

BEAUFORTIA

INSTITUTE OF TAXONOMIC ZOOLOGY (ZOOLOGICAL MUSEUM)
UNIVERSITY OF AMSTERDAM

Vol. 33 no. 1

October 18, 1983

THE OCTOCORALLIAN GENERA *SPONGODES* LESSON, *NEOSPONGODES* KÜKENTHAL AND *STEREONEPHTHYA* KÜKENTHAL

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ABSTRACT

The type specimens of *Spongodes celosia* Lesson and of *spicata* Wright & Studer are redescribed. They are conspecific and must be called *Stereonephthya celosia* (Lesson). Most probably, *Spongodes digitata* Wright & Studer is also a *Stereonephthya* species. The validity of the genus *Neospongodes* Kükenthal is discussed. The species *N. portoricensis* must be transferred to the genus *Stereonephthya*, but the generic name *Neospongodes* must be maintained for *N. atlantica* Kükenthal. *N. bahiensis* Kükenthal is conspecific with *N. atlantica*.

I. THE GENUS *SPONGODES* LESSON

As regards the history of the genera *Spongodes*, *Spongodia*, *Nephthea*, *Dendronephthya* and *Stereonephthya* the reader is referred to detailed surveys by Holm (1895, 1904), Kükenthal (1905) and Tixier-Durivault & Prevorsek (1957). I confine myself to a few remarks.

Gray (1862: 27, 28) divided the genus *Spongodes* (misspelled as *Spoggodes*) into two "groups or subgenera", viz. *Spoggodes* and *Spoggodia*. His diagnoses of these subgenera are far from clear, but one thing is rather evident: in *Spoggodes* the polyps are "crowded together at the ends of the branchlet"(s) (= the twigs?) and in *Spoggodia* they are "isolated" and "scattered".

Klunzinger (1877) adopted Gray's division. Wright & Studer (1889: 192) summed up Gray's division as follows: "The polyps are placed on the branches and twigs, several may be united in one bundle or they may be isolated and scat-

tered. Gray attempted to base two genera upon this character, which he distinguished as *Spoggodes* (= *Spongodes*), with the polyps united in bundles, and *Spoggodia* (= *Spongodia*), with isolated polyps". (However, Wright & Studer themselves followed another division of the genus *Spongodes*).

Holm (1895: 23, 24) divided *Spongodes* into four subgenera: *Nephthea*, *Panope* (invalid synonym of *Nephthea*), *Spongodes* and *Spongodia*. *Nephthea* has the polyps arranged in lobes (catkins); in *Spongodes* the polyps are united in distinct bundles, and in *Spongodia* the polyps occur neither in lobes nor in bundles, but isolated on elongated, cylindrical branches.

Kükenthal (1905) replaced the name *Spongodes* by *Dendronephthya* and *Spongodia* by *Stereonephthya*. His diagnosis of *Dendronephthya* (1905: 527) reads: "Nephtthyiden von baumförmig verzweigtem Aufbau, deren Polypen stets in Bündeln vereinigt sind. Polypen mit Stützbündeln". His diagnosis of

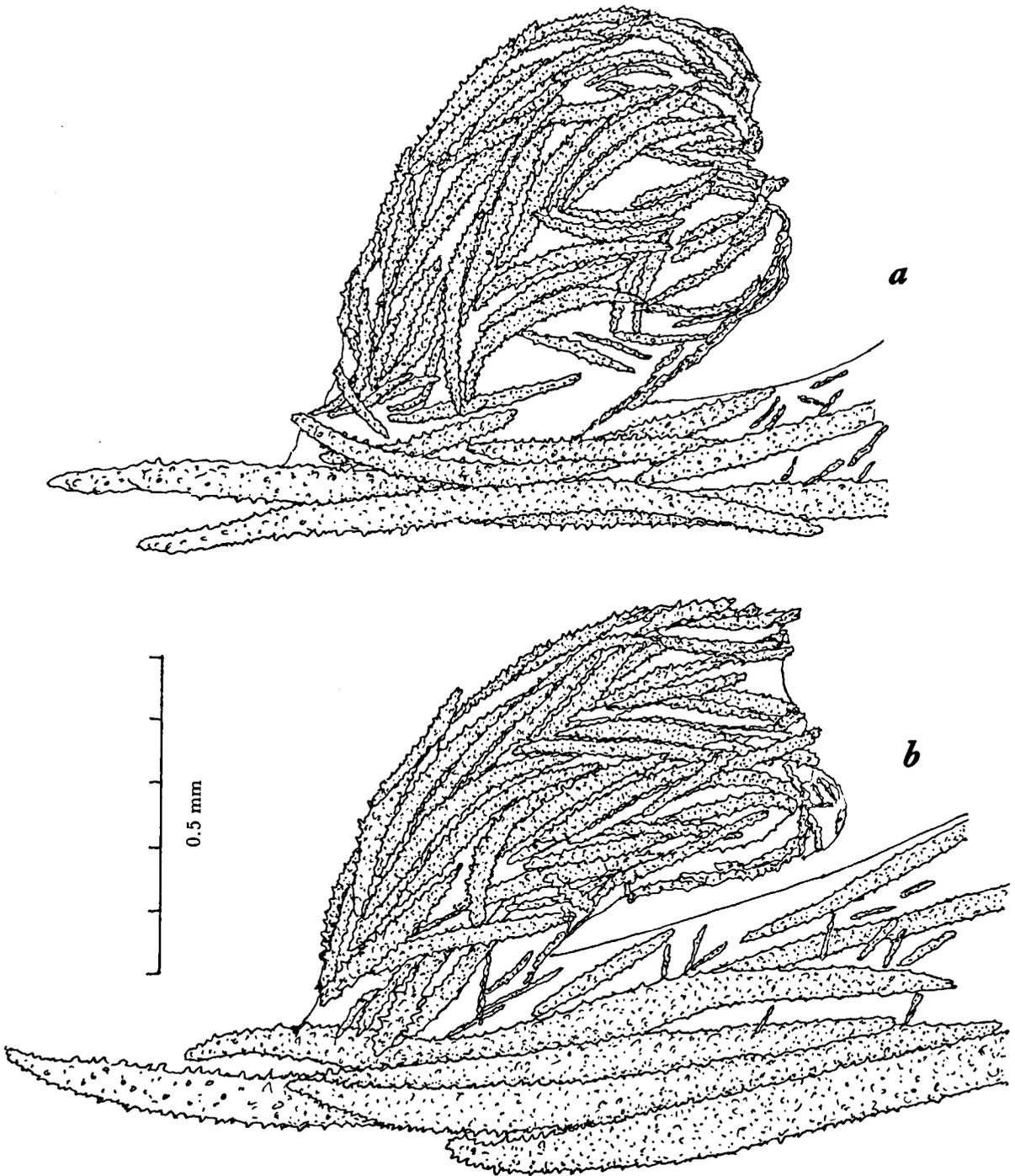


Fig. 1. *Stereonephthya celosia* (Lesson) holotype, MNHN. a, b, polyps. Enlargement indicated by 0.5 mm scale.

