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MARINE DEMOSPONGIAE OF ZANZIBAR ISLAND

P. A. THOMAS

Central Marine Fisheries Research Institute, Cochin-682 018

ABSTRACT

A systematic account of 14 species of sponges collected from Zanzibar Island as hosts of shrimps and prawns is presented in this paper. These species belong to 13 genera divided among 10 families. The distribution pattern of these species, in the six widely distributed geographic areas is discussed. While most of the species described at present are found to be new records to the Island, the distribution of *Megactella tibiellifer* (Ridley) is extended to the Indian Ocean.

INTRODUCTION

THE present account is based on a small collection of sponges made by Dr. A. J. Bruce, East African Marine Fisheries Research Organisation, Mombasa, Kenya from Zanzibar (Fig. 1). This collection cannot be taken as a representative collection of the sponge fauna of Zanzibar since the specimens were collected as hosts of shrimps and prawns in which Dr. Bruce was interested. Most of the specimens were large with meandering canals inside or tubular in nature. Some were bushy or provided with long conules. However, a detail study of the specimens revealed that it is very interesting both faunistically and zoogeographically and hence brief descriptions and sketches are presented in this account, which it is hoped would supplement the already published accounts of the sponge fauna of Zanzibar by Baer (1905) and Lendenfeld (1897).

I am thankful to Dr. S. Z. Qasim, Director, Central Marine Fisheries Research Institute, Cochin-18, for kindly permitting me to publish this account. My thanks are also due to Dr. A. J. Bruce, East African Marine Fisheries Research Organisation, Mombasa, Kenya for permitting me to study the material and also to Dr. R. E. Morris, Director, East African Marine Fisheries Research Organisation for his kind permission to publish this account.

MATERIAL AND METHODS

The material for the present study was collected by Dr. A. J. Bruce from different parts of Zanzibar Island in connection with his studies on shrimps associated with sponges. All the specimens were from shallow water, intertidal pools, from SCUBA dives or trawl hauls; and all are in dry condition.

Sections were taken parallel and vertical to the surface in thickness not exceeding 0.5 mm by an ordinary blade. Spicule preparations were made according to the suggestions of Arndt (1935), Burton (1937), and de Laubenfels (1953). Sections and

spicules were examined under water. Measurements were taken by calibrated ocular micrometer and sketches by using Camera-lucida. All averages are based

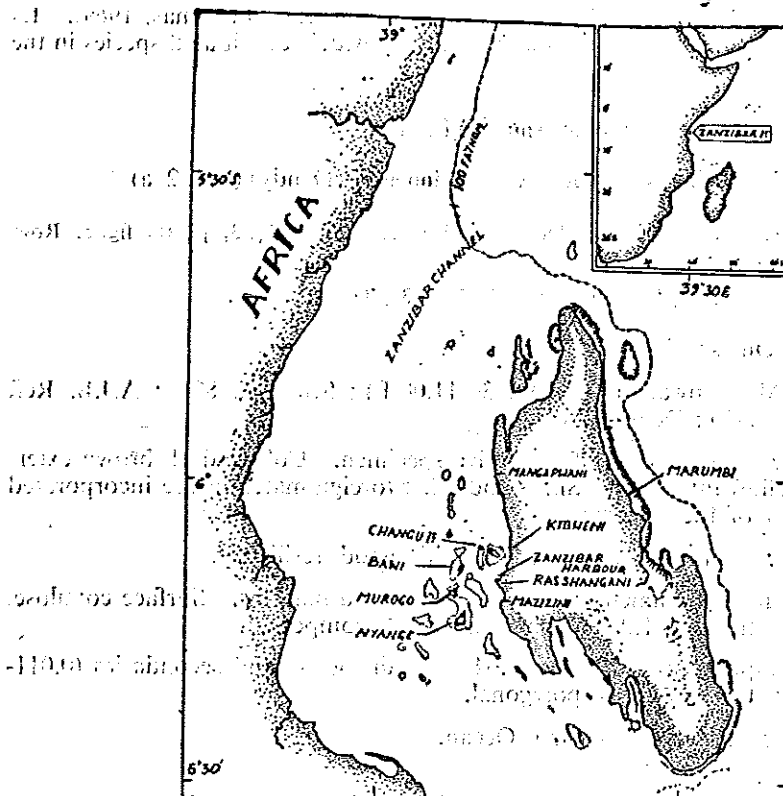


Fig. 1. Map showing the Zanzibar Island and its Geographic position.

on the measurements of 10 spicules. Dimensions are expressed in millimetre following a pattern of lower limit, upper limit and mean.

