

REVISION OF THE GENERA *BELLONELLA*, *ELEUTHEROBIA*,  
*NIDALIA* AND *NIDALIOPSIS* (OCTOCORALLIA: *ALCYONIIDAE* AND  
*NIDALLIIDAE*), WITH DESCRIPTIONS OF TWO NEW GENERA

by

J. VERSEVELDT †

and

F. M. BAYER

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Nineteen species of Alcyoniidae formerly assigned to various genera are here placed in the genera *Bellonella* and *Eleutherobia*; three new species are described in *Bellonella*. Sixteen species characterized by an abundance of capstans among their sclerites, formerly assigned to *Alcyonium*, *Bellonella* and *Nidalia* are now transferred as valid species or synonyms to the genus *Eleutherobia*, in which two new species are described making a total of 14 valid species. A new genus *Inflatocalyx* is established for a digitiform subantarctic species having only very few sclerites, in the form of nearly smooth spindles, and polyps retractile within large, inflated calyces. Six species comprising the genus *Cactogorgia* are transferred to *Nidalia*, and three new species are described, bringing the total known for the genus to twelve. The species described by Tixier-Durivault as *Alcyonium altum* and *A. violaceum* are shown to be dimorphic and are transferred to *Nidaliopsis*. J. S. Thomson's *Simularia unilobata* is redescribed and made the type of a new genus *Pieterfaurea*. The sclerites of most species are illustrated for the first time by scanning electron micrographs. Keys to the genera of Alcyoniidae and Nidaliidae and to the species of *Bellonella*, *Eleutherobia* and *Nidalia* are presented.

J. Verseveldt, deceased.

F. M. Bayer, Department of Invertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560, U.S.A.

RÉSUMÉ

Dix-neuf espèces d'Alcyoniidae appartenant auparavant à des genres variés sont ici placées sous les genres *Bellonella* et *Eleutherobia*: trois espèces nouvelles sont décrites sous *Bellonella*. Seize espèces caractérisées par une abondance de cabestans parmi leurs sclérites appartenant auparavant à *Alcyonium*, *Bellonella*, et *Nidalia* sont ici reclassées comme espèces valables ou synonymes du genre *Eleutherobia*, dans lequel deux nouvelles espèces sont décrites, rendant au total quatorze espèces valables. Un nouveau genre, *Inflatocalyx*, est établi pour une espèce subantarctique digitiforme n'ayant que quelques sclérites qui prennent la forme de fuseaux presque lisses, et des polypes rétractiles à l'intérieur de calyces larges et renflés. Six espèces formant le genre *Cactogorgia* sont reclassées chez *Nidalia*, et trois nouvelles espèces sont décrites, ce qui amène à douze le total connu dans le genre. Le dimorphisme des espèces décrites par Tixier-Durivault comme *Alcyonium altum* et *A. violaceum* est démontré, et ces espèces sont reclassées chez *Nidaliopsis*. *Simularia unilobata*, décrite par J. S. Thomson, est redécrite et devient l'espèce-

type du nouveau genre, *Pieterfaurea*. Pour la première fois, les sclérites de la plupart des espèces sont illustrés au M.E.B. Les clés des genres d'Alcyoniidae et de Nidaliidae et des espèces de *Bellonella*, *Eleutherobia*, et *Nidalia* sont présentées.

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## INTRODUCTION

### *Nidalia* and *Bellonella*, a short survey

Gray (1835:60) established the genus *Nidalia*, but it was not until 1857 (129, pl. 7) that he published a figure of the type species *N. occidentalis*. Still later he created the genus *Bellonella* (Gray 1862:35) with a single species, *B. granulata* (the figure of the colony was mistakenly placed on p. 34 with *Solenocaulon*). According to Gray (l.c.), *Bellonella* "has some characters in common with my genus *Nidalia* . . . , but differs from it in the surface of the coral being minutely granular and not spiculose." He stressed the difference in surface of the colonies, but the difference in appearance between "minutely granular" and "spiculose" is far from clear. A "granular" surface might even suggest a rougher and coarser one, if the sclerites are larger and coarser. In reality, *Nidalia occidentalis* has larger coenenchymal sclerites, up to 2.50 mm long, whereas those of *Bellonella granulata* reach 0.40 mm maximally.

In addition to the difference in sclerites there is also a difference in the shape of the colonies of the two type species. In *N. occidentalis* the capitulum is hemispherical; it projects sideways far beyond the cylindrical stalk, like the head of a mushroom. In *B. granulata* it is low, dome-shaped and is only a little wider than the stalk.

For a historical review of the genus *Nidalia* see Kükenthal (1906a:30-31; 1906b:21-22). Following May (1899:100), he united Gray's genera *Nidalia* and *Bellonella* into one genus *Nidalia*, to which he referred eleven species.

Should we still accept Kükenthal's conception of *Nidalia* (including *Cactogorgia* Simpson, 1907), the number of species belonging to it would amount to thirty-eight, all showing great differences not only in the shape of the colony but also in the introvert, the anthocodial armature, and the coenenchymal sclerites. This presents the taxonomist with an almost impossible task. The following survey may illustrate this.

1. Four species (*agariciformis*, *deichmannae*, *occidentalis*, *rubripunctata*)

have a hemispherical capitulum; the coenenchymal spicules have a maximum length of 2.45 to 5.00 mm.

II. Three species (*alciformis*, *celosioides*, *expansa*) have the polyparium flattened laterally, and the spicules measure up to 2.20 mm in length.