Stereonephthya reads (1905: 695): “Sehr starre Nephthyiden, deren Polypen weder in Läppchen noch in Bündeln angeordnet sind, sondern einzeln oder in kleinen Gruppen direkt vom Stamm wie den nicht oder wenig ver-

zweigten Hauptästen entspringen. Polypen mit Stützbündeln”. So the outstanding difference is that in *Dendronephthya* the polyps are always united in bundles, and in *Stereonephthya* they are isolated on the branches and branchlets.

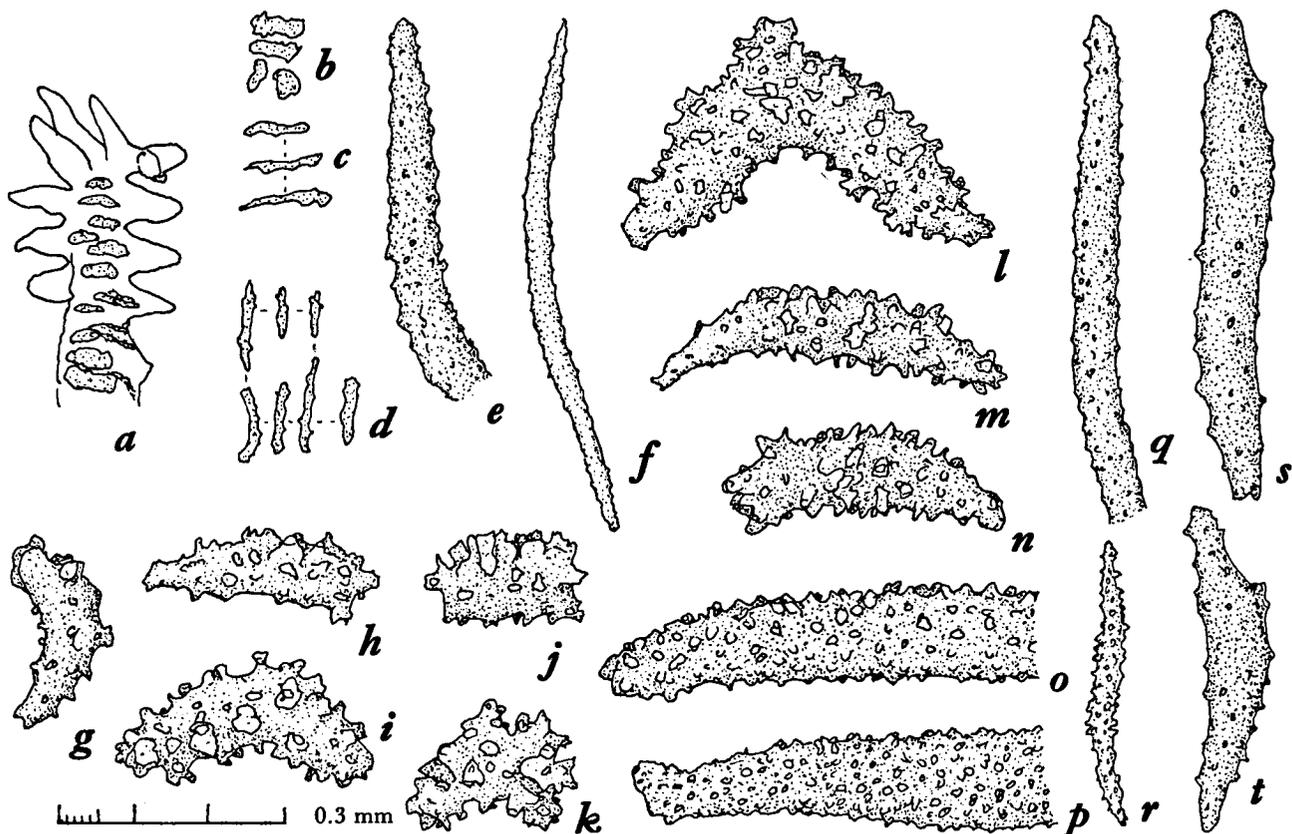


Fig. 2. *Stereonephthya celosia* (Lesson), holotype, MNHN. a, tentacle; b, c, sclerites from a tentacle; d-f, sclerites from surface layer of a branch; g-p, sclerites from surface layer of the stalk; q-t, sclerites from interior of the stalk. All enlargements are the same: scale 0.3 mm.

Distinct drawings of such branches are given by Thomson & Dean (1931, pl. 7 figs. 2, 5).

After the redescription of the type specimen of *Spongodes celosia* the reference of this species to *Stereonephthya* is explained. The species *spicata* Wright & Studer and probably also *digitata* Wright & Studer must be included in *Stereonephthya* as well.

Stereonephthya celosia (Lesson) (figs. 1, 2, pl. 1 figs. 1-5)

Spongodes celosia Lesson, 1834: 90, with pl. 21; Tixier-Durivault & Prevorsek, 1957: 172-179, figs. 1-3; 1959: 31-36, figs. 14, 15.

Nephthya celosia, Kükenthal, 1903: 148-149; 1905 716-718; Holm, 1904: 10 (listed only).

Spongodes spicata Wright & Studer, 1889: 194-195, pl 36D figs. 1a, 1b.

I investigated Lesson's type specimen, which is kept in the Muséum National d'Histoire Naturelle at Paris. Since it was redescribed by Tixier-Durivault & Prevorsek (1957), I will confine myself to some remarks.

Pl. 1 fig. 1 shows the colony at natural size. Many reddish branchlets have been broken off; pl. 1 figs. 2-5 shows a few of them, enlarged. The photographs show that the polyps are placed singly or they form small clusters of two or three individuals, they are not grouped into bundles. This was already stated by Tixier-Durivault & Prevorsek (l.c., p. 173, 174), and Lesson's pl. 21 fig. 1 shows without any doubt that the polyps are isolated on the terminal branches and not united in bundles. This important point is discussed below.

