs of *Diplosphaera hexagonalis* Haeckel. Scales are 0.1 mm.

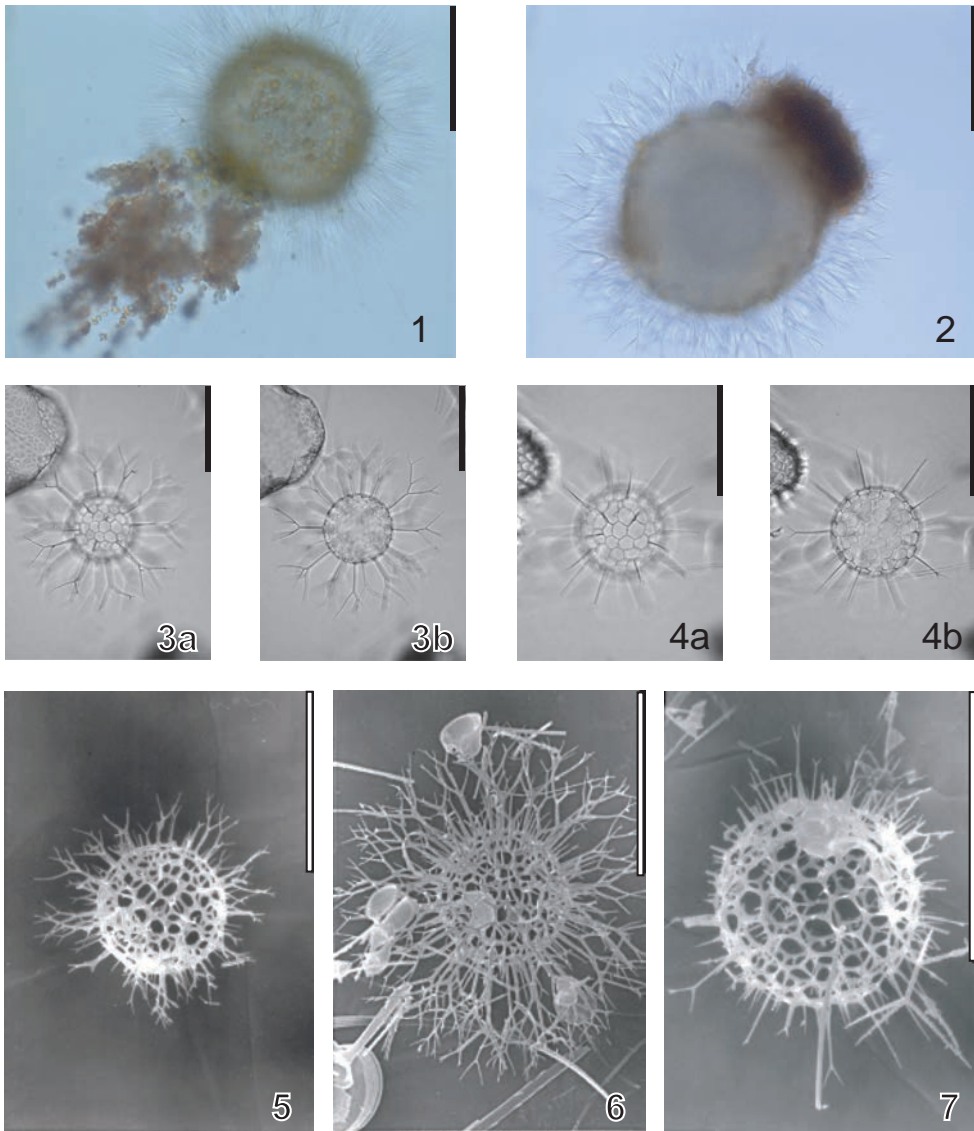


## *Cladococcus cervicornis* Haeckel

*Cladococcus cervicornis* Haeckel, 1861, p. 801; 1862, p. 370, pl. 14, figs. 4-6.

*Cladococcus cervicornis* Haeckel: Nishimura and Yamauchi, 1984, p. 24, pl. 11, figs. 1-6, 9, pl. 49, fig. 4, pl. 50, fig. 10.

*Cladococcus cervicornis* Haeckel: Takahashi, 1991, p. 67, pl. 10, figs. 8-10.



**Fig. 3.** Photomicrographs of *Cladococcus cervicornis* Haeckel. Scales are 0.1 mm.

## *Rhizosphaera trigonacantha* Haeckel

*Rhizosphaera trigonacantha* Haeckel, 1861, p. 840.

*Rhizosphaera trigonacantha* Haeckel: Haeckel, 1862, p. 452-453, pl. 25, figs. 1-7.

*Rhizosphaera serrata* Haeckel: Nishimura and Yamauchi, 1984, p. 32, pl. 6, figs. 5, 8, pl. 10, figs. 2, 10, pl. 45, fig. 6.

*Actinomma aracadoporum* Haeckel: Takahashi, 1991, p. 65, pl. 8, fig. 8.

*Rhizosphaera serrata* Haeckel: Sashida and Kurihara, 1999, p. 138, fig. 9.3.

*Rhizosphaera trigonacantha* Haeckel, Suzuki, 2005, pl. 1, figs. 1-8, pl. 2, figs. 1-18.

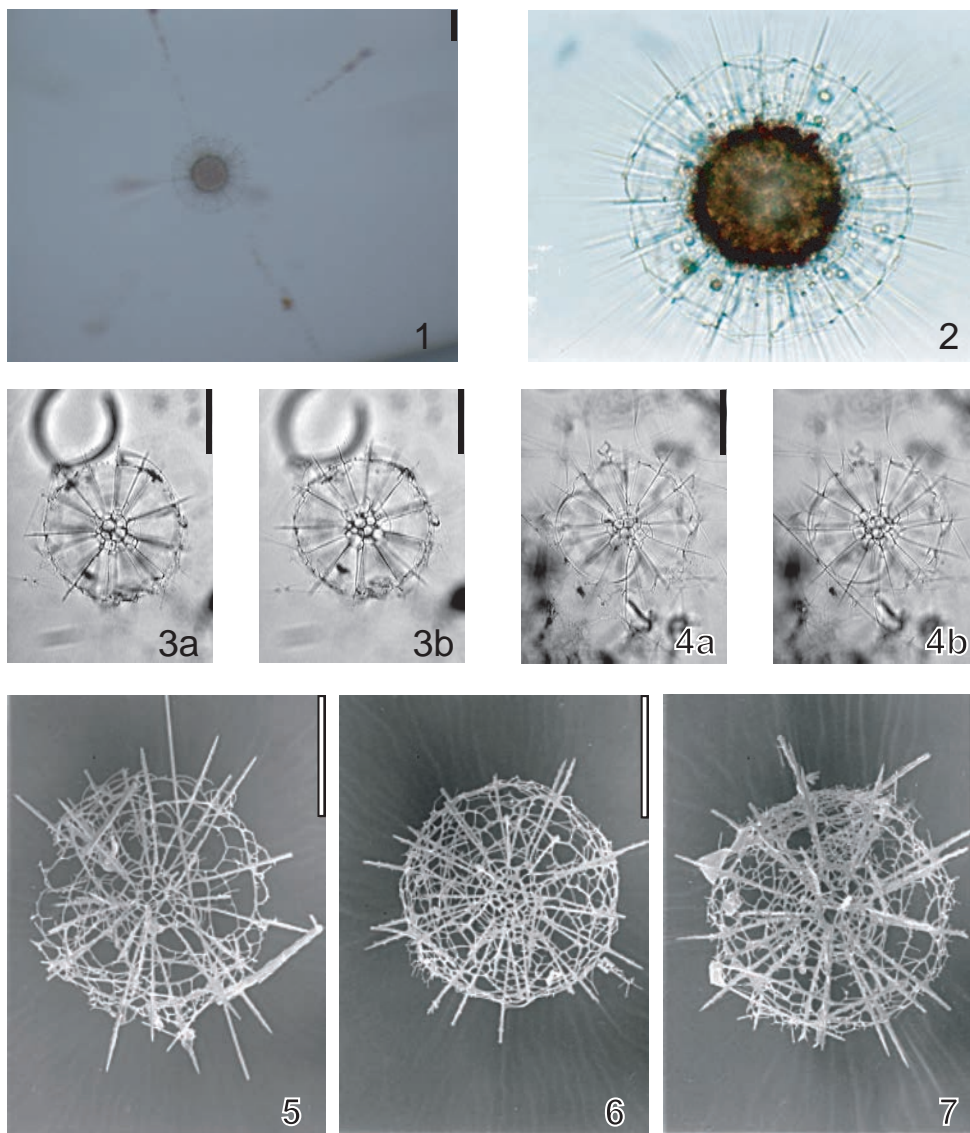


Fig. 4. Photomicrographs of *Rhizosphaera trigonacantha* Haeckel. Scales are 0.1 mm.



## *Haliommilla capillaceum* (Haeckel)

*Haliomma capillaceum* Haeckel, 1861, p. 814; 1862, p. 426, pl. 23, fig. 2; 1887, p. 236.

*Actinosphaera capillacea* (Haeckel) group: Nishimura and Yamauchi, 1984, p. 22-23, pl. 9, figs. 1-10, pl. 48, fig. 7.

*Actinosphaera capillacea* (Haeckel): Takahashi, 1991, p. 68, pl. 9, figs. 4-5.

*Actinosphaera capillacea* (Haeckel): Sashida and Kurihara, 1999, p. 133, figs. 9.4, 12.

*Haliommilla capillaceum* (Haeckel): Suzuki et al., 2009, p. 158, figs. 1.1-10.

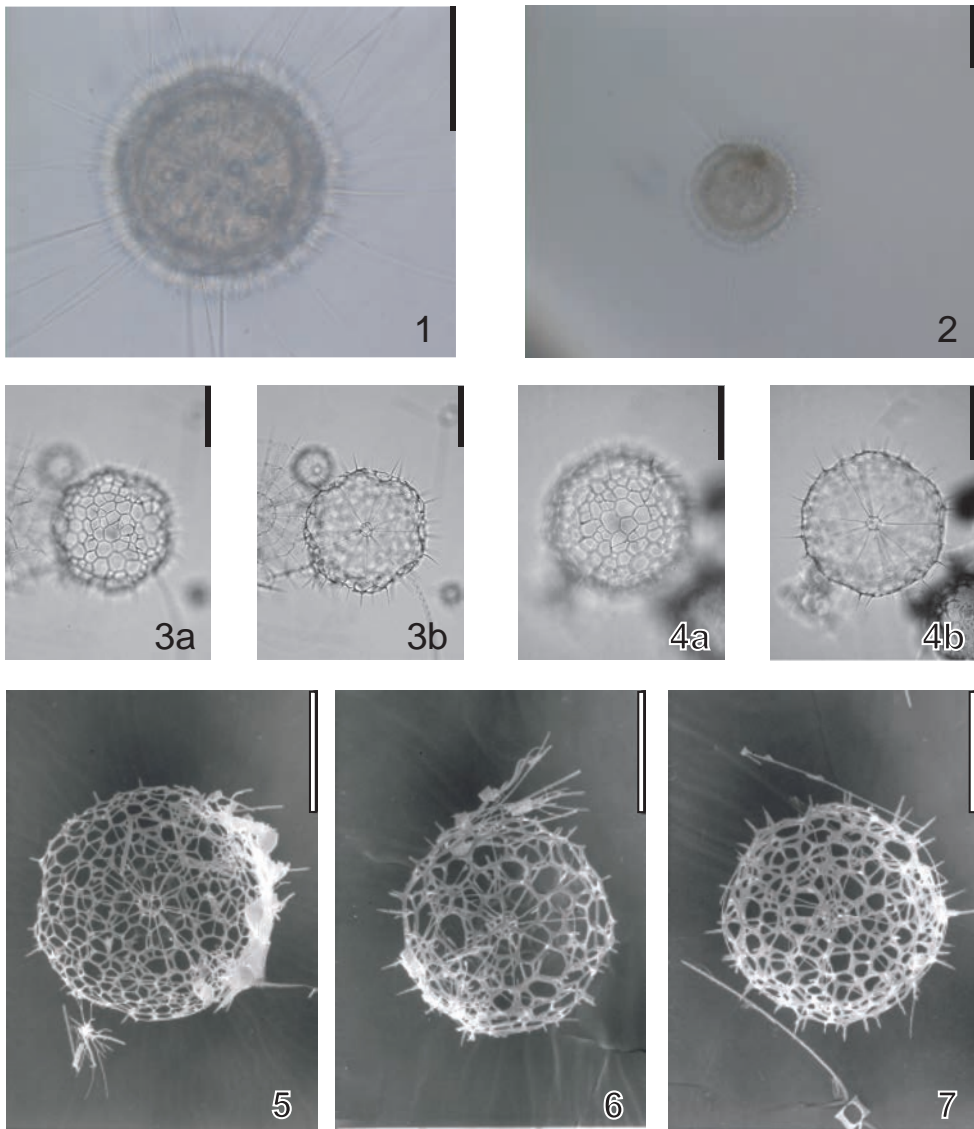


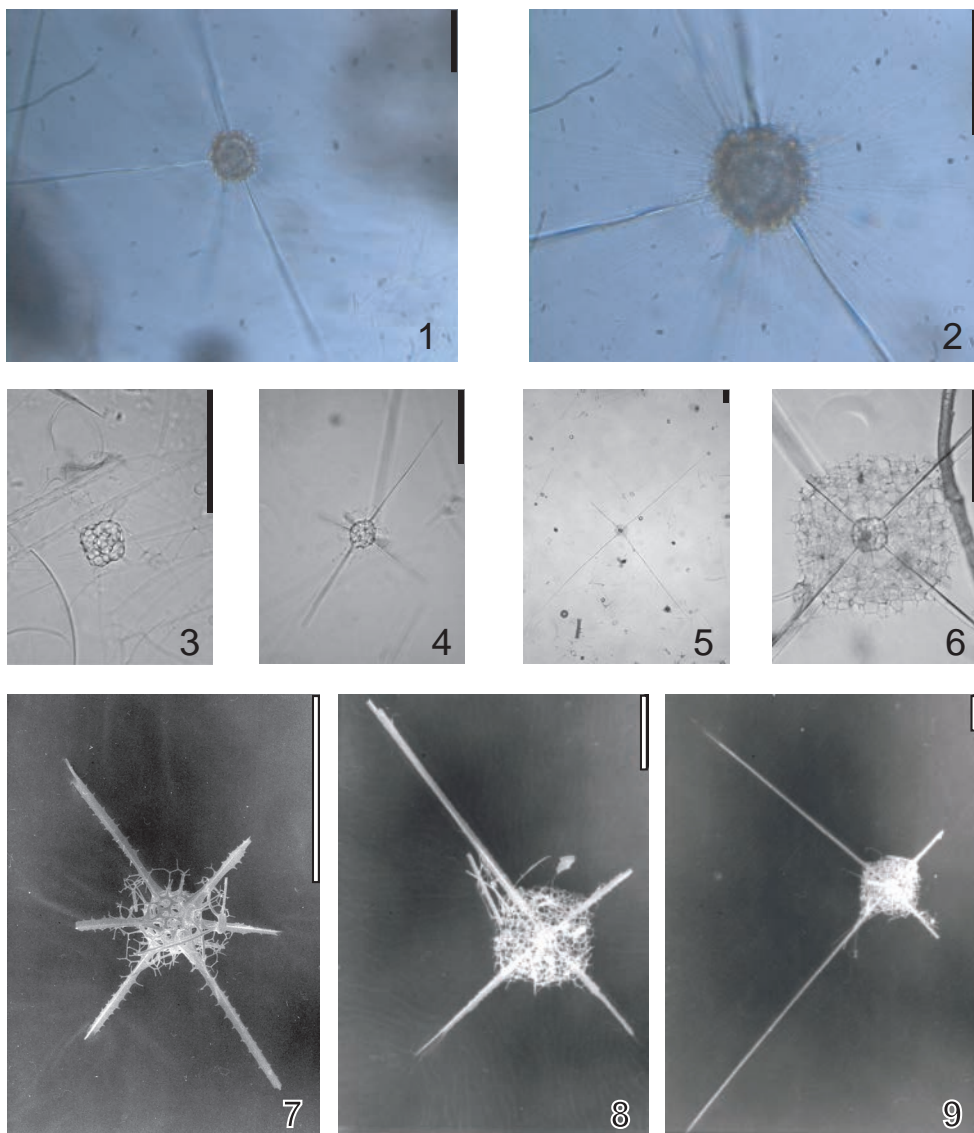
Fig. 5. Photomicrographs of *Haliommilla capillaceum* (Haeckel). Scales are 0.1 mm.