III. Five species (*borongaensis*, *dissidens*, *granulata*, *lampas*, *simpsoni*) have a funnel-shaped distal end of the stalk surmounted by a low, more or less dome-shaped capitulum; the length of the fusiform coenenchymal sclerites varies from 1.00 to 2.60 mm, but in *granulata* the length is less than 0.40 mm; *lampas* has no sclerites in the introvert, *granulata* has a few, and the three remaining species have many.

IV. All other species (twenty-five) have a finger-like, conical or thread-like (whip-shaped) polyparium.

IVA. Thirteen of these have many sclerites in the introvert; six have spindles in the calyx, and seven have eight-radiates in the calyx.

IVB. Three have some small sclerites only in the proximal part of the introvert, two have spindles in the calyx, and one has eight-radiates in the calyx.

IVC. One has some small sclerites only in the distal part of the introvert.

IVD. Eight have no sclerites in the introvert at all; two of these have spindles in the calyx, and six have eight-radiates or spheroids in the calyx. Among the species referred to this group there are three that do not have an anthocodial armature; in the coenenchyme one of these has capstans, another has tiny eight-radiates, and a third has spheroids.

Apart from the thirty-seven species listed above there is one which has a finger-like polyparium, but it differs so widely from all other species in spiculation and in shape of the calyces, that a new genus must be created; the species is named *Inflatocalyx infirmata* gen. et spec. nov.; see p. 46 for the description of this coral.

Is there any possibility to put things straight here, to prevent the genus *Nidalia* from becoming a catchall for unrelated species?

Utinomi (1958) greatly contributed to the solution of this problem. Mainly on the basis of the dimensions of the sclerites occurring in the outer layer of the colony, he found that *Bellonella* with its small sclerites (length less than 0.50 mm) had to be referred to the Alcyoniidae and *Nidalia* with its large spicules (length 1 mm and more) to the Nidaliidae.

We agree with Utinomi that the latter group of species should be assigned to *Nidalia*. But in *Bellonella* sensu Utinomi a further separation into two groups of species is possible. In his revised diagnosis of *Bellonella*, Utinomi (1958:113) records the presence of "spindles, rods, clubs and capstans." The difference between spindles and rods is negligible, and the club is also a form

allied to the spindle: transitional forms between them are very common. But capstans and eight-radiates are quite different forms. When we group together the species having eight-radiates and capstans in their coenenchyme, and we do the same with the species having small spindles and rods, we attain a surprising result. It appears that all species with capstans, eight-radiates and the like have finger-like or conical polypariums that are rarely split or branched. In this group we count fourteen species, which we refer to the genus *Eleutherobia* Pütter, 1900, with *E. japonica* Pütter, 1900 [= *E. rigida* (Pütter, 1900)] as type-species.

The colonies with small spindles, rods and clubs include ten species. They have cylindrical, whip-shaped (thread-shaped) or differently shaped polypariums; one species (*granulata*) has a low, dome-shaped capitulum. We refer these species to the genus *Bellonella*; the type-species is *B. granulata* Gray, 1862.

The genus *Nidalia* includes twelve species; *N. occidentalis* Gray (1835) is the type-species. The spindles are often more than 2 mm long, but in *dissidens* they are not longer than 1 mm; in *alciformis* and in *expansa* they are up to 1.60 and 1.50 mm respectively. In *Nidalia* we find all colonies with hemispherical or dome-shaped or laterally flattened polypariums; only *macrospina* has a finger-like polyparium.

It appears that there exists a certain correlation between the shape of the colonies and the shape and dimensions of the sclerites. The division into three genera now proposed may only to a limited extent be called a natural one. Based upon the shape of the colony, *granulata* should be referred to *Nidalia*, but the sclerites are less than 0.40 mm long, so we place it among the *Bellonella* species. Thus we now distinguish three genera, *Bellonella*, *Eleutherobia* and *Nidalia*, the diagnoses of which are given with the discussions of the species.

In *Eleutherobia* the calyces contain small eight-radiates and capstans (spheroids in *rotifera*), as well as spindles or slender rods. These longer spicules always occur in the innermost layer of the calyx (see p. 9). Consequently it is not always necessarium to investigate the interior of a polyparium to determine the shape and size of the sclerites in that part of the colony, and it is no longer necessary to seriously damage specimens, especially small and delicate ones in the course of investigation; see also the subsequent chapter.

In this paper three other genera are considered, viz. *Inflatocalyx* gen. nov., *Nidaliopsis* Kükenthal, 1906, and *Pieterfaurea* gen. nov. The genus *Nidaliopsis* was established by Kükenthal (1906a:27) and included one species, *N. pygmaea*. The genus is characterized by a barren stalk, a dome-shaped polyparium, and dimorphic polyps. The autozooids are retractile into stiff calyces. The coenenchymal sclerites are large, warty spindles. To this genus we refer

two other species, viz. *N. alta* (Tixier-Durivault) and *N. violacea* (Tixier-Durivault), collected along the Atlantic coast of Africa, as was the type-species, *N. pygmaea*. They have been referred to the genus *Alcyonium* by Tixier-Durivault (1955b).