The polyps have ovoid anthocodiae, which stand at an acute angle to their very short stalks

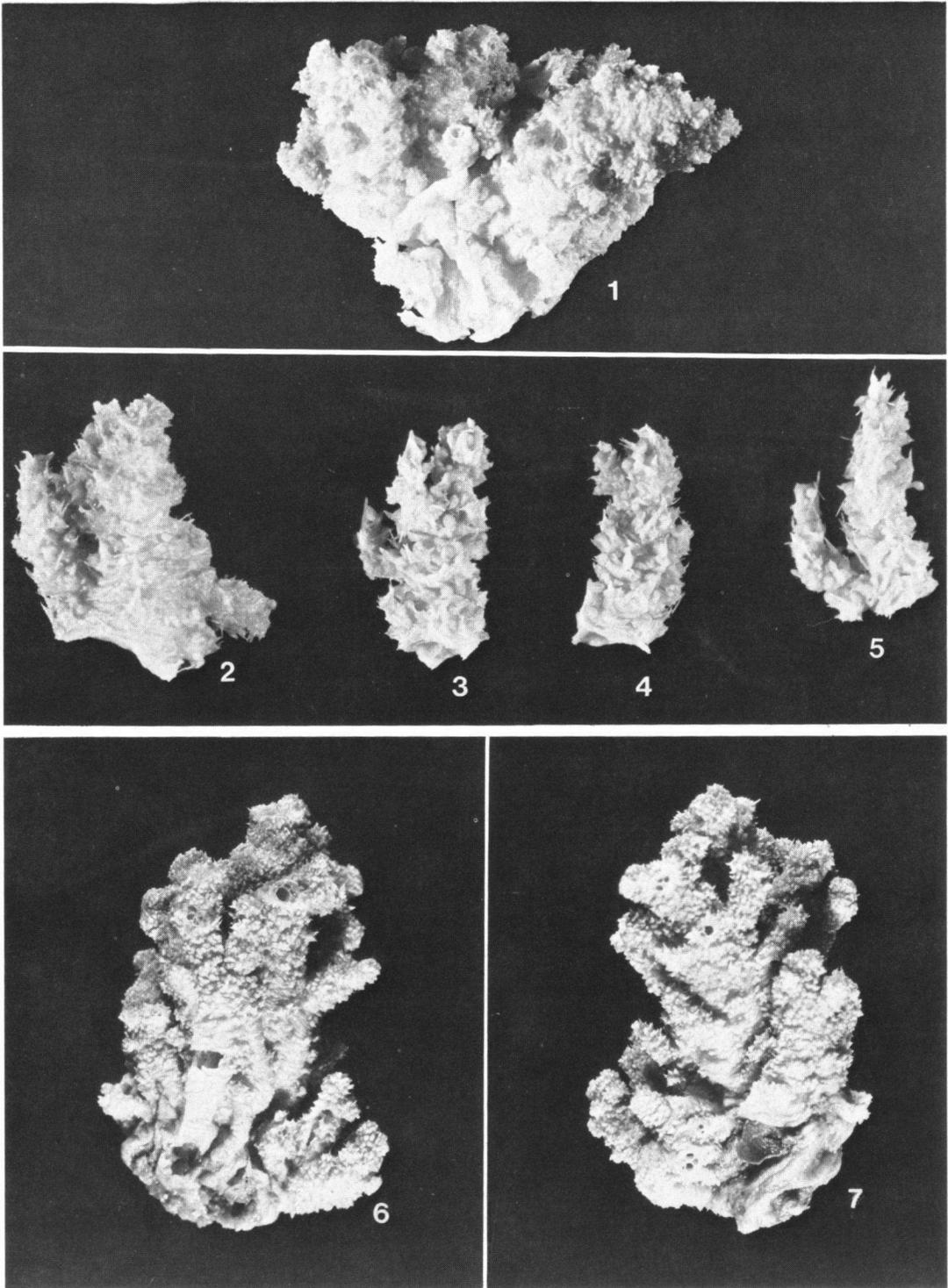


Plate 1. Fig. 1. *Stereonephthya celosia* (Lesson), holotype, MNHN, X 1. Figs. 2-5, lobes of the same colony, (X 3). Figs. 6
7. *Stereonephthya celosia* (Lesson), holotype of "*Spongodes spicata*" Wright & Studer, BMNH 90-4-11-2, (X 1).

(fig. 1). At the abaxial side the height of the anthocodiae is 0.80 to 1.00 mm; their width is 0.50 to 0.60 mm. The armature consists of eight double rows of thorny spindles arranged en chevron. There are usually five to seven in each lateral row; the length is up to about 0.50 mm.

Sometimes the tentacles are not retracted; in that case the length is about 0.40 mm (fig. 2a). The pointed pinnules are up to 0.10 mm long; they are devoid of sclerites. In the tentacle axis there are small, wide sclerites, 0.03 to 0.07 mm long (fig. 2b) and, more proximally, sticks, 0.07 to 0.13 mm long (fig. 2c).

The supporting bundle is moderately developed and usually has two projecting spindles; the longest one projects for a distance of 0.30 to 0.70 mm (see also Lesson's pl. 21 figs. 2-4).

The surface layer of the main branches contains thin, pointed spindles up to 2.40 mm long (fig. 2e, f), and, in addition to these, numerous tiny rods, 0.07 to 0.12 mm long (fig. 2d); they are not mentioned by Tixier-Durivault & Prevorsek, see below. The surface layer of the stalk has the following types of sclerites: (1) spindles, wider than those in the branches, with a length of up to 2 mm (fig. 2o, p); (2) shorter, white, curved spindles, 0.90 to 1.20 mm long, with less but bigger processes, and (3) numerous still shorter, irregularly shaped, sometimes strongly bent sclerites, white in colour, with a length of 0.15 to 0.60 mm (fig. 2g-n). The interior of the stalk contains slender, nearly smooth rods, up to 2 mm long, and shorter, wider spindles, covered with distant, low spines (fig. 2q-t).

These lengths differ from those mentioned by Tixier-Durivault & Prevorsek. There must also be something wrong with the enlargement mentioned in the caption of their fig. 3. I give three examples. According to the text the sclerite from the supporting bundle (their fig. 3b) is up to 2 mm long, but in measuring the length it appears to be 100 mm: $28 = 3.57 \text{ mm}$ ($85 \times 1/3 = 28$). The anthocodial spindle in fig. 3h should have a length of 55 mm: $70 = 0.78 \text{ mm}$ ($210 \times 1/3 = 70$), but the anthocodial spicules are not longer than about 0.50 mm. The spin-

dle in fig. 3l is, according to the enlargement, 0.74 mm long, and not 0.38 mm.

