

Final Report

**Diversity study on Echinoderms in Had Khanom – Mu Ko Thale Tai
National Park, Nakhon Si Thammarat Province**

BRT R_149014

By

Arom Mucharin

For

The Biodiversity Research and Training Program (BRT)

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Executive summary

The Diversity study on Echinoderms in Had Khanom – Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province Project was supported by the TOTAL Coporate Foundation, TOTAL E&P Thailand and the Biodiversity Research and Training Program (BRT) on survey in November, 2006 and May 2008. This work has been complete follow by objectives of the study.

The total obtained 453 specimens were classified into 5 classes, 10 orders, 14 families, 20 genera and 24 species; only two of them have not yet been identified down into the species level and most species are common in coral reefs in the Gulf of Thailand. The most abundant and common echinoderms in this area are: *Lamprometra palmata* J.Müller, 1841; *Diadema setosum* (Leske, 1778) and *Holothuria (Metensiothuria) leucospilota* Brandt, 1835. All species found are inhabitants of the South China Sea in Pacific Ocean.

Echinoderms in the study area distribute into throughout the reef zones of coral reef. The most abundant is in the reef slope zone, it is because the environmental factors of this zone might be suitable for them such as temperature, depth and water transparency.

Some echinoderms associate with the other living organism such as the basket star, *Euryle aspera* and gorgonian brittle star *Ophiopsammium semperi* are the rare species of the Gulf of Thailand including *Ophiothela danae* associate with gorgonians. The brittle star, *Ophiothrix (Ophiothrix) exigua*, *Opiactis savinyi* and *Ophiocomella sexradia* live inside the exhalent pores of sponges while the sea cucumbers, *Synaptula* sp.1 and *Synaptula* sp.2 infest on surface of sponges. These echinoderms used associated sponges for different purposes. The brittle stars use sponges as host for sheltering and feed suspension particles from water current made by sponges while the sea cucumbers use sponges as feeding area from the surface of sponges.

Abstract

Echinoderms of Had Khanom – Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province, locating in the southern part of the Gulf of Thailand were studied at 12 sties namely, Ko Tan (4 sties), Ko Mudsum (2 sites), Ko Wang Nai (2 sites), Ko Wang Nok (2 sites) and Ko Rab (2 sites) in November, 2006 and May 2008. The investigations were carried out by SCUBA diving in the daytime and random searched throughout the reefs. The results yielded 24 species of Echinoderms from 5 classes, 10 orders, 14 families and 20 genera. The most abundant echinoderms in the study area are: *Lamprometra palmata*, *Ophiothrix* (*Ophiothrix*) *exigua*, *Holothuria* (*Metensiothuria*) *leucospilota* and *Diadema setosum*. All observed species were commonly found in the Gulf of Thailand and the Indo-Pacific.

Introduction

Some of the most familiar seashore animals are members of the phylum Echinodermata. The Phylum contains about 7,000 living species and 13,000 or so species known from a rich fossil record dating back to early Cambrian times (Brusca & Brusca, 2003). Echinoderms include animals commonly known as feather stars and sealilies (Crinoidea); starfish or sea stars (Asteroidea); brittle and basket stars (Ophiuroidea); sea urchins, sand dollars and heart urchins (Echinoidea); and sea cucumbers (Holothuroidea). They play an important role in marine ecosystems, and some are economically marine animals, used as sources of natural products and medicinal substances.

Had Khanom – Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province is located in the upper western part of the Gulf of Thailand and encompasses a portion of the shallow Sunda shelf which adjoining to the South China Sea. This area forms a small part in the Indo-Malayan sub-region of Indo-west Pacific Zoogeographic Region, which contains a very high diversity of marine animals (Hooper, 1997). Mu Ko Thale Tai declared as a marine protected area by National Park, Wildlife and Plant Conservation Department for acting as nursery ground and breeding site of marine living organisms of the Gulf of Thailand. The Islands have important marine ecosystems such as coral reefs, seagrass beds, seaweed communities and also providing economically important marine living resources especially shrimps, crabs, fishes, and mantis shrimps.

The former literatures reporting on the Echinoderms in the Gulf of Thailand was first conducted in the reign of King Rama 5 by the Danish scientist, Dr. Th. Mortensen, who had surveyed and collected the sea animals in the Gulf of Thailand and reported four new sea urchins in the Gulf of Siam, namely, *Chaetodiadema granulatum*, *Pleurechinus doderleini*, *Pleurechinus siamensis* and *Gymnechinus pulchellus* (Mortensen, 1904), Sriyakorn (1970) reported fifty-four species of echinoderms from those collected during the fifth Thai-Danish expedition along the west coast of peninsular Thailand. Klinasak (1965) recorded forty-nine echinoderm species in the Gulf of Thailand. Satayamas (1982) revealed twenty-seven species of echinoderms in Songkhla province. Waiyanida (1984) notified twelve species of starfishes from Ao Pattaya and Mu Ko Phai, Chon Buri Province. Waiyanida (1985-1986) also reported 24 species of echinoderms from the Gulf of Thailand. Rodma (1996) reported fifty-nine echinoderms from Chon Buri and Rayong Provinces. Putchakarn (1998) informed fifty-six echinoderms from the eastern coast of Thailand. Mucharin (1998) narrated seventeen species of sea cucumbers from Mu Ko Lan and Mu Ko Phai, Chon Buri Province. Putchakarn, *et al.*, (2000) provided the details of thirteen species of sea cucumbers (Aspidochirotida) from Mu

Ko Lan and Mu Ko Phai, Chon Buri Province. Putchakarn and Sonchaeng (2004) surveyed and invented Thai echinoderm checklist. Mucharin and Putchakarn (2005) in add known the new record of holothurian in Thailand i.e. *Holothuria (Stauropora) discrepans* Semper, 1868. Mucharin, *et al.*, (2005) gave an account of thirty-four sea cucumbers from the eastern coast of Thailand. Mucharin (2008) in add known the first record of *Cladolabes hamatus* (Sluiter, 1914) from the South China Sea. Mucharin and Sukkasem (2008) add occurrence of *Holothuria (Metriatyla) scabra* Jaeger, 1833 at Mu Ko Man, Rayong Province, Eastern Coast of Thailand. Lastly the Eastern Marine and Coastal Resources Research Center (2008) reported twenty nine echinoderms from the Mu Ko Man, Rayong Province.

Objectives

To investigate the diversity and distribution of Echinoderms in the coral reef habitats of Mu Ko Thale Tai areas in the Had Khanom – Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province, the Gulf of Thailand and serve as a baseline and updated data for the diversity and distribution of coral reef marine fauna in the Gulf of Thailand.

Materials and methods

Survey and collection sites

The echinoderm specimen collection was carried out in November 2006 in the coral reef habitats in Mu Ko Thale-Tai, covering 12 sites as shown in Table 1 and Figure 1.

Table 1 List of specimen collection sites of the study.

Field code	Locality	DATE	Latitude (UTM)	Lontitude (UTM)
TAN-A	North east side of Ko Tan	7 Nov. 06	47 P 0604554 N	1037590 E
TAN-B	South east side of Ko Tan	7 Nov. 06	47 P 0605256 N	1036139 E
TAN-C	North side of Ko Tan	6 Nov. 06	47 P 0603632 N	1038152 E
TAN-D	Ao Tok, south west side of Ko Tan	6 Nov. 06	47 P 0602527 N	1035689 E
MUS-A	North side of Ko Mudsum	8 Nov. 06	47 P 0607301 N	1037100 E
MUS-B	South west side of Ko Mudsum	8 Nov. 06	47 P 0606843 N	1036039 E
WON-A	North side of Ko Wong Nai	10 Nov. 06	47 P 0597652 N	1029920 E
WON-B	South west side of Ko Wong Nai	10 Nov. 06	47 P 0597709 N	1029171 E
WOK-A	South west side of Ko Wong Nok	11 Nov. 06	47 P 0600061 N	1029358 E
WOK-B	North side of Ko Wong Nok	11 Nov. 06	47 P 0600047 N	1030043 E
RAB-A	North side of Ko Rab	12 Nov. 06	47 P 0605411 N	1029603 E
RAB-B	North west side of Ko Rab	12 Nov. 06	47 P 0604280 N	1029397 E

Collection, fixation and preservation

The field surveys were conducted at 12 sites of Mo ko Thale-Tai (Figure 1). The echinoderm specimens were collected by SCUBA diving during the daytime and random sampling throughout the coral reefs. Specimens were photographed *in situ* and kept in the zip

plastic bag with sea water. Field notes were recorded on some morphological, color, host organisms (brittle stars) and essential ecological aspects such as depth, substrates. The specimens were relaxed by menthol then preserved in 70% alcohol. The obtained specimens were deposited in the collection of the Thailand Natural History Museum (THNHM), National Science Museum, Khlong Luang, Pathum Thani province, Thailand.