## *Spongosphaera streptacantha* Haeckel

*Spongosphaera streptacantha* Haeckel, 1861, p. 840-841; 1862, p. 455-456, pl. 26, figs. 1-3.

*Spongosphaera streptacantha* Haeckel: Nishimura and Yamauchi, 1984, p. 33, pl. 15, fig. 4, pl. 52, fig. 2.

*Spongosphaera streptacantha* Haeckel: Takahashi, 1991, p. 65, pl. 7, fig. 6.



**Fig. 6.** Photomicrographs of *Spongosphaera streptacantha* Haeckel. Scales are 0.1 mm.

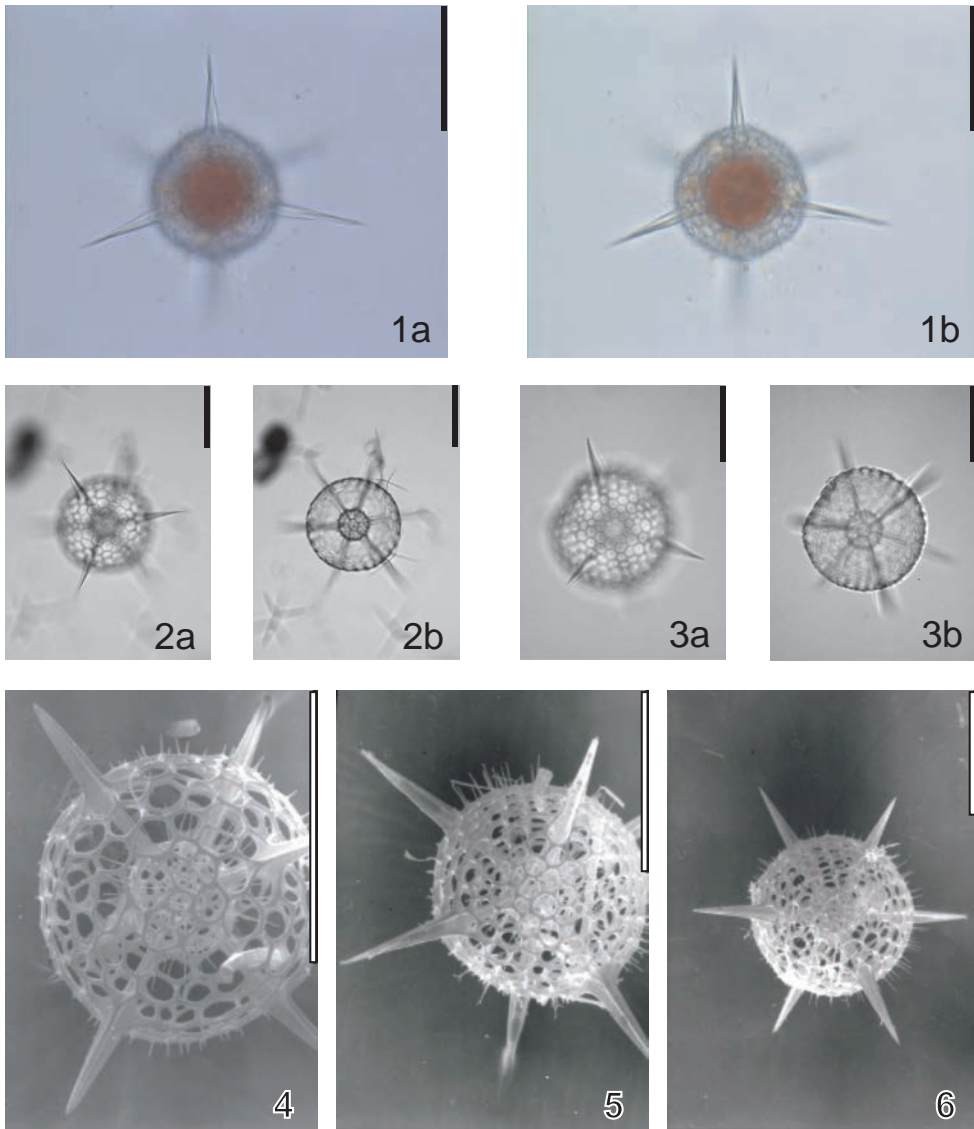
## *Hexacontium hostile* Cleve

*Hexacontium hostile* Cleve, 1900, p. 9, pl. 6, fig. 4.

*Hexacontium hostile* Cleve: Nishimura and Yamauchi, 1984, p. 30, pl. 3, figs. 2, 7, pl. 45, fig. 5, non pl. 46, fig. 5.

*Hexacontium hostile* Cleve: Takahashi, 1991, p. 72, pl. 13, fig. 1-2.

*Hexacontium hostile* Cleve: Sashida and Kurihara, 1999, p. 135, figs. 9.6-7.



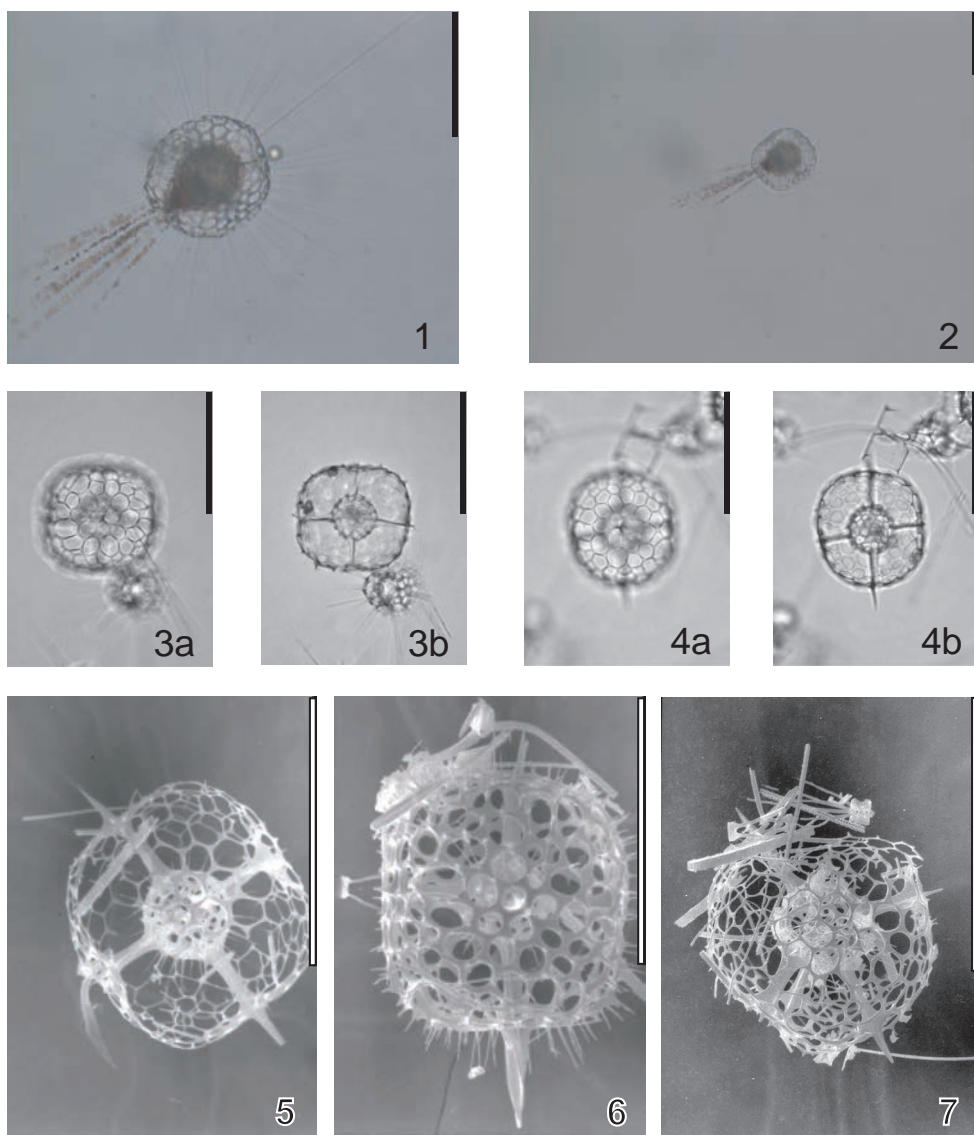
**Fig. 7.** Photomicrographs of *Hexacontium hostile* Cleve. Scales are 0.1 mm.

## *Stylosphaera melpomene* Haeckel

*Stylosphaera melpomene* Haeckel, 1887, p. 135, pl. 16, fig. 1.

*Stylatractus melpomene* (Haeckel): Nishimura and Yamauchi, 1984, p. 34, pl. 6, fig. 2, pl. 51, fig. 4.

*Stylosphaera melpomene* Haeckel: Takahashi, 1991, p. 75, pl. 14, figs. 1-2.



**Fig. 8.** Photomicrographs of *Stylosphaera melpomene* Haeckel. Scales are 0.1 mm.



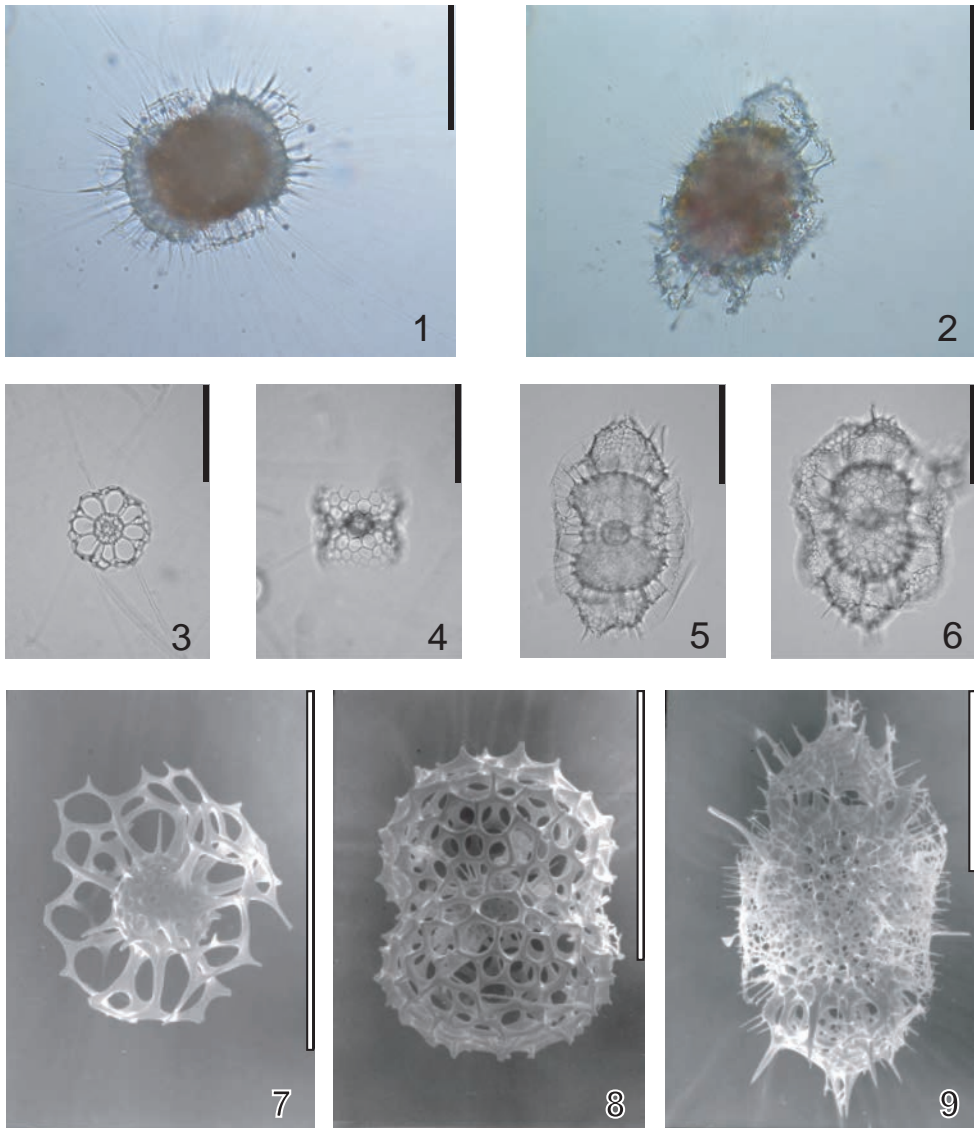
## *Didymocyrtis tetrathalamus tetrathalamus* (Haeckel)

*Panartus tetrathalamus* Haeckel, 1887, p. 378, pl. 40, fig. 3.

*Ommatartus tetrathalamus tetrathalamus* (Haeckel): Nishimura and Yamauchi, 1984, p. 36, pl. 16, figs. 1-4, 7-9, pl. 52, fig. 12.

*Didymocyrtis tetrathalamus tetrathalamus* (Haeckel): Takahashi, 1991, p. 79, pl. 21, figs. 1-14.

*Didymocyrtis tetrathalamus tetrathalamus* (Haeckel): Sashida and Kurihara, 1999, p. 138, figs. 8.13-14, 16, fig. 12.8, 20.