In the past the question has arisen whether *Spongodes* Lesson is a valid genus and, in case *Spongodes* is invalid, to which genus *celosia* should be assigned. Holm (1895, 1904) and Kükenthal (1903, 1905) transferred the species to *Nephthea*, and Kükenthal (1903: 145) united it, together with the species *digitata* and *aurantiaca* in his group A with cylindrical or fingerlike lobes. Kükenthal (1905: 716) described a fragment of a colony, which in his opinion could be a piece of Lesson's type specimen. I believe Kükenthal was right. It is noteworthy that he (1905: 717) mentioned the numerous small, nearly smooth rods, 0.10 mm long, which occur in the surface layer of the stem and branches (fig. 2d). These rods were overlooked by Tixier-Durivault & Prevorsek; they are recorded here above. Kükenthal (1905: 716) states that the polyps are very closely arranged on the lobes and more distantly and singly on the stem. This observation is important. Kükenthal possibly referred *celosia* to *Nephthea* chiefly because of this fact. At any rate the polyps are not in bundles, so reference to Kükenthal's genus *Dendronephthya* is precluded.

Tixier-Durivault & Prevorsek (1957: 173) stated that the polyps are arranged in soft ears, very different from the catkins of *Nephthea*. Isolated polyps and small groups of two to five individuals also occur on the main branches, but these authors, too, do not mention any clustering of polyps to form bundles; on the contrary.

Although it is impossible to refer *Spongodes celosia* to the genus *Dendronephthya*, Tixier-Durivault & Prevorsek in fact did so: they united *celosia* with other typical *Dendronephthya* species in their genus *Spongodes*, which they substituted for the group Glomeratae (vide Tixier-Durivault & Prevorsek, 1959: 5). Such typical *Dendronephthya* species are, among others, *mucronata*, *hemprichi*, *gigantea*, *koellikeri*, and these species differ widely from *celosia*.

It is difficult to understand why Tixier-Durivault & Prevorsek (and Kükenthal as well) did not assign *celosia* to the genus *Stereonephthya*.

Tixier-Durivault & Prevorsek (1957: 177) themselves wrote that in *Stereonephthya* the polyps are isolated on the stem and the branches, never forming lobes, catkins, bundles or groups (the French word *paquet* means bundle or bunch). This is the case in *celosia*.

Add to this the fact that the shape of the polyps also goes in the direction of *Stereonephthya*. The polyp heads, hanging down on their stalks "like a campanulate flower" (Utinomi, 1954: 329), are typical of many *Stereonephthya* species (*S. papyracea* Kükenthal, *S. ulex* Holm, *S. crystallina* & *S. ulicoides* Thomson & Dean, *S. cundabuluensis* Verseveldt, *S. acaulis* Verseveldt, *S. cordylophora* Verseveldt).

I also consider it highly questionable whether some "*Spongodes*" (i.e. *Dendronephthya*) species, which have been referred to this genus by Tixier-Durivault & Prevorsek (1959), do not belong to *Stereonephthya*; I am thinking of species such as *Dendronephthya* (*Spongodes*) *kuekenthali* Gravier and *D. (Sp.) mortenseni* Tixier-Durivault & Prevorsek.

Summarizing, I come to the conclusion that *Spongodes celosia* belongs to *Stereonephthya*. The question whether the oldest name *Spongodes* can be used instead of the junior name *Stereonephthya* has been conclusively answered by Kükenthal (1905: 503, 511) and Shann (1912: 512-513). Since 1834, the year of Lesson's publication, the names *Spongodes* and *Spongodia* have been used in different meanings; in this respect historical surveys make staggering reading! In any case the name *Spongodes* can henceforth no longer be used for species of the *Dendronephthya* type, the former *Glomeratae*, as Tixier-Durivault & Prevorsek have done.

Remark on "*Spongodes*" *spicata* Wright & Studer, 1889: 194-195, pl. 36D, figs. 1a, 1b.—Holm (1895: 23; reprint p. 16) was the first author who asserted: *S. spicata* = *S. celosia*. Kükenthal (1896: 114, 115; 1903: 149) included *S. spicata* within "*Nephthea*" *celosia*, apparently without having seen the type of the former. I have been able to investigate Wright & Studer's holotype; it is kept in the British Museum (Natural History) (BMNH) reg. no. 90-4-11-2; it is represented in our pl. 1 figs. 6,

7. I agree with Holm and Kükenthal in synonymizing the two species, and, consequently, *Spongodes spicata* must become *Stereonephthya celosia*.

Remark on "*Spongodes*" *digitata* Wright & Studer, 1889: 193-194, pl. 36 figs. 2a, 2b.—Kükenthal (1896: 114-115; 1903: 148; 1905: 709-712, pl. 32 figs. 58, 59) transferred also this species to *Nephthea*. I think Kükenthal was wrong in doing so. Especially Wright & Studer's drawing of the colony and of a terminal branch points in the direction of *Stereonephthya*. The polyps are not arranged in bundles and the anthocodiae make acute angles with the polyp stalks, just as in "*Spongodes*" *celosia*.

Tixier-Durivault (1966: 295-298, figs. 276-278) described two colonies from Mitsio Island (Madagascar), which she referred to *Nephthea digitata*. This identification cannot be correct. First, the lobes are oval, not fingerlike; and, secondly, the shape of the polyps differs markedly from that in *S. digitata* as drawn by Wright & Studer: their fig. 2b shows that the anthocodiae are like hanging bell-flowers, and the supporting bundles project far beyond the polyp heads.

II. THE GENUS *NEOSPONGODES* KÜKEN- THAL

The genus *Neospongodes* was erected by Kükenthal (1903) for two nephtheid species from Bahia, Brazil, namely *N. atlantica* and *N. bahiensis*. His diagnosis of the genus runs as follows: "Nephtyiden von baumartigem Habitus. Polypen vereinzelt oder in Bündeln, mit Stützbündeln. Canalwände im Centrum von Stamm und Ästen eine unregelmäßige Achse bildend".

***Neospongodes atlantica* Kükenthal, 1903**
(figs. 3, 4, pl. 2 figs. 1-3)

Neospongodes atlantica Kükenthal, 1903: 274.

Neospongodes bahiensis Kükenthal, 1903: 274-275.

In the Zoological Museum at Hamburg there are two specimens of *N. atlantica*, ZMH C2350, and one specimen of *N. bahiensis*, ZMH C2349.

The labels with these colonies record: "Bahia, Paessler leg.". Pl. 2 figs. 1-3 shows these colonies. I designate the colony represented in pl. 2 fig. 2 as lectotype and the colony represented in pl. 2 fig. 1 as paralectotype. In addition to these colonies I was able to investigate a specimen received from Dr. Frederick M. Bayer (USNM, Washington), which was collected on the east coast of Brazil (exact locality unknown), and the colony described by Kükenthal (l.c.) as *N. bahiensis* and figured in pl. 2 fig. 3.

