

Five new species of the genus *Dendronephthya* Kükenthal, 1905, (Octocorallia: Nephtheidae) from the Indian Ocean

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Five new species of *Dendronephthya* from the Indian Ocean are described and figured: *Dendronephthya* (*Morchellana*) *bruuni*, *D. (M.) hystricosa*, *D. (M.) pyriformis*, *D. (M.?) staphyloidea* and *D. (Roxasia) vervoorti*.

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Introduction

The present report is based on an unfinished manuscript left behind by the late Dr Jakob Verseveldt (cf. Den Hartog, 1988: vi). The descriptions and drawings are basically from his hand. The second author has written the text link and verified, and to some extent adapted and completed the descriptions and drawings.

The material forming the basis of the present publication was collected in 1963 and 1964 during cruises of the research vessel "Anton Bruun" in the Indian Ocean. The specimens are preserved in 70% alcohol and deposited in the collections of the United States National Museum, Washington D.C., U.S.A. (USNM) and in the Nationaal Natuurhistorisch Museum, formerly Rijksmuseum van Natuurlijke Historie (RMNH), Leiden.

Tixier-Durivault and Prevorsek (1959, 1960, 1962) in their revisions of the genera *Spongodes* Lesson, 1831, *Roxasia* Tixier-Durivault & Prevorsek, 1957, and *Morchellana* Gray, 1862 (here treated as subgenera of the genus *Dendronephthya* Kükenthal, 1905), described 213 different species. Since these revisions the number of species of *Dendronephthya* even increased, so that by now the genus *Dendronephthya* contains circa 250 species, forming by far the largest genus of the family Nephtheidae. The classification of the genus is based on colony form and on the anthocodial armature (presented in the anthocodial grade and formula; for an explanation see Tixier-Durivault & Prevorsek, 1959: 6). As these characters are subject to considerable variation (for a discussion of variation in colony form, see Verseveldt, 1965: 34; for variation of the anthocodial armature see e.g. the description of *D. bruuni* spec. nov.) and as many species are poorly described, it is at present next to impossible to identify species of the genus *Dendronephthya*. Therefore, a new revision of the genus, not only based on the colony form and the anthocodial armature, but also and in particular on the sclerites, is badly needed. Pending such a revision, the descriptions given below of what apparently are new species, are presented according to current standards, and as thoroughly as seemed desirable.

† 1903-1987.

Systematic part

Dendronephthya (Morchellana) bruuni spec. nov.

(figs. 1-3)

Material.— Sta. 9-445, 09°41'N 51° 03'E, 16.xii.1964, benthic, trawl, 60-70 m, one colony, the holotype (USNM 87632), and five fragments, (RMNH Coel. no. 17961); sta 9-447, 10°00' N 51°15'E, 16.xii.1964, benthic, trawl, 59-61 m, one colony (USNM 87633); sta 9-465, 11°37'N 51°27'E, 18.xii.1964, benthic, trawl, 67-72 m, one colony (USNM 87634).

Description.— In all of the material the sterile stalk is absent. The polyparium of the holotype (fig. 1) is flattened and roughly oval in shape; it measures 150 mm x 110 mm in diameter. The flexible stem is thick. At different levels it gives off short, wide branches, which by repeated ramification give rise to the twigs, on which the polyps are situated. None of the branches is flattened.

The polyps are arranged in groups of about six. These small groups are arranged in umbels, which in their turn may form large, hemispherical masses. In each group most polyps have very short stalks; two are longer, viz. 0.60 to 0.80 mm. The anthocodiae are placed on the stalks at a right angle, which may be slightly obtuse to acute (fig. 2a). In the polyps with the longer stalks the armature consists of eight double rows of spiny spindles, ca 0.12-0.25 long (fig. 2c). They lie close together, and are arranged en chevron, seven to ten in a row. Of each double row one of the uppermost sclerites is larger, up to 1.00 mm long, projecting above the anthocodia for a dis-

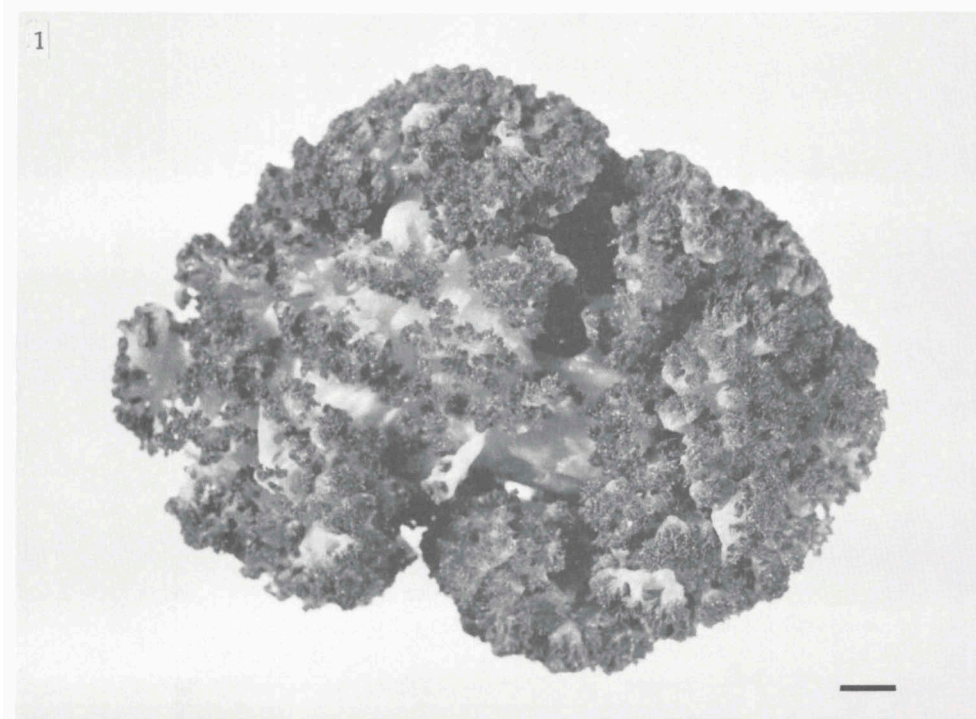


Fig. 1. *Dendronephthya (Morchellana) bruuni* spec. nov., holotype (from sta. 9-445). Scale bar 1 cm.

