



ISSN
Online 0974–7907
Print 0974–7893

OPEN ACCESS

DESCRIPTION OF A NEW CORAL SPECIES *CTENACTIS TRIANGULARIS* (SCLERACTINIA: FUNGIIDAE) FROM ANDAMAN ISLANDS, INDIA

Tamal Mondal¹ & C. Raghunathan²

^{1,2}Zoological Survey of India, Andaman and Nicobar Regional Centre, Port Blair, Andaman and Nicobar Islands 744102, India

¹t_genetics@yahoo.com (corresponding author), ²raghuksc@rediffmail.com

Abstract: A new species of scleractinian coral *Ctenactis triangularis* sp. nov. in the family Fungiidae has been described from the Andaman and Nicobar Islands. This species has a triangular arm shaped corallum with the mouth extending along all three arms. Septal dentition is long, cylindrical, equally sized and closely arranged. Numerous pits on the costae and costal spines are spinulose. *Ctenactis triangularis* sp. nov. has an affinity with *Ctenactis echinata* (Pallas, 1766), *Ctenactis crassa* (Dana, 1846) and *Ctenactis albitentaculata* (Hoeksema, 1989), thus the morphological features have been compared with these three species and discussed.

Keywords: Andaman & Nicobar Islands, coral, *Ctenactis*, Fungiidae.

Mushroom corals (Family Fungiidae) are one of the most conspicuous groups restricted to shallow-water habitats of coastal areas, islands and banks in the tropical Indo-Pacific reefs. This family is one of the very few in which species can be traced back to pre-Linnaean literature (Tournefort 1706; Rumphius 1750). The Fungiidae includes both colonial forms and the mushroom-shaped, monostomatous (presence of single mouth), free living corals of the genera *Cycloseris*, *Diaseris*, *Fungia*, *Ctenactis* and *Heliofungia*. Although these genera are fundamentally monostomatous, there is an incipient tendency to develop several mouths among the several species under above said genera (Veron & Pichon 1980). All colonial fungiids are derived from the

solitary genus *Cycloseris* or else from four of the five subgenera of *Fungia*, and have inherited the septo-costal structures of their predecessors (Wells 1966).

In the tropical Indo-Pacific region, 41 species of fungiid corals have been found (Hoeksema 1989) out of a total of 56 species of mushroom corals recorded throughout the world (Veron 2000). Venkataraman et al. (2003) recorded 22 species of mushroom corals in Indian waters. However, Ramakrishna et al. (2010) recorded 44 species of mushroom corals from Andaman & Nicobar Islands.

Revisionary studies on the family Fungiidae revealed three species of *Ctenactis*—the occasionally polystomatous *C. echinata* (Pallas, 1766), the consistently polystomatous *C. crassa* (= *Herpetoglossa simplex*) (Dana, 1846), and the almost consistently monostomatous *C. albitentaculata* (Hoeksema 1989; Veron 2000). All three species constitute a genus which can easily be separated from *Fungia* by a combination of characters: (i) the coralla are more elongate and become much larger and heavier; (ii) the septal and costal ornamentations are coarser and more spinose; (iii) there exists a clear tendency from monostomatism to polystomatism, in which *C. albitentaculata* and *C. crassa* are the extremes and *C. echinata* an intermediate form (Hoeksema 1989).

DOI: <http://dx.doi.org/10.11609/JoTT.o3194.4653-9> | **ZooBank:** urn:lsid:zoobank.org:pub:12A21252-A751-46E5-BCF9-394ACB37012D

Editor: John Veron, Coral Reef Foundation, Townsville, Australia

Date of publication: 26 August 2013 (online & print)

Manuscript details: Ms # o3194 | Received 10 May 2012 | Final received 17 July 2013 | Finally accepted 19 July 2013

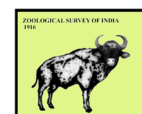
Citation: Mondal, T. & C. Raghunathan (2013). Description of a new coral species *Ctenactis triangularis* (Scleractinia: Fungiidae) from Andaman Islands, India. *Journal of Threatened Taxa* 5(12): 4653–4659; <http://dx.doi.org/10.11609/JoTT.o3194.4653-9>

Copyright: © Tamal Mondal & C. Raghunathan 2013. Creative Commons Attribution 3.0 Unported License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: The Ministry of Environment and Forests, Government of India.