The new genus *Inflatocalyx* is closely related to *Bellonella*; it is characterized by its large, inflated calyces and by its scarce, practically smooth spindles. *Pieterfaurea* has been referred to *Sinularia* by J. S. Thomson (1921:172) and to *Bellonella* by Verseveldt (1980:11), albeit with some hesitation. Its polyps, monomorphic, retractile, and devoid of sclerites, are surrounded by a wreath of vertical or slanting, often club-shaped sclerites forming a kind of palisade (see fig. 63). We refer it to the family Nidaliidae on the ground of the sclerites in the palisades. The morphological and anatomical terms used in this paper are in accordance with Bayer et al. (1983).

#### Contraction and Retraction of the Polyps and critical Remarks on the Calyx

In Octocorallia a polyp consists of a part that projects or may project, above the surface of the colony, and an internal basal part, the continuation of the gastric cavity. The latter part is unimportant both taxonomically and in regard to the contraction and the retraction of the polyp. The more important part is the former, called the polyp for the sake of brevity, in this paper.

In the present chapter we confine ourselves to the contraction and retraction of polyps in the families Alcyoniidae and Nidaliidae. The retraction may happen either into a calyx or into the coenenchyme of the colony.

First of all the question needs to be answered: What is a calyx? According to Bayer et al. (1983:5-6), a calyx is a "cylindrical or wartlike projecting anthostele", and an anthostele is "the proximal, rigid part of some polyps, often stiffened by sclerites, and into which the anthocodia may be withdrawn; equivalent to calyx." A more detailed discussion of the calyx is given by von Marenzeller (1878:373) and especially by Broch (1928:4-6). The latter emphasized two points in his definition of a calyx. First, that the calyx is "thicker and stiffer" than the distal part of the polyp, which part is "thinner, more flexible and contractile." And second, that the calyx "is not retractile into the coenenchyme of the colony."

It is noteworthy that a calyx is always considered the basal part of a polyp. Morphologically this may be right, but in point of fact a calyx is part of the coenenchyme of the polyparium; it is formed by the coenenchyme, it is a

cylindrical or wart-like projection of the coenenchyme, and it contains (this is very important) the same kind of sclerites as the coenenchyme. In studying the sclerites in a great many calyces, it appeared that the outermost layer of the calyx contained the same kind of sclerites as those in the outermost layer of the polyparium, and that the same kind of sclerites are found in the innermost layer of the calyx as in the interior of the polyparium. Pütter (1900:450) already ascertained the presence of two layers with different sclerites in the calyces of *Eleutherobia japonica* (= *Bellonella rigida* Pütter) and he found that the spindles occurring in the innermost layer of the calyx are also present in the interior of the coenenchyme. One can say that the innermost layer of the calyx is a continuation of the interior of the polyparium and that the outer layer of the calyx is the same as the surface layer of the polyparium.

The calyx is not only a shelter for the polyp, it is also a pedestal. It is not a part of the polyp; the thin-walled polyp begins at the edge of the calyx. And this polyp consists of two parts: a distal part, the anthocodia with the tentacles, and a proximal part, the introvert. Verrill (1922:4, footnote) called these parts the stomodeal part (in which the pharynx is found) and the mesenterial part (containing the mesenterial filaments).

The anthocodial wall contains crown and points; sometimes an anthocodial armature is absent. In the introvert sclerites may be absent, they may be restricted to the most distal or the most proximal part of the introvert, or they may be present in the whole introvert. But, when present, they are always small and not too numerous, for they may not hinder the mobility and the retractility of the polyp.

Contraction and retraction of a polyp-with-a-calyx. — In fig. 1 we have tried to show the contraction and retraction of a polyp-with-a-calyx. In fig. 1A the polyp is completely extended. The calyx is thick-walled and contains numerous, often large spicules. Distally it passes into the membranous introvert. This part may be devoid of sclerites, it may contain a few sclerites, mainly in its basal part, or it is filled with many sclerites. But, if present, the sclerites are nearly always small (less than 0.10 or 0.15 mm long), a prerequisite for the ability of the anthocodia to retract within the calyx. Similarly, the *en chevron* arrangement of the sclerites (if present) in the rachis of the tentacles does not inhibit tentacular mobility. The *en chevron* arrangement of the sclerites in the anthocodial wall also plays a part in contraction. If a large number of sclerites is present in this wall, the lowermost sclerites of the points may assume a more or less transverse position, thus becoming crown sclerites.

When a polyp begins to contract and retract, the tentacles bend over the mouth and shorten. The introvert becomes flabby (fig. 1B). In fig. 1C this

process continues. In figs. 1D and 1E, retraction is complete. One can easily observe that the incurved tentacles are joined to the upper edge of the anthocodial wall (see figs. 1D, 1E). When investigating retracted anthocodiae by means of a dissecting microscope it is possible to cut them open longitudinally and to remove the tentacles, beginning at the point of each tentacle.

In case the introvert contains sclerites only in the proximal part it is clear that in the retracted state these sclerites are situated close to the edge of the calyx; see Utinomi, 1958, fig. 1c and our fig. 54 (*N. rubripunctata*).

**Contraction and retraction of a polyp-without-a-calyx.** — In some genera, such as *Alcyonium*, *Sinularia*, *Sarcophyton*, and *Lobophytum*, a polyp consists of two parts: 1. a distal, usually wider part, the anthocodia; it bears the tentacles and is mostly armed with sclerites, which form crown and points; and 2. a proximal part, the polyp stalk. A calyx is absent.