**Fig. 9.** Photomicrographs of *Didymocyrtis tetrathalamus tetrathalamus* (Haeckel). Scales are 0.1 mm.



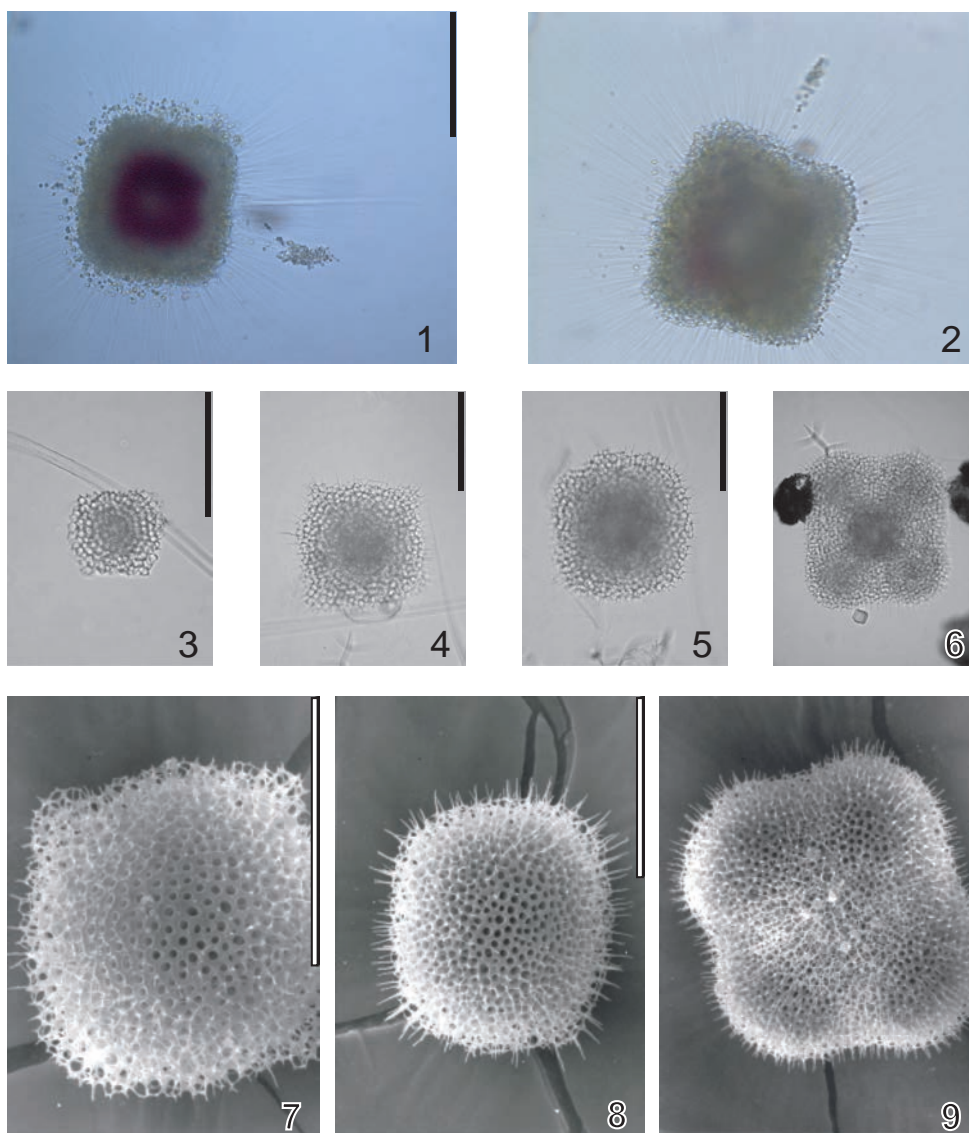
## *Spongaster tetras tetras* Ehrenberg

*Spongaster tetras* Ehrenberg, 1862, p. 301; 1873b, p. 299, pl. 6, fig. 8.

*Spongaster tetras tetras* Ehrenberg: Nishimura and Yamauchi, 1984, p. 39, pl. 19, figs. 14-15.

*Spongaster tetras tetras* Ehrenberg: Cheng and Yeh, 1989, p. 185, pl. 3, figs. 16, 20, pl. 6, fig. 17.

*Spongaster tetras tetras* Ehrenberg: Takahashi, 1991, p. 86, pl. 17, figs. 10-11.



**Fig. 10.** Photomicrographs of *Spongaster tetras tetras* Ehrenberg. Scales are 0.1 mm.

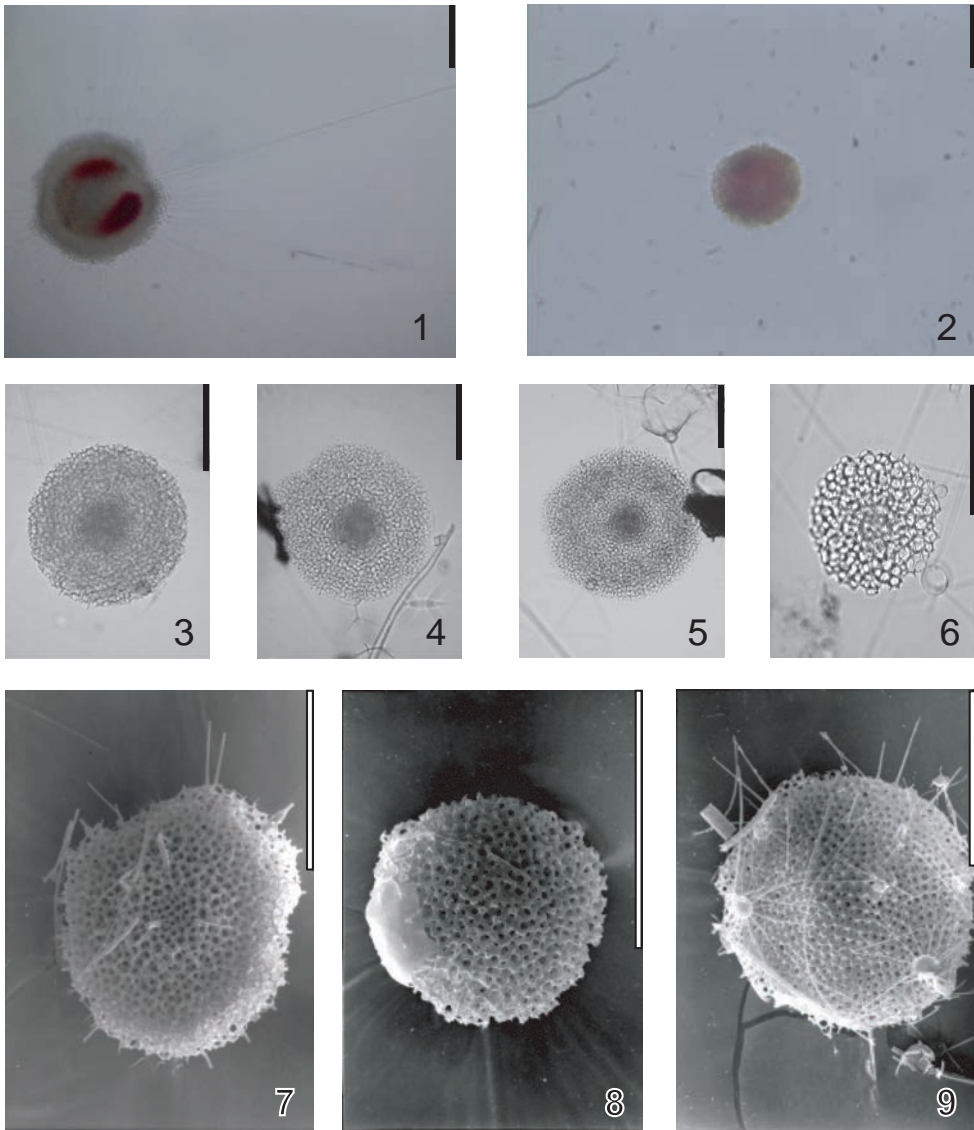
## *Spongodiscus biconcavus* Haeckel

*Spongodiscus biconcavus* Haeckel, 1887, p. 577.

*Spongodiscus biconcavus* Haeckel: Nishimura and Yamauchi, 1984, p. 40, pl. 20, fig. 14, pl. 53, fig. 1.

*Spongodiscus resurgens* Ehrenberg: Cheng and Yeh, 1989, p. 185, pl. 1, fig. 19, non pl. 8, fig. 15.

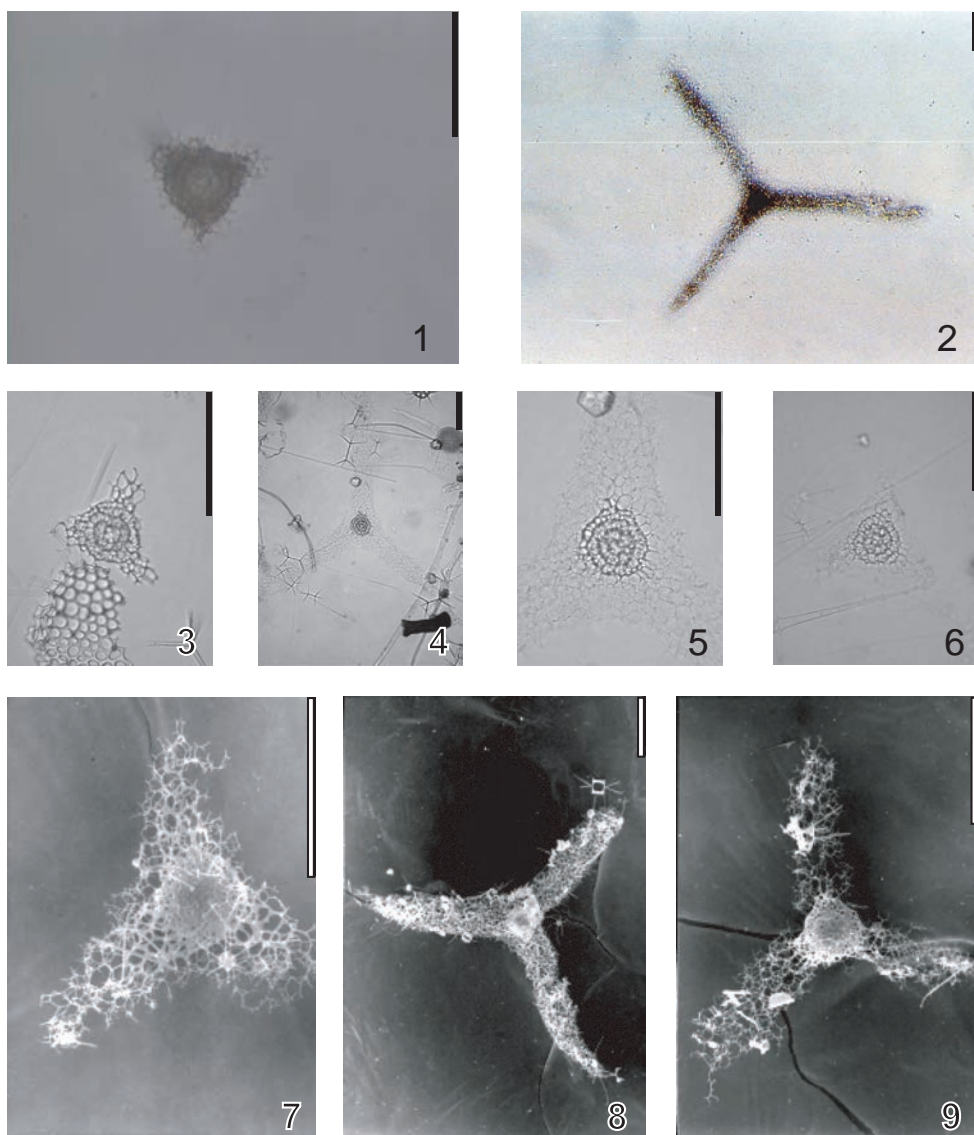
*Spongodiscus biconcavus* Haeckel: Takahashi, 1991, p. 84, pl. 19, figs. 4-6.



**Fig. 11.** Photomicrographs of *Spongodiscus biconcavus* Haeckel. Scales are 0.1 mm.

## *Myelastrum trinibrachium* Takahashi

*Myelastrum trinibrachium* Takahashi, 1991, p. 88, pl. 18, figs. 7-12.



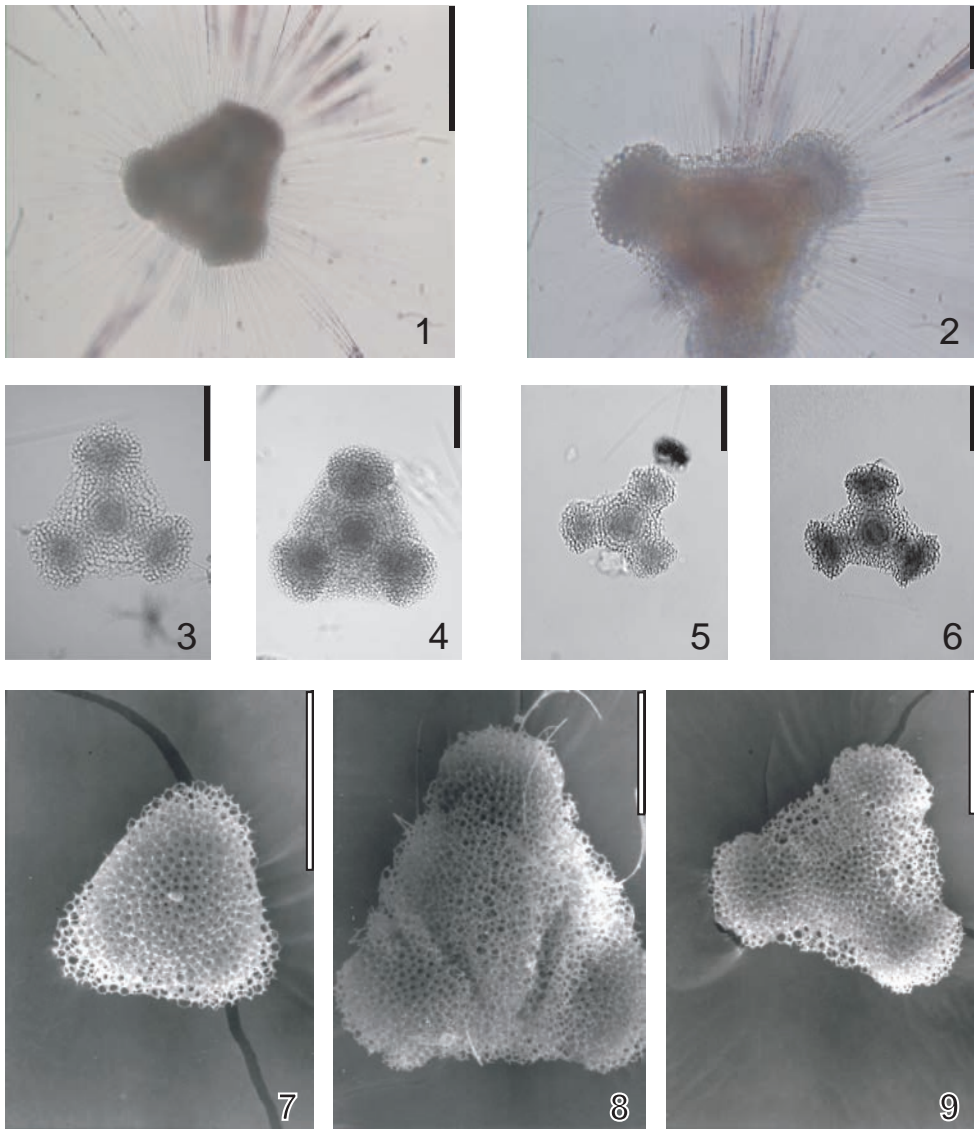
**Fig. 12.** Photomicrographs of *Myelastrum trinibrachium* Takahashi. Scales are 0.1 mm.