No attempt is made to give complete synonymy of each species and instead only the major works are referred to.

SPECIES AND GEOGRAPHIC DISTRIBUTION

The distribution of the 14 species of sponges collected from Zanzibar Island is as follows: two viz., *Dysidea fragilis* and *Tedania anhelans* are cosmopolitan; *Megaciella tibeillifer* was first reported from Torres Strait (Ridley, 1884) and the present discovery from Zanzibar extends its distribution to Indian Ocean. *Haliclona cribricutis*, *Sigmosceptrella quadrilobata* and *Aurora globostellata* are widely distributed in the Western Indian Ocean; the only record of the former from the

Australian Region being that of Dendy and Frederick (1924). 3 species occurring in Zanzibar are known to have a wide distribution from Red Sea to Australia and another two species in the Indo-Pacific. *Damiriana schmidtii*, known previously from Red Sea, Australian Region and Pacific was recorded from Galaxea Reef (Gulf of Mannar) (Thomas, 1968) and from Seychelles Bank (Thomas, 1969). Its occurrence in the present collection makes it a very widely distributed species in the Indian Ocean.

Genus *Spongia* Linnaeus

Spongia officinalis Linnaeus var. *ceylonensis* (Dendy) (Fig. 2 a)

Euspongia officinalis var. *ceylonensis* Dendy, 1905, p. 211, pl. 14, fig. 3, pl. 16, fig. 5. Row, 1911, p. 380.

Spongia officinalis var. *ceylonensis* Burton, 1937, p. 39, Thomas, 1968.

Material : One specimen.

Locality : Mangapwani (5°59.30'S 39°11.00'E); Stn. No. 82/1; A.J.B. Ref. No. 1197; Dt. 20-7-70; Depth L.W.S.

Description : Sponge part of a massive specimen. Colour dark brown externally and pale yellow internally. Shells and other foreign materials are incorporated at the lower part of the specimen.

Consistency : Soft and compressible with good resiliency.

Oscules 2-4 mm in diameter surrounded by raised margins. Surface conulose, conules 1.0-1.5 mm apart, 1.0-1.5 mm high; rarely compound.

Skeleton composed of primaries (0.048 mm diameter) and secondaries (0.011-0.025 mm diameter). Meshes polygonal.

Distribution : Red Sea, Indian Ocean.

Genus *Dysidea* Johnston

Dysidea fragilis (Montagu) (Fig. 2 b)

Dysidea fragilis Burton, 1934, p. 583, pl. 2, fig. 2-11. Text figs. 18-33. (Thomas, 1968 (Synonymy)).

Material : One specimen.

Locality : 'Glasgow wreck', Zanzibar Harbour; Dt. 1-5-1970. Other details not available.

Description : Sponge clathrous, branches slender and strongly conulose, partly or completely fused together except at the growing tips. Size 80 × 40 mm.

Consistency : Fragile.

Fibres divisible into main and connectives. Main fibres about 0.25 mm and connectives a little lesser in diameter. Both are well packed with sand grains.

Distribution : Cosmopolitan.