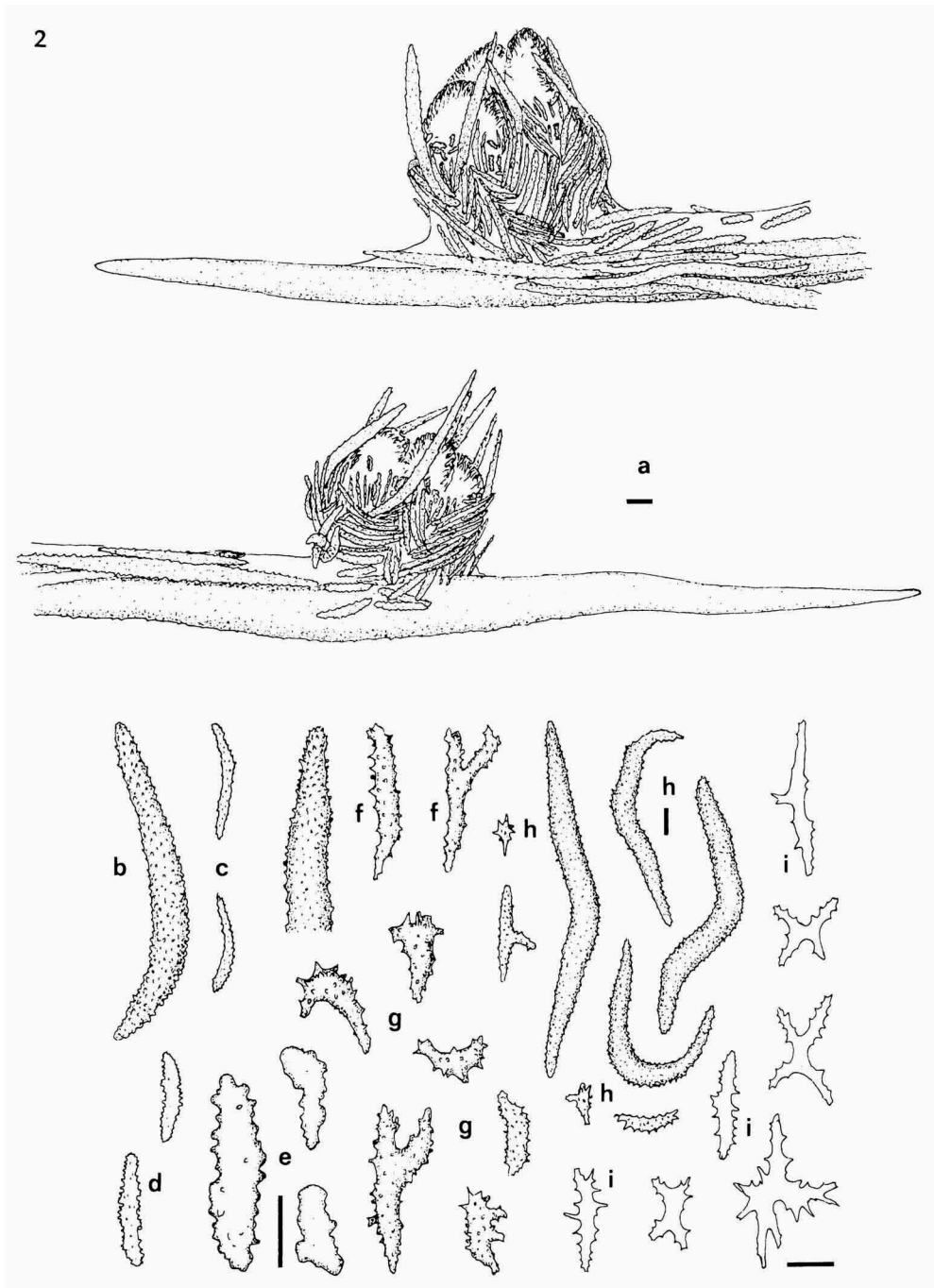


Fig. 2. *Dendronephthya (Morchellana) bruuni* spec. nov., holotype (from sta. 9-445); a, polyps; b-d, anthocodial sclerites; e, tentacular sclerites; f, sclerites of surface layer of middle part stem; g-h, sclerites of surface layer of basal part stem; i, sclerites of interior stem. Scale bar at a and i 0.10 mm. Scale bar for e 0.05 mm, scale bar for h 0.20 mm; scale bar for a also applies to f and g, scale bar for i also applies to b,c and d.

tance of 0.20 to 0.40 mm. These large point sclerites are nearly straight to slightly curved or hockeystick-shaped (fig. 2b). Between the points occur a number of intermediates (flat sclerites, 0.06 to 0.12 mm long). The aboral surface of the expanded tentacles is armed with numerous transversely placed flat sclerites, 0.04-0.07 mm long (fig. 2e).

The supporting bundle of the polyps with longer stalks is strong. It consists of one spindle, up to 4 mm long, and a few shorter ones. The long spindle projects beyond the anthocodia for a distance of up to 2 mm. The point of the spindle is smooth; for the rest it has minute spines. Owing to the presence of numerous of these projecting supporting bundles the colony is prickly to the touch. The ventral and lateral sides of the stalks and the base of the anthocodiae are characterized by a varying number of small, usually flattened sclerites 0.15 to 0.30 mm long, with rounded processes along the edges (fig. 2d).

The anthocodial grade and formula is: $I = 1P + (6-9)p + 0 Cr + \text{very strong S.B.} + \text{many M.}$ In the smaller polyps with short stalks and weaker supporting bundles all the anthocodial sclerites are of nearly the same length, the uppermost ones not projecting. The anthocodial grade and formula of these polyps is: $I = (7-10)p + 0 Cr + \text{medium S.B.} + \text{many M.}$ The surface layer of the stem has irregularly curved spiny spindles, up to 6 mm long and 0.22 mm wide. There are also smaller, curved spindles, sometimes with longer spines on the convex side, pseudo-clubs and ramified sclerites, 0.25 to 0.50 long (fig. 2f-h).

In the interior there are flat, radiated sclerites and broad, flat rods with sharp teeth along the edges, 0.15 to 0.25 mm long or in diameter (fig. 2i). In addition a few spindles occur, 0.35 to 0.45 mm long.