Description of the lectotype of *N. atlantica*—The shape and the dimensions of this colony (pl. 2 fig. 2) were correctly described by Kükenthal (l.c.).

The polyps (fig. 3) have short stalks, up to 0.60 mm long. Kükenthal records a length of 1.2 mm. However, it has struck me more than once that the measurements of polyp stalks reported by Kükenthal are too long. I think he measured as the length of a stalk the distance between the base of the stalk and the abaxial side of the anthocodia, whereas the stalk should be measured from the base up to the adaxial side; in the present case the latter distance is half that of the former.

The anthocodiae are 0.70 to 0.80 mm wide and high. These numbers are in agreement with Kükenthal's, but here, too, some clarification is necessary. What is to be understood by the height of an anthocodia? In my opinion the answer is clear: the supporting bundle is one part of the polyp, and the anthocodia is another part. So in measuring the height of the anthocodia the thickness of the supporting bundle should be excluded.

My remaining observations concerning the polyps and their sclerites do not differ much from Kükenthal's. The supporting bundle is of the ensheathing type; one or two spindles project beyond the anthocodia for a distance of 0.10 to 0.25 mm. The length of the spicules is up to 1.50 mm.

The anthocodial sclerites are slender, curved, spiny spicules, arranged en chevron, five to six in a row. The uppermost ones may reach a length of 0.50 mm, and sometimes they project

slightly above the anthocodia. In addition to these spicules there are many small, nearly smooth rods and needles.

The surface layer of a branch contains slender rods and slightly wider spindles. The majority is irregularly bent, and sometimes they are branched (fig. 4a-e). The length is rarely up to 1.60 mm. The prominences are rounded thorns and spines (fig. 4f, g). In the surface layer of the stalk small double-stars predominate; they are 0.08 to 0.15 mm long (fig. 4h-k). Larger sclerites are more rod-shaped or irregular in form (fig. 4 l, m).

In the interior of the stalk there are some wide canals. In the thin walls between them lie few sclerites, but in the centre, where the walls come together, there is an accumulation of sclerites (fig. 4n-p). They are curved, often branched spindles, up to 0.85 mm long. The prominences are rather distant, low cones. The central accumulation just mentioned is called "zentrale Achse" or "innere Achse" by Kükenthal (l.c.). After the description of *Stereonephthya portoricensis* I will state my opinion on the value of Kükenthal's axis.

Variability.—In the specimen handed to me by Dr. Bayer the sclerites do not differ from those described above. The polyps are more contracted, the anthocodial spicules are more densely placed, and the anthocodiae make sharper angles with their stalks. The colour is nearly the same as in the type of *N. atlantica*.

Finally, what about the difference between *N. atlantica* and *N. bahiensis*? Kükenthal himself (l.c.) stated that the two forms are closely related. According to him the two species differ in rigidity, in the right-angled or oblique position of the branches, the number and/or size of the processes on the spicules, whereas the sclerites in the surface layer of the basal part of the stalk are distinctly different. In my opinion these differences are not essential, they are insufficient to distinguish two species. My own observations indicate that the two types belong to one species, which must bear the name *atlantica*, for this is the first name given by Kükenthal and it has been selected as type species of the genus by Deichmann's (1936: 55) subse-

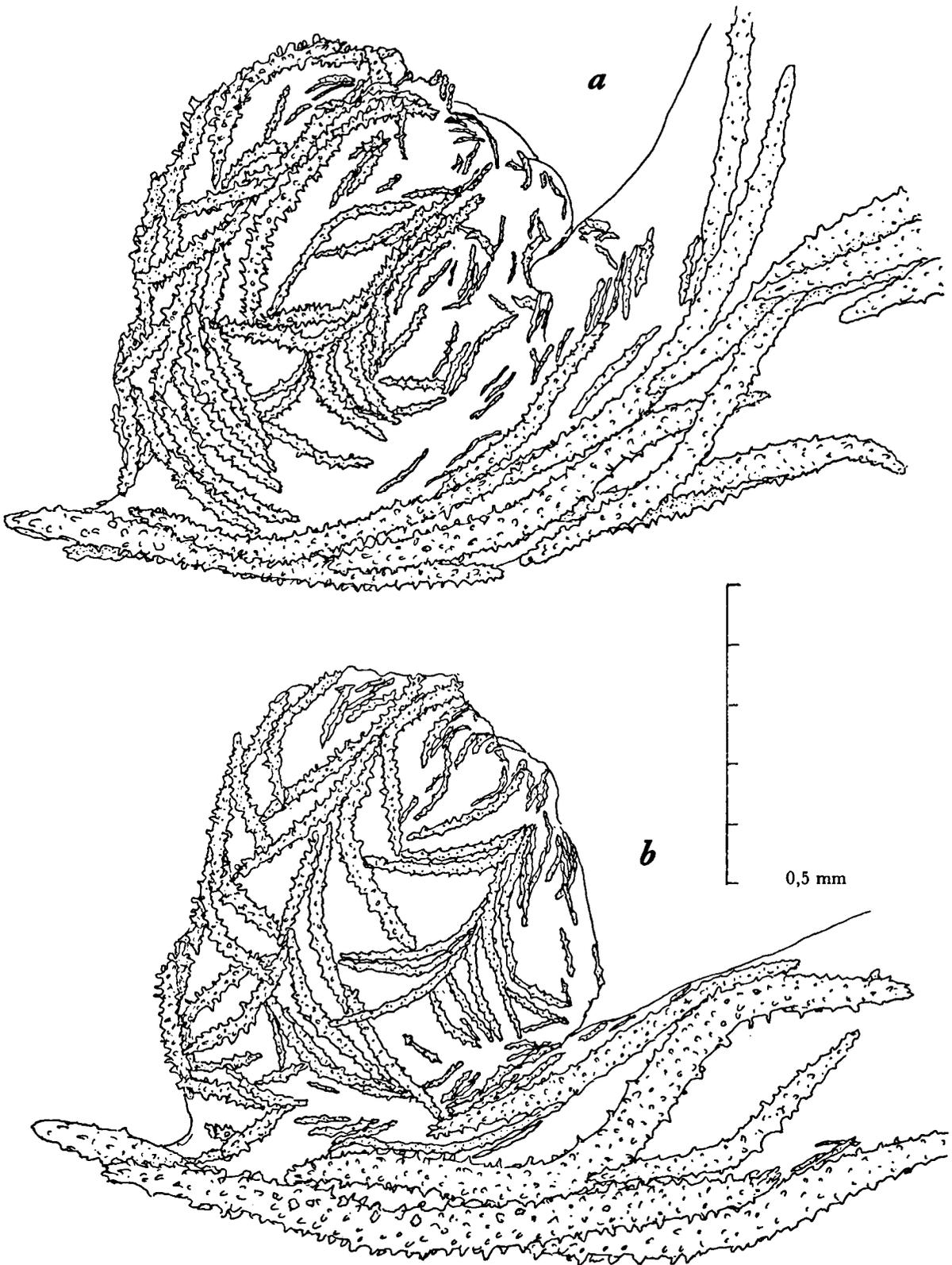


Fig. 3. *Neospongodes atlantica* Kükenthal, lectotype, ZMH C2350. a, b, polyps. Enlargement indicated by 0.5 mm scale.

