STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 172

A REVISION OF THE MEGACANTHOXEA-BEARING TETILLIDS (PORIFERA, SPIROPHORIDA),

with a description of a new species

by

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A megacanthoxea-bearing tetillid specimen is recorded for the first time from the West Indies (Barbados). The three specimens with similar spiculation known from the literature are re-examined and compared with the West Indian specimen. As a result, the genera *Acanthotetilla* Burton, 1959, and *Acanthocinachyra* Lévi, 1964, are synonymized, and the West Indian specimen is described as a new species: *Acanthotetilla gorgonosclera*, bringing the total number of species of *Acanthotetilla* to four. The development of the megacanthoxea is described in detail.

A sponge collection dredged by Dr. P. WAGENAAR HUMMELINCK in the vicinity of Barbados (West Indies) contained a *Cinachyra*-like specimen bearing large and conspicuous acanthoxea. This find induced the present author to re-examine all specimens with similar spiculation reported so far. A review of the literature revealed that a total of three such specimens has been described in two different genera, all as separate species, viz. *Acanthotetilla hemisphaerica* Burton, 1959, *Acanthocinachyra enigmatica* Lévi, 1964, and *Acanthocinachyra seychellensis* Thomas, 1973. Both genera are reported to differ in the presence (genus *Acanthocinachyra*) or absence (genus *Acanthotetilla*) of sigmaspire microscleres. In view of the close similarity of the two genera it seemed wise to compare all the specimens.

Miss S. M. STONE (British Museum (Natural History), London) kindly consented to the loan of the holotype of *Acanthotetilla hemisphaerica*; Dr. P. L. G. BENOIT (Koninklijk Museum voor Midden Afrika, Tervuren, Belgium) and Dr. C. LÉVI (Muséum National d'Histoire Naturelle, Paris) readily sent the specimens of *Acanthocinachyra seychellensis* and *A. enigmatica*, respectively. Dr. P. WAGENAAR HUMMELINCK (Zoölogisch Laboratorium, State University of Utrecht) is kindly thanked for his

donation of the West Indian collection. Scanning Electron Microscope illustrations were made by Drs. S. WEINBERG, the other photographic illustrations by Mr. L. A. VAN DER LAAN (both ZMA), which aid is gratefully acknowledged.

A first examination of *Acanthotetilla hemisphaerica* revealed the presence of fairly numerous sigmaspires, which means that the two genera are synonymous. *Acanthotetilla* Burton, 1959, is the oldest name available; it receives *Acanthocinachyra* Lévi, 1964, into its synonymy.

Genus **Acanthotetilla** Burton, 1959

Type species (by original monotypy): *Acanthotetilla hemisphaerica* BURTON, 1959: 201, fig. 5.

Diagnosis: Tetillidae closely resembling the genus *Cinachyra* Sollas, 1888, from which it primarily differs in the presence of abundant and conspicuous middle-sized acanthoxea serving as megascleres. It shares with *Cinachyra* the dermal specialization into concentrated areas of pores (so called "porocalices"), the dermal palissade of radiating huge oxea, protriaenes and anatriaenes, and the presence of sigmaspire microscleres most abundant in the choanosome. The acanthoxea are distributed both in the ectosomal region (strengthening the dermal palissade of huge megascleres) and in the choanosome (all but completely filling the interior). Choanosome cavernous.

Acanthotetilla hemisphaerica Burton, 1959

(Fig. 1; Pls. Ia–b, IIc–d)

Type locality: John Murray Expedition, stat. 45, SOUTH ARABIAN COAST (18°30'30" N 57°02'30" E), depth 38 m, bottom Lithothamnion, October 29, 1933. (British Museum (Natural History) no. 1936.3.4.530).