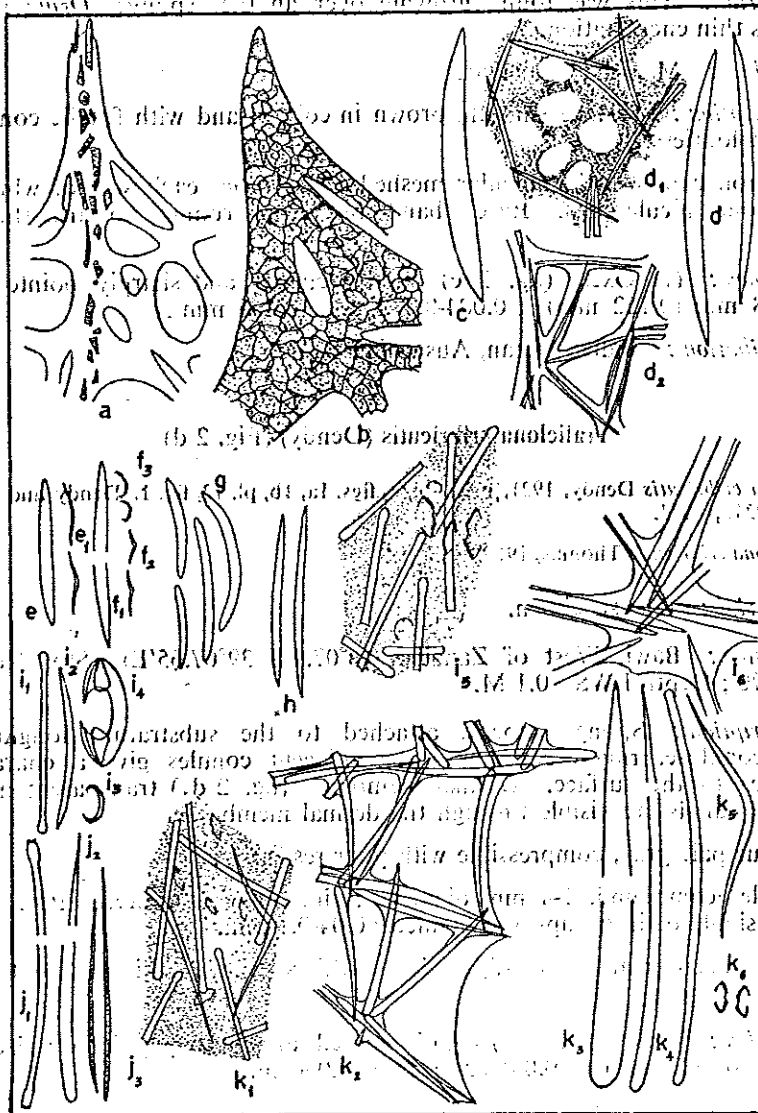


Fig. 2. Some species of sponges

- a. *Spongia officinalis*; b. *Dysidea fragilis*; c. *Haliclona exigua*; d. *Haliclona cribricutis*;
 e. *Toxadocia toxius*; f. *Orina sagittaria*; g. *Petrosia testudinaria*; h. *Callyspongia fibrosa*;
 i. *Damiriana schmidti*; j. *Tedania anhelans*; k-1, k-2. *Megaciella tibiellifer*;

Genus *Haliclona*

Haliclona exigua (Kirkpatrick) (Fig. 2 c)

Petrosia exigua Kirkpatrick, 1900, p. 139, pl. 12, fig. 7, pl. 13, fig. 4.
Haliclona exigua Burton, 1934, p. 532; 1937, p. 17. Thomas, 1969,

Material : This was found growing over another sponge, *Orina sagittaria* (Sollas) as thin encrustation.

Locality : Mazizini, Zanzibar.

Description : Surface smooth, brown in colour, and with fragile consistency. Spongine colourless.

Skeleton consists of triangular meshed reticulation, each side of which composed of one spicule each. Rarely bands of spicules running towards the surface are seen.

Spicules : (1) Oxea (fig. 2 c) slightly curved and sharply pointed; size, 0.08-0.128 mm (0.122 mm) \times 0.004-0.008 mm (0.006 mm).

Distribution : Indian Ocean, Australian Region.

Haliclona cribricutis (Dendy) (Fig. 2 d)

Reniera cribricutis Dendy, 1921, p. 32, pl. 3, figs. 1a, 1b, pl. 12, fig. 1. Dendy and Frederick, 1924, p. 497.

Haliclona cribricutis Thomas, 1969.

Material : One specimen.

Locality : Bawi, West of Zanzibar (6°07.9'S 39°07.65'E); Stn. No. 92/2; Dt. 19-9-70; Depth LWS—0.1 M.

Description : Sponge repent, attached to the substratum longitudinally. Surface conulose, ridges connecting the adjacent conules give a characteristic appearance to the surface. Dermal membrane (fig. 2 d₁) transparent and deep subdermal canals are visible through the dermal membrane.

Colour pale gray, compressible with poor resiliency.

Oscules compound, 1-4 mm diameter; rim slightly elevated. Pores minute, arranged singly or in groups and diameter 0.04-0.1 mm.