The Russian investigators Slepikova & Seravin (1983) studied the contraction and retraction of the polyps in *Gersemia fruticosa*. Their drawings give a good impression of this action; they are reproduced here (fig. 2). The extended polyp is cylindrical; the distalmost part (I) is usually wider than is shown in the figures. In fig. 2A the polyp wall is transparent; in the interior, pharynx and mesenteries are visible. Fig. 2B shows the same polyp with its sclerites. Part I shows some sclerites in the rachis of each tentacle (no. 1) and chevroned sclerites in the polyp wall just below the tentacles. These chevroned sclerites form the eight anthocodial points (no.2). In part II the sclerites are transversely placed; they form the crown (no.3). Parts I and II together form the anthocodia.

In part III the sclerites are small and irregularly disposed in longitudinal strips. This part can contract and retract into the undermost part IV, the coenenchyme. It is perfectly homologous with the introvert present in a polyp-with-a-calyx, and consequently it should be called introvert.

Utinomi (1961, figs. 1a, 1b) gave drawings of an extended and of a contracted polyp of the same species, *G. fruticosa*, referring to the proximal part as anthostele. In our opinion this terminology is incorrect, for the anthostele is the same as the calyx (see above), and in *G. fruticosa* a calyx is absent. Besides, it strikes us that in Utinomi's figures 1a and 1b the sclerites in the introvert are much larger than those represented by Slepikova & Seravin, but most of them are transversely arranged so contraction is possible.

In several genera, especially of the family Nephthidae (e.g. in *Dendronephthya* and in *Capnella*) the sclerites in the polyp stalk are numerous, large, and usually arranged in a longitudinal direction. Because of this, retraction and introversion is impossible and consequently the term introvert cannot be used. In these cases the common term polyp stalk will serve.



## SYSTEMATIC PART

## Family Alcyoniidae Lamouroux, 1812

**Diagnosis.** — More or less fleshy colonies, membranous or massive, bush-like or tree-like, in the last cases with a barren basal part, the stalk, and a distal part bearing anthocodiae, the polyparium. Sclerites small (usually less than 1 mm long but sometimes more), mostly spindle-shaped but occasionally with clubs. Polyps monomorphic or dimorphic, retractile.

## Key to the Genera

- 1(16) Polyps monomorphic.
- 2(3) Sclerites are stellate bodies similar to those of didemnid tunicates  
 ..... *Asterospicularia* Utinomi, 1951
- 3(2) Sclerites may include spindles, rods, capstans, double heads, and clubs, but never didemnid-like stellate bodies.
- 4(11) Colonies digitiform ("finger-like").
- 5(6) Vertically placed sclerites form a palisade around each polyp .....  
 ..... *Pieterfaurea* gen. nov.
- 6(5) No palisade of vertically placed sclerites surrounding polyps.
- 7(8) Sclerites in surface layer of colony are octoradiate capstans sometimes developing as double heads ..... *Eleutherobia* Pütter, 1900
- 8(7) Sclerites in surface layer of colony are spindles, needles, rods or clubs.
- 9(10) Sclerites are nearly smooth spindles with low, inconspicuous prickles, few, sparsely distributed in a firm, translucent, gelatinous mesogloea  
 ..... *Inflatocalyx* gen. nov.
- 10(9) Sclerites are warty spindles and/or clubs, abundantly distributed in the spiculiferous coenenchyme ..... *Bellonella* Gray, 1862
- 11(12) Colonies lobate; sclerites are spindles and octoradiate capstans  
 ..... *Alcyonium* Linnaeus, 1758
- 12(4) Colony mushroom-shaped, polyps large .....  
 ..... *Pseudoanthomastus* Tixier-Durivault & d'Hondt, 1974
- 13(11) Colonies massive, polyps small.
- 14(15) Colonies with distinct stalk, polyparium thrown into folds, lobes or digitate processes; sclerites are spindles and clubs .....  
 ..... *Sinularia* May, 1898
- 15(14) Colonies with short and inconspicuous stalk, polyparium thrown into

- numerous crowded, rounded or conical lobes; sclerites are double heads (dumb-bells, barrels) . . . . . *Cladiella* Gray, 1869
- 16(1) Polyps dimorphic.
- 17(18) Colonies composed of a single giant autozoid with numerous siphonozooids embedded in the thick coenenchymal wall; sclerites are octoradial capstans and thorny spindles . . . . . *Bathyalcyon* Versluys, 1906
- 18(19) Colonies composed of numerous smaller autozooids and accompanying siphonozooids.
- 19(20) Polyps situated on several digitiform lobes at the summit of a stalk into which the lobes can retract at least partially; sclerites are double stars and thorny rods or spindles; anthocodiae without sclerites . . . . . *Carotalcyon* Utinomi, 1952
- 20(17) Polyps situated on a capitulum incapable of retraction into the stalk.
- 21(24) Colonies capitate, mushroom-shaped.
- 22(23) Coenenchyme with numerous sclerites in the form of double stars and spiny rods; margin of the capitulum conspicuously overhanging the stalk; autozooids very large; stalk not covered by horny cuticle . . . . . *Anthomastus* Verrill, 1878
- 23(22) Sclerites completely lacking; margin of capitulum not overhanging stalk; autozooids of moderate size; stalk covered by horny cuticle often overgrown by smaller sessile epizoa . . . . . *Malacacanthus* J. S. Thomson, 1910
- 24(27) Colonies digitiform, of small to moderate size, with short stalk and tall, tapered polyparium; anthocodiae without sclerites.
- 25(26) Sclerites are capstans, no clubs . . . . . *Minabea* Utinomi, 1957
- 26(25) Sclerites include numerous stout thorn-clubs. *Acrophytum* Hickson, 1900
- 27(21) Colonies massive, reaching large size.
- 28(29) Colonies with a broadly flared, discoidal capitulum often thrown into deep marginal folds, surmounting a strong but narrower stalk; coenenchymal sclerites are small clubs and strong spindles with irregularly disposed tubercles; polyps commonly with weak armature composed of scattered rods often set *en chevron*, sometimes completely unarmed . . . . . *Sarcophyton* Lesson, 1834
- 29(28) Colonies with polypiferous upper surface thrown into numerous, often crowded folds or lobes that vary from low and hemispherical to digitiform; stalk wide, short, and often inconspicuous; coenenchymal sclerites are blunt, barrel-like rods with tubercles mostly arranged in transverse girdles; polyps either completely unarmed or, in a few