Shape, size and consistency: The specimen is irregularly semiglobular (hence its name), 4.5 cm in diameter. Porocalices are numerous circular pits free of projecting spicules with a diameter of 1–2 mm. Oscules are not apparent. The surface of the sponge is bristly

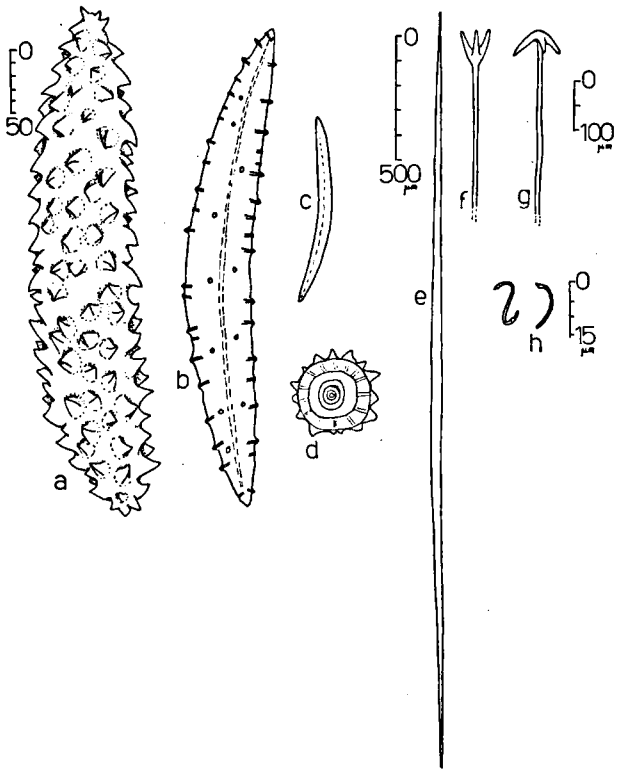

Fig. 1. Spicules of *Acanthotetilla hemisphaerica*: a. fully developed megacanthoxea, b–c. growth stages of the same, d. perpendicular section through a megacanthoxea showing concentric growth layers, e. large ectosomal oxea, f. protriaene, g. anatriaene, h. sigmaspires (scales are given with each spicule type).

with a feltwork of spicules projecting at least 1 mm beyond the ectosome. The consistency is wooden and incompressible.

Colour (in spirit): Externally yellowish brown, interiorly somewhat lighter.

Ectosome: The very tight dermis consists of a palissade of huge oxea, intermingled with rare protriaenes and even rarer anatriaenes (the latter were not reported by BURTON); the dermal palissade is reinforced by numerous stout acanthoxea, characterized by their large size (cf. Table 2), and relatively blunt and heavily "thorned" appearance (Fig. 1a, Pl. IIc). The thorns are placed in a very irregu-

lar system of "whorls". The number of such whorls in acanthoxea of this species is 20–25.

Choanosome: Rather cavernous; the flesh is scarce compared to the spicule component. Dominating spicules are acanthoxea of the same size and shape as those of the ectosome. A few smooth growth stages of the acanthoxea, mostly without a centrotylote swelling, of all sizes are to be found among the full-grown acanthoxea. Sigmaspires are present in moderate quantities; it is hard to explain why BURTON overlooked them.

Sizes of all spicule categories are given in Tables 1 and 2.

Acanthotetilla enigmatica (Lévi, 1964)

(Fig. 2; Pls. Ic–d, IIb)

Acanthocinachyra enigmatica LÉVI, 1964: 386, fig. 2.

Type locality: 100 miles E. of INHACA ISLAND (Indian Ocean), depth 70 m, August 1961. (Muséum National d'Histoire Naturelle, Paris).

Shape, size and consistency: Irregularly semiglobular, about 10 mm in diameter. Porocalices 4 mm in diameter, surrounded by collars of huge oxea projecting about 2 mm beyond the ectosome. The area between the porocalices is bristly with spicules projecting only 0.5 mm or less; thus the porocalices are sharply set off, in contrast to the condition in the preceding species. Oscules not apparent. The surface is littered with calcareous debris. The consistency is wooden and brittle.

Colour: Dirty white.