Colour.— In alcohol stem and branches are white. A number of sclerites in the twigs and all sclerites in the supporting bundles, the anthocodiae and the tentacles are wine-red.

Variation.— The other colonies agree with the holotype but the polyparia are smaller. In one of the paratypes (RMNH Coel. no. 17961) the umbels of the polyps are directed upwards, lying stepwise above another, so that the colony is more open, without hemispherical masses. In some colonies most of the anthocodiae are white, not wine-red as in the other colonies; only the tentacles being dark wine-red.

Remarks.— The species is characterized by the number and the arrangement of the anthocodial sclerites, by the large uppermost point sclerites, and by the strong supporting bundles with their long projecting points.

Etymology.— The species is named after the reserch vessel "Anton Bruun".

Dendronephthya (Morchellana) hystricosa spec. nov.

(figs. 3-4)

Material.— Sta. 8-420A, 02°42'S 40°53'E, 6.xi.1964, GMT, 140 m, one colony, the holotype (USNM 87635); sta. 9-444, 09°36'N 51°01'E, 16.xii.1964, benthic, trawl, 80 m, three fragments (RMNH Coel. no. 17965); sta. 9-445, 09°41'N 51°03'E, 16.xii.1964, benthic, trawl, 60-70 m, one fragment (RMNH Coel. no. 17966); sta. 9-447, 10°00'N 51°15'E, 16.xii.1964, benthic, trawl, 59-61 m, one fragment (USNM 87636).

Description.— The colony (fig. 3) has a total height of 65 mm. The polyparium is

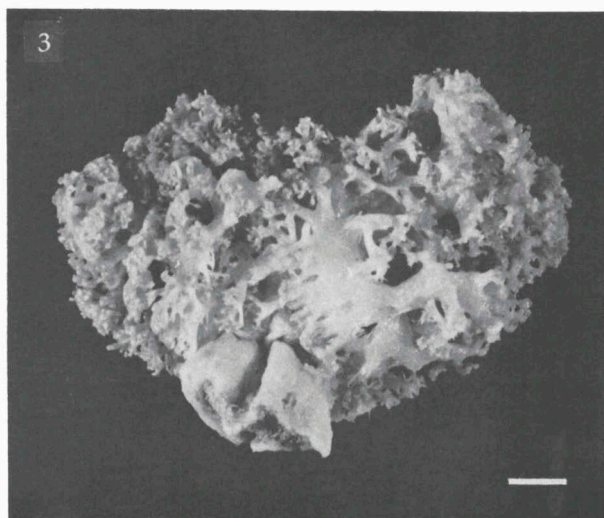


Fig. 3. *Dendronephthya (Morchellana) hystricosa* spec. nov., holotype (from sta. 8-420A). Scale bar 1 cm.

rigid and flattened, 80 mm broad. On one side the umbels are compactly arranged, on the other side less so, so that the polyparium is open. The sterile stalk is short, about 20 mm long; its diameter at the base is 27 mm. The top of the stalk bears a whorl of foliaceous branches, which do not form a collar. Proximally the stem gives off a number of branches and twigs, many of which are more or less flattened.

The polyps are arranged in bundles of about five, which form umbel-like aggregates. In each bundle there are polyps with long

and short stalks. In the first category the stalks are up to 1.40 mm long and the anthocodiae make obtuse angles with them. The anthocodial points usually consist of four to five strong, curved, spiny spindles, 0.25-0.50 mm long. Especially in the short-stalked polyps they are arranged en chevron (fig. 4a). In other polyps they are longitudinally arranged or irregularly distributed (fig. 4b). The uppermost sclerites are largest, up to 1.60 mm long, projecting for a distance of up to 0.80 mm beyond the polyp. They are hockeystick-shaped to nearly straight and may stand more or less upright, or project sideways in a star-shaped manner. Between the points occur two or three intermediates. The tentacles are armed with toothed plates, ca. 0.07 mm long.

The supporting bundle is strong. It consists of a few spiny spindles, up to 3 mm long, one of them projecting beyond the anthocodia for a distance of up to 1.20 mm. On the ventral and lateral sides of the polyp stalks, and also at the base of the anthocodiae, occur numerous slender, spiny accessory sclerites, up to 0.65 mm long.

The anthocodial grade and formula is: IV = 1P + (3-4)p + 0Cr + strong S.B. + (1-1,5)M.

The surface layer of the stem has thick, irregularly curved spindles, up to 4 mm long, which bear numerous spines (fig. 4c-d). In the foliaceous lower branches these spindles may reach a length of 6.75 mm and a width up to 0.50 mm. In the upper part of the sterile stalk the spindles are shorter, up to 3.40 mm long and densely set with blunt spines. Some of them are club-shaped or oval (fig. 4e-f). In the basal part of the stalk most surface sclerites are spherical, 0.20 to 0.45 mm in diameter. Ovals, spindles and irregularly curved sclerites also occur. They all are densely covered with spines or tiny warts (fig. 4g-h).

In the canal walls of the stem and sterile stalk occur numerous branched rods and spindles, blunt-ended or pointed, up to 2.90 mm long and 0.40 mm wide, and sparsely to closely set with small spines (fig. 4i).