cases, with weak armature of small rods set *en chevron* .....  
 ..... *Lobophytum* von Marenzeller, 1886

Genus **Bellonella** Gray, 1862

*Bellonella* Gray, 1862:35. [Type species, *Bellonella granulata* Gray, 1862, by monotypy.]  
*Cereopsis* Saville Kent, 1870:398. [Type species, *Cereopsis bocagei* Saville Kent, 1870, by monotypy.]  
 Not *Cereopsis* Latham, 1801 (Aves).  
 Not *Cereopsis* Dejean, 1836 (Insecta).  
*Cereopsida* Strand, 1928:32. [Replacement name for *Cereopsis* Saville Kent, 1870, preoccupied.]  
*Acyonium* (part); Deichmann 1936: 48.  
*Nidalia* (part); Auctt., non Gray, 1839.  
*Metacyonium* Pfeffer, 1888:49. [Type species, *Metacyonium capitatum* Pfeffer, 1888, by subsequent designation: Utinomi, 1964:7.]

Diagnosis. — Alcyoniidae with usually unbranched, finger-like, conical or whipshaped polyparium, sometimes laterally flattened. Polyps monomorphic; anthocodiae retractile within firm calyces. Sclerites in outer layer of calyces and polyparium are spindles and/or clubs not longer than about 0.15 mm.

Key to the species

- 1(5) In calyx wall thorn clubs are numerous, often predominant.
- 2(3) Polyparium cone-shaped; calyces project obliquely upward; anthocodial crown 5-7 rows deep; introvert with many spindles 0.08-0.12 mm long ..... *B. bocagei* (Saville Kent)
- 3(4) Polyparium cylindrical; calyces dome-shaped, less than 0.5 mm high; anthocodial crown 3 rows deep; introvert without sclerites .....  
 ..... *B. conspicua* Tixier-Durivault
- 4(3) Polyparium short, dome-shaped; stalk proportionally long, cylindrical; anthocodial crown 10-15 rows deep; introvert with few small spindles 0.10-0.20 mm long ..... *B. granulata* Gray
- 5(1) Calyx wall with spindles and rods.
- 6(7) Colony squarish, inverted ovoid or pear-shaped, stalk short; anthocodial sclerites arranged *en chevron*, crown absent .....  
 ..... *B. capitata* (Pfeffer)

- 7(8) Colony whip-shaped, tapering to a sharp point; anthocodial crown 10-15 rows deep, points with 6-9 pairs of sclerites *en chevron*; introvert with few tiny spindles . . . . . *B. petila* spec. nov.
- 8(11) Colony narrow and slender but not tapering to a sharp point.
- 9(10) Expanded polyps usually 8 mm high including calyces; introvert 3-4 mm long; calyx and surface layer of stalk with pointed spindles . . . . . *B. epedana* spec. nov.
- 10(9) Polyps short, introvert short, containing numerous small spindles 0.04-0.07 mm long, each with two median girdles of thorns; calyx and surface layer of stalk with spindles having long, pointed ends . . . . . *B. molokaiensis* spec. nov.
- 11(8) Colony finger-shaped or conical.
- 12(13) Anthocodial crown hardly distinguishable; introvert devoid of sclerites except in its basalmost part . . . . . *B. clavata* (Pfeffer)
- 13(14) Anthocodial sclerites densely and longitudinally placed, crown and point hardly distinguishable; introvert with numerous spiny spindles . . . . . *B. cinerea* (Tixier-Durivault & d'Hondt)
- 14(13) Anthocodial crown distinct, 5-10 rows deep; introvert with few rods . . . . . *B. rubistella* (Deichmann)

? *variabilis* - see p. 25.

***Bellonella bocagei* (Saville Kent, 1870)**

(figs. 3a-c, 4a-c, 5a-b, 6)

*Cereopsis bocagei* Saville Kent, 1870:398-399, pl.21 figs. 5-13.

*Bellonella bocagei*; Wright & Studer, 1889:241-242, pl.37 fig.2, pl.42 fig.7. — Pütter, 1900:445-446. — Utinomi, 1958:107-110, figs. 5, 6. — Tixier-Durivault & d'Hondt, 1975:1389.

*Nidalia bocagei*; Kükenthal, 1906a:36.

*Alcyonium bocagei*; Molander, 1915:35-36. — Deichmann, 1936:51.

*Cereopsida bocagei*; Strand, 1928:32. — Bayer, 1956:F188.

*Bellonella madseni* Tixier-Durivault, 1961:243-245, figs. 7-9.

?*Nidalia atlantica* Studer, 1878:635, pl.1 figs. 5a-c.