Ectosome: The dermis consists of a palissade of radially arranged large oxea and scarce protriaenes, reinforced by acanthoxea of moderate length and thickness (cf. Table 2). The acanthoxea are almost invariably curved, thinner and conspicuously less heavily "thorned" than those of *A. hemisphaerica* (Pl. IIb). The thickness given in the original description by LÉVI apparently included the thorns. Number of whorls per spicule: 12–17. The huge oxea and protriaenes are in the same size range as those of the preceding species (cf. Table 1).

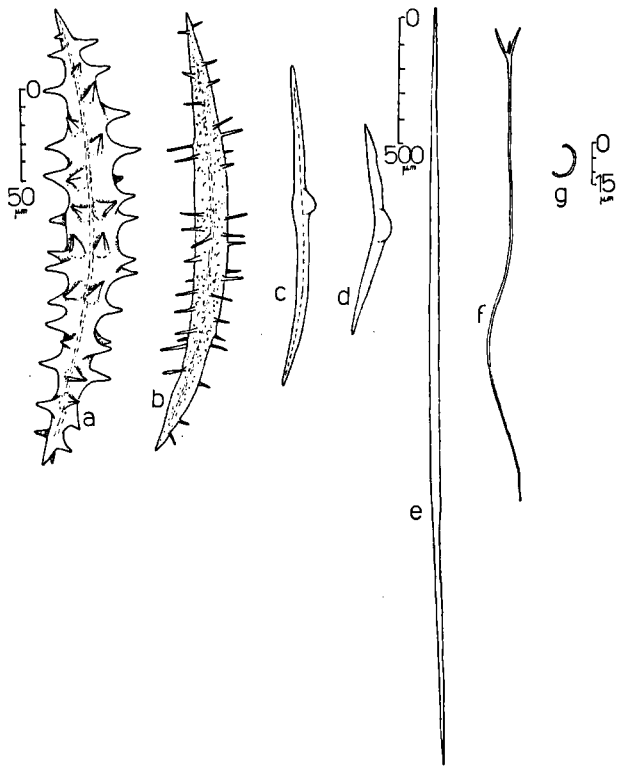

Fig. 2. Spicules of *Acanthotetilla enigmatica*: a. fully developed megacanthoxea, b–d. growth stages of the same, e. large ectosomal oxea, f. protriaene, g. sigmaspire.

Choanosome: Again the spicule component is larger than the flesh. Spicules include acanthoxea similar to those of the ectosome. Smooth growth stages of these spicules are invariably strongly curved and centrotylote. Sigmaspires are extremely abundant throughout the choanosome. They are of the same size range as those of *A. hemisphaerica.*

Acanthotetilla seychellensis (Thomas, 1973)

(Fig. 3; Pl. IIe)

Acanthocinachyra seychellensis THOMAS, 1973: 80, pl. IV 5.

Type locality: Mahé Island, SEYCHELLES. (Museum Tervuren, no. 1410).

Shape, size and consistency: The holotype is kept in a dry condition; it is not much more than a mass of spicules adhering to a piece of coral. In the original description it is characterized as irregularly encrusting with a hispid surface, covered by a large amount of silt.