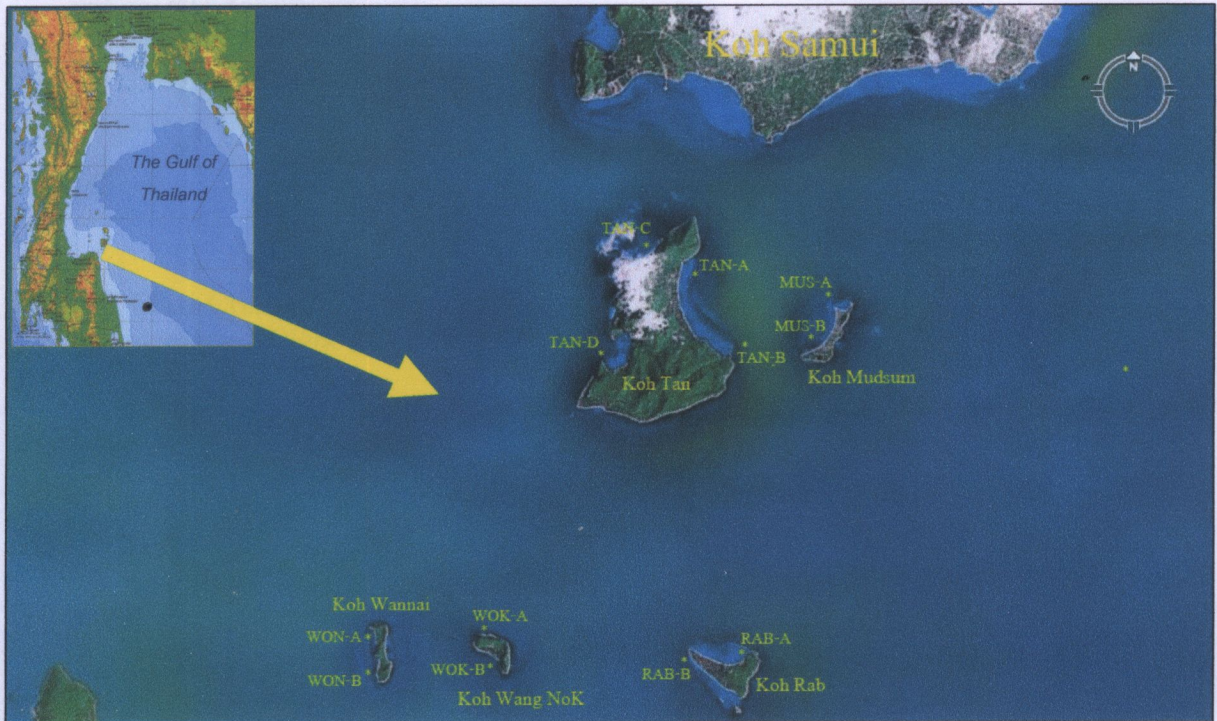
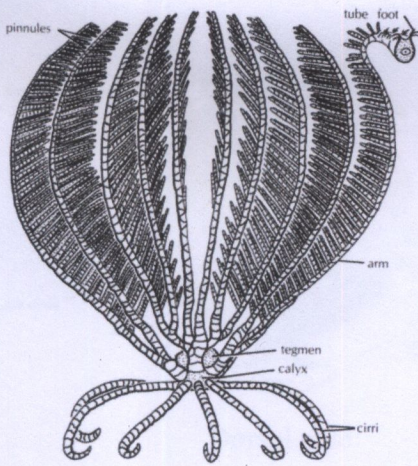


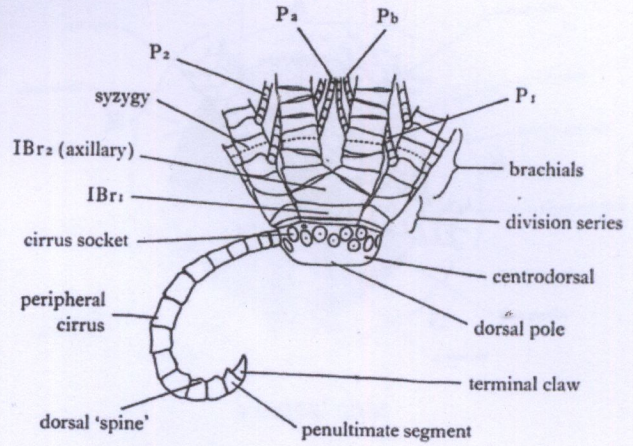
Figure 1 Specimen collection sites along Had Khanom – Mo Ko Thale Tai National Park, Nakhon Si Thammarat Province.

Laboratory Works

The feather stars (Figure 2), sea stars (Figure 3), brittle stars (Figure 4) and sea urchins (Figure 5) were specifically identified mainly on their morphological characters with using a stereo and compound microscope. For the sea cucumbers (Figure 6), they are identified mainly on the basis of spicules and morphological characters such as form and number of tentacles, distribution of tube feet and papillae, color, shape, length of bodies, calcareous ring and presence or absence of cuvierian tubules. For spicule examination, thin sections of the dorsal and ventral body walls, tentacle and tube feet were digested in sodium hypochlorite (chlorox), dissolving the tissues and leaving the calcareous spicules intact. These were then washed 3 times with distilled water, then dried on a hotplate, finally mounted in permount, and examined under 100-400x magnification. The samples were then examined under the scanning electron microscope (SEM) and photos taken. The echinoderms taxonomic scheme used in this paper follows those of Clark and Rowe (1971).

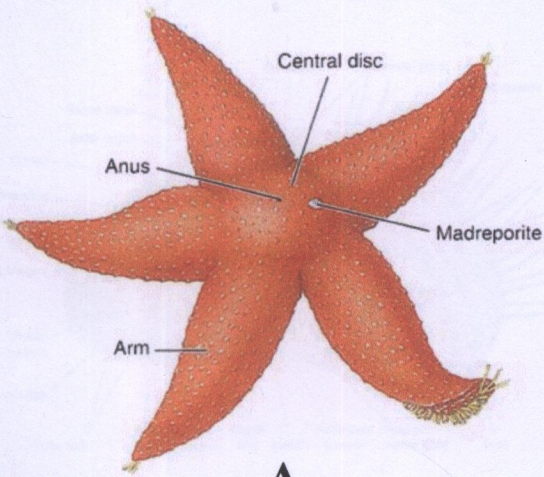


A

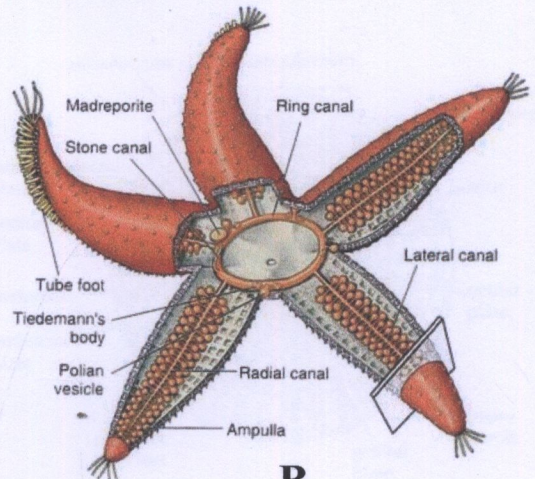


B

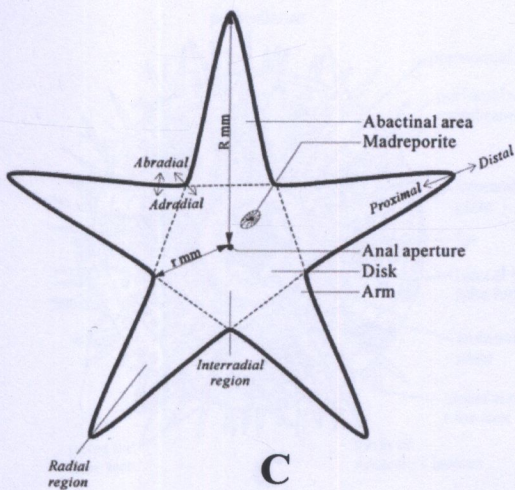
Figure 2 Class Crinoidea. A : External morphology; B : Largely based upon skeletal elements. (Clark & Rowe, 1971)



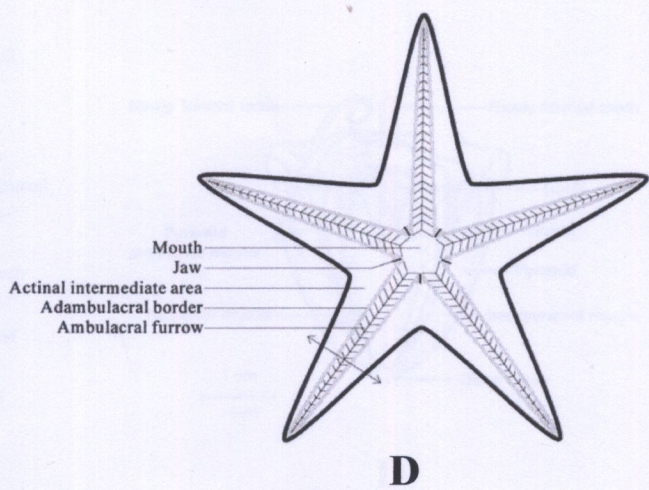
A



B



C



D

Figure 3 Class Asteroidea. A : External morphology; B : Internal morphology C-D : Again mainly based on skeletal characteristics, mainly the architecture of plates and various secondary appendages of sea stars. (Slide presented by Yves, 2004)