The skeletal arrangement (fig. 2 d₂) of this specimen tallies well with that of the type.

Spicules : Oxeas (fig. 2 d₂) slightly curved and sharply pointed; size, 0.132-0.183 mm (0.043 mm) \times 0.004-0.008 mm (0.006 mm).

Distribution : Indian Ocean.

Genus *Toxadocia* de Laubenfels

Toxadocia toxius (Topsent) (Fig. 2 e)

Gellius toxius Topsent, 1897, p. 470. Hentschel, 1912, p. 391. Dendy, 1921, p. 28. Kumar, 1925, p. 219.

Adocia toxius Burton, 1934, p. 537.

Toxiclona toxius Levi, 1958, p. 39, fig. 37.

Toxadocla toxius Thomas, 1968.

Material: A small encrustation, size $6 \times 3 \times 1$ mm.

Locality: Bawi, West of Zanzibar ($6^{\circ}07.9'S$ $39^{\circ}07.65'E$); Stn. No. 92/3; Dt. 19-9-70; Depth LWS—0.1 mm.

Description: Sponge encrusting, thickness 1 mm.

Consistency: Fragile.

Skeleton: consists of a triangular network of oxeas cemented only at corners by spongin.

Spicules: (1) Oxeas (fig. 2 e) slightly curved and sharply pointed. Size, $0.122-0.212$ mm (0.162 mm) \times $0.004-0.010$ mm (0.008 mm). (2) Toxas (fig. 2 e₁) slender with slightly curved tips. Size, $0.06-0.08$ (0.07 mm) \times $0.001-0.002$ mm.

Distribution: Red Sea, Indian Ocean, Australian Region.

Genus *Orina* Gray

Orina sagittaria (Sollas) (Fig. 2 f)

Gellius sagittarius Sollas, 1902, p. 212, pl. 15, fig. 7.

Adocla sagittaria Burton, 1934, p. 538.

Adocla sagittarius Burton, 1959, p. 220.

Orina sagittaria Bergquist, 1965, p. 155, fig. 18. Thomas, 1968.

Material: One specimen attached to *Haliclona exigua* (Kirkpatrick).

Locality: Mazizini, Zanzibar; Dt. 22-4-70.

Description: The morphology is difficult to make out since the association with another sponge. Colour pale yellow externally and fragile in consistency. Ectosome well developed and deeply pigmented. Oxeas form a tangential skeleton at the surface. Spongin and 'brown material' clearly seen.

Spicules: (1) Oxeas (fig. 2 f₁) slightly curved. Size, $0.224-0.384$ mm (3.55 mm) \times $0.004-0.012$ mm (0.009 mm). (2) Sigmas (fig. 2 f₂) centrangulate, chord length 0.021 mm average. (3) Toxas (fig. 2 f₃). Arms straight; tips slightly reflected. Size $0.020-0.058$ (0.038 mm) \times 0.001 mm.

Distribution: Indian Ocean, Australian Region, Pacific Ocean.

Genus *Petrosia* Vosmer*Petrosia testudinaria* (Lamarck) (Fig. 2 g)*Alcyonium testudinarium* Lamarck, 1815, p. 167.*Rentleria testudinaria* Ridley, 1884, p. 409.*Petrosia testudinaria* Dendy, 1889, p. 77, pl. 3, figs. 1-3. Thomas, 1968 (Synonymy).**Material:** A portion of the cup representing the inner surface of the cup and the outer surface of the specimen.**Locality:** Zanzibar Harbour (6°09.5'S; 39°10.2'E). Stn. No. 95; A.J.B. Ref. No. 1256; Dt. 28-9-1970, Depth 20 m.**Description:** Outer surface of the specimen ridged, inner surface smooth and uniform. Colour pale gray when dry. Rough and incompressible. Surface reticulate microscopically. Spicules oxeas; assuming strongylote or stylote nature. Size upto 0.425 × 0.002 mm.**Distribution:** Red Sea, Indian Ocean, Australian Region.Genus *Callyspongia* Duchassaing and Michelotti*Callyspongia fibrosa* (Ridley and Dendy) (Fig. 2 h)*Dasychallina fibrosa* Ridley and Dendy, 1887, p. 21.*Callyspongia fibrosa* Burton, 1934, p. 540 (Synonymy). Thomas, 1968 (Synonymy).**Material:** Two specimens.**Locality:** (1) Mazizini lights, Zanzibar (6°11.6'S 39°11.9'E); Stn. No. 89; A.J.B. Ref. No. 1231; Dt. 1-9-70. Depth 0.5 m. (2) Murago Island, Zanzibar (6°12.00'S 39°8.50'E), Stn. No. 79; Dt. 3-6-70; Depth 122 m.**Description:** Height of specimen 88 mm, from Stn. No. 89 and diameter 18 mm. Club shaped with a hollow interior, opening to the outside by an aperture of 15 mm diameter situated at the central part. Other specimen is also hollow, height 53 mm and diameter 10-15 mm. Surface highly conulose, conules 1-3 mm high. Hard and slightly compressible.