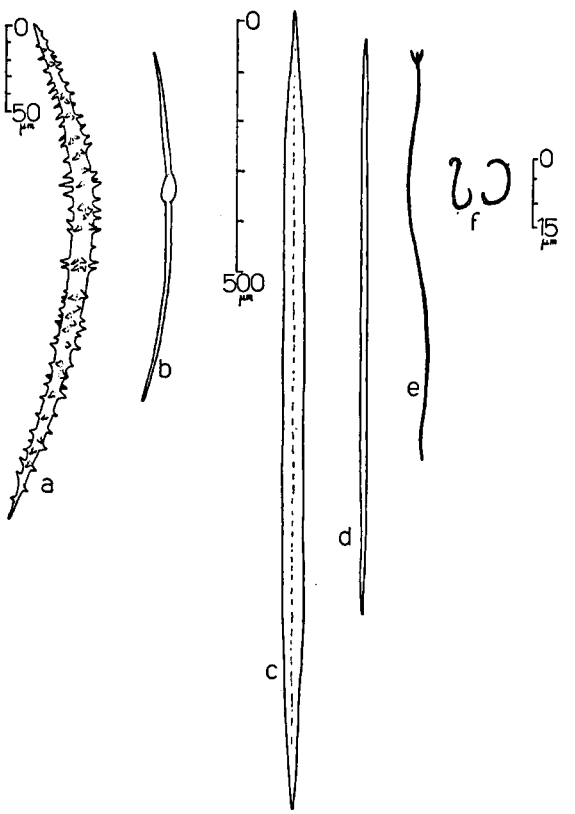

Fig. 3. Spicules of *Acanthotetilla seychellensis*: a. fully developed megacanthoxea, b. growth stage, c–d. large ectosomal oxea, e. protriaene, f. sigmaspire.

Oscules are stated to be absent. The consistency was hard and incompressible.

Colour (in dry condition): Pale grey.

Spicules: Huge oxea, slender protriaenes, acanthoxea and sigmaspires. The huge oxea occur in two size categories: 740–1260 μm by 6–14 μm and 1400–1680 μm by 34–47 μm. (THOMAS distinguished only one category: 849–1641 by 6–42 μm). Protriaenes are much more slender than in both previous species. Anatriaenes have not been found, but in view of their rareness in the other species of *Acanthotetilla* not much value should be attached to this. The acanthoxea are quite remarkable for their slenderness. They are much curved and relatively sparsely "thorned" in 25–33 irregular "whorls". Growth stages of these acanthoxea are thin, centrotylote and much curved oxea, smooth, granulated or spiky. Sigmaspires are of the same size range as in the preceding species.

Acanthotetilla gorgonosclera n. sp.

(Figs. 4–6; Pls. Ie–f, IIa, IIIa–d, IVa–d)

Holotype: ZMA reg. no. POR. 3814.

Type locality: Alleynes Bay, about 800 m off Holetown, BARBADOS (West Indies); depth 90–100 m, muddy sand with shell debris. Collected by P. Wagenaar Hummelinck, sta. 1442, 19.II.1964 (dredged by Dr. John B. Lewis and staff of Bellair's Institute).

Shape, size and consistency: The specimen is an irregularly shaped tuber, beset and riddled with coral rubble, worm tubes, calcareous algae, mollusc shells, etc. Size: 6 × 3.5 × 4.5 cm. The consistency is wooden and brittle. The surface is pilose, owing to a feltwork of projecting spicules. This feltwork is much finer than that of *A. hemisphaerica*, because the projecting spicules are more delicate and they project only 0.5 mm or less beyond the ectosome. Porocalices are numerous shallow pits devoid of projecting spicules, diameter 1–2 mm.

Colour (in spirit): Grey; interiorly it is off-white in colour.

Ectosome: As in all other *Acanthotetilla* species the ectosome consists of a palissade of large oxea, intermingled with protriaenes and