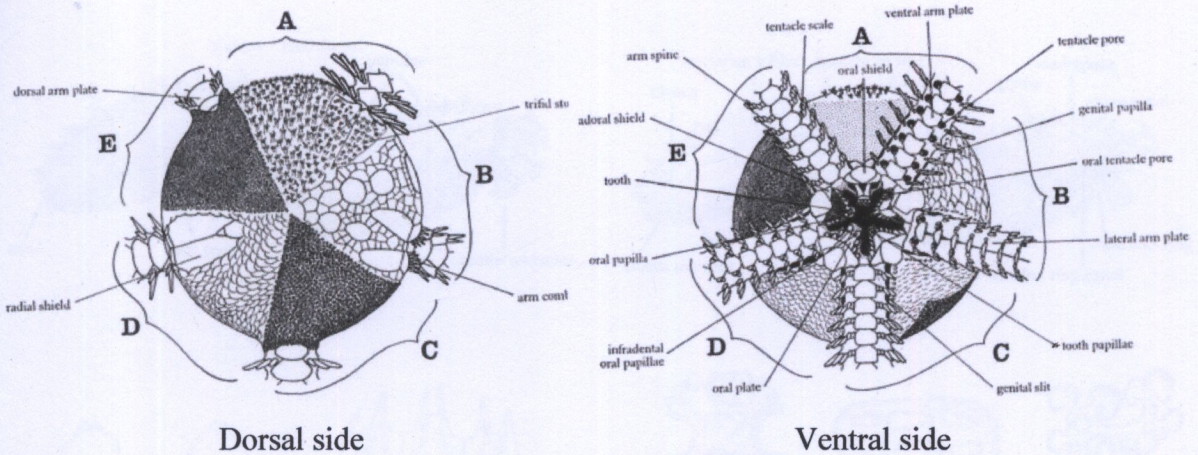


Figure 4 Class Ophiuroidea. Largely based on skeletal elements: articulated ossicles (vertebrae), plates, spines, jaws. A : Ophiotrichidae; B : Ophiuridae; C : Ophiocomida; D : Amphiuridae; E : Ophiodermatidae. (Clark & Rowe, 1971)

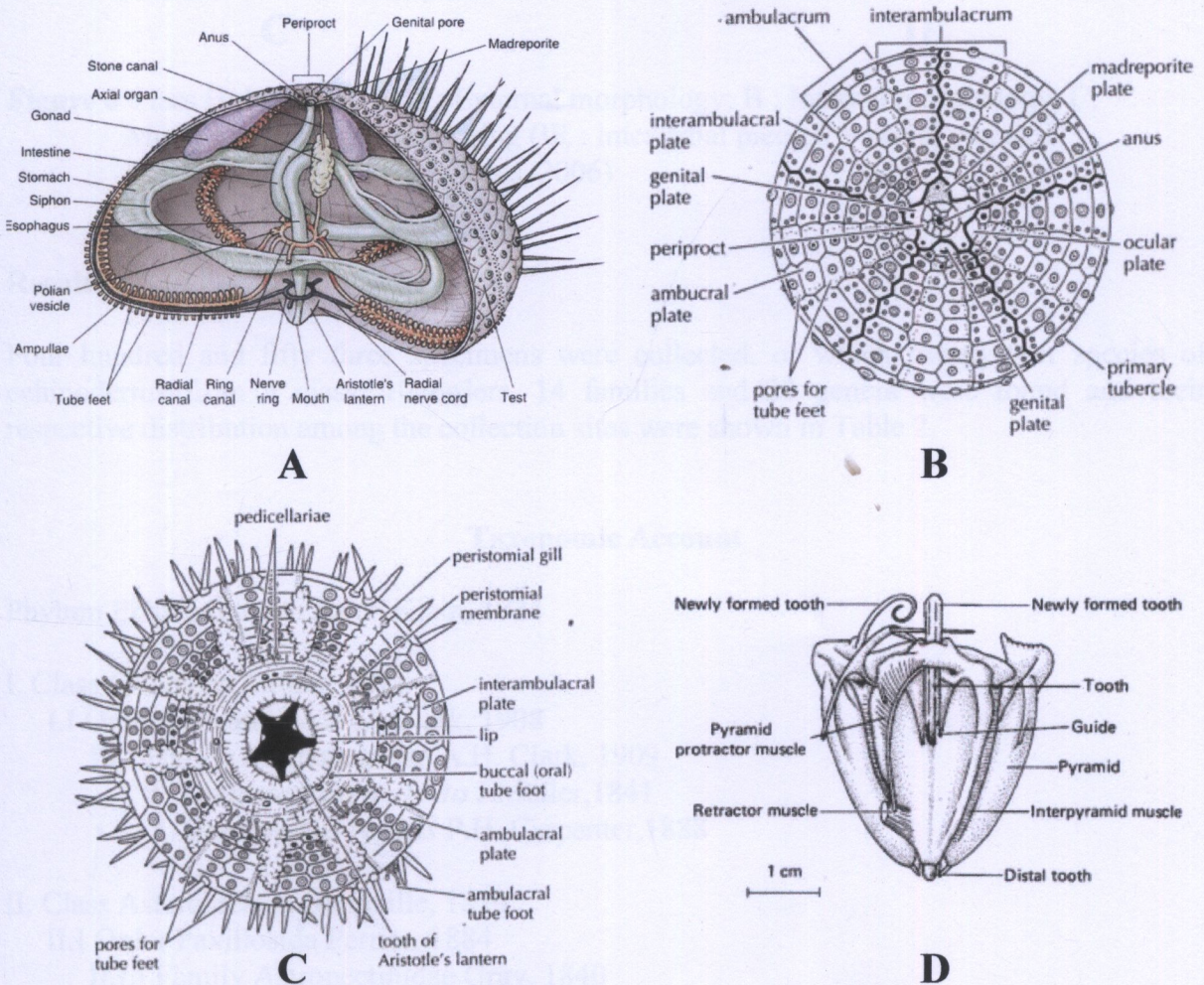


Figure 5 Class Echinoidea. A : Internal morphology; B-C: Ossicles joined to form a rigid test, with podia passing through pores in ambulacral plates; D : Aristotle's lantern for grazing. (Slide presented by Yves, 2004)

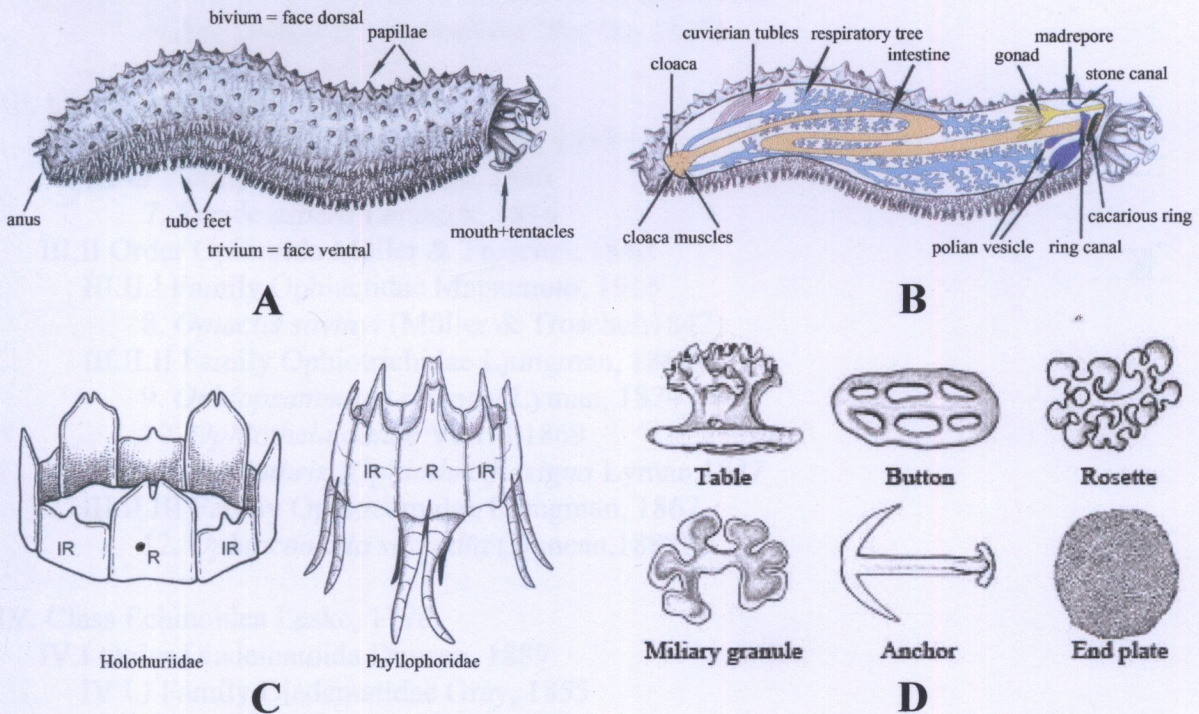


Figure 6 Class Holothuroidea. A : External morphology; B : Internal morphology; C: Morphology of calcareous ring (IR : interradial piece; R = radial piece); D : Morphology of spicules. (Yves, 2006)

Results

Four hundred and fifty three specimens were collected, of which twenty-four species of echinoderms from 5 class, 10 orders, 14 families and 20 genera were found and their respective distribution among the collection sites were shown in Table 2.