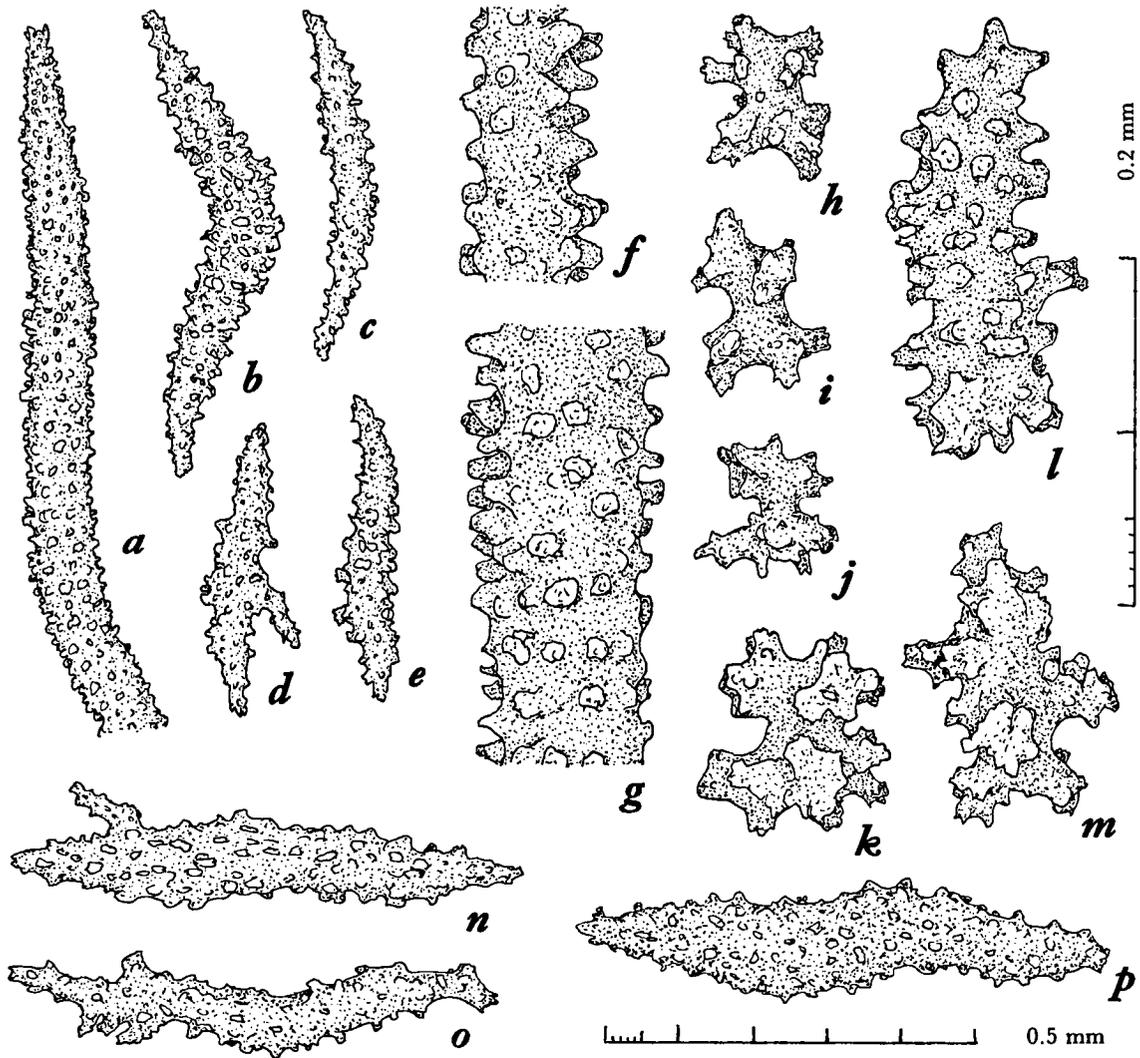


Fig. 4. *Neospongodes atlantica* Kükenthal, lectotype, ZMH C2350. a-g, sclerites from surface layer of a branch; h-m, sclerites from surface layer of the stalk; n-p, sclerites from interior of the stalk. Enlargement of a-e and n-p indicated by 0.5 mm scale at p; that of f-m by 0.2 mm scale at l.

quent designation. Consequently the specific name *bahiensis* must be abandoned.

III. *STEREONEPHTHYA PORTORICENSIS* (HARGITT)

Stereonephthya portoricensis (Hargitt, 1901) (fig. 5, pl. 2 figs. 4-7)

Spongodes portoricensis Hargitt, 1901: 279, fig. B; Kükenthal, 1905: 718.

Neospongodes portoricensis, Deichmann, 1936: 67-71, pl. 1 fig. 10, pl. 27 figs. 3-12; Bayer, 1961: 56, figs. 9i, 10d-f; Tixier-Durivault, 1970: 148.

Hargitt's (l.c.) description leaves much to be desired. His drawing, fig. B, shows several types of sclerites, but from which part of the colony the sclerites were taken is left unmentioned.

Deichmann (l.c.) gave a much better description and good pictures of a number of colonies. Bayer's (l.c.) short description and his drawings of a colony and of a few sclerites are good. Both authors used the term "operculum" instead of "points".