Competing Interest: Authors declare no competing interest.

Acknowledgements: The Authors are grateful to the Ministry of Environment and Forests, Government of India for financial support and facilities provided. Authors are thankful to the Director of this institution for his encouragement, support and extended facilities.



The genus *Ctenactis* Verrill, 1864 is characterized by an elongate corallum with coarse, elongated septal dentations at least 1.5mm apart and composed of numerous, strongly diverging trabeculae. Costae are unequal, with strong and arborescent spines (Veron & Pichon 1980). Only three species in this genus *Ctenactis* have been recorded globally all of which have been found in the Andaman & Nicobar Islands (Ramakrishna et al. 2010).

The present specimen has characteristic differences from the previously reported three species of genus *Ctenactis* and hence it is described as a new species *Ctenactis triangularis*.

Material and Methods

The coral specimen was collected in Rutland Island (Fig. 1), South Andaman by snorkeling as well as skin diving. Morphological measurements were made with Vernier Caliper. Characteristic features of the specimen were examined using the digital stereozoom microscope, model Leica M205A. Two other specimens were observed at the study area. Taxonomic characters of the specimen were studied by comparing the three

related species—*Ctenactis echinata* (Pallas, 1766) and *Ctenactis crassa* (Dana, 1846) and *Ctenactis albitentaculata* (Hoeksema, 1989)—in consultation with the keys prepared by Veron & Pichon (1980) and Veron (2000).

Systematic Position

Order Scleractinia Bourne, 1900
Suborder Fungiina Verrill, 1856
Superfamily Fungiicae Dana, 1846
Family Fungiidae Dana, 1846
Genus *Ctenactis* Verrill, 1864

Species *Ctenactis triangularis* sp. nov. (Image 1)

urn:lsid:zoobank.org:act:C3FF1598-96AD-4D94-A644-D7EEFD473DEA

Material Examined

Holotype: ZSI/ANRC-4899, 04.vii.2008, one example collected (Image 1) at a depth of 4m in reef area of Surumai Dikri (11°25.504'N & 92°40.301'E), located at Rutland Island, South Andaman. Length of the three corallum from the centre is 12.1cm, 10.2cm and 9.6cm.