Taxonomic Account

Phylum Echinodermata Jacob Klein, 1734

I. Class Crinoidea Müller, 1821

I.I Order Comatulida A.H. Clark, 1908

I.I.I Family Mariametridae A.H. Clark, 1909

1. *Lamprometra palmata* J.Müller, 1841
2. *Liparometra regalis* P.H. Carpenter, 1888

II. Class Asteroidea de Blainville, 1830

II.I Order Paxillosida Perrier, 1884

II.I.I Family Astropectinidae Gray, 1840

3. *Astropecten polyacanthus* Müller & Troschel, 1842

II.II Order Valvatida Perrier, 1884

II.II.I Family Oreasteridae Fisher, 1911

4. *Anthenea chinensis* Gray, 1840

- 5. *Culcita novaeguineae* Müller & Troschel, 1842
- 6. *Goniodiscaster forficulatus* (Perrier, 1875)

III. Class Ophiuroidea Gray, 1840

III.I Order Phrynophiurida Matsumoto, 1915

III.I.I Family Euryalidae Gray, 1840

- 7. *Euryle aspera* Lamarck, 1816

III.II Order Ophiurida Müller & Troschel, 1840

III.II.I Family Ophiactidae Matsumoto, 1915

- 8. *Opiactis savinyi* (Müller & Troschel, 1842)

III.II.II Family Ophiotrichidae Ljungman, 1866

- 9. *Ophiopsammium semperi* Lyman, 1874
- 10. *Ophiothela danae* Verrill, 1869
- 11. *Ophiothrix* (*Ophiothrix*) *exigua* Lyman, 1847

III.II.III Family Ophiocomidae Ljungman, 1867

- 12. *Ophiocomella sexradia* (Duncan, 1887)

IV. Class Echinoidea Leske, 1778

IV.I Order Diadematoidea Duncan, 1889

IV.I.I Family Diadematidae Gray, 1855

- 13. *Diadema setosum* (Leske, 1778)
- 14. *Echinothrix calamaris* (Pallas, 1774)

IV.II Order Temnopleuroidea Mortensen, 1942

IV.II.I Family Temnopleuridae A. Agassiz, 1872

- 15. *Salmacis sphaeroides* (Linnaeus, 1758)

IV.III Order Echinoida Claus, 1876

IV.III.I Family Laganidae A. Agassiz, 1873

- 16. *Laganum decagonale* (de Blainville, 1827)

IV.IV Order Spatangoida Claus, 1876

IV.IV.I Family Loveniidae Lambert, 1905

- 17. *Lovenia elongata* (Gray, 1845)

V. Class Holothuroidea de Blainville, 1834

V.I Order Aspidochirotida Grube, 1840

V.I.I Family Holothuriidae Ludwig, 1884

- 18. *Holothuria* (*Halodeima*) *atra* Jaeger, 1833
- 19. *Holothuria* (*Metensiothuria*) *leucospilota* Brandt, 1835
- 20. *Holothuria* (*Semperothuria*) *flavomaculata* Semper, 1868
- 21. *Holothuria* (*Stauropora*) *fuscocinerea* Jaeger, 1868

V.I.II Family Stichopodidae Haeckel, 1886

- 22. *Stichopus horrens* Selenka, 1867

V.II Order Apodida Brandt, 1835

V.II.I Family Synaptidae Burmeister, 1837

- 23. *Synaptula* sp.1
- 24. *Synaptula* sp.2

Conclusion

Study of the echinoderms in Had Khanom – Mo Ko Thale Tai National Park, Nakhon Si Thammarat Province, Thailand were conducted by actual hand collecting techniques through out the field trips. The total obtained 453 specimens were classified into 5 classes, 10

orders, 14 families, 20 genera and 24 species; only two of them have not yet been identified down into the species level and most species are common in coral reefs in the Gulf of Thailand. The most abundant and common echinoderms in this area are: *Lamprometra palmata* J.Müller, 1841; *Diadema setosum* (Leske, 1778) and *Holothuria* (*Metensiothuria*) *leucospilota* Brandt, 1835. All species found are inhabitants of the South China Sea in Pacific Ocean.

Echinoderms in the study area distribute into throughout the reef zones of coral reef. The most abundant is in the reef slope zone, it is because the environmental factors of this zone might be suitable for them such as temperature, depth and water transparency. Since echinoderms are benthic marine animals then most species are found on sandy bottom both in the coral reef zones and outer reef nearby such as sea cucumbers, *Holothuria* (*Halodeima*) *atra* and *H.* (*Metensiothuria*) *leucospilota* found on sand between coral heads in reef flat zone. The starfishes, *Astropecten polyacanthus*, *Anthenea chinensis*, *Goniodiscaster forficulatus* and sea urchin, *Salmacis sphaeroides* live on sandy bottom out of reef and hunt their prey on sand while the sand dollars, *Laganum decagonale* and heart urchin, *Lovenia elongata* buries in sand. From the survey, both of sand dollars and heart urchin were adolescent size so we could assume that the raining season in the study area is breeding season of these species. The feather star, *Lamprometra palmata* and *Liparometra regalis* and sea cucumber, *Holothuria* (*Semperothuria*) *flavomaculata*, *H.* (*Stauropora*) *fuscocinerea* and *Stichopus horrens* are nocturnal and cryptic between coral heads or hard substrates during the daytime. The pin-cushioned starfish, *Culcita novaeguineae* and sea urchin, *Diadema setosum* and *Echinothrix calamaris* distribute throughout the reef and will active at night.

Some echinoderms associate with the other living organism such as the basket star, *Euryale aspera* and gorgonian brittle star *Ophiopsammium semperi* are the rare species of the Gulf of Thailand including *Ophiothela danae* associate with gorgonians. This survey found many gorgonians along the reef slope to outer reef of the study area. The brittle star, *Ophiothrix* (*Ophiothrix*) *exigua*, *Opiactis savinyi* and *Ophiocomella sexradia* live inside the exhalent pores of sponges while the sea cucumbers, *Synaptula* sp.1 and *Synaptula* sp.2 infest on surface of sponges. These echinoderms used associated sponges for different purposes. The brittle stars use sponges as host for sheltering and feed suspension particles from water current made by sponges while the sea cucumbers use sponges as feeding area from the surface of sponges.

Acknowledgements

This work was supported by the TOTAL Coporate Foundation, TOTAL E&P Thailand and the Biodiversity Research and Training Program (BRT). We express my gratitude to Dr. Jarujin Nabhitabhata, director of the Thailand Natural History Museum, National Science Museum, Pathum Thani, for his kindness in providing useful comments for the manuscript. Finally, we thank Mr. Wanchai Sukkasem for field assistance and prepared the sea cucumber spicules.

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Acknowledgements

This work was kindly supported by the TOTAL Corporate Foundation, TOTAL E&P Thailand and the TRF/BIOTEC Special Program for Biodiversity Research and Training (Grant BRT R_149014).

Table 2 Species list and local distribution of Echinoderms from Had Khanom – Mo Ko Thale Tai National Park, Nakhon Si Thammarat Province, the Gulf of Thailand

Study sites: 1 = TAN-A; 2 = TAN-B; 3 = TAN-C; 4 = TAN-D; 5 = MUS-A; 6 = MUS-B; 7 = WON-A; 8 = WON-B; 9 = WOK-A; 10 = WOK-B; 11 = RAB-A; 12 = RAB-B
Distribution: X = present; - = absent

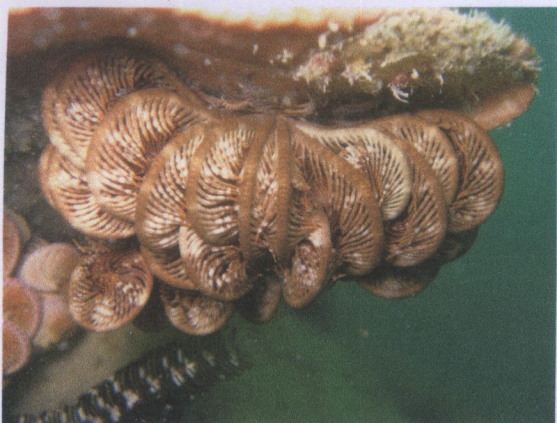
Taxa	Distribution											
	1	2	3	4	5	6	7	8	9	10	11	12
PHYLUM ECHINODERMATA												
Class CRINOIDEA												
Order COMATULIDA												
Family Mariametridae												
1. <i>Lamprometra palmata</i> J.Müller, 1841	X	-	-	X	X	X	X	X	-	-	-	-
2. <i>Liparometra regalis</i> P.H. Carpenter, 1888	-	-	-	-	-	-	X	-	-	-	-	-
Class ASTEROIDEA												
Order PAXILLOSIDA												
Family Astropectinidae												
3. <i>Astropecten polyacanthus</i> Müller & Troschel, 1842	-	-	-	X	-	-	-	-	-	-	-	-
Order VALVATIDA												
Family Oreasteridae												
4. <i>Anthenea chinensis</i> Gray, 1840	-	-	-	X	-	-	-	-	-	-	-	-
5. <i>Culcita novaeguineae</i> Müller & Troschel, 1842	-	-	-	X	-	-	-	-	-	-	-	-
6. <i>Goniodiscaster forficulatus</i> (Perrier, 1875)	-	-	-	X	-	-	-	-	-	-	-	-
Class OPHIUROIDEA												
Order PHRYNOPHIURIDA												
Family Euryalidae												
7. <i>Euryle aspera</i> Lamarck, 1816	-	-	-	X	-	-	-	-	-	-	-	-
Order OPHIURIDA												
Family Ophiactidae												
8. <i>Opiactis savinyi</i> (Müller & Troschel, 1842)	-	-	-	X	-	-	X	-	-	-	-	-
Family Ophiotrichidae												
9. <i>Ophiopsammium semperi</i> Lyman, 1874	-	-	-	X	-	-	-	-	-	-	-	-
10. <i>Ophiothela danae</i> Verrill, 1869	-	-	X	-	-	X	-	-	-	-	-	-
11. <i>Ophiothrix exigua</i> Lyman, 1847	-	-	-	X	-	X	X	-	-	-	-	-
Family Ophiocomidae												
12. <i>Ophiocomella sexradia</i> (Duncan, 1887)	-	-	-	-	-	-	-	-	-	-	-	X
Class ECHINOIDEA												
Order DIADEMATOIDA												
Family Diadematidae												
13. <i>Diadema setosum</i> (Leske, 1778)	-	X	X	X	X	-	X	X	-	X	-	-
14. <i>Echinothrix calamaris</i> (Pallas, 1774)	-	-	-	X	-	-	-	-	-	-	-	-
Order TEMNOPLEURIDAE												
Family Temnopleuridae												
15. <i>Salmacis sphaeroides</i> (Linnaeus, 1758)	-	-	-	X	-	-	-	-	-	-	-	-