Colour.— In alcohol all parts of the colony are dirty white, but the anthocodiae

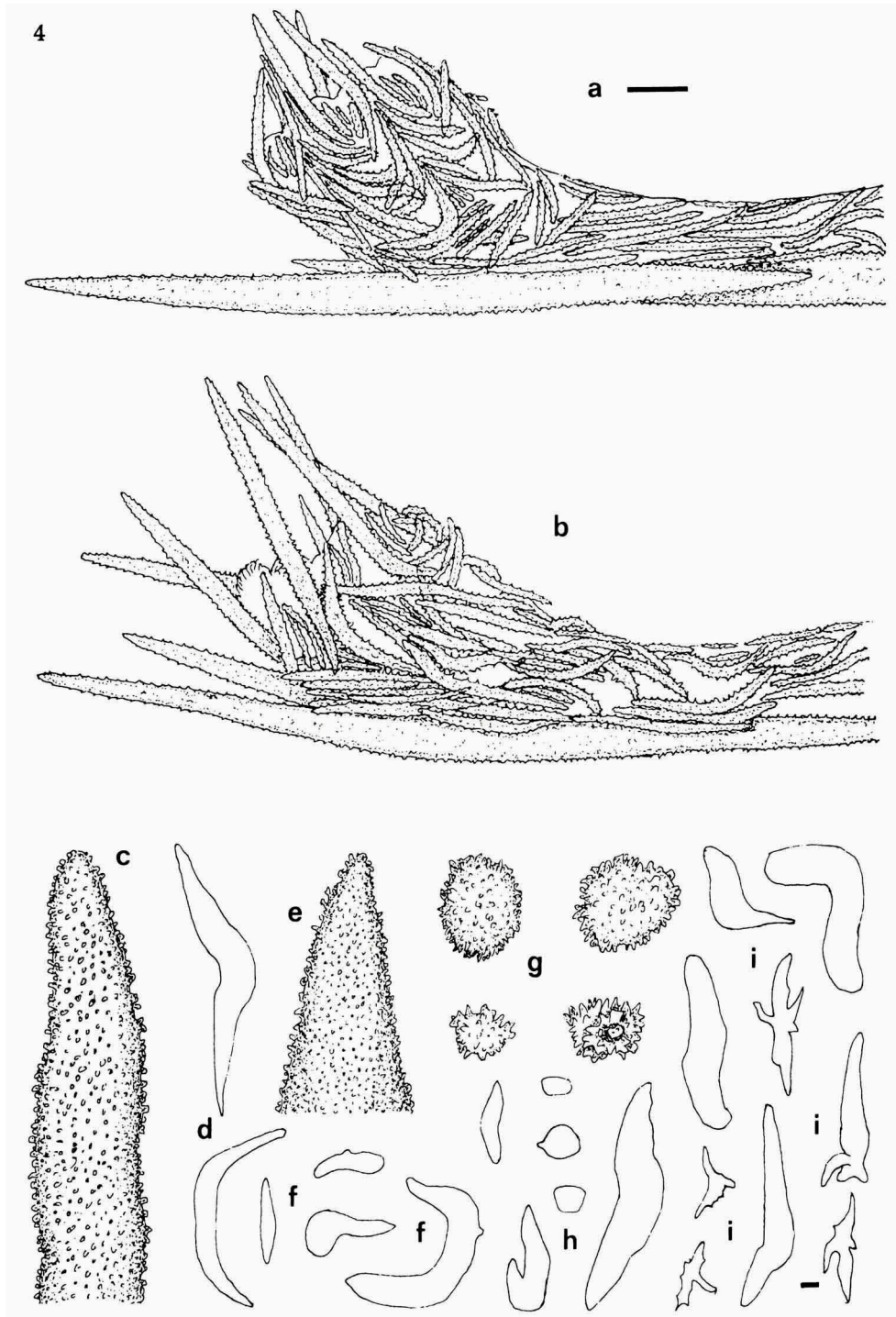


Fig. 4. *Dendronephthya (Morchellana) hystricosa* spec. nov., holotype (from sta. 8-420A); a-b polyps; c-d, spindles of surface layer of stem; e-f, spindles of surface layer of upper part of stalk; g-h, sclerites of surface layer of basal part of stalk; i, sclerites of interior of stalk. Scale bars 0.20 mm; scale bar for a also applies to b, c, e and g; scale bar for i applies to all others. d, f, h, i outlines only.

are light-brown.

Remarks.— The species is characterized by the extraordinary strong uppermost point sclerites and by the globular stalk sclerites.

Etymology.— The specific name *hystricosa* (Latin *hystrix* = porcupine) alludes to the spiny appearance of the anthocodiae.

***Dendronephthya (Morchellana) pyriformis* spec. nov.**
(figs. 5-6)

Material.— Sta. 7-371D, 24°46'S 35°20'E, 18.viii.1964, Agassiz Trawl (net ripped), 165 m, one colony, the holotype (USNM 87637).

Description.— The colony is soft and flexible (fig. 5). It measures 55 mm in height, the sterile stalk included. The latter, marked by deep longitudinal furrows, is 25 mm long and 8 mm wide. The stem gives off four main branches spread out almost in one plane. None of the main branches is leaf-like. The main branches ramify several times into slender branches and twigs, bearing the polyps. These are arranged in groups of four to six closely packed individuals. One polyp in each group has a long stalk, up to 1.60 mm in length; the others have short stalks. The groups form loose umbel-like aggregates, united into hemispherical masses. The polyparium is markedly flattened laterally and measures 45 mm in maximal width.

The anthocodiae are 0.60 to 0.80 mm wide and about 0.70 to 0.90 mm high. They make obtuse angles with the slender stalks. The armature usually consists of eight double rows of seven to ten pairs of spindles en chevron. In some anthocodiae the sclerites are short weakly spined rods, about 0.20 mm long, densely arranged in rows

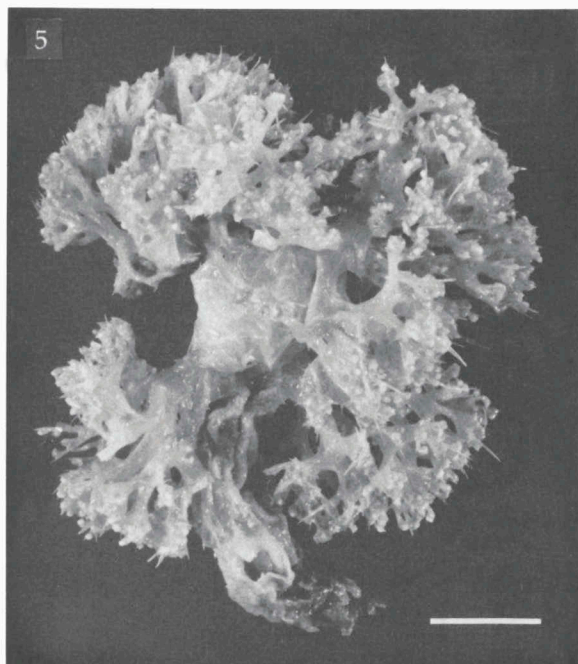


Fig. 5. *Dendronephthya (Morchellana) pyriformis* spec. nov., holotype (from sta. 7-371D). Scale bar 1 cm.