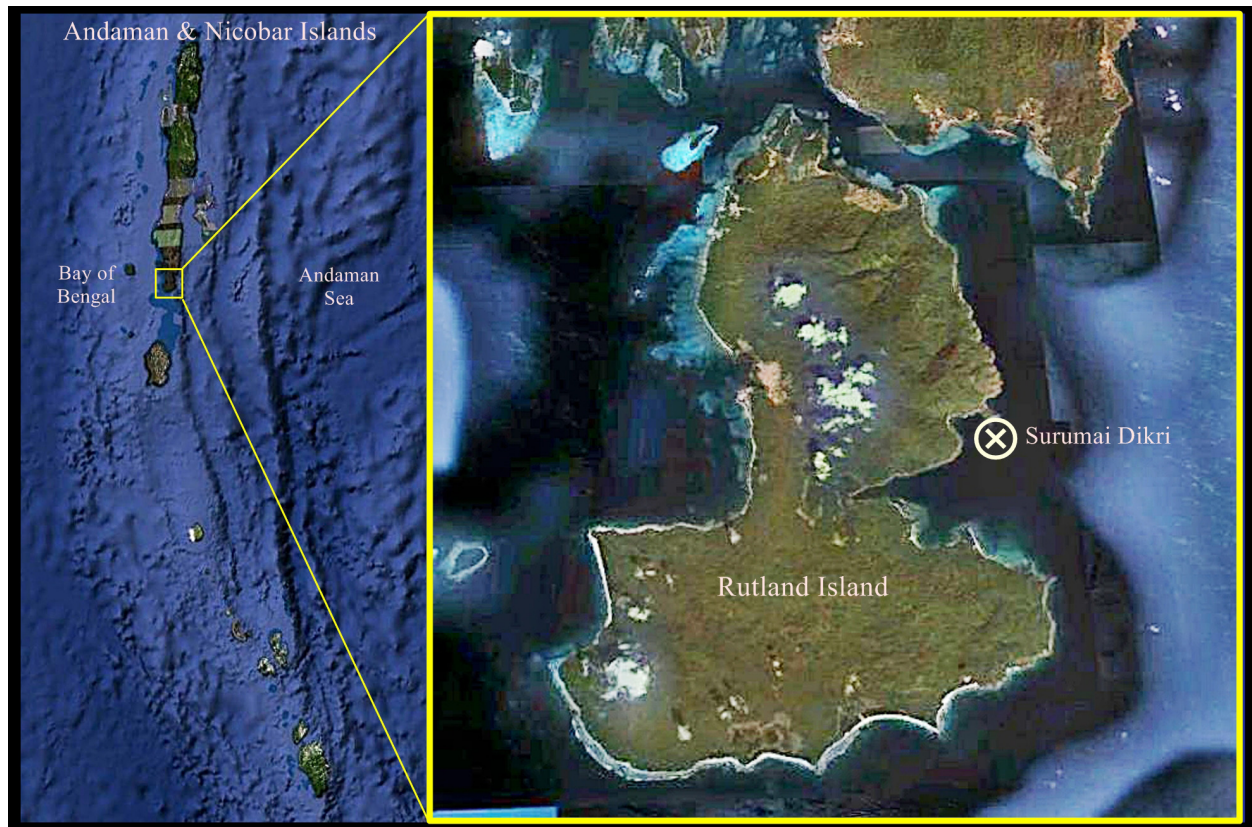


Figure 1. Locations from where *Ctenactis triangularis* sp. nov. was observed

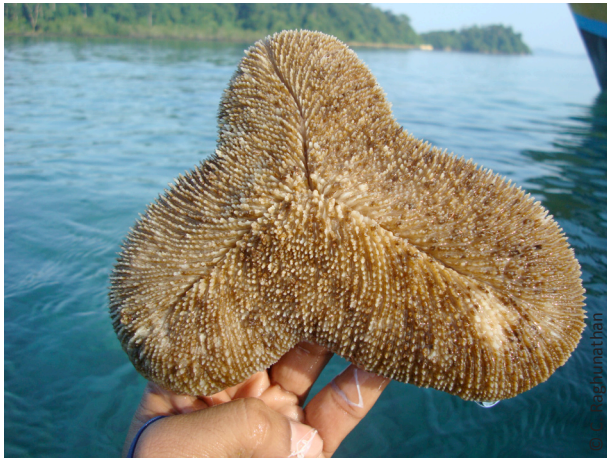


Image 1. *Ctenactis triangularis* sp. nov.

Width is 9.3cm, 8.4cm and 7.8cm. Height of the coralla is 3.9cm. Collected by C. Raghunathan and party; holotype deposited in the National Zoological Collections of Zoological Survey of India, Port Blair.

Paratype: One specimen was observed at North Bay (11°42.068'N & 92°45.116'E) South Andaman during December 2008 and another specimen was observed at Elephant Beach (12°00.582'N & 92°56.838'E), Havelock Island, Ritchie's Archipelago, Andamans, on 06 July 2010.