Dermal reticulation consists of triangular meshes; fibres uni or multispicular. Main skeleton composed of stout primaries and connectives, which are multiseriably cored. Thickness of main fibres about 0.120 mm and connectives 0.09 mm. Tertiary fibres are also seen.

Spicules: Oxea straight or slightly curved, size 0.084 to 0.105 mm (0.093 mm) × 0.001-0.003 mm (0.0028 mm).**Distribution:** Atlantic Ocean? Indian Ocean, Australian Region,

Genus *Damiriana* de Laubenfels
Damiriana schmidti (Ridley) (Fig. 2 i)

Crella schmidti Ridley, 1884, p. 432, Pl. 41, fig. aa.

Damiriana schmidti Levi, 1958, p. 30, fig. 25. Thomas, 1968 (Synonymy).

Material : Three branches, probably the oscules at their terminal parts closed.

Locality : Zanzibar Harbour (6°09.25'S 39°10.00'E); A.J.B. Ref. No. 1502; Dt. 30-4-71; Depth 20 m. Another specimen from Ras Shangani, Zanzibar (6°10.0'S 39°10.0'E); A.J.B. Ref. No. 1246; Stn. No. 93/1; Dt. 26-9-70, Depth 22 m.

Description : Specimen from Stn. No. 93/1 is the biggest in the collection; height 60 mm and diameter 18 mm at its base. Interior hollow, opening to the outside at the terminal part (oscule).

Surface conulose, conules 0.2-0.5 mm high and 0.5-0.8 mm apart. Colour pale yellow when dry.

Dermal membrane (fig. 2 i_b) about 0.05 mm thick and roofs extensive subdermal cavities beneath. Main skeleton (fig. 2 i_a) is an illdefined reticulation of oxeas with triangular or rectangular meshes, each side of which is formed of 2-4 oxeas arranged side by side. Spongin seen at the corners only.

Spicules (fig. 2 i₁₋₅): (1) Tyloles (fig. 2 i₁). Dermal, size 0.172-0.234 mm (0.223 mm) × 0.004-0.005 mm. (2) Oxeas (fig. 2 i₂) endosomal, size 0.172-0.245 mm (0.212 mm) × 0.004-0.0102 mm (0.008 mm). (3) Isochelas (fig. 2 i₃) arcuate, 0.024 mm chord. (4) Sigmas (fig. 2 i₅). 0.013 mm chord, inseparable into different sets.

Distribution : Red Sea, Indian Ocean, Australian Region, Pacific Ocean.

Genus *Tedania* Gray

Tedania anhelans (Lieberkuhn) (Fig. 2 j)

Halichondria anhelans Lieberkuhn, 1859.

Tedania anhelans Levi, 1963, p. 32, fig. 33.

Tedania nigrescens Burton, 1959, p. 241 (Synonymy).

Material : One specimen.

Locality : Changu Island Reef, Zanzibar. (6°6.10'S 39°8.55'E); Stn. No. 78/2; Dt. 2-6-70; Depth 0.5 m.

Description : Sponge massive with several upright branches. Base 18 mm in diameter. Colour pale yellow, consistency fragile. Surface corrugated.

Spicules: (1) Styles (fig. 2 j₂) slightly curved and sharply pointed. Size 0.172-0.251 mm (0.235 mm) × 0.004-0.007 mm (0.006 mm). (2) Tornotes (fig. 2 j₁) straight with oblong and minutely spined heads. Size 0.217 × 0.004 mm average. (3) Onychaetes (fig. 2 j₃) slender, one end thicker than the other. Size 0.082-0.192 mm.