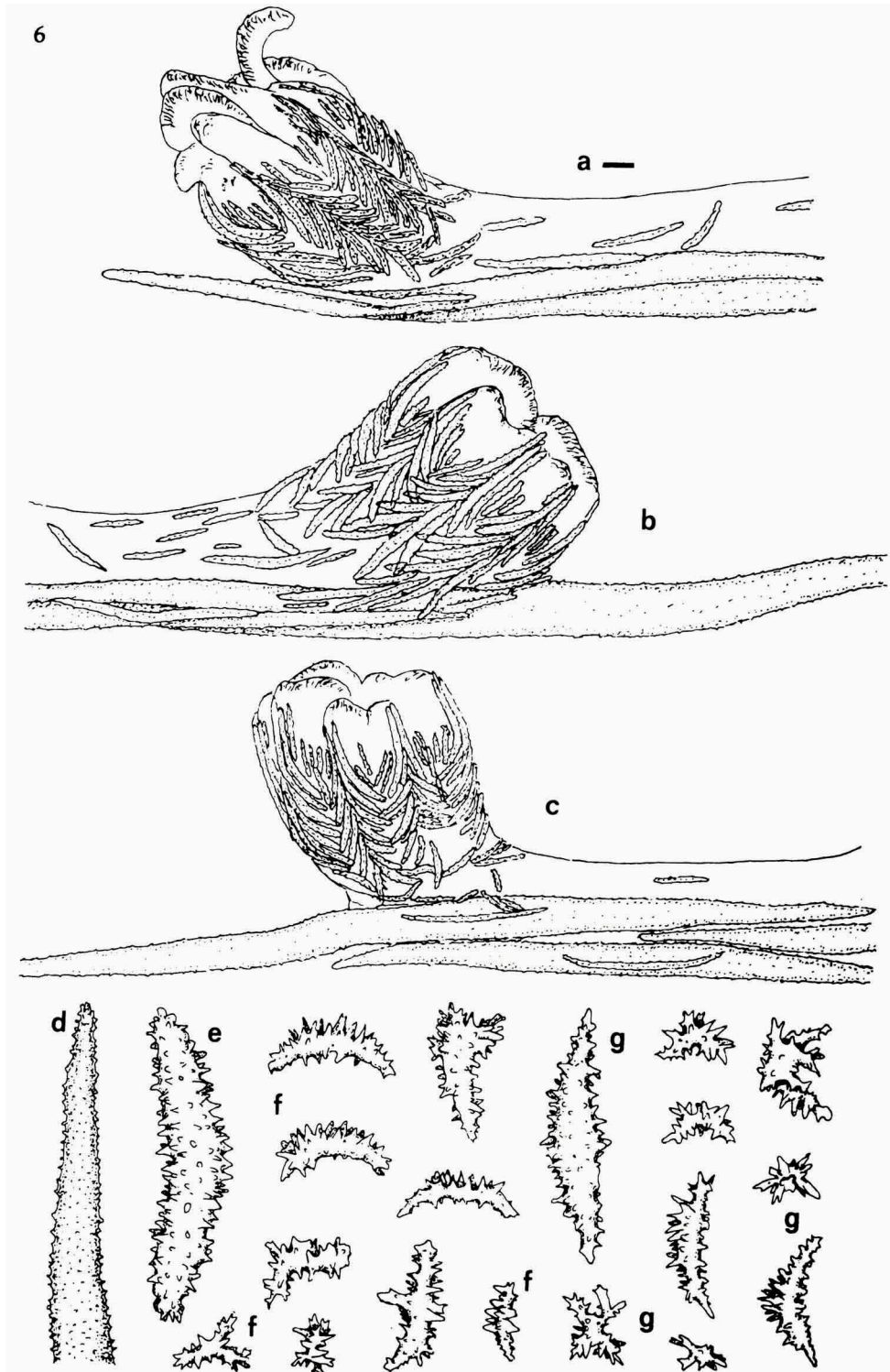


Fig. 6. *Dendronephthya (Morchellana) pyriformis* spec. nov., holotype (from sta. 7-371D); a-c, polyps; d, spindle of surface layer of stem; e-f, sclerites of surface layer of upper part of stalk; g, sclerites of surface layer of basal part of stalk. Scale bar for a 0.10 mm; also applies to b-g.

of up to ten or eleven (fig. 6a,c). In other anthocodiae there are only six or seven sclerites in a row, but these are longer, 0.30 to 0.40 mm, and more longitudinally arranged (fig. 6b). The uppermost sclerites are usually longest, up to 0.50 mm in length; they do not project. Between the points there are two to four, occasionally up to six, intermediates. The tentacles show the ordinary, transversely placed, flat, toothed rods, 0.05 to 0.10 mm long.

In the long-stalked polyps the supporting bundle is strong, consisting of a few spindles, up to about 4.50 mm long and 0.30 mm wide, and projecting for 1.80 mm beyond the anthocodia. In the polyps with shorter stalks the supporting bundle is medium, consisting of a few straight spindles, nearly smooth, but virtually covered with minute spines. In addition to these spindles the polyp stalks contain some smaller spindles.

The anthocodial grade and formula is: I-II = (7-10)p + 0 Cr + strong S.B. + (1-2) M. The surface layer of the stem contains loosely arranged, irregularly curved, minutely spined spindles, up to 4 mm long and 0.32 mm wide (fig. 6d). Where the stem passes into the sterile stalk this spiculation changes abruptly, the long spindles being replaced by short, heavily spined spindles and rods, up to about 2.00 mm long (fig. 6e), and numerous, irregularly branched, curved spindles, spiny clubs and small bodies (fig. 6f). Many of these are caterpillar-like. The length varies from 0.20 to 0.50 mm. Towards the base there is hardly any change in the spiculation. In the interior of the stem and the sterile stalk sclerites are absent.

Colour.— In alcohol the sterile stalk and the stem are greyish, the branches and the twigs are light brown. The anthocodiae are slightly darker brown. The tentacles are white.

Etymology.— The specific name *pyriformis* [(Latin) = pear-shaped] refers to the shape of the anthocodiae.

***Dendronephtya (Morchellana ?) staphyloidea* spec. nov.**
(figs. 7-8)

Material.— Sta. 9-447, 10°00'N 51°15'E, 16.xii.1964, benthic, trawl, one colony, the holotype (USNM 87638).