## *Dictyocoryne truncatum* (Ehrenberg)

*Rhopalodictyum truncatum* Ehrenberg, 1862, p. 301.

*Dictyocoryne truncatum* (Ehrenberg), Nishimura and Yamauchi, 1984, p. 39, pl. 20, figs. 8, 10-12, pl. 53, figs. 3, 12.

*Dictyocoryne truncatum* (Ehrenberg), Sashida and Kurihara, 1999, p. 141, fig. 10.3.



**Fig. 13.** Photomicrographs of *Dictyocoryne truncatum* (Ehrenberg). Scales are 0.1 mm.



## *Dictyocoryne profunda* Ehrenberg

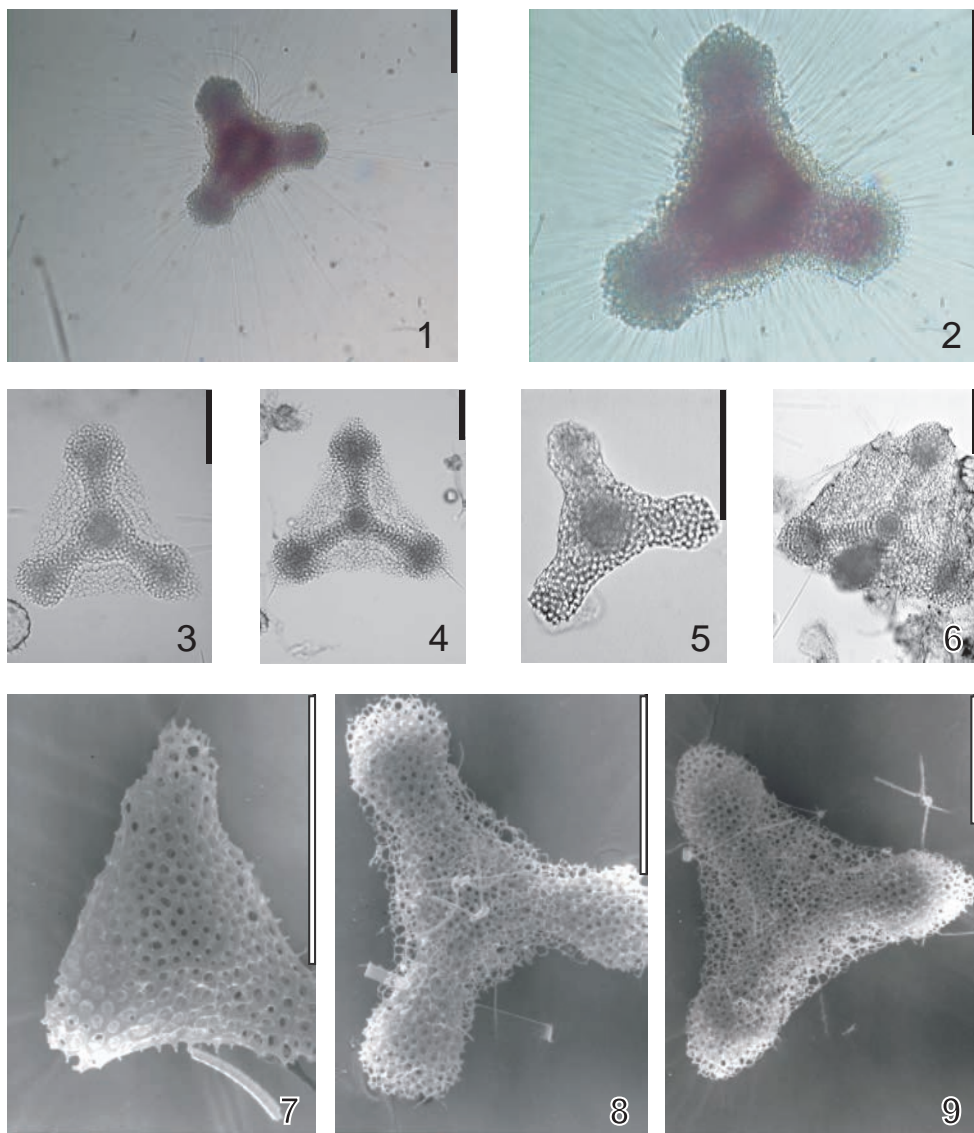
*Dictyocoryne profunda* Ehrenberg, 1873a, p. 307; 1873b, p. 288-289, pl. 7, fig. 23.

*Dictyocoryne profunda* Ehrenberg group, Nishimura and Yamauchi, 1984, p. 38-39, pl. 19, fig. 13, pl. 20, figs. 1-7, 9, pl. 54, figs. 1-6.

*Hymeniasstrum euclidis* Haeckel, Cheng and Yeh, 1989, p. 184, pl. 3, figs. 7, 11, non figs. 12-13, pl. 6, fig. 11.

*Dictyocoryne profunda* Ehrenberg, Takahashi, 1991, p. 83, pl. 16, figs. 10, 12-13, non fig. 15.

*Dictyocoryne profunda* Ehrenberg, Sashida and Kurihara, 1999, p. 141, figs. 10.1-2.



**Fig. 14.** Photomicrographs of *Dictyocoryne profunda* Ehrenberg. Scales are 0.1 mm.



## *Euchitonina elegans* (Ehrenberg)

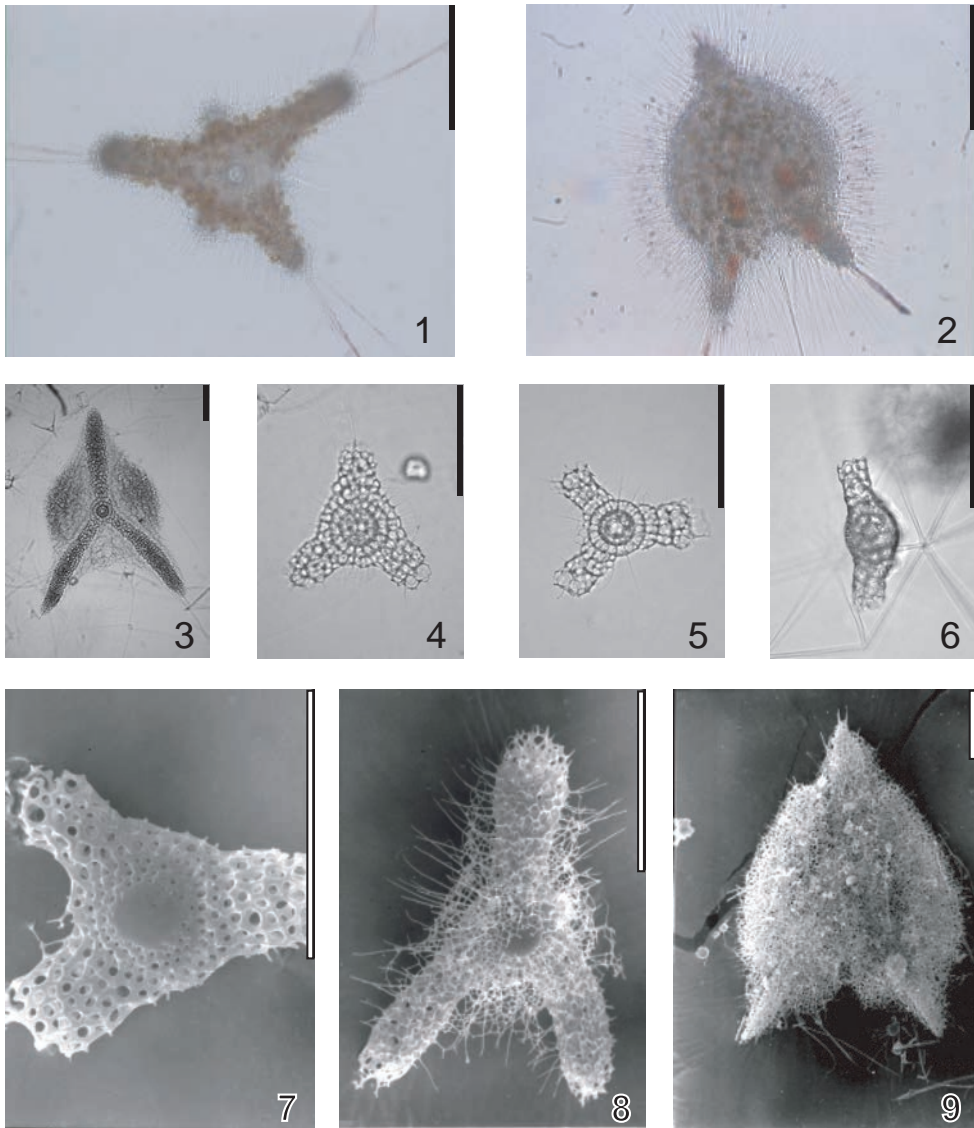
*Pteractis elegans* Ehrenberg, 1873a, p. 319; 1873b, p. 299, pl. 8, fig. 3.

*Euchitonina elegans* (Ehrenberg), Nishimura and Yamauchi, 1984, p. 37-38, pl. 19, figs. 1-3, 7-9, 11, pl. 53, fig. 11.

*Euchitonina elegans* (Ehrenberg), Cheng and Yeh, 1989, p. 184, pl. 3, figs. 6, 14, 17, pl. 6, figs. 7, 13.

*Euchitonina elegans* (Ehrenberg), Takahashi, 1991, p. 80, pl. 16, figs. 1-6

*Euchitonina elegans* (Ehrenberg), Sashida and Kurihara, 1999, p. 139, fig. 10.5, fig. 12.3.



**Fig. 15.** Photomicrographs of *Euchitonina elegans* (Ehrenberg). Scales are 0.1 mm.

## *Acanthodesmia vinculata* (Müller)

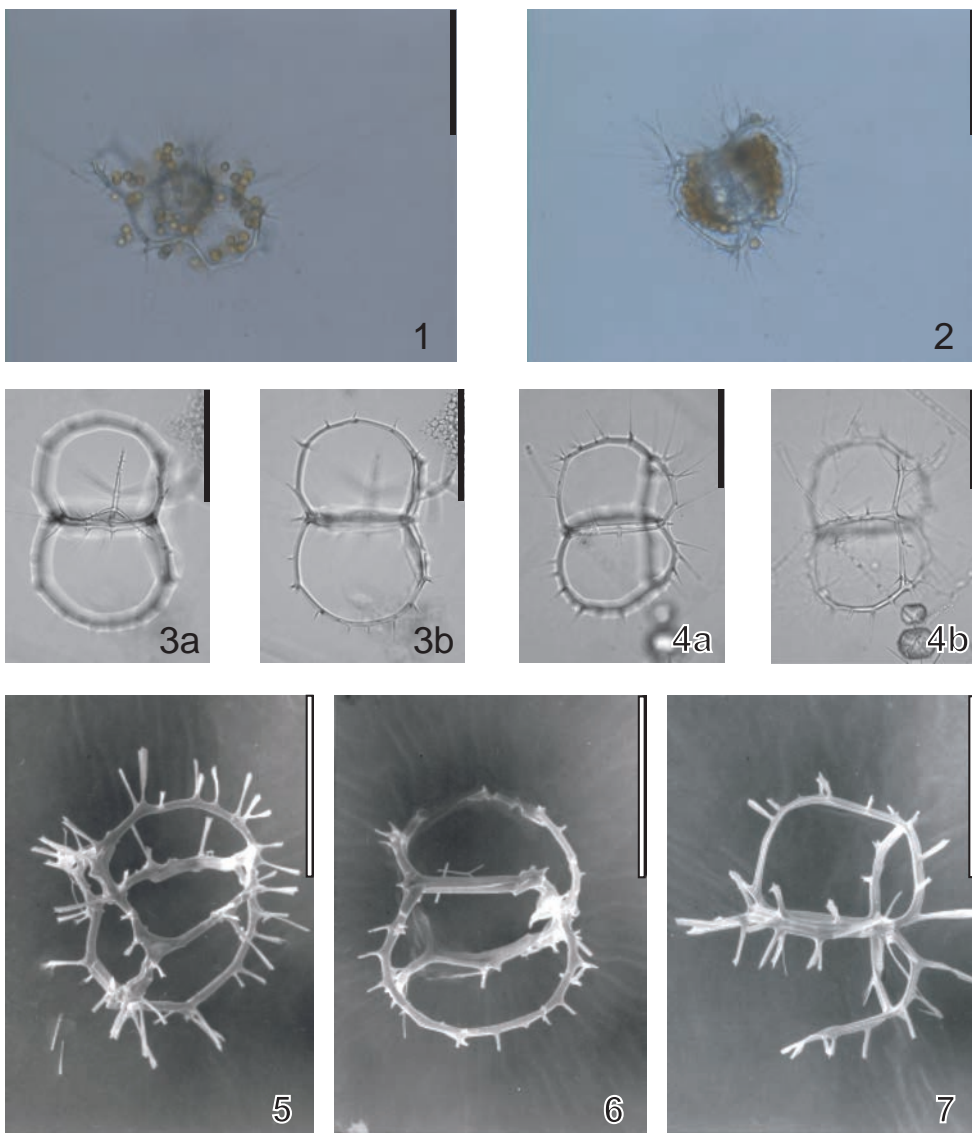
*Lithocircus vinculatus* Müller, 1856, p. 484.

*Acanthodesmia vinculata* (Müller): Müller, 1859, p. 30, pl. 1, figs. 4-7.

*Acanthodesmia vinculata* (Müller) group: Nishimura and Yamauchi, 1984, p. 67, pl. 22, figs. 1-3, 5-6, 8.

*Acanthodesmia vinculata* (Müller): Cheng and Yeh, 1989, p. 185, pl. 10, figs. 3-4, 7-8.

*Acanthodesmia vinculata* (Müller): Takahashi, 1991, p. 102, pl. 28, figs. 6-8.