Diagnostic characters: Triangular arm like corallum, oval-elongate mushroom corals, monostomatous (usually with a single, large mouth). The mouth is divisible in three extensions and extends in each arm of the coralla. Oral surface is humped and convex around the mouth. Septa straight or sinuous, the terminal ends of the coralla are regularly rounded. The septa are thick and equal in size with large, strong dentition on the margin. The septal teeth are echinulate in structure. Costae are well developed with large, cylindrical spines. The spinulose are present on the top and side walls of the spine. Pits are present throughout the costae.

Comparison with the other *Ctenactis* species: The new species (Images 2A, 3A) was compared with the existing specimens of *Ctenactis echinata* (Pallas, 1766) (Images 2B, 3B), *Ctenactis crassa* (Dana, 1846) (Images 2C, 3C) and *Ctenactis albitentaculata* (Hoeksema, 1989) (Images 2D, 3D) in order to distinguish the new species from closely related species with morphological characters. The comparative data is given in Table 1.

Etymology

The species has been named after the triangle-shaped arm like coralla, which gives a unique morphological character to distinguish it from other related species.

Discussion

A newly described coral species *Ctenactis triangularis* sp. nov. is described from the Andaman and Nicobar Islands. Although this species' close affinity with a few morphological characters of other closely related species such as *Ctenactis echinata* and *Ctenactis crassa*, it distinctly differs from having a triangular flat-shaped corallum, divisible mouth fossa, spinulose costal spines and cylindrical septal teeth. It is pertinent to note that only three species are reported under genus *Ctenactis* from world waters as well as the Andaman and Nicobar Islands. Morphological plasticity can be observed among these species, but this is not morphological differentiation of previously described species as all the characters of key components such as septa, costae, mouth and their arrangement is totally different from previously recorded species. The analytical result of all the characters of the described species is definitely a new description. The presently described species from these Islands is a new addition to the genus *Ctenactis*. Coral reefs are very important marine organisms, and play a vital role in enriching marine biodiversity. Threats, which can be categorized as natural and anthropogenic, to the reef biodiversity, have been encountered for a long time. As survival of the coral reef environment means a lot for the sustainable development of a whole lot of marine biota, conservation action plans have been taken for consideration globally, to give them protection against anthropogenic degradation. Scleractinian corals were included under CITES Appendix II. Not only that, scleractinians were included as Schedule-I species under Indian Wildlife (Protection) Act, 1972 to make sure that proper protection as well conservatory measures are ensured for the future generation.

REFERENCES

- Dana, J.D. (1846). Zoophytes. *U.S. Exploring Exped. 1838–1842*.
- Hoeksema, B.W. (1989). Taxonomy, phylogeny and biogeography of mushroom corals (Scleractinia: Fungiidae). *Zoologische Verhandlungen Leiden* 254: 1–295.
- Pallas, P.S. (1766). *Elenchus Zoophytorum*. Van Cleef, Hage-Comitum, 1-451.
- Ramakrishna, C. Raghunathan, T. Mondal & Sivaperuman (2010). *Fungiids of Andaman and Nicobar Islands. Guide to Fungiids of Andaman & Nicobar Islands*. Published by the Director, Zoological Survey of India, Kolkata, 101pp
- Rumphius, G.E. (1750). *Her Amboinsche Kruid-Boek*. Herbarium Amboinsche Amsterdam, Pt 6.
- Tournefort, J.P. de (1706). Observations sur les plantes qui naissent dans le fond de la mer. *Mémoires de l'Académie royale des sciences (Paris)* Année 1700.
- Venkataraman, C., C. Satyanarayan, J.R.B. Alfred & J. Wolstenholme (2003). *Handbook on Hard Corals of India*. Published by the Director, Zoological Survey of India, Kolkata, 266pp.