Material. — Ghana: off Eviano, depth 40m; ORSTOM, SMF 4944, one specimen. Gold Coast: 4°40'N, 2°8'W, depth 50 m, 24 May 1956; R/V Calypso, Sta. 24; MNHN, one specimen, type of *B. madseni* Tixier-Durivault. South Atlantic Cruise, Sta. 10; MNHN, three specimens; Sta. 193; MNHN, one branched specimen. Portugal: mouth of Sado River, Setubal; 15 fathoms (=27 m); purchased by Mr. Beale; BMNH 1872.2.3.121, syntype. The colony is broken in two; the basal part is still attached to the shell of a species of *Cardium*. The total height was about 20 mm. The colour is white but the few polyps are red. The colony is too small to be investigated in detail.

Description of the specimen from Ghana. — The height of the colony is 25 mm (fig.4a). It is attached to a stony substratum by a membranously expanding holdfast. The stalk is 7 mm wide, the length is 10 mm.

The polyparium tapers distally. The calyces project obliquely upwards. At the outside their length varies from 0.80 to more than 2 mm; at the base the width is about 1.70 mm. Some of the anthocodiae are totally retracted within the calyces, but others project above the edge of the calyx, being 1.10 mm long and 0.80 to 0.90 mm wide. The armature consists of crown and points (fig.5a, b). The crown is composed of five to seven rows of curved rods, 0.40 mm long. Each point consists of two rows of chevroned spicules, about ten in a row; their length is up to 0.55 mm (fig.6i, j). A few sclerites are clavate, their heads consisting of spines directed upwards.

In the proximal part of a tentacle the rachis has more or less clavate sclerites 0.12 to 0.25 mm long. More distally the sclerites are shorter, up to 0.20 mm; they are more flattened, with rounded prominences on the edges. On each side of the rachis there is a row of remarkable sclerites; they consist of two parts: a flat one with scalloped edge and a narrow, smooth, usually curved point. These points are bent outward in the direction of the pinnules. Smaller sclerites are without the flat part. In the introvert there are many spindles 0.08 to 0.12 mm long.

Each calyx consists of two layers. The outer one contains thorn-clubs 0.08 to 0.16 mm long (fig.6a, f) and some spindles. In the surface layer of the polyparium between the calyces the same kind of clubs are found. The inner layer of the calyx has slender rods, covered with blunt thorns; they reach 0.45 mm in length (fig.6g, h).

The surface layer of the stalk is provided with small rods and ovals 0.08 to 0.11 mm long (fig.6k-n). The interior of the stalk contains longer and wider, more or less fusiform or irregular, warty sclerites up to 0.28 mm long (fig.6o-r).

Colour. — The crown-and-point sclerites and those in the distal part of the tentacles and the calyces are red; all the other sclerites are colourless.

Remarks. — Although we have not seen the type specimen, in our opinion it is by no means certain that *Nidalia atlantica* Studer, 1878, can be identified with *B. bocagei* as Kükenthal (1906a:36) did. Doubts are raised especially by Studer's description of the cylindrical "Kelche" (= anthocodiae, his pl.1 fig.5b), the length of these "Kelche" (5 mm), the length of the sclerites in these "Kelche" (up to 1 mm) and the presence of fusiform, longitudinally arranged, spiny spicules in the stalk.

Geographical distribution. — West coast of Africa, Portugal, Azores.

**Bellonella capitata** (Pfeffer, 1889)  
(figs. 3d-f; 5c; 7)

*Metalcyonium capitatum* Pfeffer, 1889: 50-51. — May, 1899:8.

*Alcyonium (Metalcyonium) capitatum*; Kükenthal, 1906a: 46-47.

Material. — South Georgia, Polar Committee, leg. v.d. Steinen; ZMH C2453, several colonies ("Types").

Preliminary notes. — Each colony consists of a capitulum and a stalk, which merge into each other without a distinct boundary. In most cases the stalk is broad and short, sometimes measuring half the height of the colony. The capitulum, which is usually slightly flattened laterally, has a round or roughly square, sometimes oval shape (fig.3d-f). The smallest colony has a height of 18 mm, a width of 20 mm and a thickness of 12 mm. The dimensions of the largest colony are 45, 45 and 25 mm respectively (fig.3e).

We designate the medium-sized colony represented in fig.3a as the lectotype. The biggest colony is softer, possibly owing to initial preservation in formalin.

Description of the lectotype. — The colony is 30 mm high and 25 mm wide; it is inverted pear shaped and somewhat flattened laterally. The stalk is very short. Some polyps are expanded, others retracted within the calyces. The anthocodiae proper (i.e., without introvert) are 1.50 mm long, armed with numerous rods and spindles 0.12 to 0.27 mm long. A crown is absent; in the proximal part of the armature the sclerites are arranged *en chevron*. A striking feature is the width of this part (fig.5c). In the comparatively short points the sclerites are longitudinally arranged; between the points there are a few intermediate sclerites.

The rachis of the tentacles is filled with numerous transversely placed, flat sclerites, usually 0.10 to 0.12 mm long. There are about twelve short, cylindrical, blunt pinnules on each side of the tentacles.

The introvert is up to about 3.50 mm long. It is entirely devoid of sclerites, except in the basalmost part, where some of the sclerites resemble those in the surface layer of the polyparium.

The crowded calyces are 1.00 to 1.50 mm high, conical when the anthocodiae are retracted. The wall has eight grooves, which end at the eight-lobed margin. If the anthocodiae are extended, the calyces are cylindrical and 2.50 mm in diameter.