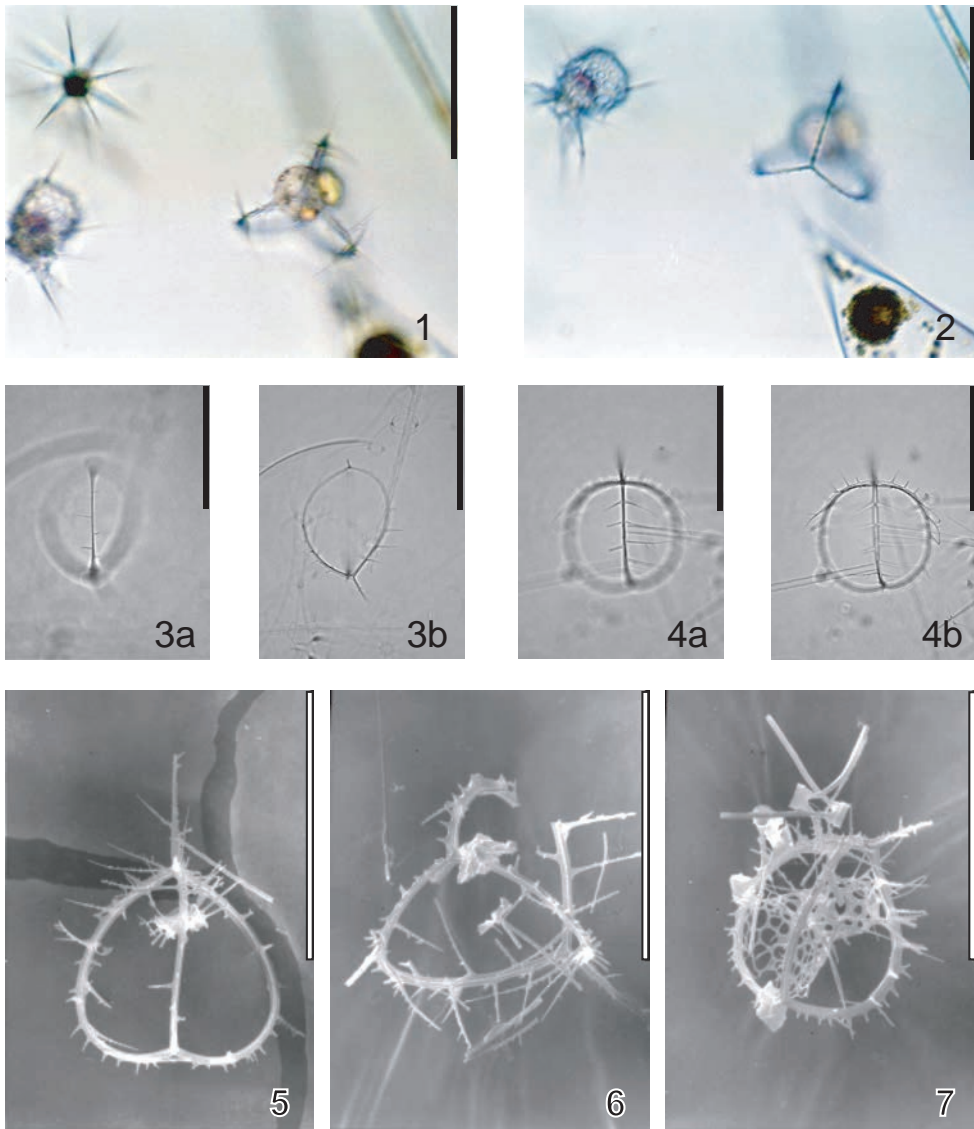
**Fig. 16.** Photomicrographs of *Acanthodesmia vinculata* (Müller). Scales are 0.1 mm.

## *Neosemantis distephanus* Popofsky

*Neosemantis distephanus* Popofsky, 1913, p. 299, pl. 29, fig. 2.

*Neosemantis distephanus* Popofsky: Nishimura and Yamauchi, 1984, p. 47, pl. 22, figs. 7, 10.

*Neosemantis distephanus* Popofsky: Takahashi, 1991, p. 95, pl. 27, fig. 12.



**Fig. 17.** Photomicrographs of *Neosemantis distephanus* Popofsky. Scales are 0.1 mm.

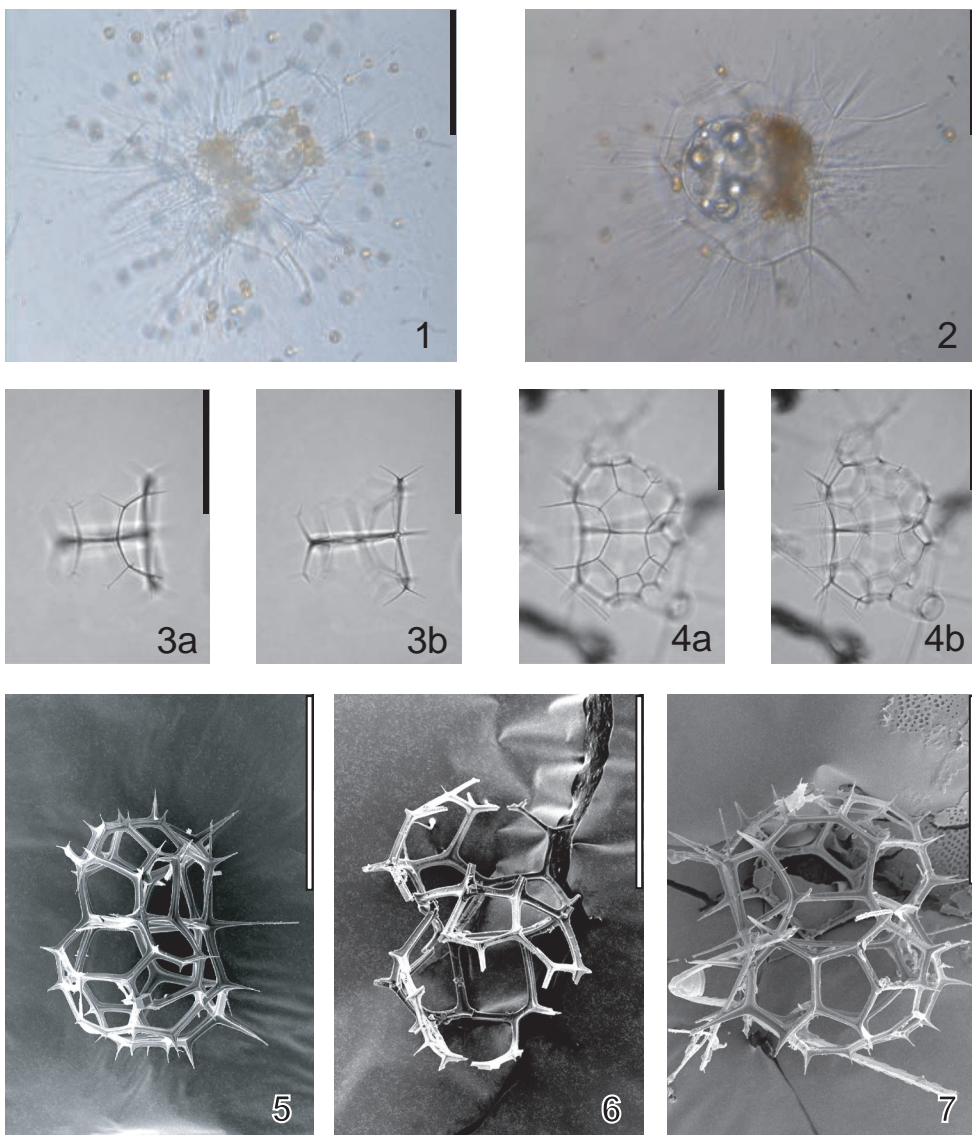
## *Lophospyris pentagona pentagona* (Ehrenberg)

*Ceratospyris pentagona* Ehrenberg, 1873a, p. 303; 1873b, p. 286-287, pl. 10, fig. 15.

*Lophospyris pentagona pentagona* (Ehrenberg): Nishimura and Yamauchi, 1984, p. 68, pl. 22, figs. 14-15.

*Lophospyris pentagona pentagona* (Ehrenberg): Cheng and Yeh, 1989, p. 185-186, pl. 5, figs. 11-12, 14-16.

*Lophospyris pentagona pentagona* (Ehrenberg): Takahashi, 1991, p. 102, pl. 28, figs. 9-14.



**Fig. 18.** Photomicrographs of *Lophospyris pentagona pentagona* (Ehrenberg). Scales are 0.1 mm.

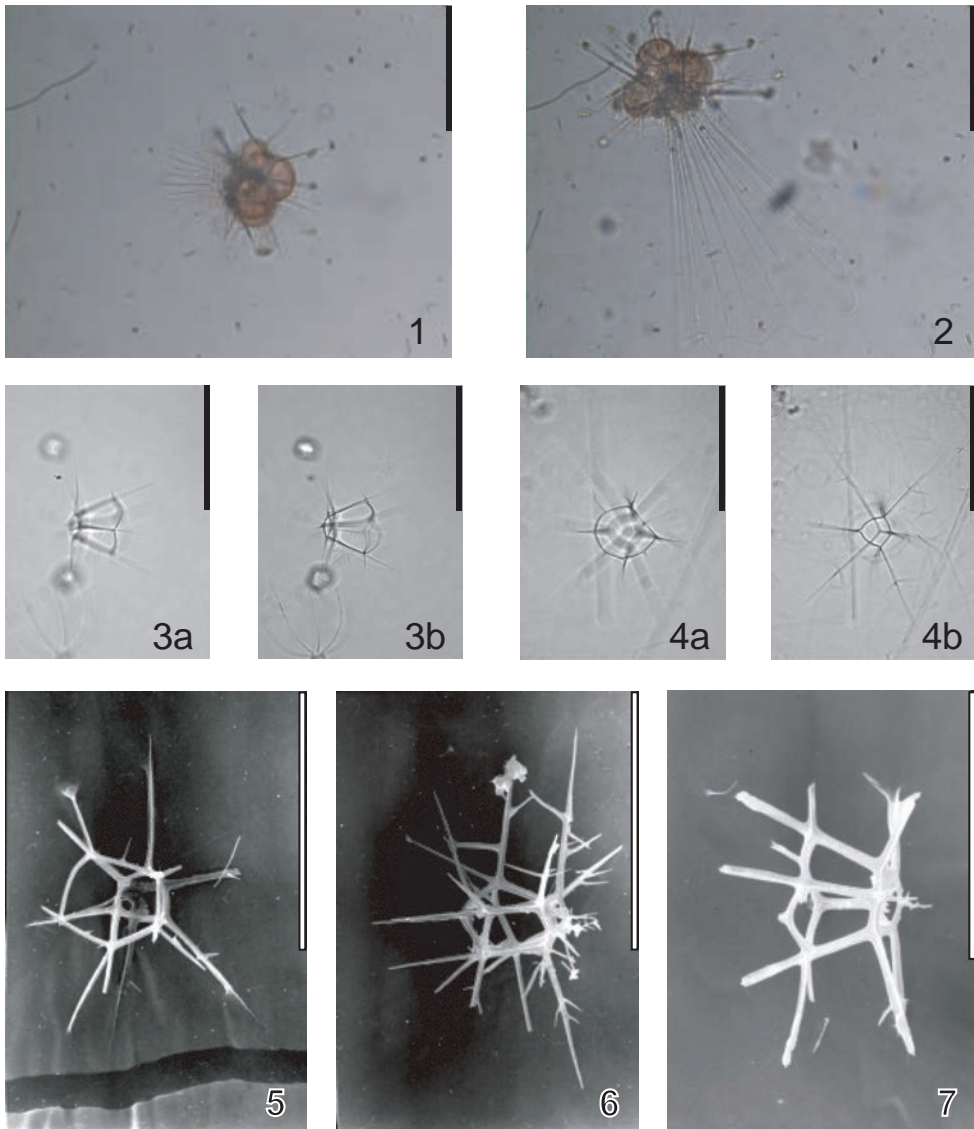


## *Pseudocubus obeliscus* Haeckel

*Pseudocubus obeliscus* Haeckel, 1887, p. 1010, pl. 94, fig. 11.

*Pseudocubus obeliscus* Haeckel: Takahashi, 1991, p. 95, pl. 26, fig. 1.

*Pseudocubus obeliscus* Haeckel: Sashida and Kurihara, 1999, p. 125, 127, figs. 7. 20-21.



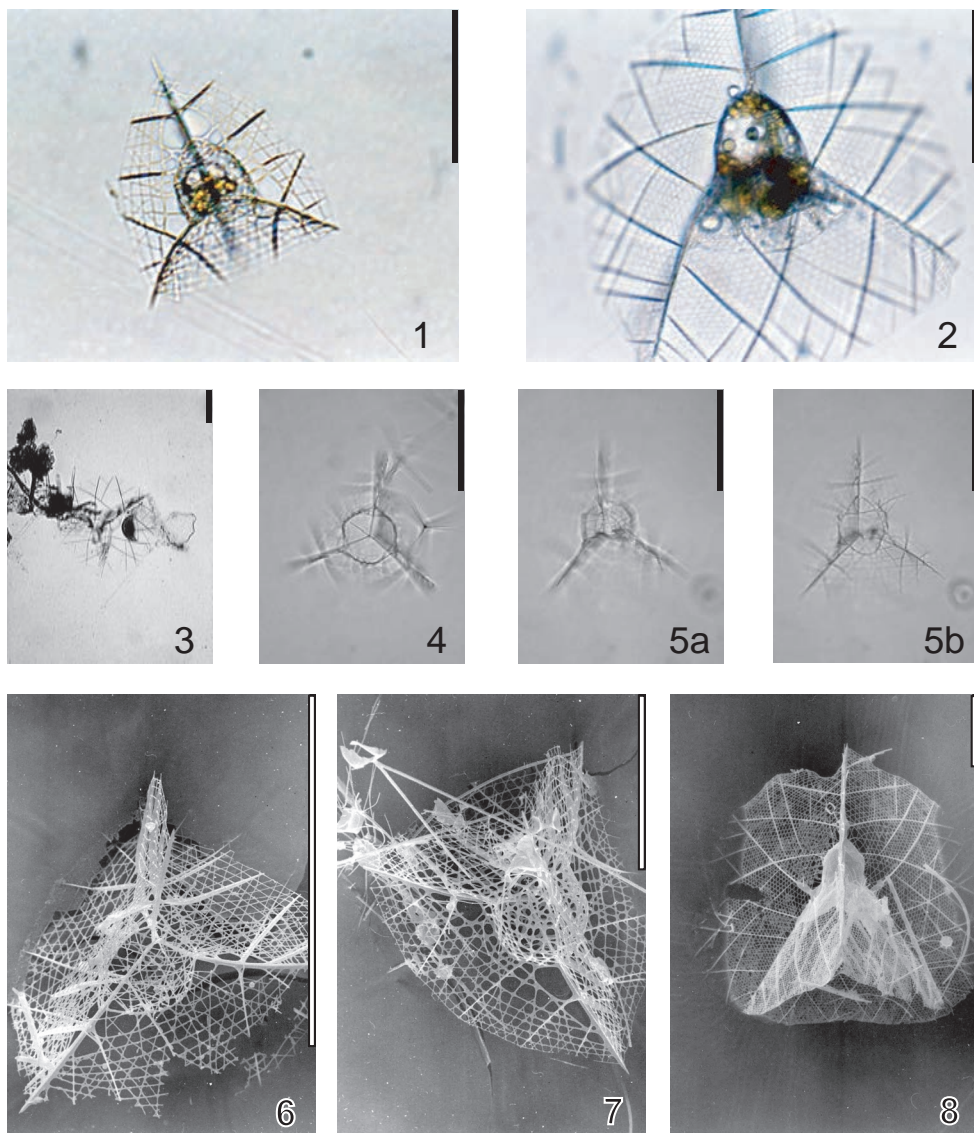
**Fig. 19.** Photomicrographs of *Pseudocubus obeliscus* Haeckel. Scales are 0.1 mm.