Table 1. Comparison of Characteristics

Characters	<i>Ctenactis triangularis</i> sp. nov.	<i>Ctenactis echinata</i>	<i>Ctenactis crassa</i>	<i>Ctenactis albitentaculata</i>
1. Coralla	Triangular, flat in shape. The length and width ratio from central part of the corallum arms shows different types of values such as 1.21, 1.31 and 1.28. The terminal region of the corolla is regularly rounded (Image 4A).	Elongate, slightly arched in shape. Sometimes it is completely flat. The length and width ratio averages 2–3. The end of the corolla is either regularly rounded or slightly tapered (Image 4B).	Elongate, markedly arched or flat, usually with tips more or less pointed. The length and width ratio averages 2–5. The end of the corolla is usually tapered sometimes rounded or oval in shape (Image 4C).	Elongate, flat in shape. The length and the width ration averages 2–2.5. The end of the corolla is usually regularly rounded and sometimes tapered (Image 4D).
2. Central constriction	A central constriction in corolla is present. The mouth fossa is divisible in three and extends till the end of the all three corallum, Three cleavages can be seen in the proximate side of the corolla indicating a extension towards the central region of mouth (Image 5A).	A central constriction in corolla is common; the maximum width to minimum width ratio is 1.4. The length of the mouth fossa may extend the whole length of the corolla or are far short of the ends (Image 5B).	The axial furrow has several centres (except juveniles), which are separated from each other by the fusion of two opposite pairs of septa. There are no secondary, lateral centres (Image 5C).	Central constriction is common. More than one mouth is arranged along the axial furrow but do not occur outside the furrow (Image 5D).
3. Septa	Principal septa are thicker, stronger with large dentition. There are 1–3 secondary septa between the primaries. The secondary septa have dentition in regular pattern. The specimen has more than 1000 septa. The height of the septa is usually the same (Images 6A & 7A).	Principal septa are conspicuously thicker than the others and distinctly exert with dentition. There are 1–5 secondary septa between the primaries with much smaller or no dentition. Bigger specimens may have as many as 1000 septa. Primary septa may be extremely exert (up to 7mm) and distant from each other (up to 8mm). The septa sometimes show height variation (Images 6B & 7B).	Principal septa run uninterrupted from central fossa to the corallum perimeter, are separated by one or several higher order septa which have large dentition. Secondary septa are thick and porous, even spongiose. The upper margins are devoid of large dentitions, but are irregular and echinulate. The sides are heavily granulated (Images 6C & 7C).	Septa are long and tapered. There are 1–3 secondary septa between the primaries with smaller dentition. The specimen has more than 800 septa (Images 6D & 7D)
4. Septal teeth	Septal teeth are located on the upper portion of the principal septa. The teeth are large, some extent cylindrical in shape. The proximal end of the teeth is ecinulate. The height of the teeth is 5.250mm and width is 1.211mm. The minimum distance between two teeth is 0.784mm, where they form an angle of 46.172°. Some oval outgrowth like structure is visible in regular manner on the surrounding outer layer of the teeth. This has given the septal teeth a regular wavy characteristic. Teeth on the secondary septa are smooth and arranged in regular pattern. The angle between two teeth is ~86°. The height of the teeth is 0.974mm and the width is 1.149mm (at base) Image 8A.	Septal teeth are located on the upper margin of principal septa, are long and sub-triangular shape. It has echinulate or spinose tops and slightly granulated sides. The granules sometimes fuse in rows parallel to the dentition margins. The granules form wave like structure and the deposition of the granular structure is in progressive rate from lower to higher. The height is 3.039mm and width 2.896mm (at base). Image 8B	Septal teeth are triangular in shape. The vertical axis of each dentition is greatly thickened and the principal septa appear to be composed of a linear series of dilations. The margins of the dentitions bear rounded or irregular granules. The height of the septal teeth is 3.290mm and the width is 3.087mm (at base) Image 8C.	Septal teeth are located on the upper margin of the primary septa as a long tapered structure. It is sub-triangular in shape, the total body of the teeth is covered with granulated structures but the top of the teeth is echinose. The granules are arranged in rows. The height is 8.944mm and width is 2.651mm at the base and the angle between two septal teeth is 37° (Image 8D).
5. Costae and spine	The lower portion is well covered with cylindrical, well developed spines. Spines are arranged in regular rows corresponding to costae. Pits are distributed throughout the costae. The spines are unequal in size, giving a rough surface to the costae. Sometimes form rosette like structure in stipulated region of costae. The spine has spinulose on top and side wall. The spinulose are arranged in a spine in regular ways. The height of the spine is 2.907mm and width is 1.372mm (Images 9–11A).	The lower surface is covered with well, developed, cylindrical or arborescent spines, which have spinulose and echinulate tops. Spines are arranged in regular rows corresponding to costae. Numerous elongate pits are visible near the margins of the most specimens. The length of spine in examined specimen is 0.979mm and width is 0.752mm (Images 9–11B).	The lower surface can be perforated, except towards the centre of the corallum. The surface is covered by numerous, small, compact spines. The spines are arranged in rows corresponding to costae, except towards the corallum centres. In the centre of the corallum the spines are irregular. Spines are ornamented with spinules on the top and some granules at the side. The length of spine in examined specimen is 1.192mm and width is 0.656mm (Images 9–11C).	The lower surface of the corolla is perforated in regular interval. The surface is covered with numerous spines. Spines are regularly arranged towards the corolla centre. Spicules are present on the top of the spine in much more frequency than the side wall. The length of the spine of the examined material is 2.453mm and width is 1.354mm (Images 9–11D).