Description.— The colony (fig. 7) is rigid and measures 115 mm in total height. The sterile stalk is 65 mm high and 28 mm wide and has irregular, longitudinal furrows. At the base it bears a number of stolons, one of which is attached to a piece of coral. The uppermost part of the stalk has a nearly complete collar of leaf-like branches with groups of polyps along their edges. The stalk passes into a short, broad stem, which immediately above the collar divides into short, wide branches. By repeated ramification the branches give rise to short twigs, which bear groups of polyps. These groups consist of four to ten closely set polyps and do not form umbels or corymbs. The groups are rather loosely disposed on the surface of the polyparium. The polyparium is rounded and flattened, irregular in outline, and not thrown into hemispherical masses; it measures 85 mm x 40 mm in diameter.

The polyps have short stalks, up to 0.60 mm long. The anthocodiae are about 0.60

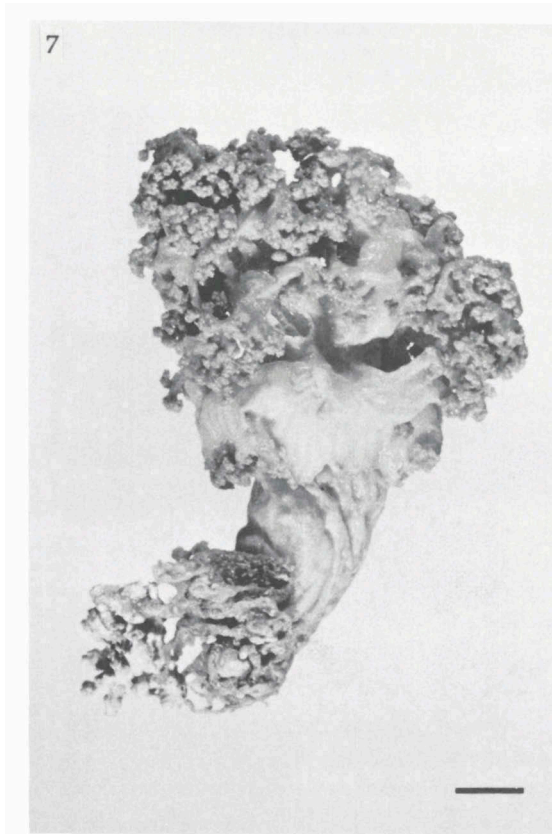


Fig. 7. *Dendronephthya* (*Morchellana* ?) *staphyloidea* spec. nov., (holotype from sta. 9-447). Scale bar 1 cm.

mm high and 0.60 to 0.80 mm wide, placed on the stalks at right or slightly obtuse angles. The anthocodial sclerites are arranged in eight double rows of about six to eight pairs of curved spindles en chevron. However, sometimes the chevroned arrangement is lost, the armature consists of irregularly placed clusters of five to eight sclerites (fig. 8a). In the clusters the sclerites are arranged parallel to each other. In some cases a number of sclerites is transversely placed forming a crown. The spindles are 0.25 to 0.50 mm long and weakly spined. In young polyps they are smaller, 0.15 to 0.25 mm, and more regularly arranged en chevron. Occasionally there are more than eight sclerites in a row. Between the point sclerites occur one to two pairs of intermediates. The tentacles are provided with transversely placed minute scales, 0.06 to 0.09 mm long, with toothed edges.

The supporting bundle is medium, consisting of a few large spindles, 2.00 to 2.50 mm long, and some smaller ones. One of the larger

spindles may project for a distance of up to 0.60 mm beyond the anthocodia. In young polyps the supporting bundle is weak, and not or hardly projecting. On the ventral side of the stalk occur numerous medium-sized, minutely spined spindles.

The anthocodial grade and formula is: II = (5-8)p + 0 Cr + medium S.B. + (1-2) M. The sclerites in the surface layer of the branches are: (1) slender, spiny needles and spindles, up to 2.25 mm long (fig. 8b), (2) many shorter, irregularly curved spindles and clubs, 0.35 to 0.80 mm long (fig. 8c), and (3) smaller sclerites with long spines, 0.15 to 0.25 mm long (fig. 8d). In the upper part of the sterile stalk the sclerites have longer spines (fig. 8e). In the basal part occur irregularly shaped bodies, rods, spindles, clubs and stars, a few of which slightly caterpillar-like; their length or diameter varies from 0.15 to 0.60 mm (fig. 8f). Spindles are scarce (fig. 8g). In the canal walls occur exclusively antlers, 0.15 to 0.20 mm long.

Colour.— In alcohol the sterile stalk, lower foliaceous branches, stem and main branches are dirty white. The side-branches, twigs, supporting bundles and anthocodial sclerites are light brown. The tentacles are white.

Remarks.— It is not clear to which of the three subgenera this puzzling species belongs. The polyps are arranged in small groups, which do not form rounded bunches as in the *Glomeratae* (= subgenus *Dendronephthya*). Nor is the polyparium