Distribution: Cosmopolitan.

Genus *Megaciella* Hallmann

Megaciella tibiellifer (Ridley) (Fig. 2 k₁-k₆)

Amphilectus tibiellifer Ridley, 1884, p. 428.

Material: Two specimens.

Locality: Bawi, West of Zanzibar (6°07.9'S 35°07.65'E); Stn. No. 92/1 A.J.B. Ref. No. 1242; Dt. 19-9-70; Depth LWS-0.1 m.

Description: Morphology of these specimens is same as that described by Ridley (1884). Colour pale gray.

Surface minutely conulose, conules 0.5-0.8 mm apart. Oscules and pores not seen.

Dermal skeleton (fig. 2 k₁) tangential, composed of tylots and microscleres, mostly arranged without definite order; but sometimes in a triangular pattern. Main skeleton (fig. 2 k₂) composed of triangular meshes, each side of which is made of 2-5 styles connected with scanty spongin. Rarely polyspicular fibres running towards the surface met with.

Spicules: (1) Styles (fig. 2 k₁) slightly curved and sharply pointed. (Measurements are given in Table). (2) Tylots (fig. 2 k₂) straight, head somewhat well developed. Measurements of styles, tylots, toxas (fig. 2 k₃) and Isocheles (fig. 2 k₄) are given in below:

Author/year	Style	Tylote	Toxa	Isochela
Ridley, 1884	0.38 × 0.014	0.25 × 0.004	0.15 × 0.006	0.016
92/1 (Zanzibar)	0.31-0.378 × 0.008-0.016 (0.012)	0.20-0.22 × 0.002-0.004 (0.003)	0.210 × 0.006	0.014

Remarks: This is the first record of this species from Indian Ocean.

Distribution: Australian region, Indian Ocean.

Genus *Biemna* Gray
Biemna fortis (Topsent) (Fig. 3 c)

Desmacella fortis Topsent, 1897, p. 463, pl. 21, fig. 30. Sollas, 1902, p. 213.

Biemna fortis Hentschel, 1912, p. 350. Burton, 1959, p. 226 (Synonymy). Thomas, 1968 (Synonymy).

Material : One specimen.

Locality : Zanzibar ; Stn. No. 76/5 & 6 ; Dt. 26-4-70.

Description : Specimen only a small bit ; growing deep rooted in sand. Height 80 mm, width 40 mm.

Colour pale gray when dry. Foreign particles heavily incorporated into the body. Surface smooth, but slightly hispid at the growing parts.

Oscules and pores not traceable.

Skeleton arrangement tallies well with that described by previous workers.

Spicules (fig. 3 c) : (1) Styles slightly curved, size 0.821—1.42 mm (0.993 mm) \times 0.004—0.022 mm (0.018 mm). (2) Sigmas chord length upto 0.112 mm. (3) Sigmas chord length varies from 0.012-0.028 mm. (4) Raphides in groups, length of individual raphide upto 0.142 mm.

Remarks : Brittle Stars (*Ophiactis* Sp.) are seen in plenty inside the specimen.

Distribution : Red Sea, Indian Ocean, Australian Region.

Genus *Sigmosceptrella* Dendy

Sigmosceptrella quadrilobata Dendy (Fig. 3 a, a₁)

Sigmosceptrella quadrilobata Dendy, 1921, p. 137, pl. 18, Fig. 4a-c. Vacelet and Vasseur, 1965, p. 109, pl. 8, fig. 30.

Material : One specimen.

Locality : North of Bawi Island, West Zanzibar (6°08.1'S 39°6.8'E) ; A.J.B. Ref. No. 1261 ; Dt. 29-9-70 ; Depth 16 m.

Description : Sponge (fig. 3 a) attached to the substratum by a flat stalk of about 18 mm wide thickness 2-4 mm and at the distal and expanding into a flat body. Stalk and entire body strongly conulose. Conules 1-2 mm high.

Colour pale yellow when dry. Consistency *Chondrilla* like.

Oscules and pores are not seen.

Main skeleton composed of fibres rising from the base of the stalk and running towards the lamellar portion in perpendicular manner; fibres interconnected either by slender fibres or by loose bands of spicules and end in conules in the surface.