The calyx wall and surface layer of the capitulum contain numerous rods, spindles and needles. The shorter rods and spindles, which are about 0.12 to

0.22 mm long, are closely covered with small, stalked warts and high, truncated spines often with swollen tips (fig. 7a-f). Longer rods, 0.25 mm on the average, have less closely placed processes. Still longer sclerites, almost needle-shaped and up to 0.35 mm long, are ornamented with few, often conical processes.

The surface layer of the stalk is provided with shorter spindles and rods, 0.10-0.19 mm long (fig. 7g-j). In the interior of the stalk, the sclerites are up to 0.40 mm long (fig. 7k-o).

Colour. — Dirty white to brown in alcohol.

Variation. — The shape of the colonies has been discussed above. In the various colonies, the polyps show different degrees of contraction and retraction. The longest anthocodiae (excluding calyx and tentacles) measure 5 to 6 mm in length; the tentacles are up to about 1.75 or 2.00 mm long. In fig. 5c the anthocodia is rather contracted, hence the apparent great width. In polyps less contracted, the anthocodial armature is longer and narrower, and the sclerites are less closely placed.

Remarks. — In nearly all respects, this species agrees with *B. clavata*. The shape and armature of the polyps, the absence of a crown, the sclerites with their remarkably high processes, the shortness of the stalk, all point to a close relationship of the two species. The only difference is the shape of polyparium: colonies of *B. clavata* are digitiform, whereas those of *B. capitata* are rounded, more or less spheroidal or squarish.

Geographical distribution. — South Georgia.

### ***Bellonella cinerea* (Tixier-Durivault & d'Hondt, 1974)**

(figs. 4g, 8)

*Nidalia cinerea* Tixier-Durivault & d'Hondt, 1974:256-258, figs. 5-7.

Not *Bellonella cinerea* Brundin, 1896:8, pl.1 fig.3, pl.2 fig.3. [= *Eleutherobia rubra* Brundin, 1896].

Material. — North of Nosy Bé, NW coast of Madagascar, 12°41.3'S., 48°16'E., depth 308-314 m, 15 april 1971; A. Crosnier, collector; MNHN, one colony, holotype.

Description. — The calyces are 2 mm wide; on the adcauline side they are 0.90 mm high. The retracted anthocodiae are oval, less than 2 mm in length, and about 1 mm wide (the dimensions as given by Tixier-Durivault & d'Hondt cannot be correct). The anthocodial wall is very densely filled with longitudinally placed spiny spindles, up to about 0.25 or 0.30 mm long; it is

difficult, in fact impossible, to distinguish eight points. The crown, too, merges with the points without any distinct boundary. Several rows of spiny spindles are present, but the exact number is difficult to establish; five or six rows may be correct, but it also is possible to count as many as ten rows. The introvert contains numerous spiny spindles, 0.08 to 0.18 mm long.

The colony is very well depicted by Tixier-Durivault & d'Hondt (1974: fig.5). The enlargement is  $\times 3.5$ ; our fig.4g shows the colony at natural size. It is not "subcylindrique" but conical and flattened laterally. The maximal diameters are 11 and 7 mm; the length is 35 mm. The holdfast is attached to a small piece of shell.

The coenenchymal sclerites are distinctly figured by Tixier-Durivault & d'Hondt in their figures 6 and 7; unfortunately the enlargement is not given. Our fig.8 presents SEM micrographs for comparison.

Geographical distribution. — Nosy Bé, NW coast of Madagascar.

**Bellonella clavata** (Pfeffer, 1889)  
(figs. 4e-f, 5d, 9)

*Metalcyonium clavatum* Pfeffer, 1889:49-50. — May, 1899:8, fig.2.

Not *Metalcyonium clavatum*; J. S. Thomson, 1910:556-559, pl.1 fig.7, pl.2 fig.9, pl.3 fig.17, 19, pl.4 figs. 35-37.

*Alcyonium (Metalcyonium) clavatum*: Kükenthal, 1906a: 45-46.

*Alcyonium clavatum*: Molander, 1929:52, pl.4 fig.9.

Not *Alcyonium clavatum* Studer, 1891: 90-91; 1901: 23, pl.2 figs. 1-4. — Deichmann, 1936:51. — Utinomi, 1964:3-7, figs.1-3, pl.1 fig.1. — Tixier-Durivault & d'Hondt, 1975:1381.

Material. — South Georgia, Polar Commission, leg. v.d. Steinen; ZMH C2452, several colonies.

Description. — The largest colony is here selected as the lectotype (fig.4f). It already has been described by Kükenthal (1906a), but a few additions are necessary.

Each polyp consists of an anthocodia with tentacles, and an introvert. The anthocodiae are 1.10 to 1.40 mm in length and 1.00 to 1.20 mm in width. They are armed with eight points; in the interstices between these are some intermediates (fig.5d). The sclerites of the points are thin, sparingly thorned needles and spindles up to about 0.40 mm long and only 0.03 to 0.04 mm wide. They are numerous and crowded. Usually a crown is absent, but sometimes the lowermost sclerites are arranged transversely, forming an indistinct crown, two to five rows deep. In the tentacles sclerites are absent except in the most



proximal part; here there are some rods and flat sclerites, more or less transversely disposed; their length is up to 0.20 mm.