## *Callimitra emmae* Haeckel

*Callimitra emmae* Haeckel, 1887, p. 1218, pl. 63, fig. 3-4.

*Callimitra emmae* Haeckel: Takahashi, 1991, p. 99, pl. 26, fig. 14.



**Fig. 20.** Photomicrographs of *Callimitra emmae* Haeckel. Scales are 0.1 mm.

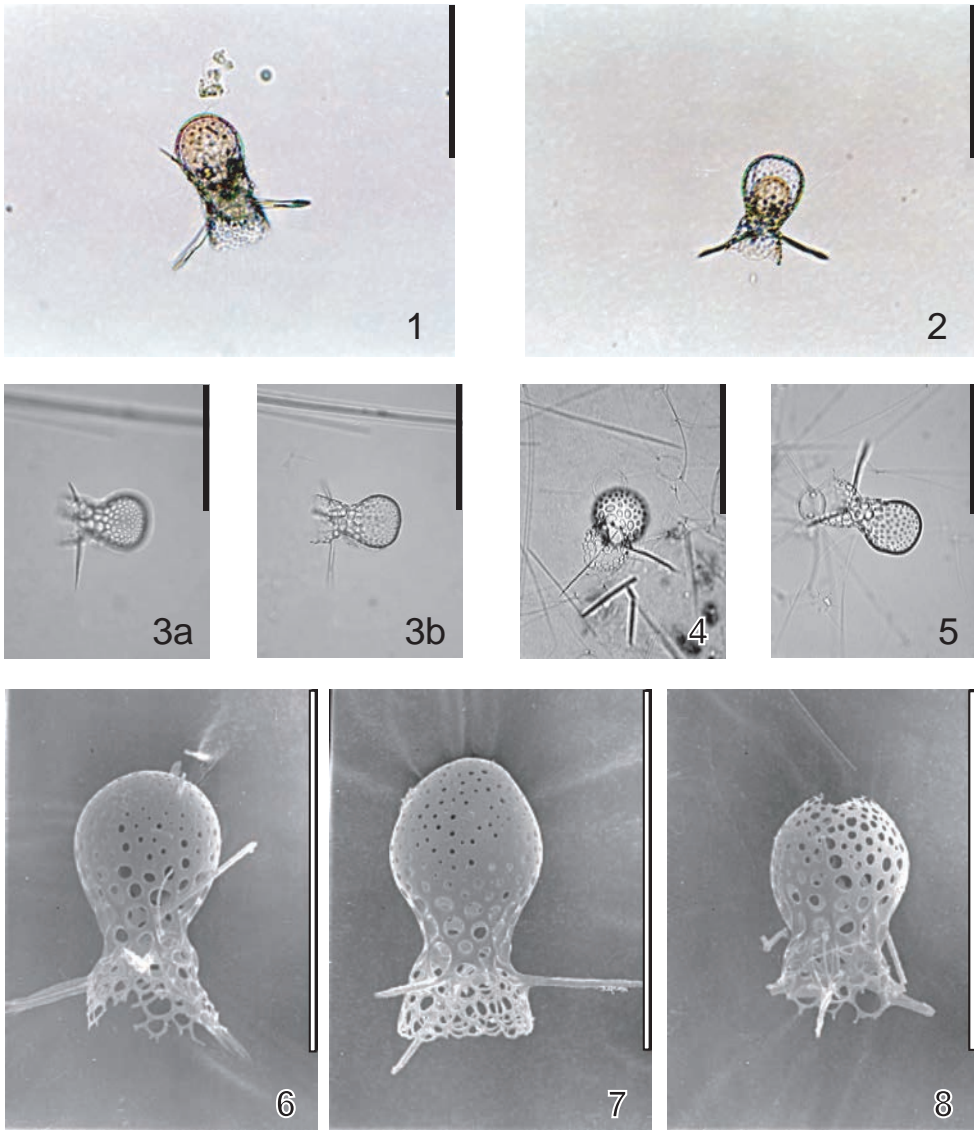
## *Peromelissa phalacra* Haeckel

*Peromelissa phalacra* Haeckel, 1887, p. 1236-1237, pl. 57, fig. 11.

*Peromelissa phalacra* Haeckel: Nishimura and Yamauchi, 1984, p. 47, pl. 32, figs. 1, 12.

*Peromelissa phalacra* Haeckel: Takahashi, 1991, p. 97, pl. 25, figs. 11-15.

*Peromelissa phalacra* Haeckel: Sashida and Kurihara, 1999, p. 125, fig. 7.12, fig. 11.4.



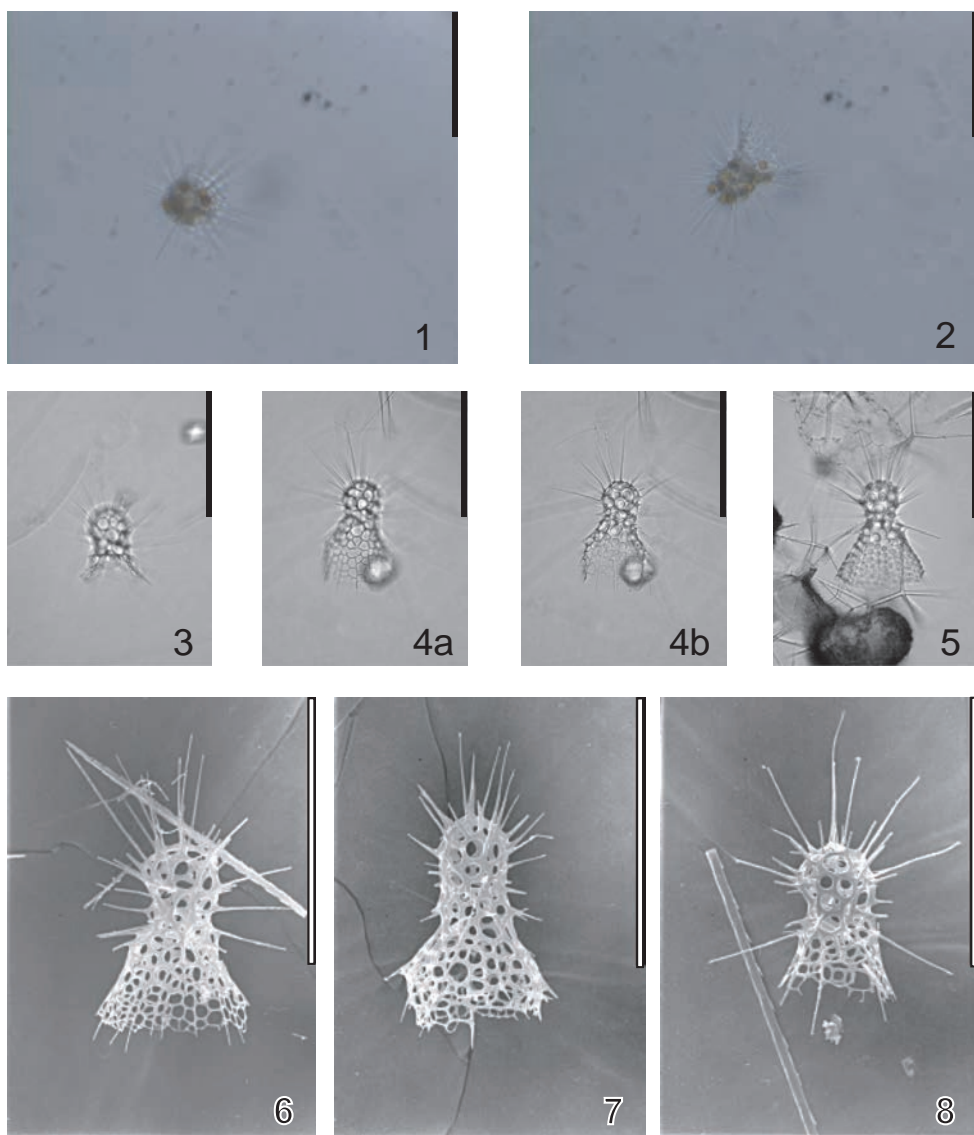
**Fig. 21.** Photomicrographs of *Peromelissa phalacra* Haeckel. Scales are 0.1 mm.

## *Lophophaena hispida* (Ehrenberg)

*Dictyocephalus hispidus* Ehrenberg, 1862, p. 298; 1873b, p. 288-289, pl. 5, fig. 18.

*Lophophaena hispida* (Ehrenberg): Nishimura and Yamauchi, 1984, p. 46, pl. 32, figs. 6-7.

*Lophophaena cylindrica* (Cleve): Takahashi, 1991, p. 96, pl. 25, figs. 4-5, non fig. 3.



**Fig. 22.** Photomicrographs of *Lophophaena hispida* (Ehrenberg). Scales are 0.1 mm.

## *Pterocanium praetextum praetextum* (Ehrenberg)

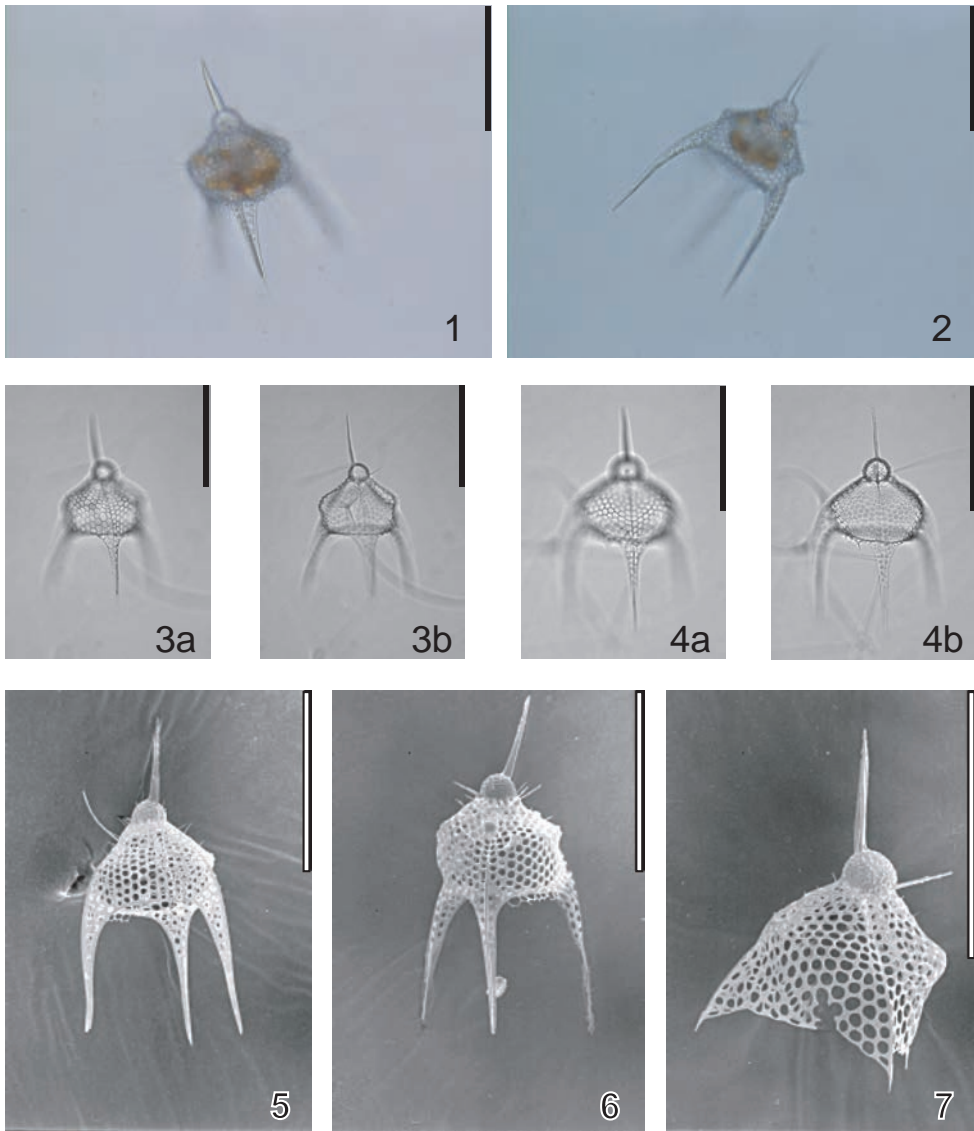
*Lychnocanium praetextum* Ehrenberg, 1873a, p. 316; 1873b, p. 296-297, pl. 10, fig. 2.

*Pterocanium praetextum praetextum* (Ehrenberg): Nishimura and Yamauchi, 1984, p. 60-61, pl. 30, figs. 1-2, 4, 7.

*Pterocanium praetextum praetextum* (Ehrenberg): Cheng and Yeh, 1989, p. 187, pl. 4, fig. 1, pl. 9, figs. 3-6.

*Pterocanium praetextum praetextum* (Ehrenberg): Takahashi, 1991, p. 115, pl. 36, figs. 15-18.

*Pterocanium praetextum praetextum* (Ehrenberg): Sashida and Kurihara, 1999, p. 130, figs. 6. 1-3, 5, 8-10, fig. 11. 10.



**Fig. 23.** Photomicrographs of *Pterocanium praetextum praetextum* (Ehrenberg). Scales are 0.1 mm.



## *Eucyrtidium hexagonatum* Haeckel

*Eucyrtidium hexagonatum* Haeckel, 1887, p. 1489, pl. 80, fig. 11.

*Eucyrtidium hexagonatum* Haeckel: Nishimura and Yamauchi, 1984, p. 57, pl. 39, fig. 2, non fig. 11, pl. 56, fig. 4.