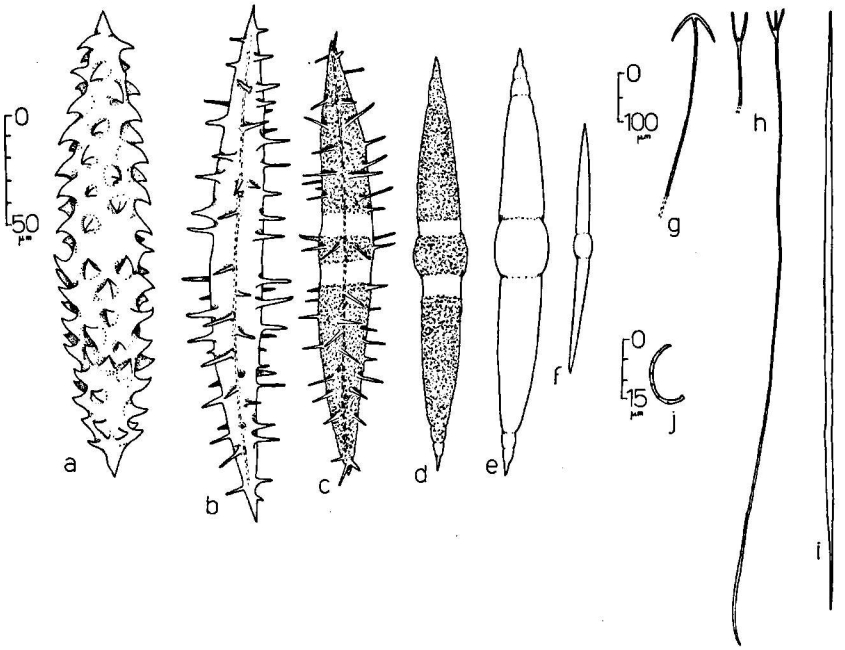

Fig. 4. Spicules of *Acanthotetilla gorgonosclera* n. sp.: a. fully developed megacanthoxea, b–f. growth stages of the same, g. anatriaene, h. prodiaene and protriaene, i. large ectosomal oxea, j. sigmaspire.

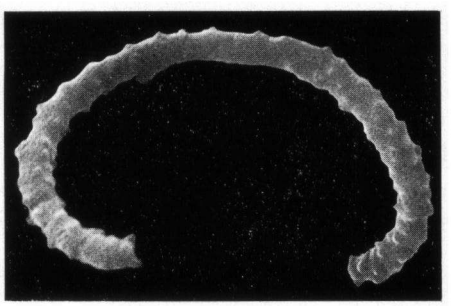

Fig. 5. Scanning electron micrograph of a sigmaspire microsclere of *Acanthotetilla gorgonosclera* n. sp. (× 4675).

rarer anatriaenes. The large oxea are much shorter and thinner than those of the preceding species, with the exception of the smaller category found in *A. seycheliensis* (cf. Table 1). Again the dermal palissade is reinforced by massive amounts of acanthoxea, which are intermediate in size and shape between those of *A. hemisphaerica* and *A. enigmatica*. The number of whorls of thorns is 13–21.

Choanosome: Acanthoxea and sigmaspires make up the spiculation of the interior. Sigmaspires seem to be slightly but significantly larger than those of the preceding species. Growth stages of the acanthoxea include smooth, stout, straight, centrotylote oxea and similar ones decorated by fine granulations and thin spikes (cf. Pls. III and IV and section below on the development of the acanthoxea).

Etymology: The species name reflects the superficial resemblance of its megacanthoxea to calcareous spicules of certain Gorgonacea.

Taxonomic summary

Surface characters: *Acanthotetilla enigmatica* differs from *A. hemisphaerica* and *A. gorgonosclera* in the possession of distinct collars of projecting spicules surrounding the porocalices. In both latter species the porocalices are merely smooth depressions in a dense overall feltwork of projecting spicules. In *A. hemisphaerica* these spicules project far beyond the ectosome (over 1 mm), in *A. gorgonosclera* only 0.5 mm or less, producing a strikingly less bristle appearance. The condition of the surface in *A. seychellensis* is unknown.

Spicules: By their slenderness and curvature the acanthoxea of *A. seychellensis* stand out distinctly among those of the other species, in which the acanthoxea differ primarily only in size (cf. Table 2). In the oxeote megascleres again *A. seychellensis* stands out for possessing two categories. The large oxea of *A. gorgonosclera* are two to three times as short and two times as thin as those of *A. enigmatica* and *A. hemisphaerica*. The sigmaspires of *A. gorgonosclera* (Fig. 5) seem to be significantly larger than those of the other species.