Order ECHINOIDEA
Family Laganidae
16. *Laganum decagonale* (de Blainville, 1827)

Order SPATANGOIDA
Family Loveniidae
17. *Lovenia elongata* (Gray, 1845)

Class HOLOTHURIOIDEA
Order ASPIDOCHIROTIDA
Family Holothuriidae
18. *Holothuria (Halodeima) atra* Jaeger, 1833
19. *H. (Metensiothuria) leucospilota* Brandt, 1835
20. *H. (Semperothuria) flavomaculata* Semper, 1868
21. *H. (Stauropora) fuscocinerea* Jaeger, 1868
Family Stichopodidae
22. *Stichopus horrens* Selenka, 1867
Order APODIDA
Family Synaptidae
23. *Synaptula* sp.1
24. *Synaptula* sp.2

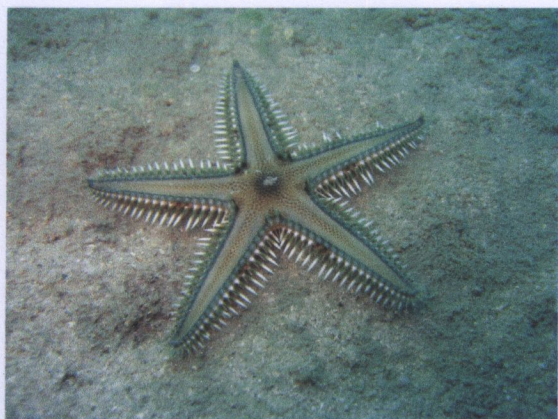
-	-	-	X	-	-	-	-	-	-	-	-	-
-	-	-	X	-	-	-	-	-	-	-	-	-
X	-	X	-	X	X	-	X	-	-	-	-	-
-	X	X	X	X	X	-	X	X	-	X	X	X
-	-	-	-	-	-	-	-	X	-	-	-	-
X	X	-	-	-	-	-	-	-	-	-	-	-
-	-	X	X	X	-	-	-	-	-	-	-	-
X	-	-	X	-	-	-	X	-	-	-	-	-
X	-	-	X	X	X	-	X	-	X	-	-	-



Lamprometra palmata J.Müller, 1841



Lamprometra regalis P.H. Carpenter, 1888



Astropecten polyacanthus Müller & Troschel, 1842



Anthenea chinensis Gray, 1840



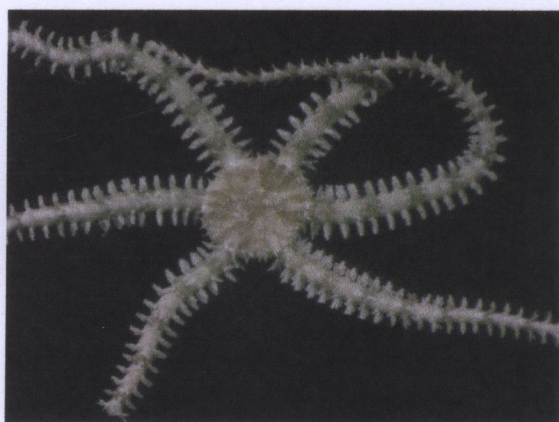
Culcita novaeguineae Müller & Troschel, 1842



Goniodiscaster forficulatus (Perrier, 1875)



Euryle aspera Lamarck, 1816



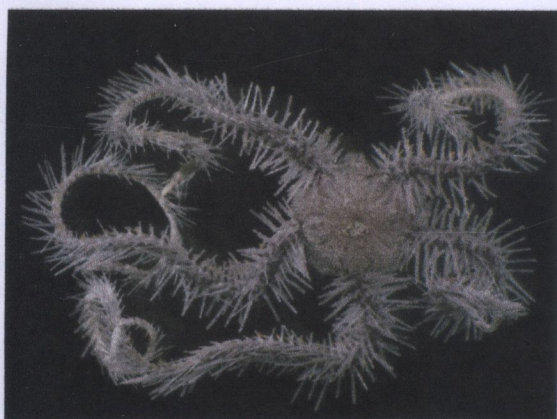
Opiactis saviny (Müller & Troschel, 1842)



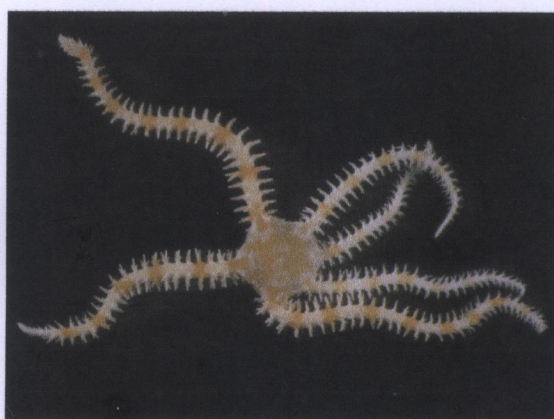
Ophiopsammium semperi Lyman, 1874



Ophiothela danae Verrill, 1869



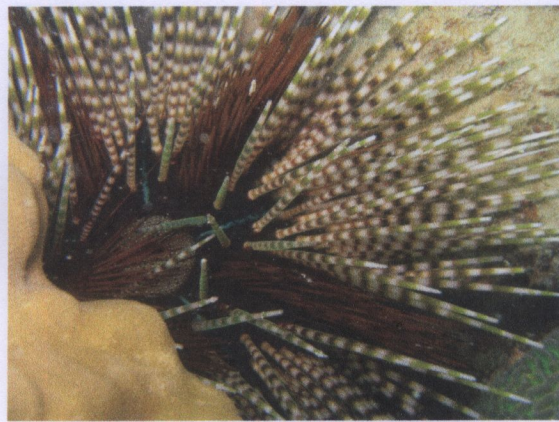
Ophiothrix exigua Lyman, 1847



Ophiocomella sexradia (Duncan, 1887)



Diadema setosum (Leske, 1778)



Echinothrix calamaris (Pallas, 1774)



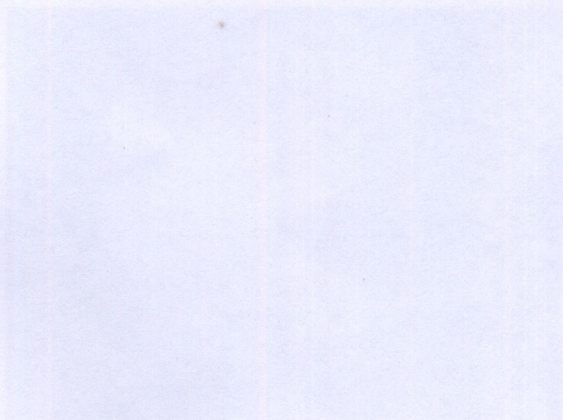
Salmacis sphaeroides (Linnaeus, 1758)



Laganum decagonale (de Blainville, 1827)

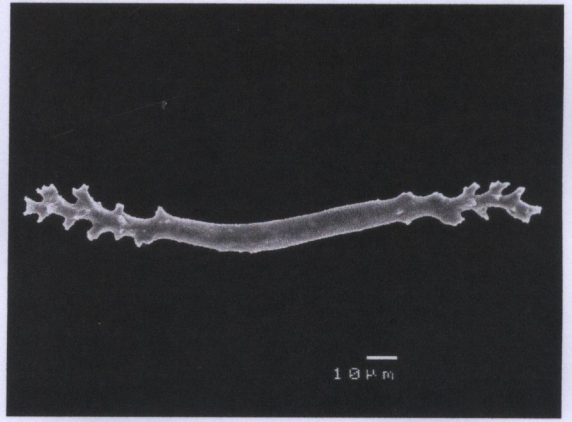


Lovenia elongata (Gray, 1845)

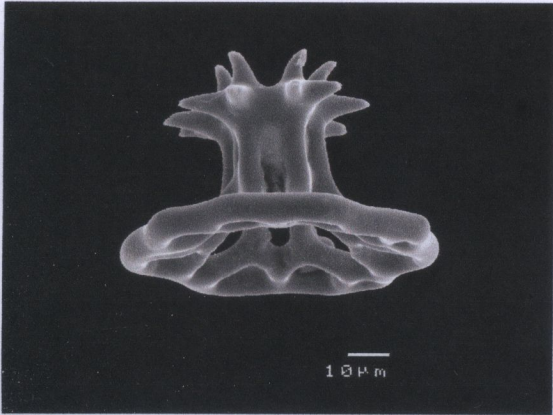




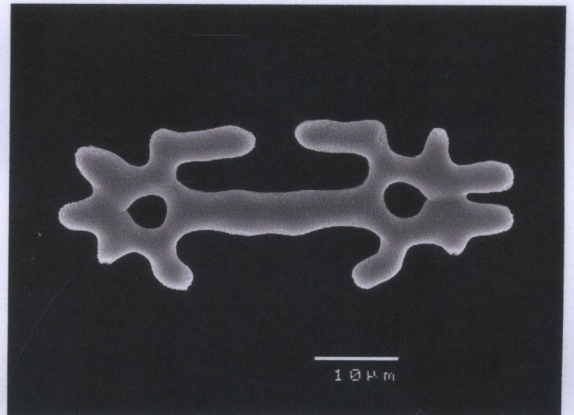
H. (Halodeima) atra Jaeger, 1833



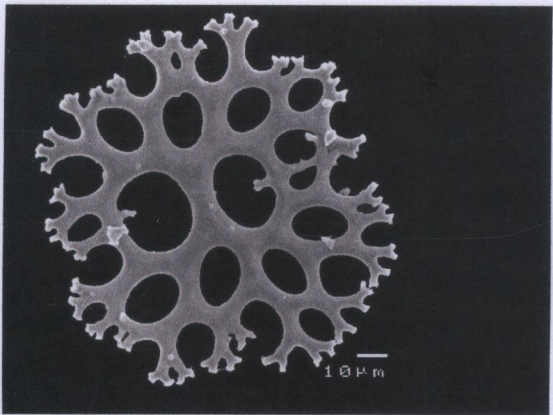
Tentacle rod of *H. (H.) atra* Jaeger, 1833