From the U.S. National Museum at Washington I received a number of colonies

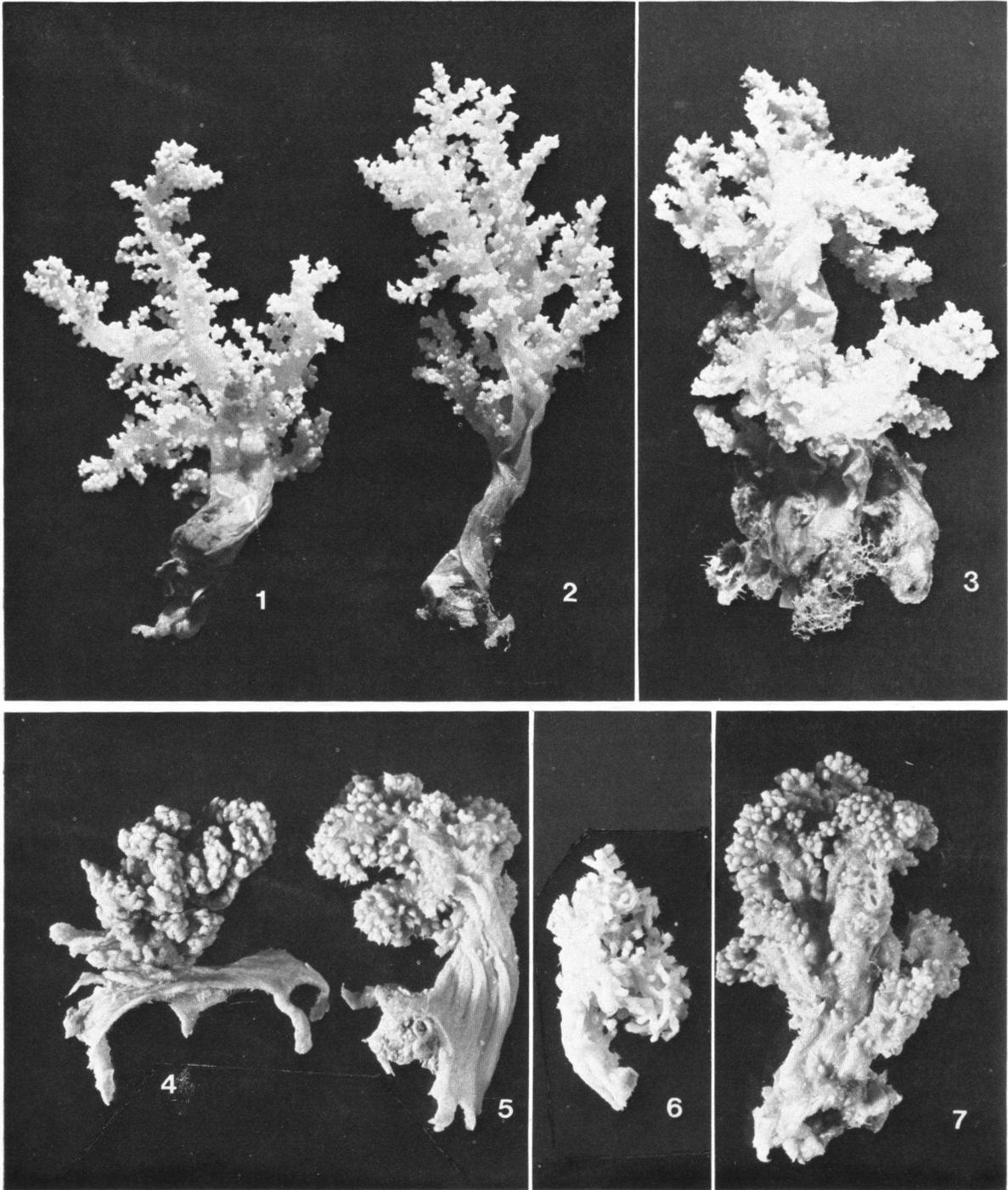


Plate 2. Fig. 1. *Neospongodes atlantica* Kükenthal, paralectotype, ZMH C2350. Fig. 2. *Neospongodes atlantica* Kükenthal, lectotype, ZMH C2350. Fig. 3. *Neospongodes atlantica* Kükenthal, holotype of *N. "bahiensis"* Kükenthal, ZMH C2349. Figs. 4-7. *Stereonephthya portoricensis* (Hargitt), from diverse localities in the West Indian region, USNM. All photographs show the colonies at natural size.

collected in several places in the Caribbean region at depths of 100 to 350 m. For a good description I refer to Deichmann's paper, but a more detailed description complemented with some figures is desirable.

In contrast to *Neospongodes atlantica* the colonies are stiff. The stalk is short and wide; it may be attached to a stone by membranous offshoots (see pl. 2 figs. 4, 5). The stem gives off a few branches. The polyps are densely and uniformly distributed around stem and branches.

The polyps have straight or curved stalks up to 1.50 mm long and on the average 1 mm wide (fig. 5a), but sometimes the stalks are shorter than 1 mm. The anthocodiae, 1.40 to 1.80 mm wide, make right or obtuse angles with the stalks.

The armature consists either of crown and points (fig. 5a) or of points only (fig. 5b-d). The crown, if present, is about six rows deep, in contracted anthocodiae sometimes more, but when the polyp is less contracted, the crown consists of fewer rows and the points and polyp stalk contain more sclerites. The crown spicules are curved rods, 0.20 to 0.45 mm long. The eight points vary in composition. This variability can be clearly illustrated by formulae such as are used (but more completely) in *Dendronephthya*: 1P; 1P + 1p; 1P + (2-4)p; (2-6)p, etc. In these formulae P means a sclerite predominating over the other, smaller point sclerites (p). In each point the arrangement of the sclerites on both sides of the point is usually different; for example: to the left the arrangement is 1P + 1p, to the right 4p. A few examples of arrangements are shown in fig. 5a-d.

The P-sclerites are often hockey-stick-shaped. Their length is up to 1.65 mm; they may project above the anthocodia for a distance of up to 0.80 mm. The length of the smaller (p) sclerites varies from about 0.25 to 0.70 mm. Between the P and the p sclerites there are, of course, all kinds of transitional forms.

The tentacles may be retracted entirely; in that case the point spicules project farthest. The rachis of a tentacle is packed with rods, 0.10 to 0.20 mm long and covered with many blunt

thorns (fig. 5f, g). The pinnules contain a number of curved, flat sclerites, averaging 0.10 to 0.12 mm long (fig. 5e), and tiny rods, 0.04 or 0.05 mm long.

The supporting bundle consists of a few straight spindles, usually up to 3 mm, rarely 4 mm long. In many cases it projects beyond the anthocodia for a distance of 0.40 to 0.50 mm. All polyp sclerites (except the tiny rods in the tentacles) bear blunt thorns (fig. 5h).

The surface layer of stem and stalk is filled with longitudinally arranged, slender, pointed spindles, up to 2.20 mm long and 0.20 mm wide.