10

Development of the acanthoxea

Burton (1959) suggested that the acanthoxea could be derivations of the sigmaspirae, because he had failed to find these microscleres in his *A. hemisphaerica*. Even accounting for this error, it is hard to imagine he regarded the stout acanthoxea (30 × as large as a normal sigmaspire) as replacement spicules. Lévi (1964) has considered this question, too. He did not find growth stages, but hints at the possibility that the acanthoxea could be comparable to those found in *Higginsia, Halicnemia* or *Sceptintrus* (order Axinellida), in which genera the acanthoxea are sometimes considered to be derivations of asters. Thomas (1973) was the first to connect the smooth and granulated oxea found in his *A. seychellensis* to the acanthoxea; he considered them to be developmental stages of the same spicule category.

In the West Indian *A. gorgonosclera* a fair number of growth stages of the acanthoxea were present, allowing a detailed study of their development. The following middle-sized oxeote forms were found:
— fully developed ("thorned") acanthoxea (Plate IVc–d).
— spiky, smooth acanthoxea (Plate IVb).
— spiky, granulated acanthoxea (Plate IVa).
— granulated centrotylote oxea (Plate IIIc–d).
— smooth centrotylote oxea (Plate IIIa–b).

A remarkable detail of the granulated oxea is the occurrence of two perfectly smooth areas to the left and right of the centrotylote swelling (cf. Pl. IIIc). Noteworthy, too, is the direction in which the curved thorns of the fully developed acanthoxea are pointing: always towards the central part of the spicule (Pl. IVc).

Careful measurements of all these growth stages revealed that the length of the middle three oxeote forms given above does not differ significantly: apparently those spicules have all reached, or nearly reached a critical length. The smooth oxea may vary from as short as 81 μm to about the maximal length of the other oxeote forms (with the exception of the fully developed stage, which still further increases in length and width). It is clear that in *A. gorgonosclera* the acanthoxea start as a smooth oxea; at a certain critical length they subsequently develop granules, "spikes" and at last "thorns", after

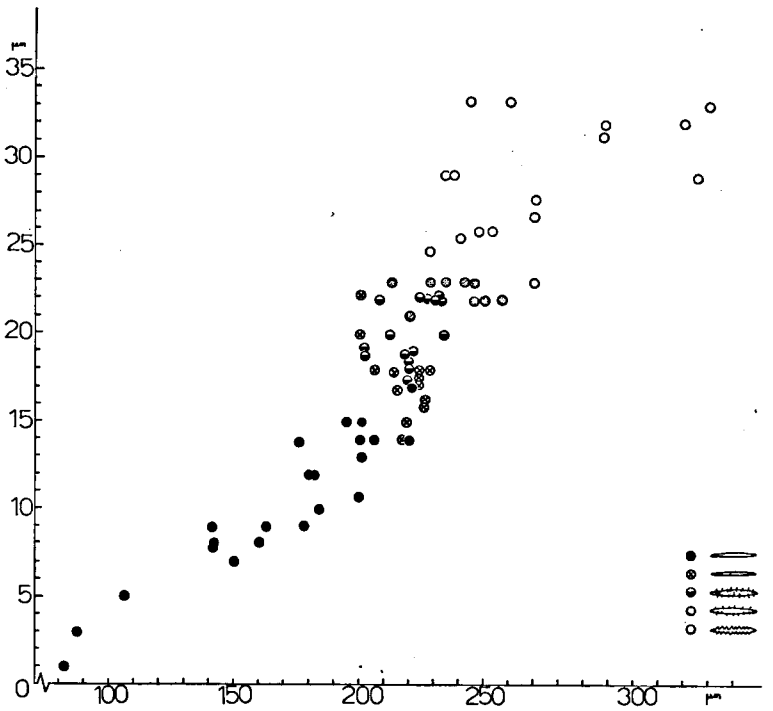

Fig. 6. Graphic representation of the development of the megacanthoxea of *Acanthotetilla gorgonosclera* n. sp.; horizontal axis: length of the spicules, vertical axis: width of the spicules. Symbols are explained in the right hand corner.

which growth proceeds. The whole process has been graphically represented in Fig. 6. As far as could be made out from the scarcer material of the remaining *Acanthotetilla* species, this process is basically the same in the whole of the genus, with the possible exception of *A. hemisphaerica* in which some peculiarly deviating growth stages (cf. Fig. 1, Pl. IId) have been found. Shortly before acquiring the thorns the acanthoxea appear to develop indentations in stead of spikes. As the growth stages in *A. hemisphaerica* are very few in number no further remarks can be made on this.