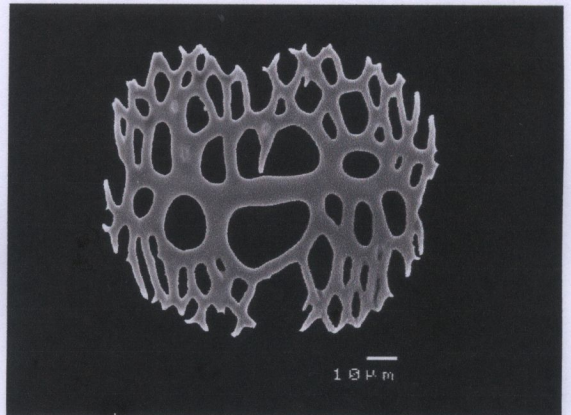
Body wall table of *H. (H.) atra* Jaeger, 1833



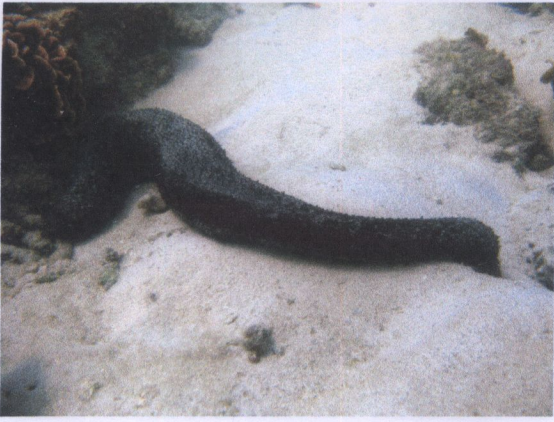
Body wall rosette of *H. (H.) atra* Jaeger, 1833



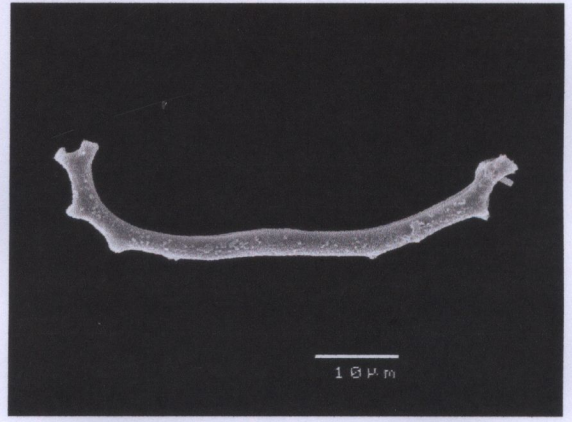
Papillae perforate plate of *H. (H.) atra* Jaeger, 1833



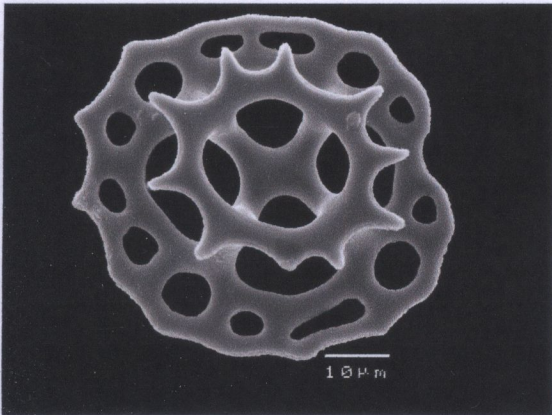
Tube feet perforate plate of *H. (H.) atra* Jaeger, 1833



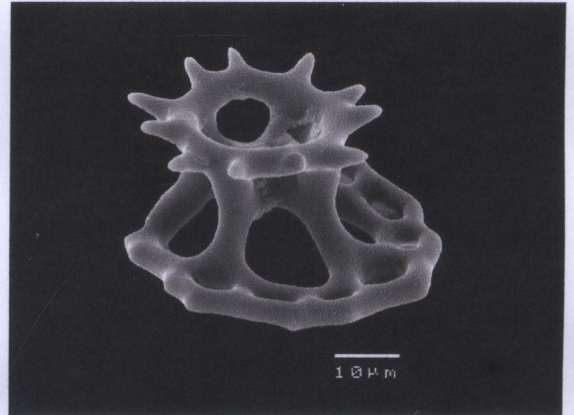
H. (Metensiothuria) leucospilota Brandt, 1835



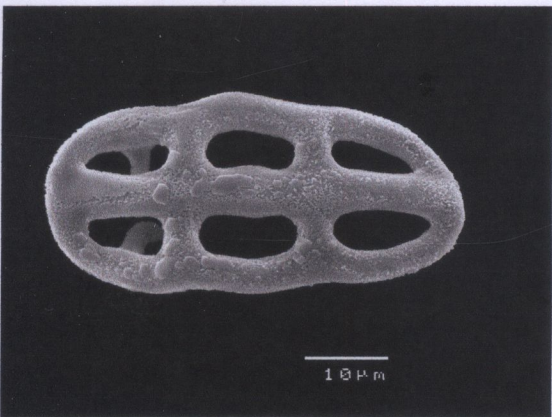
Tentacle rod of *H. (M.) leucospilota* Brandt, 1835



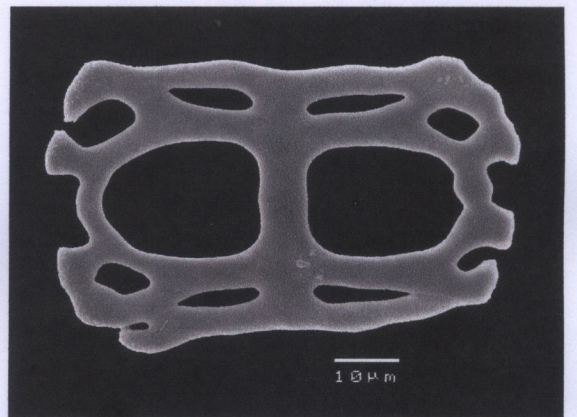
Body wall table of *H. (M.) leucospilota* Brandt, 1835



Body wall table of *H. (M.) leucospilota* Brandt, 1835



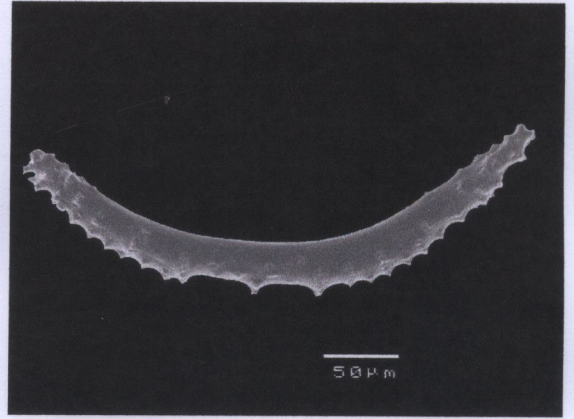
Body wall button of *H. (M.) leucospilota* Brandt, 1835



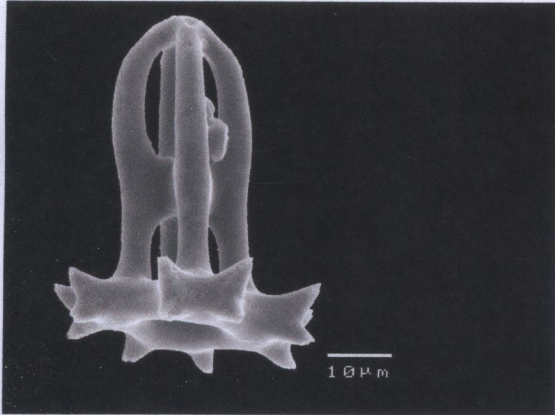
Tube feet perforate plate of *H. (M.) leucospilota* Brandt, 1835



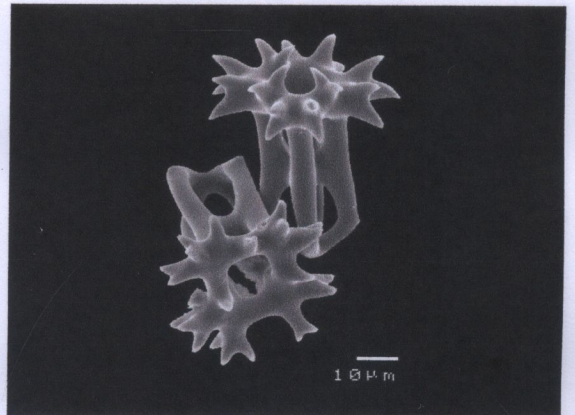
H. (Semperothuria) flavomaculata Semper, 1868