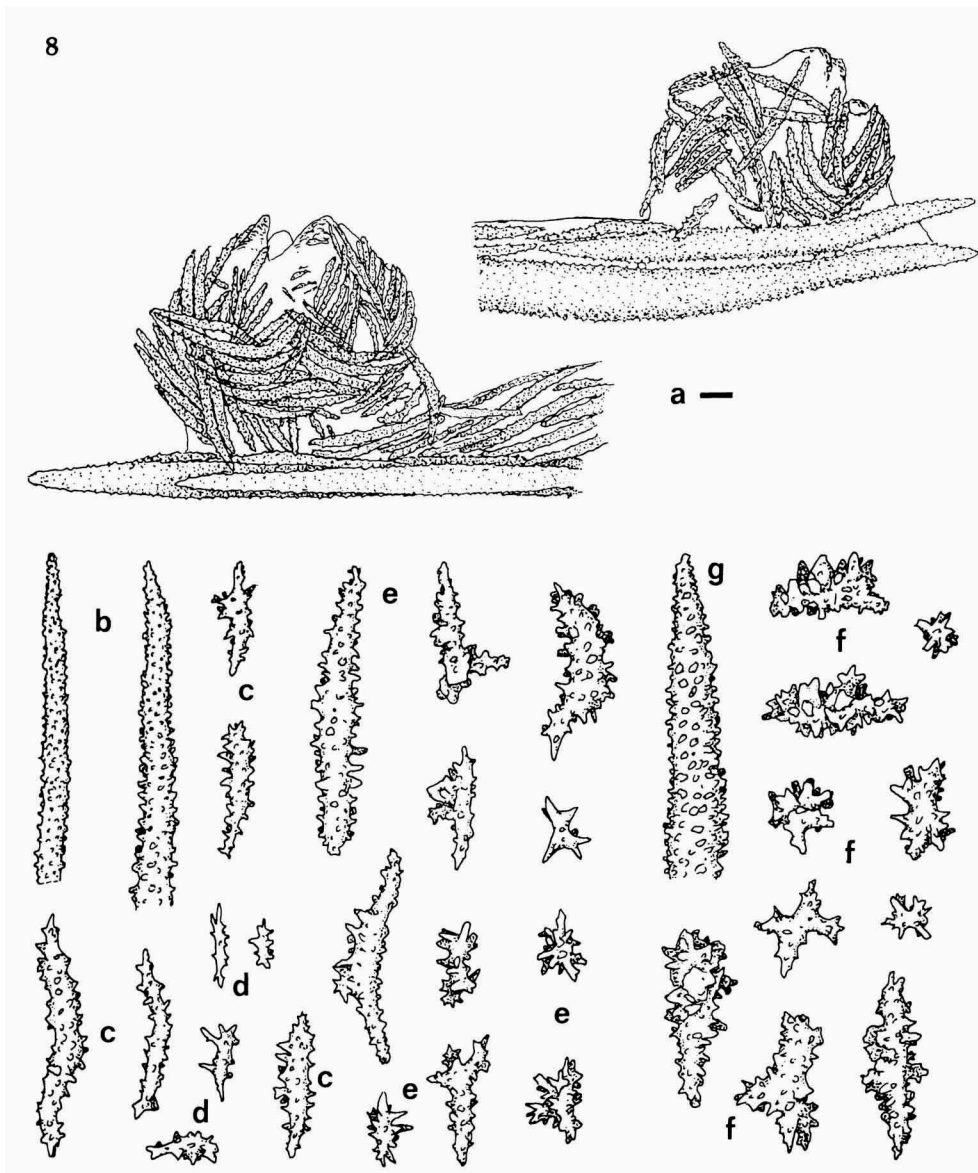


Fig. 8. *Dendronephtya (Morchellana ?) staphyloidea* spec. nov. (holotype from sta. 9-447); a, polyps; b-d, sclerites of surface layer of branch; e, sclerites of surface layer of upper part of stalk; f-g, sclerites of surface layer of basal part of stalk. Scale bar for a 0.10 mm, also applies to b-g.

profusely branched, with slender branches and twigs, and the bundles of polyps are not irregularly distributed on the branches as in the *Divaricatae* (= subgenus *Roxasia*). The habit of growth recalls most that of the *Umbellatae* (= subgenus *Morchellana*), for most groups of polyps are disposed on the surface of the colony. However, these groups don't have the shape of umbels or corymbs; they are more globular, like small bunches of grapes.

Etymology.— The specific name *staphyloidea* [from staphyle (Greek) = bunch of grapes] refers to the arrangement of the polyps.

***Dendronephthya (Roxasia) vervoorti* spec. nov.**
(figs. 9-10)

Material.— Sta. 7-371D, 24°46'S 35°20'E, 18.viii.1964, Agassiz trawl (net ripped), 165 m, one incomplete colony (USNM 87639); sta. 8-394B, 29°27'S 31°31'E, 25.ix.1964, 68-70 m, one complete colony, the holotype (USNM 87640), and a fragment, (RMNH Coel. no. 17972); sta. 9-437, 09°25'N 50°54'E, 16.xii.1964, benthic, trawl, 85-95 m, one colony and one fragment (RMNH Coel. no. 17973); sta. 9-442, 09°33'N 50°59'E, 16.xii.1964, benthic, trawl, 70-80 m, one colony (RMNH Coel. no. 17974); sta. 9-444, 09°36'N 51°01'E, 16.xii.1964, benthic, trawl, 80 m, one colony (USNM 87641); sta. 9-445, 09°41'N 51°03'E, 16.xii.1964, benthic, trawl, 60-70 m, two fragments (RMNH Coel. no. 17976); sta. 9-447, 10°00'N 51°15'E, 16.xii.1964, benthic, trawl, 59-61 m, one colony (USNM 87642).

Description.— The holotype measures 190 mm in height and 120 mm in maximum width (fig. 9). The flabby, sterile stalk is 100 mm long and 20 to 25 mm wide.



Fig. 9. *Dendronephthya (Roxasia) vervoorti* spec. nov.; left, holotype; right, paratype (both from sta. 8-394B), scale bar 1 cm.