Discussion

The present taxonomic evaluation of the genus *Acanthotetilla* may seem somewhat suspect, if one considers the fact that each of the four known specimens of this genus is given separate specific status. On the other hand, it is impossible at this stage to assign any two or more of these specimens to one species, as the specific variation is unknown and they all differ in a number of characteristics.

In the meantime it is clear from the development of the acanthoxea, that *Acanthotetilla* is quite close to *Cinachyra*; in fact the acanthose condition of the mature oxea is the only generic difference, as *Cinachyra* species possessing a middle-sized category of smooth or slightly roughened oxea are quite common (e.g. *Cinachyra australiensis* (Carter, 1886) sensu Burton (1934: 523) and *Cinachyra kuekenthali* Ulicka, 1929: 44).

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TABLE 1

MEASUREMENTS (μm) OF THE SPICULES, EXCEPTING ACANTHOXEA, OF FOUR SPECIMENS OF THE GENUS *Acanthotetilla*

(Unless otherwise indicated measurements are based on 25 spicules per category and per specimen.)

Species	Oxea	Protriaenes		Anatriaenes		Sigma-spires
		shaft	clads	shaft	clads	
A. hemisphaerica	3100–*3812*–4400	1000–*1920*–2520 (n=4)	30–*38*–56 (n=5)	1260–*1450*–1600 (n=3)	55–*70*–80 (n=3)	9–*11*–13
	24–*29.9*–35*)	6–*10*–14 (n=5)	6–*8*–10 (n=5)	9–*9.5*–10 (n=3)	*9* (n=3)	
A. enigmatica	2200–*2960*–3800	2000–*2500*–3000 (n=3)	50–*68*–95 (n=3)	*3000***)	50–70**)	8–*9.6*–11
	14–*25.1*–30	*9* (n=3)	*9* (n=3)	—	—	
A. seychellensis						
cat. 1:	1400–*1516*–1680	360–*907*–1880 (n=7)	20–*38*–50 (n=7)	—	—	8–*10.3*–12
	34–*37.8*–47	1.5–*2.5*–4 (n=7)	1.5–*3.0*–4 (n=7)	—	—	
cat. 2:	740–*1138*–1260					
	6–*10.9*–14					
A. gorgonosclera	770–*1216*–1600	1260–*1377*–1540 (n=5)	41–*63*–81 (n=11)	—	42–*53*–64 (n=4)	9–*13.1*–16
	3–*13.2*–17	4–*5.3*–9 (n=11)	3–*4.1*–7 (n=11)	5–*5.5*–6 (n=4)	4–*5.0*–6 (n=4)	

*) BURTON (1959) gives 40 μm.

**) After LÉVI (1964)

TABLE 2

MEASUREMENTS (μm) AND NUMBERS OF "WHORLS" OF THORNS OF ACANTHOXEA OF FOUR SPECIMENS OF THE GENUS *Acanthotetilla*

(Based on the examination of 25 spicules per specimen.)

Species	Length	Thickness	Number of whorls
A. hemisphaerica	325–*372.3*–414	40–*46.4*–60	20–*22.5*–25
A. enigmatica	211–*225.8*–244	16–*19.5*–23	12–*15.2*–17
A. seychellensis	212–*278.4*–322	4– *8.0*– 9	25–*29.0*–33
A. gorgonosclera	228–*281.1*–371	24–*29.3*–35	13–*17.6*–21