In a transverse section of the stalk a number of angular canals can be seen, up to 1.50 mm wide, and separated one from the other by firm partition-walls. In these walls spindles occur, up to 3.40 mm long and 0.30 mm wide; like those in the surface layer they are covered with blunt thorns.

Final remarks.—At the beginning of chapter II (The genus *Neospongodes* Kükenthal) I quoted Kükenthal's (1903: 273-274) diagnosis of *Neospongodes*. Kükenthal apparently attached great importance to the presence of a central axis. But he admits that also in *Scleronephthya* such an axis occurs. And in many colonies of *Dendronephthya* and *Stereonephthya* I myself found the same situation: an accumulation of sclerites in the centre of the stalk, where the thin canal-walls come together. So the presence of such an "axis" has no taxonomical value.

Consequently the diagnosis of *Neospongodes* must be altered into: *Treelike, very flabby Nephtheids, with a slender stalk and stem. Polyyps isolated and scattered on thin branches and twigs, with supporting bundles.* To this genus one species must be referred, viz., *N. atlantica* Kükenthal.

In the introduction of chapter I (The genus *Spongodes* Lesson) I quoted Kükenthal's (1905: 695) diagnosis of *Stereonephthya*. According to this diagnosis *Stereonephthya* species are very stiff, and this holds good for *portoricensis*. The other characters are also applicable. In a few colonies of *portoricensis* I tried to find a central axis, but in vain. I could find no trace of an accumulation of

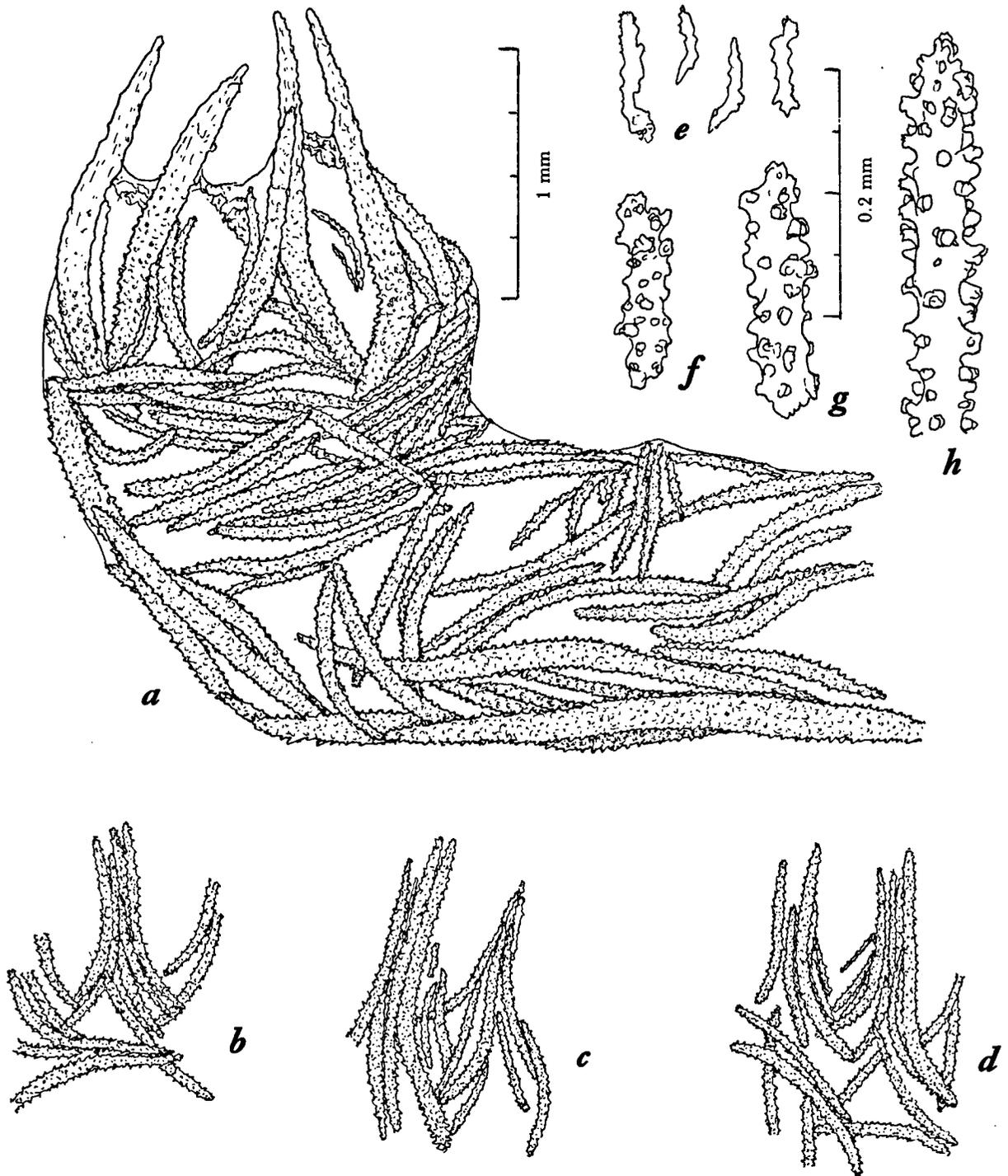


Fig. 5. *Stereonephthya portoricensis* (Hargitt); a, polyp from USNM 55646; b-d, arrangements of sclerites in anthocodial points; e, sclerites in pinnules and distal part of tentacle; f, g, sclerites in tentacle rachis; h, part of anthocodial sclerite. Enlargement of a-d indicated by 1 mm scale to the left of e; that of e-h by 0.2 mm scale at g.

sclerites that could be called an axis; with respect to this point I disagree with Deichmann (1936: 56).

Deichmann (l.c.) referred two other species to the genus *Neospongodes*, viz., *N. agassizii* Deichmann and *N. caribaea* Deichmann. According to Bayer (1961: 56) they belong to the genus *Siphonogorgia*.

ACKNOWLEDGEMENTS

First of all I thank Dr. Frederick M. Bayer for his stimulating ideas and suggestions, and for the loan of material from the U.S. National Museum, Washington (USNM). I am also thankful to Mrs. M.-J. d'Hondt, Muséum National d'Histoire Naturelle, Paris (MNHN), for the loan of Lesson's valuable type specimen of "*Spongodes*" *celosia*. Dr. M. Dzwillo, Zoologisches Museum Hamburg (ZMH), was kind enough to enable me to investigate the colonies of *Neospongodes atlantica* and *N. "bahiensis"*.

Finally I am indebted to Mr. G. J. Vrijmoeth for making the photographs, and to Mr. W. ter Spill for assisting me in preparing this paper.

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Received: October 2, 1982.

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