Image 2. Dorsal view

Image 3. Ventral view

Image 4. Corallum

A - *Ctenactis triangularis* sp. nov.; B - *Ctenactis echinata*; C - *Ctenactis crassa*; D - *Ctenactis albitentaculata*. © Tamal Mondal



Image 5. Central constriction

Image 6. Mouth and septal arrangement

Image 7. Septa

A - *Ctenactis triangularis* sp. nov.; B - *Ctenactis echinata*; C - *Ctenactis crassa*; D - *Ctenactis albitentaculata*. © Tamal Mondal

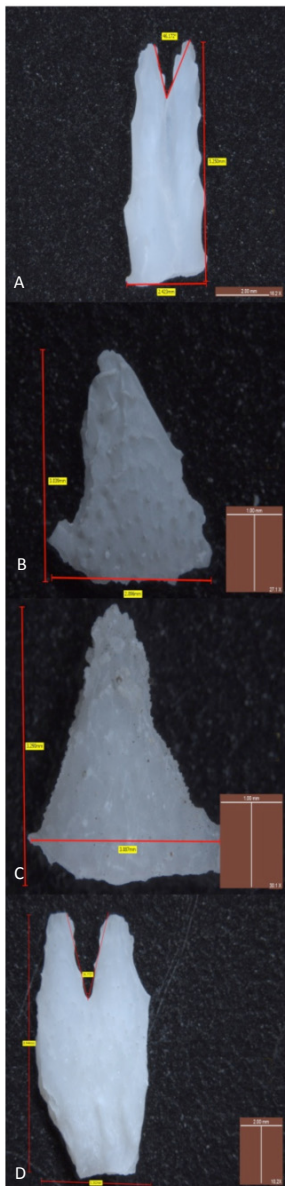


Image 8. Septal teeth

A - *Ctenactis triangularis* sp. nov.; B - *Ctenactis echinata*; C - *Ctenactis crassa*; D - *Ctenactis albitentaculata*. © Tamal Mondal