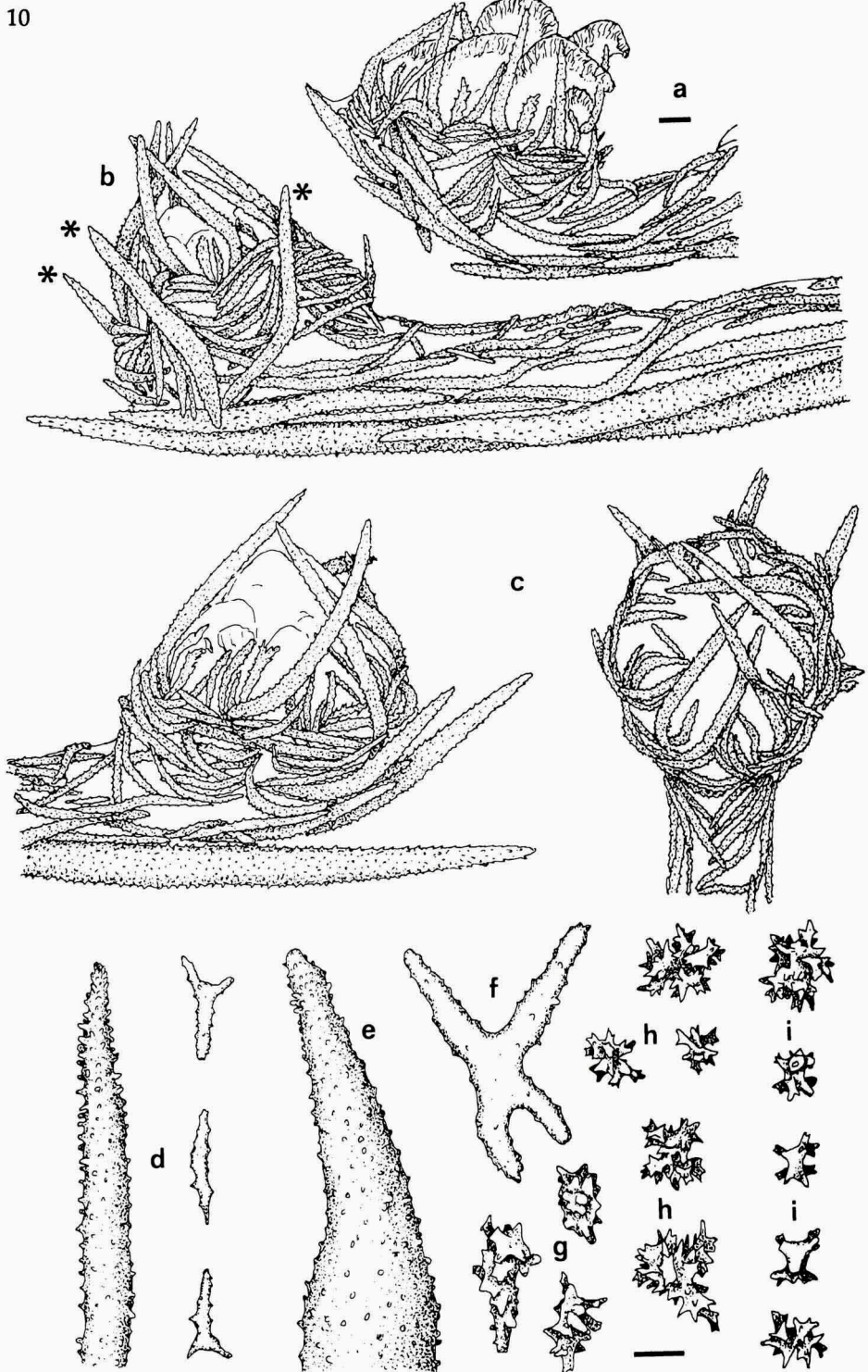


Fig. 10. *Denaronephtya (Roxasia) verwoorti* spec. nov.; holotype (from sta. 8-394B); a-c, polyps; d, sclerites of surface layer of upper part stem; e-g, sclerites of surface layer of basal part stem; h, sclerites of surface layer of upper part of stalk; i, sclerites of surface layer of basal part of stalk. Scale bars 0.10 mm: scale bar for a also applies to b and c. scale bar for h applies to all others.

The polyparium (now broken in three pieces) is irregular in outline and flattened in one plane. The stalk passes into the stem, which bears a number of short branches on its lower part. These are not leaf-like, but at a height of about 30 mm, measured from the base of the polyparium, there is a complete collar of reflexed, foliaceous branches. At this level the stem gives off two main branches, 60 and 70 mm long, which rise on opposite sides in the same plane, and which are surrounded by a collar of leaf-like branches at their base. By repeated branching stem and branches give rise to the polyp-bearing, slender twigs.

The polyps are arranged in small groups of three to seven. Some have long, diverging stalks, up to 2.20 mm long. Others have shorter stalks. The anthocodiae form obtuse, sometimes almost right angles with the stalks. In many cases the polyp-heads are turned away from the supporting bundle. The anthocodiae are 1.00 to 1.20 mm high. They are double-cone-shaped; at the middle they are widest, 0.80 to 1.00 mm.

The sclerites are arranged in the following manner (fig. 10): at the base of the anthocodia there are eight double rows of two to four pairs of bent sclerites arranged en chevron. On the dorsal and lateral sides one of these supplementary sclerites is larger, up to 1.00 mm long, and projects considerably beyond the polyp-wall, giving the anthocodiae a special protection. In fig. 10b these sclerites are marked by an asterisk. In the short-stalked polyps these large sclerites are less distinct or wanting (fig. 10a). Above the supplementary sclerites there is a crown of horizontally placed sclerites, about three rows deep. The length of these sclerites is 0.30 to 0.45 mm. Above this crown occur eight points of one or two pairs of converging, hockey-stick-shaped sclerites. These points are a continuation of the lower double rows of supplementary sclerites. One sclerite of each point is largest, it is up to 0.85 mm long, and the projecting spiny part is 0.35 to 0.45 mm long. In the space between two adjacent points one or two spiny intermediates are present.

On the aboral surface of the tentacles occur transversely placed flat rods, with rounded knobs along their edges; at the base of the tentacles these rods reach their maximal length, 0.15 mm.

The polyp stalk is filled with longitudinally arranged, spiny, often curved spindles. Those on the dorsal side are largest, up to 3 mm long and 0.14 mm wide, and have pointed spines. They form the medium supporting bundle, which projects beyond the anthocodia for a distance of 0.15 to 0.35 mm.

The anthocodial grade and formula is: VI = 1P + 1p + 3Cr + 1SS + (2-3)ss + medium S.B. + (0.5-1)M. The surface layer of the twigs and the upper part of the stem and the main branches contains slender, spiny spindles and needles, 2 to 3 mm long, and a number of irregularly shaped, often ramified, flat sclerites, about 0.20 mm long (fig. 10d). In the basal part of the stem some spindles are more robust and less spiny, up to 3 mm long and 0.27 mm wide (fig. 10e). In addition to these occur smaller, bifurcated, three- or four-radiated forms (fig. 10f) and a number of still smaller bodies (fig. 10g). In the sterile stalk most sclerites are spiny stars, 0.08 to 0.20 mm in diameter (fig. 10h); those in the basal part are usually smaller and some are slightly dumb-bell-shaped (fig. 10i); spindles are nearly absent.

Canal-wall sclerites are absent, except for a few spindles in the interior of the stem.

Colour.— In alcohol the sterile stalk, stem, branches and twigs are dirty white.

The polyp stalks and the anthocodia are light brown.

Variation.— Also in other specimens the undermost branches are not leaf-like, while a short distance above the base of the polyparium there is a collar of reflexed foliaceous branches. The length of the polyp stalks may be different: in the colony from sta. 7-371D they are 2.50 to 3.20 mm long, in the colony from sta. 9-444 up to about 1.10 mm. The colour is practically identical in all of the material.

Etymology.— The species is named after Dr. W. Vervoort, former director of the Rijksmuseum van Natuurlijke Historie, Leiden.

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