*Eucyrtidium cienkowskii* Haeckel: Cheng and Yeh, 1989, p. 186, pl. 4, fig. 5, non fig. 4, pl. 9, figs. 13-16.

*Stichopodium dictyopodium* Haeckel: Cheng and Yeh, 1989, p. 187, pl. 4, fig. 9.

*Eucyrtidium hexagonatum* Haeckel: Takahashi, 1991, p. 124, pl. 42, figs. 18-19.

*Eucyrtidium hexagonatum* Haeckel: Sashida and Kurihara, 1999, p. 121, figs. 5.3-6, 15-16, 19, fig. 11.11.

*Eucyrtidium hexagonatum* Haeckel: Sugiyama et al., 2008, p. 121, 214, 216, figs. 3.1-5, figs. 4.1-5, figs. 5.1-4, figs. 6.1-2.

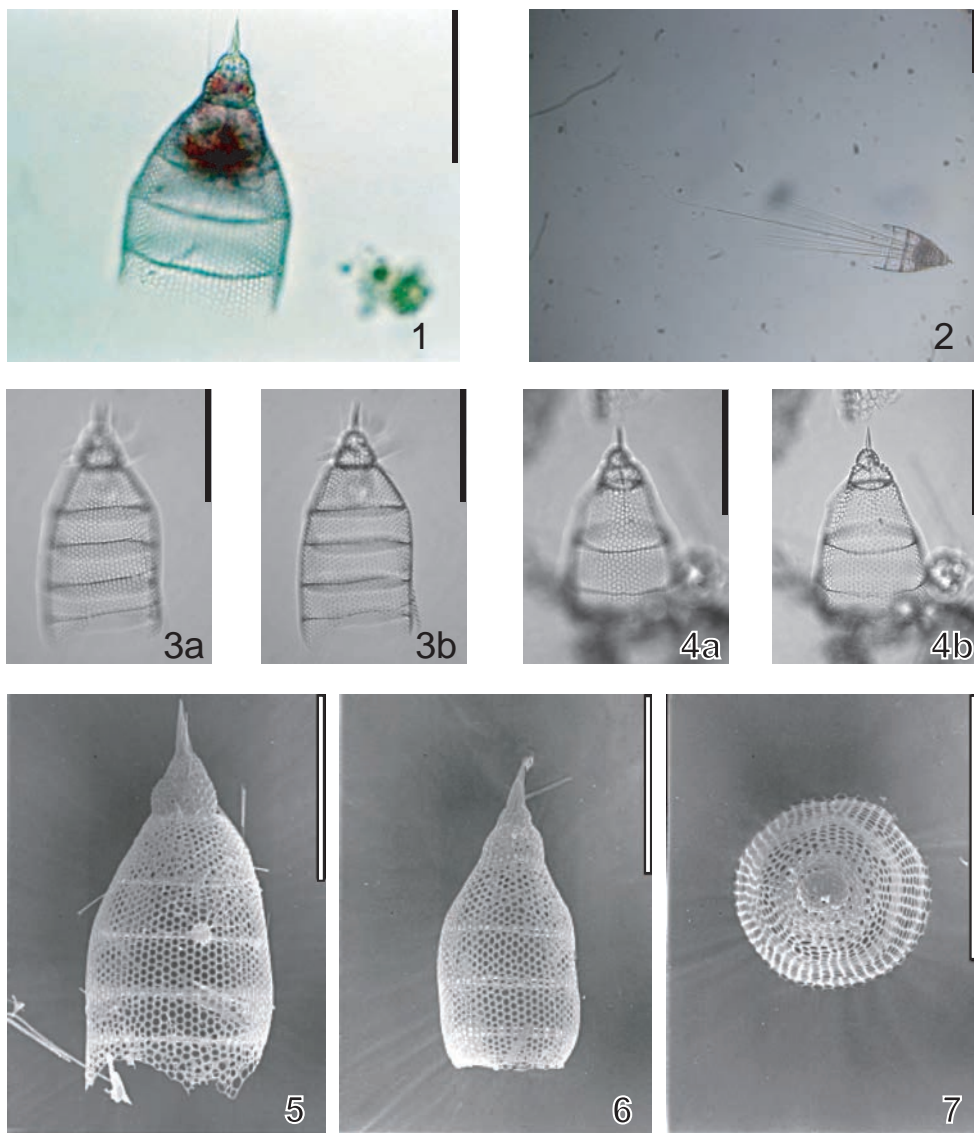


Fig. 24. Photomicrographs of *Eucyrtidium hexagonatum* Haeckel. Scales are 0.1 mm.



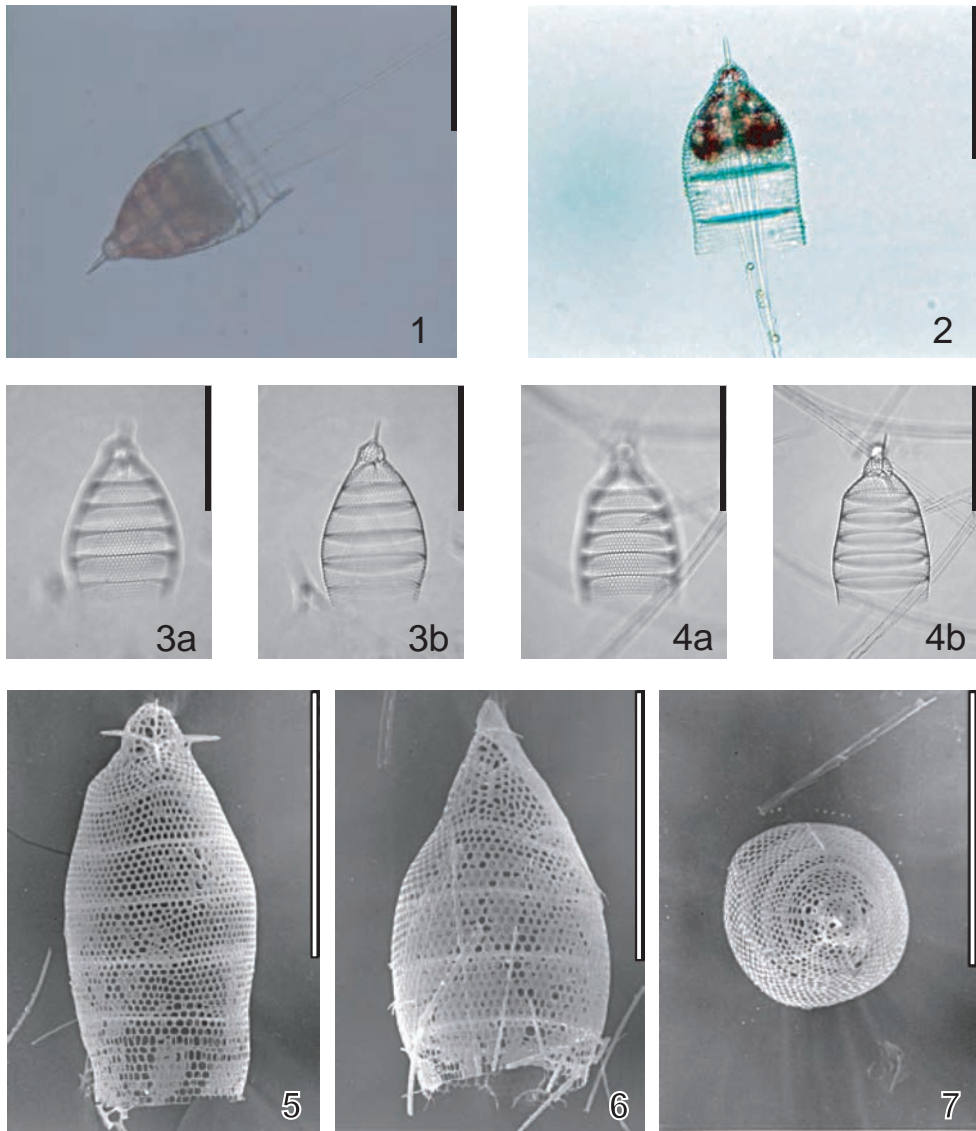
## *Eucyrtidium hexastichum* (Haeckel)

*Lithostrobos hexastichus* Haeckel, 1887, p. 1470, pl. 80, fig. 15.

*Eucyrtidium hexastichum* (Haeckel): Nishimura and Yamauchi, 1984, p. 57, pl. 39, figs. 9-10.

*Eucyrtidium hexastichum* (Haeckel): Takahashi, 1991, p. 125, pl. 42, fig. 22.

*Eucyrtidium hexastichum* (Haeckel): Sashida and Kurihara, 1999, p. 121, figs. 5.7-8, non fig. 11.6.



**Fig. 25.** Photomicrographs of *Eucyrtidium hexastichum* (Haeckel). Scales are 0.1 mm.

## *Pterocorys campanula* Haeckel

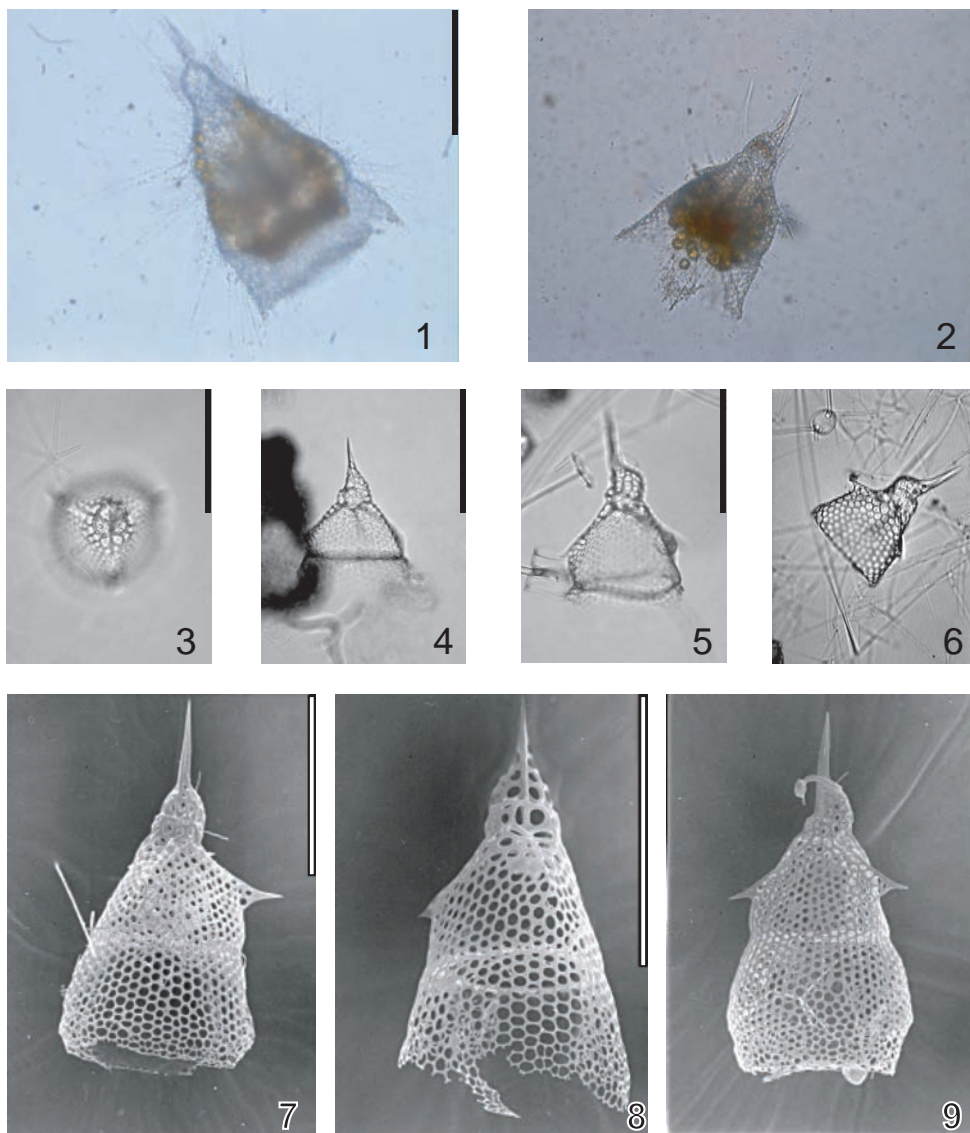
*Pterocorys campanula* Haeckel, 1887, p. 1316, pl. 71, fig. 3.

*Stichopilium campanulatum* Haeckel: Nishimura and Yamauchi, 1984, p. 62, pl. 35, fig. 7.

*Pterocorys campanula* Haeckel: Cheng and Yeh, 1989, p. 186, pl. 9, figs. 11-12.

*Pterocorys campanula* Haeckel: Takahashi, 1991, p. 124, pl. 42, figs. 5-8.

*Pterocorys campanula* Haeckel: Sashida and Kurihara, 1999, p. 127, fig. 6.14, fig. 11.3, non figs. 5.17-18, fig. 6.18.



**Fig. 26.** Photomicrographs of *Pterocorys zancleus* Müller. Scales are 0.1 mm.

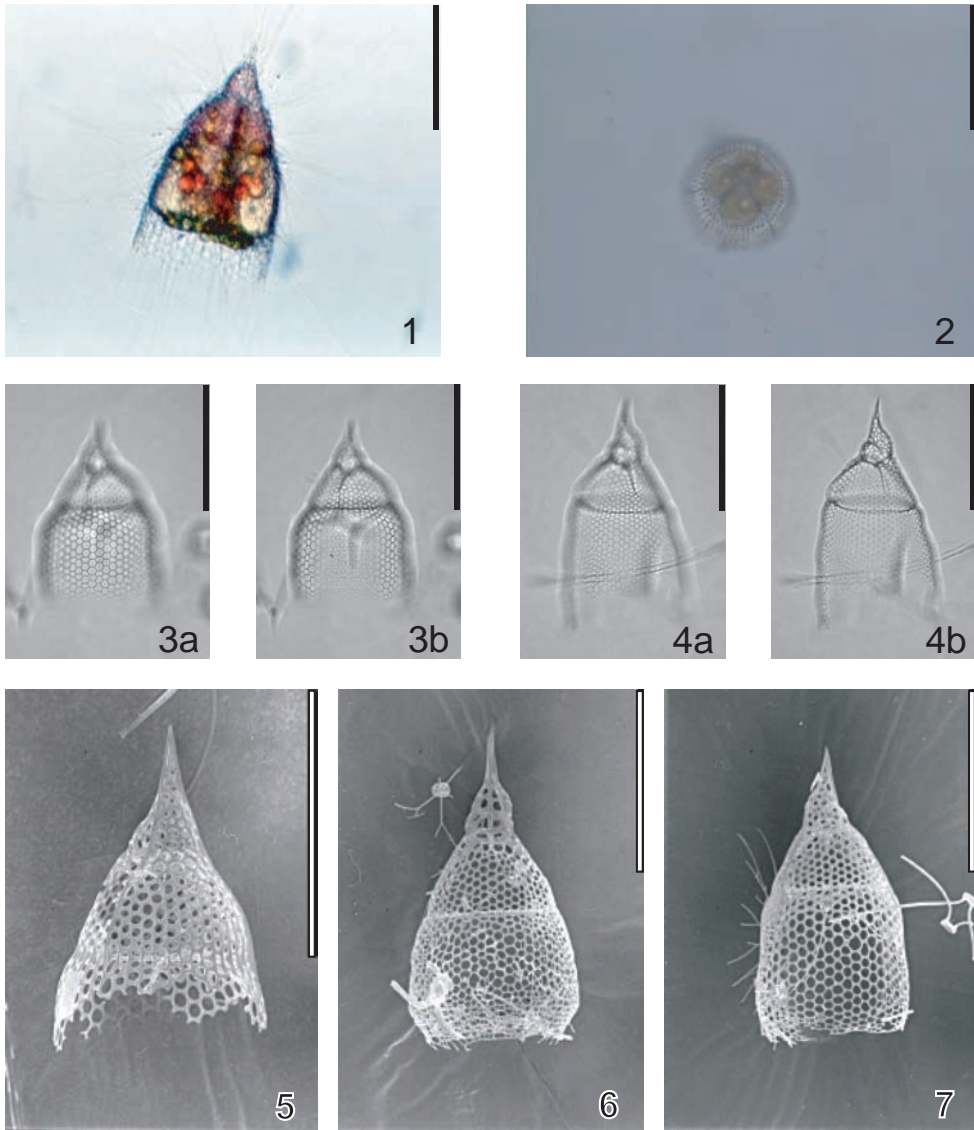
## *Pterocorys zancleus* (Müller)

*Eucyrtidium zancleus* Müller, 1855, p. 672; 1859, p. 41, pl. 6, figs. 1-3.