In the surface the sigmodiscorhabds arranged in plenty; and most of them perpendicular to the surface.

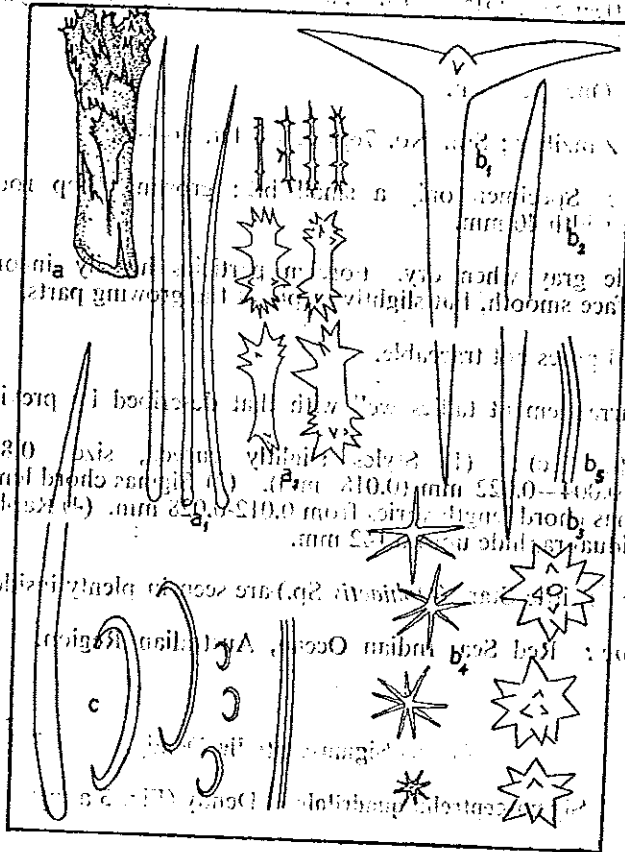


Fig. 3. A few more species of sponges

a, a-1. *Sigmosceptrella quadrilobata*; b. *Aurora globostellata*; c. *Bienna fortis*.

Spicules: (1) Styles (fig. 3 a₁) straight or slightly curved; head prominent in about 8%, polytylote rare. Size 0.235-0.273 mm (0.247 mm) × 0.003-0.008 mm (0.005 mm). (2) Sigmodiscorhabds (fig. 3 a₂) spines mainly in two whorls; and in the dorsal view the spines are arranged in four lobes. Size, when well developed 0.050 × 0.016 mm.

Remarks: The various specimens studied by previous workers were encrusting with *Chondrilla* like morphology. The lamellar structure seen in the present specimen is worth mentioning.

Distribution: Indian Ocean.

Genus *Aurora* Sollas*Aurora globostellata* (Carter) (Fig. 3 b)

Stelletta globostellata Carter, 1883, p. 353, pl. 14, fig. 5a-h.

Aurora globostellata Sollas, 1888, p. 187. Burton and Rao, 1932, p. 317. Thomas, 1968.

Material : One specimen.

Locality : West coast of Zanzibar (6°10.4'S 39°9.0'E); Stn. No. 98/1 ; A.J.B. Ref. No. 1235 ; Dt. 16-9-70 ; Depth LWS-0.5 m.

Description : Sponge obviously burried in sand, only a part represented. Burried part yellow in colour and that growing above the sand dark gray. Consistency hard. Cortex somewhat well developed. Skeleton radial.

Spicules : (1) Orthotriaenes (fig. 3 b₁) clads at right angles to the shaft. Shaft about 1.11 mm × 0.018 mm. Chord 0.211 mm. (2) Oxeas (fig. 3 b₂) uniformly curved or sinuous, size 1.12 × 0.015 mm (maximum). (3) Spherasters (fig. 3 b₃) centrum small, rays 1/3 of the total diameter which measures upto 0.071 mm. (4) Oxyasters (fig. 3 b₄) with 4-10 slender rays ; rays slightly roughened. Centrum indistinct. Diameter upto 0.06 mm. (5) Raphides (fig. 3 b₅) Slender, straight or slightly curved. Hairlike, length upto 0.123 mm.

Distribution : Indian Ocean.

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