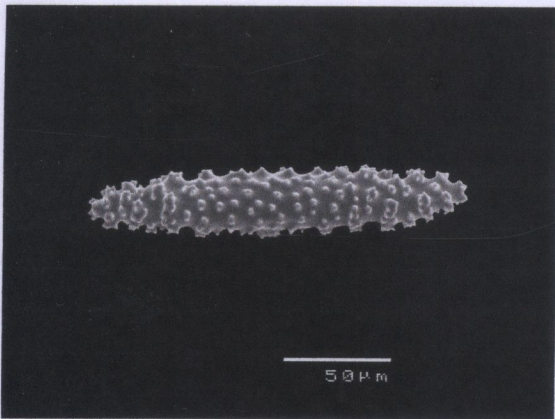
Tentacle rod of *H. (S.) flavomaculata* Semper, 1868



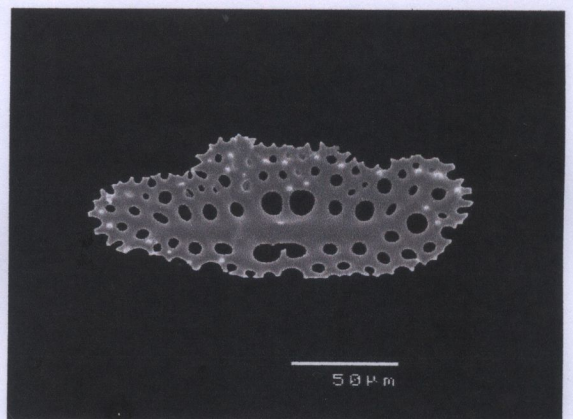
Body wall table of *H. (S.) flavomaculata* Semper, 1868



Body wall table of *H. (S.) flavomaculata* Semper, 1868



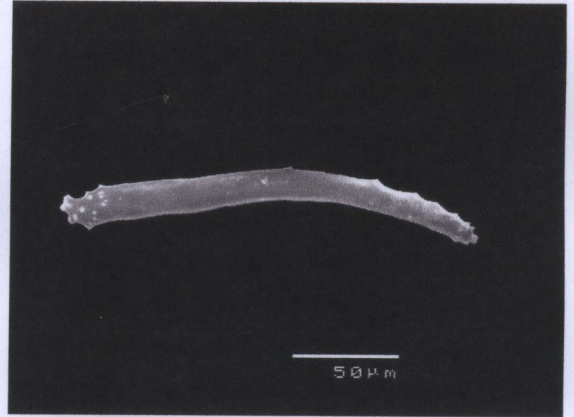
Tube feet rod of *H. (S.) flavomaculata* Semper, 1868



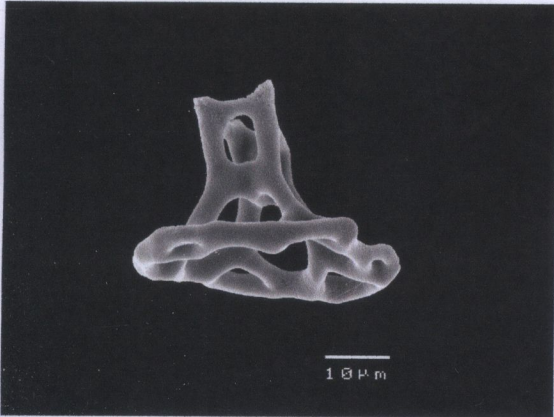
Tube feet perforate plate of *H. (S.) flavomaculata* Semper, 1868



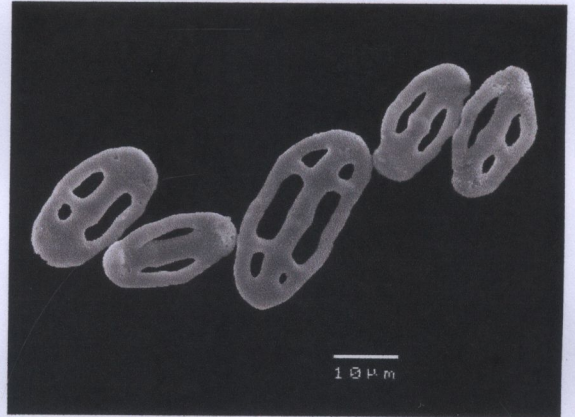
H. (Stauropora) fuscocinerea Jaeger, 1868



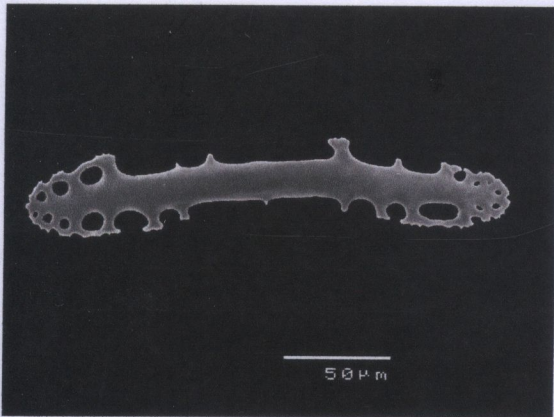
Tentacle rod of *H. (S.) fuscocinerea* Jaeger, 1868



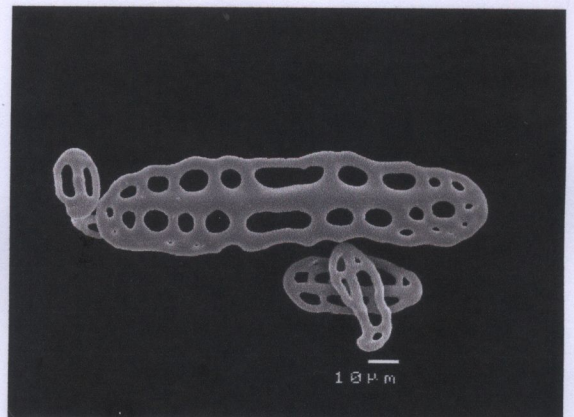
Body wall table of *H. (S.) fuscocinerea* Jaeger, 1868



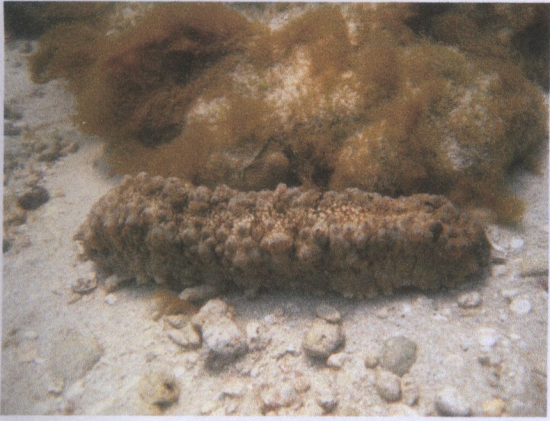
Body wall button of *H. (S.) fuscocinerea* Jaeger, 1868



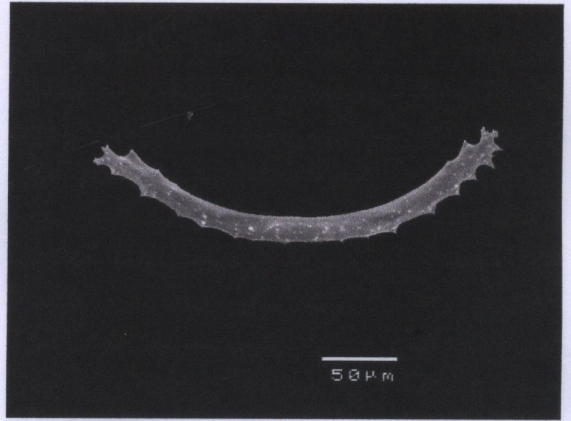
Papillae perforate rod of *H. (S.) fuscocinerea* Jaeger, 1868



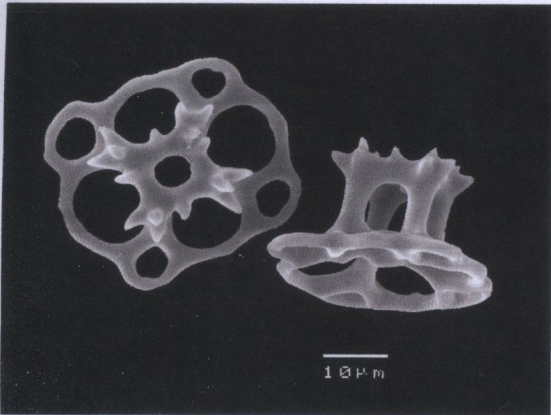
Tube feet large button of *H. (S.) fuscocinerea* Jaeger, 1868



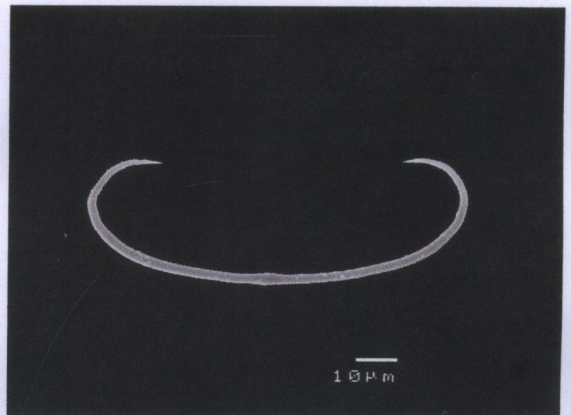
Stichopus horrens Selenka, 1867



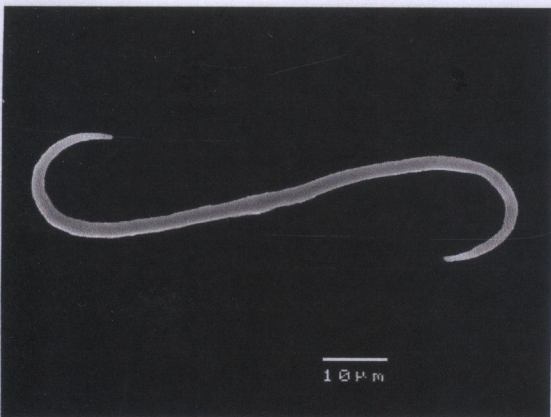
Tentacle rod of *S. horrens* Selenks, 1867