*Pterocorys zancleus* (Müller): Nishimura and Yamauchi, 1984, p. 63, pl. 38, figs. 1, 3-5, pl. 56, fig. 9.

*Pterocorys zancleus* (Müller): Takahashi, 1991, p. 123, pl. 42, figs. 1-4.

*Pterocorys zancleus* (Müller): Sugiyama et al., 2008, p. 216, 219, figs. 7.1-6.



**Fig. 27.** Photomicrographs of *Pterocorys campanula* Haeckel. Scales are 0.1 mm.

## *Theocorythium trachelium trachelium* (Ehrenberg)

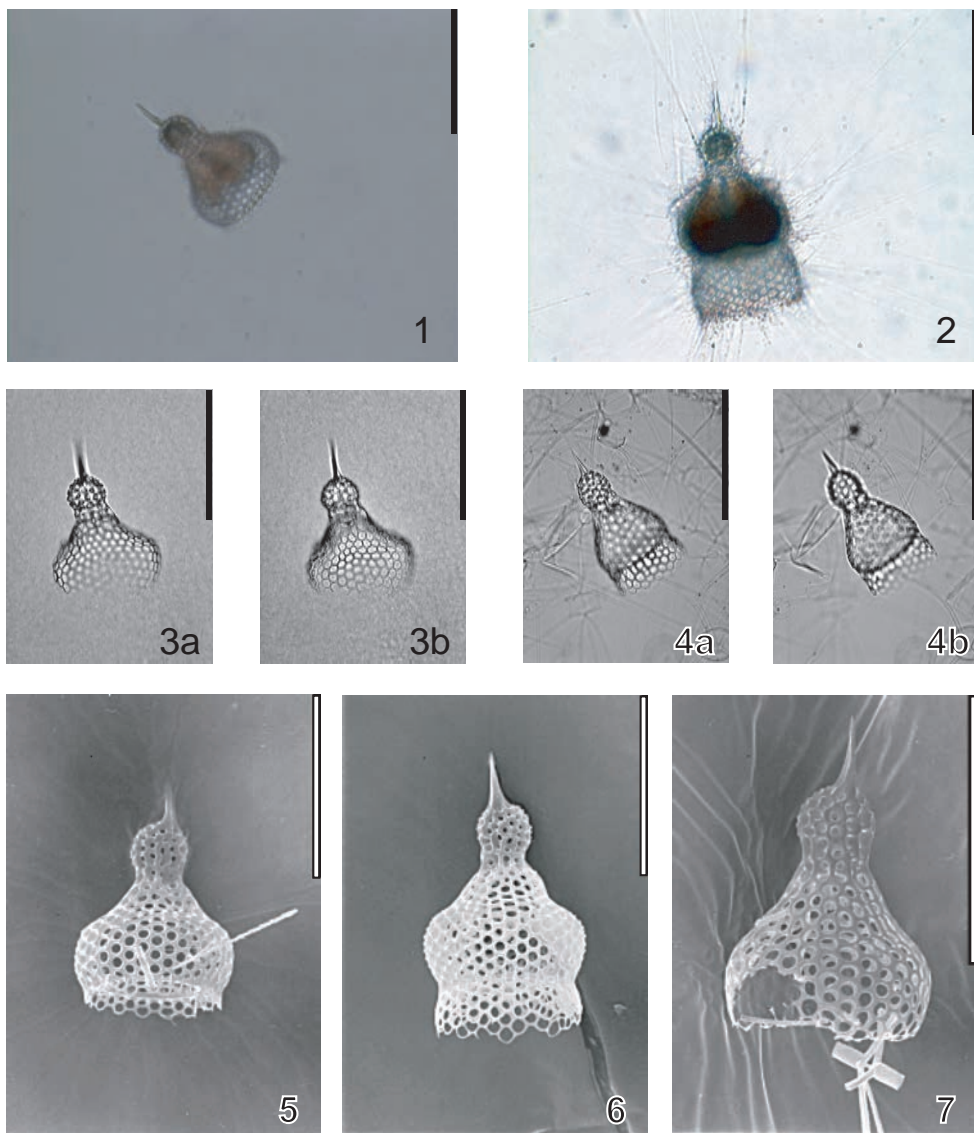
*Eucyrtidium trachelius* Ehrenberg, 1873a, p. 312; 1873b, p. 292-293, pl. 7, fig. 8.

*Theocorythium trachelium trachelium* (Ehrenberg): Nishimura and Yamauchi, 1984, p. 64, pl. 38, figs. 9-12.

*Theocorythium trachelium* (Ehrenberg): Cheng and Yeh, 1989, p. 187, pl. 10, figs. 11-13.

*Theocorythium trachelium trachelium* (Ehrenberg): Takahashi, 1991, p. 121, pl. 40, figs. 15-16.

*Theocorythium trachelium trachelium* (Ehrenberg): Sashida and Kurihara, 1999, p. 132, figs. 5.20-21, fig. 7.8.



**Fig. 28.** Photomicrographs of *Theocorythium trachelium trachelium* (Ehrenberg). Scales are 0.1 mm.



## *Spirocyrtis scalaris* Haeckel

*Spirocyrtis scalaris* Haeckel, 1887, p. 1509, pl. 76, fig. 14.

*Spirocyrtis scalaris* Haeckel: Nishimura and Yamauchi, 1984, p. 65, pl. 40, figs. 6, 9-10, 14.

*Spirocyrtis scalaris* Haeckel: Cheng and Yeh, 1989, p. 186, pl. 9, fig. 17.

*Spirocyrtis scalaris* Haeckel: Takahashi, 1991, p. 127, pl. 44, figs. 1-2.

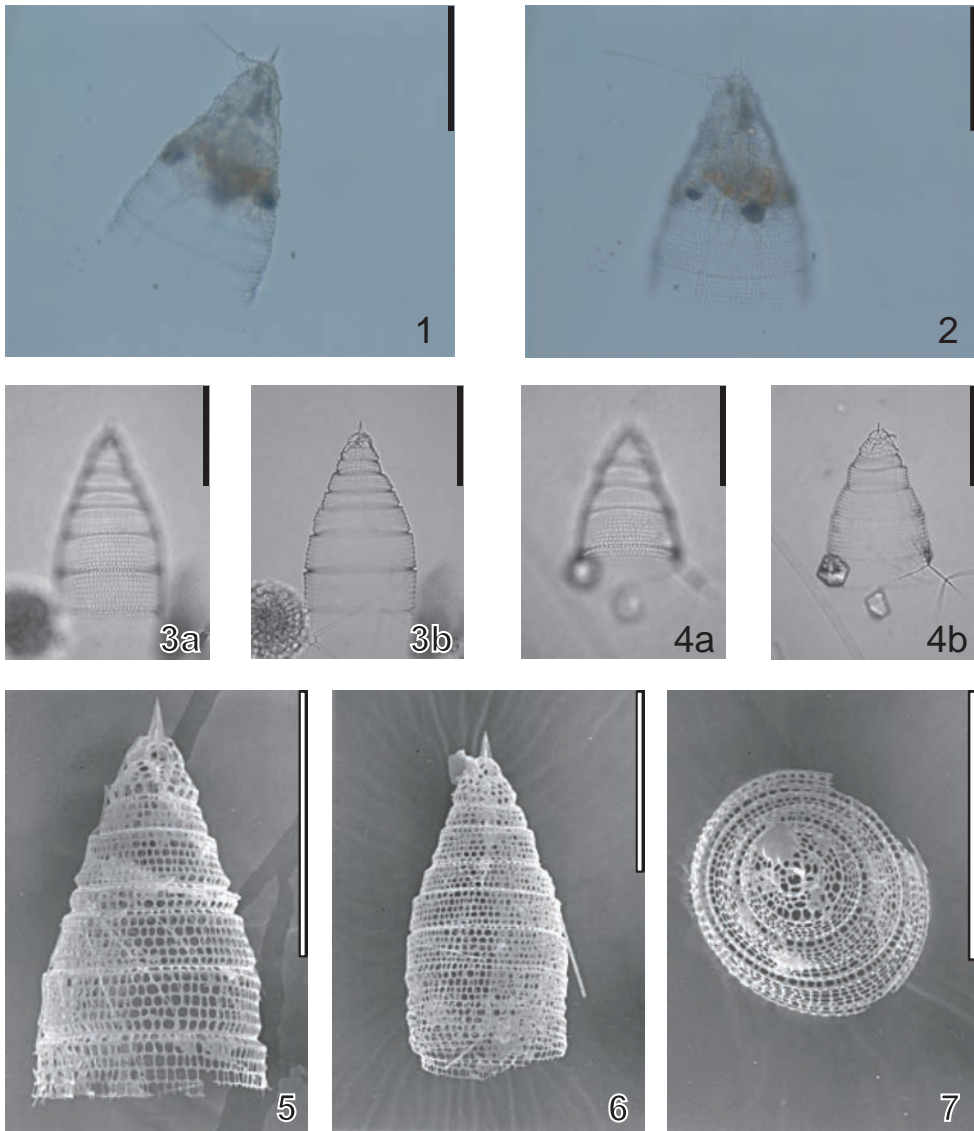
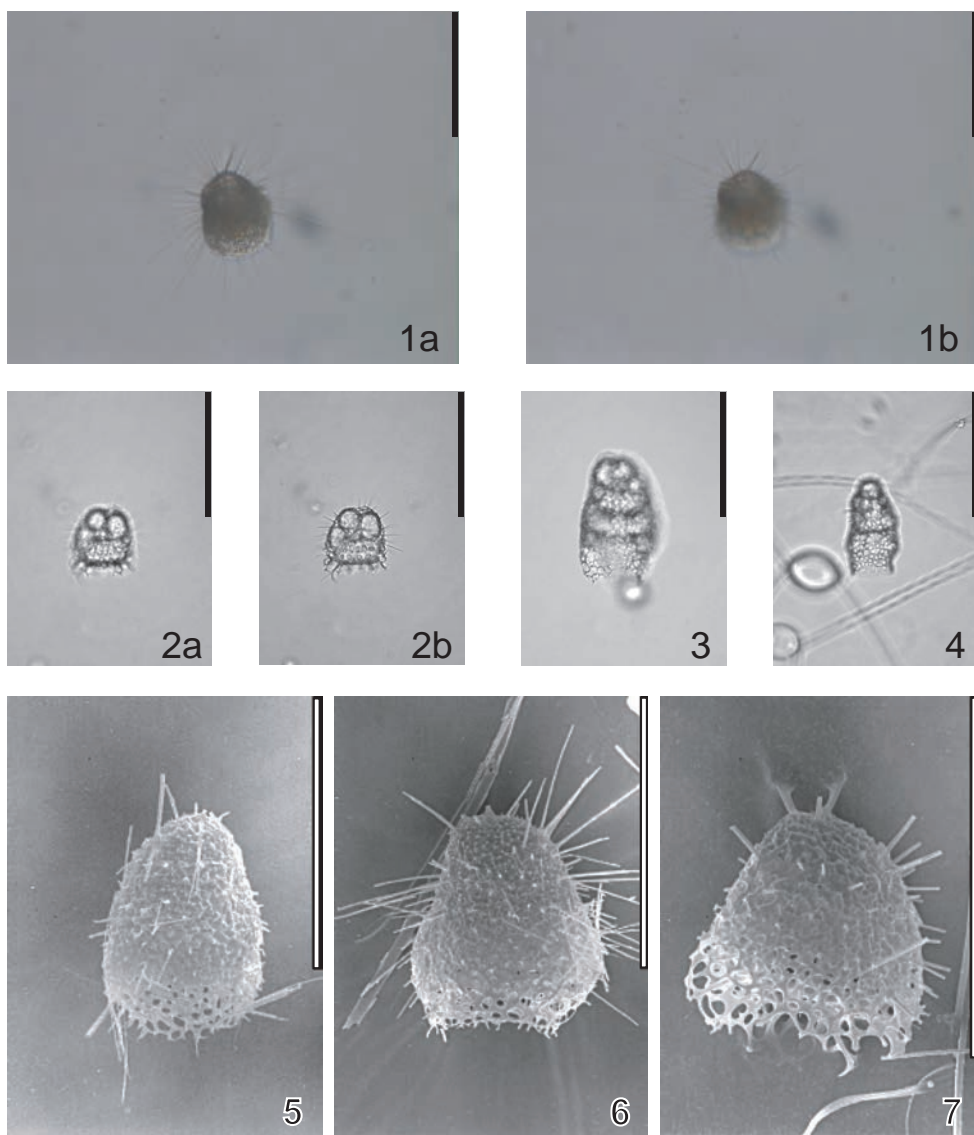


Fig. 29. Photomicrographs of *Spirocyrtis scalaris* Haeckel. Scales are 0.1 mm.

## *Botryocyrtis scutum* (Harting)

*Haliomma scutum* Harting, 1863, p. 11, pl. 1, fig. 18.

*Botryocyrtis scutum* (Harting): Takahashi, 1991, p. 135, pl. 46, figs. 6-7.



**Fig. 30.** Photomicrographs of *Botryocyrtis scutum* (Harting). Scales are 0.1 mm.