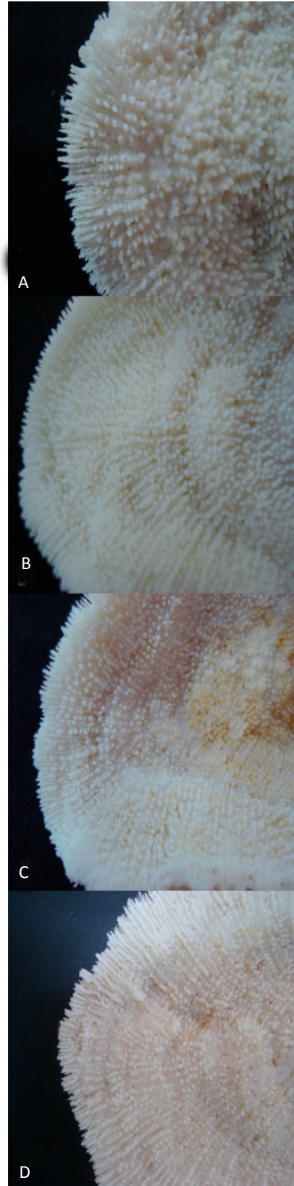


Image 9. Costae

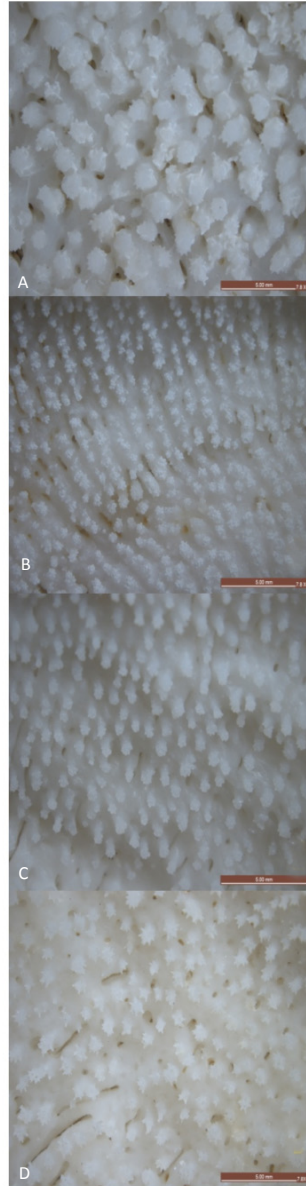


Image 10. Costal spine

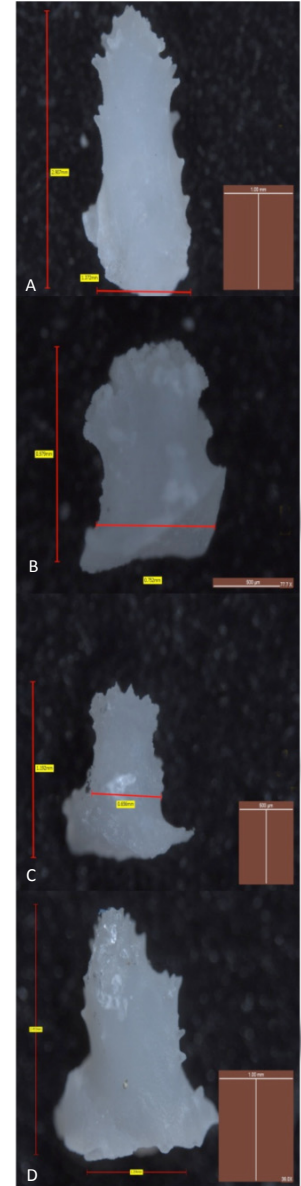


Image 11. Spine structure

Veron, J.E.N. & M. Pichon (1980). *Scleractinia of Eastern Australia - Part III*. Australian Institute of Marine Science. Townsville, 433p.
 Veron, J.E.N. (2000). *Corals of the World - Volume 2*. Australian Institute of Marine Science. Townsville, 429pp.
 Verrill, A.E. (1864). List of the polyps and corals sent by the Museum of Comparative Zoology to other institutions in exchange, with

annotations. *Bulletin of the Museum of Comparative Zoology, Harvard College. Cambridge* 1: 29-60.
 Wells, J.W. (1966). Evolutionary development in the scleractinian family Fungiidae, pp. 223-246. In: Rees, W.J. (ed.). *The Cnidaria and Their Evolution*. Symposium of the Zoological Society, Academic Press, London 16: pl. 1.