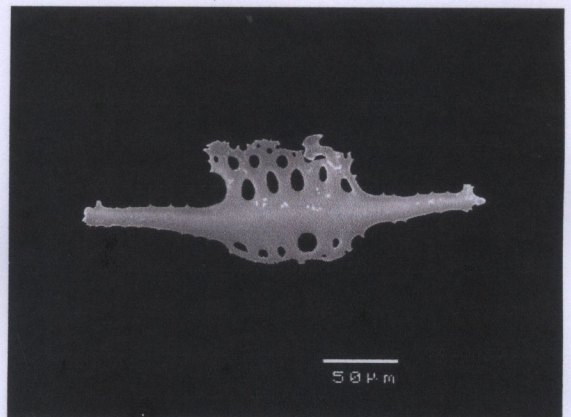
Body wall table of *S. horrens* Selenks, 1867



Body wall C-shape rod of *S. horrens* Selenks, 1867



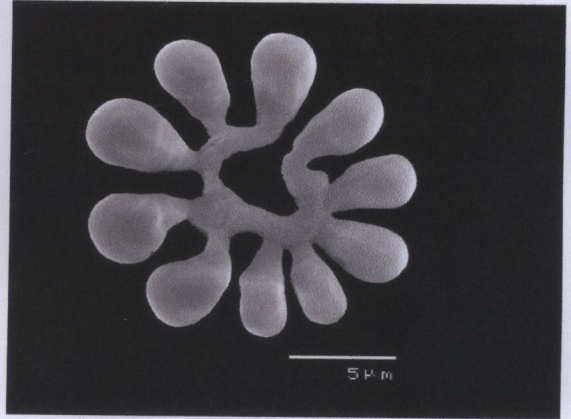
Body wall S-shape rod of *S. horrens* Selenks, 1867



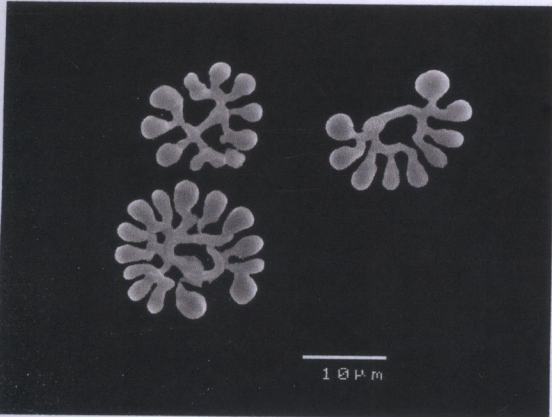
Tube feet perforate rod of *S. horrens* Selenks, 1867



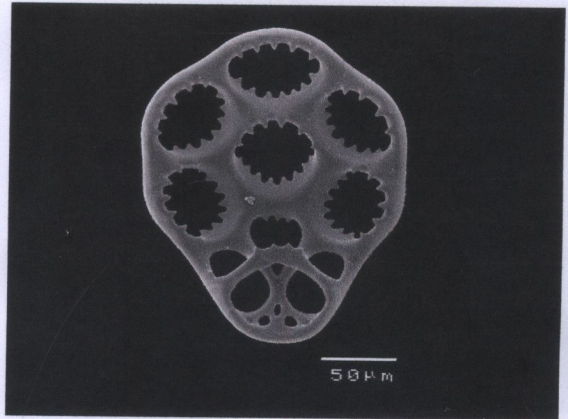
Synaptula sp.1



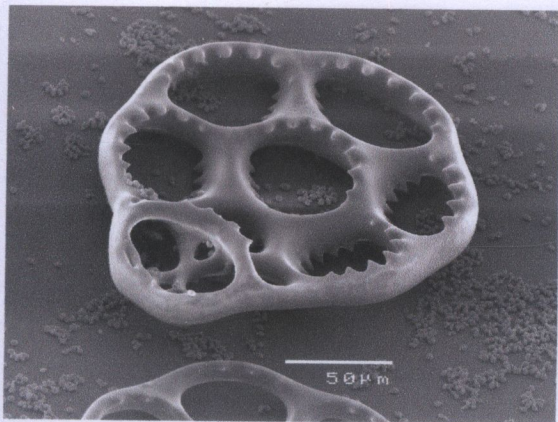
Tentacle miliary granules of *Synaptula* sp.1



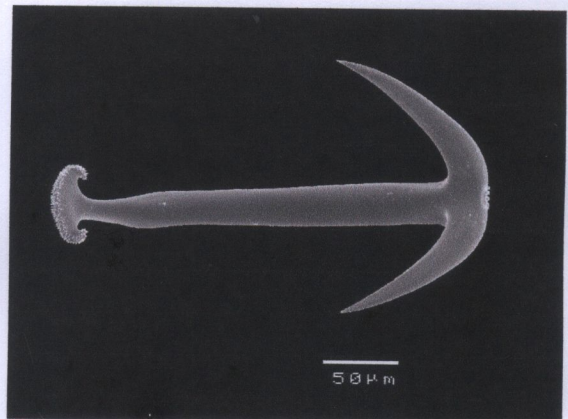
Tentacle miliary granules of *Synaptula* sp.1



Body wall anchor plate of *Synaptula* sp.1



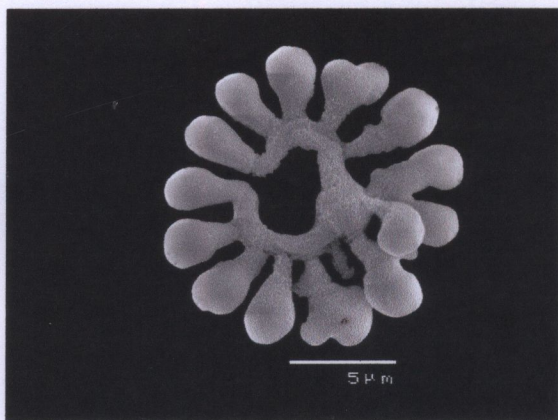
Body wall anchor plate of *Synaptula* sp.1



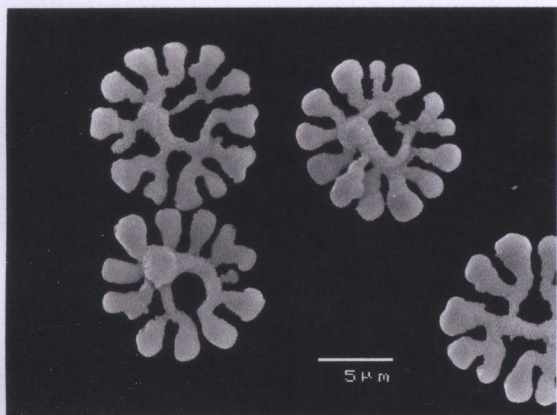
Body wall anchor of *Synaptula* sp.1



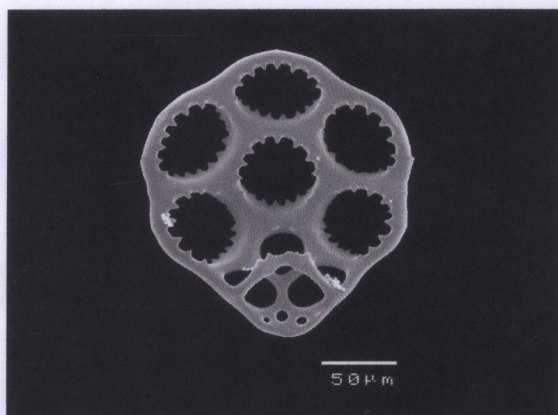
Synaptula sp.2



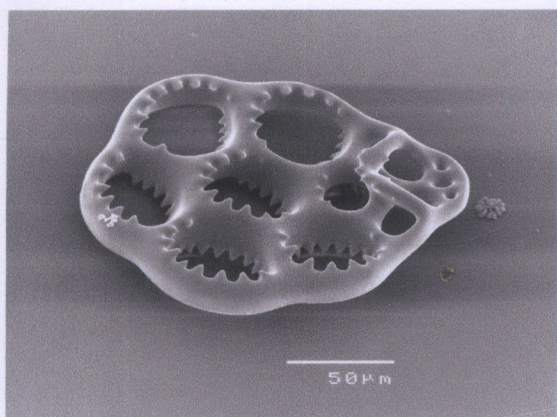
Tentacle miliary granules of *Synaptula* sp.2



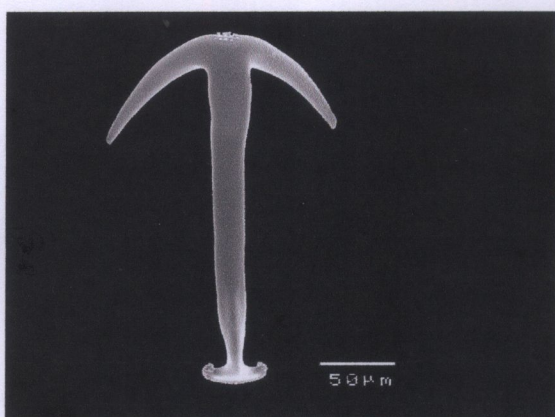
Tentacle miliary granules of *Synaptula* sp.2



Body wall anchor plate of *Synaptula* sp.2



Body wall anchor plate of *Synaptula* sp.2



Body wall anchor of *Synaptula* sp.2