The introvert, up to 3.40 mm long, has no sclerites, but in the most basal part there are a few spindles, 0.7 to 0.17 mm long.

In consequence of the scarcity of sclerites the calyces are soft. The height varies from 1 to 3 mm, and the basal diameter is 2.25 mm on an average. We do not agree with Kükenthal (1906a:45) in that the calyces may be completely retracted locally into the coenenchyme, as in *Alcyonium*. On closer investigation of all specimens it was found that some calyces are compressed but not contracted and retracted.

The calyces and the surface layer of polyparium and stalk contain narrow, straight or slightly bent rods. They may reach a length of 0.40 mm. The ornamentation consists of typical, stumpy, truncated processes (fig.9a-f).

In the interior of the colony the same kind of sclerites are found and, in addition to these, slender rods and spindles, up to 0.44 mm long, bearing more coneshaped processes (fig.9g-l). Both in the surface layer and in the interior the sclerites are few in number, but May (1899:8) is wrong in saying the spicules are absent in the interior of the coenenchyme.

Remarks. — J. S. Thomson (1910:556) wrongly identified four colonies from the coast of Natal, South Africa, as *M. clavatum* Pfeffer. A glance at Thomson's figs. 35-37 is sufficient to reveal that his colonies cannot be referred to this species; especially the small, capstan-like sclerites are lacking in Pfeffer's type material studied by us. We refer Thomson's *M. clavatum* to *Eleutherobia studeri* (J. S. Thomson), see p. 41.

Utinomi's (1964) specimen cannot be referred to *B. clavata* (Pfeffer) either. The shape of the colonies (his fig.1a, b), the shape and the arrangement of the anthocodial sclerites (his fig.2b) and the form and dimensions of the coenenchymal sclerites (his fig.3) differ from those in *B. clavata* (Pfeffer).

It is a pity that Studer (1891, 1901) gave the same specific name "*clavatum*" to another, closely related but different species, viz. *Alcyonium clavatum*.

Pfeffer (1889:49) begins the description of his new genus *Metalcyonium* as follows: "Polypenstock eine Keule von nicht bilateralem Bau", so the colony should be club shaped. A few lines further down he speaks of "gestreckte Keule" (= elongated club). But the colonies of *B. clavata* are in no way club-shaped; they are digitiform, just as Molander (1929, pl.4 fig.9) correctly figured them and as our fig.4e, f shows. In fact, the specific name *clavata* is inappropriate. Furthermore Molander (1929: 52) remarked that the colonies examined by him often have clearly formed lobes, so they may be branched. The same phenomenon is observed in other species of *Bellonella*.

Geographical distribution. — South Georgia, Falkland Islands.

**Bellonella conspicua** Tixier-Durivault, 1961  
(figs. 5e, 10)

*Bellonella conspicua* Tixier-Durivault, 1961:241-243, figs. 4-6.

Material. — Senegambia, 12°55.5'N, 17°33'W, depth 65-75 m, 16 May 1956; R/V Calypso, Sta. 4; MNHN, one colony, the holotype.

Description. — The cylindrical colony was figured by Tixier-Durivault (1961:fig.4a). It is also represented in our fig. 10a. Our observations differ but little from Tixier-Durivault's. All anthocodiac are retracted within the hemispherical calyces, 0.50 to 0.60 mm in height and 0.70 to 0.90 mm in width. The crown consists of spindles disposed horizontally in about six to eight tiers. In each point the thorny spindles and rods are arranged in converging groups of six to eight pairs. In the introvert there are no sclerites.

The calyces are very low and dome shaped; a common interval between the centers is 1 mm. Their basal part is red, just as the surface between the calyces, but distally they are white. These white spots are a striking character of the species. This difference in colour is due to the sclerites.

The outermost layer of the calyces and the surface layer of the polyparium contain mainly clubs, usually 0.10 to 0.15 mm long, rarely longer. The heads consist of spines directed upwards (fig.10b-f). In the inner layer there are slender rods and spindles, up to 0.23 mm long and covered with thorns (fig.10 g, h).

In the surface layer of the white stalk there are small clubs, 0.08 to 0.10 mm long, and larger, more or less spindle-shaped bodies, 0.10 to 0.18 mm long, with two or three, often indistinct, girdles of prominences. The larger sclerites dominate and the clubs are fewer in number (fig.10i-k). The interior of the stalk is filled with larger, fusiform or irregularly shaped sclerites 0.16 to 0.28 mm long (fig.10l-o).

Geographical distribution. — Senegambia.

**Bellonella epedana** spec. nov.  
(figs. 4d, 5f, g, 11)

Material. — Philippines: Marinduque I., off Tayabas Light (outer), N.43°W., 6 miles: 13°49' 40''N, 121°40'15''E, depth 83 fms (= 154 m); USFC Steamer Albatross Sta. D-5371, 24 February 1909; USNM 60446, one colony, the holotype.

Description. — The slender colony measures 165 mm in height. At the base the width is only 6 to 8 mm. The surface is deeply grooved.

The polyps are far apart and expanded; their total height is about 8 mm. The calyx is thin-walled, 2 mm in height. It is packed with sclerites: slender, thorny rods commonly 0.09 to 0.12 mm long, but longer rods and spindles, up to 0.30 mm long, also occur. The introvert, 3 to 4 mm long, is filled with the same kind of sclerites, but here they lie criss-cross. Distally the sclerites of the introvert merge with those of the crown; without a distinct boundary, so the number of rows of crown spicules cannot be determined; an estimate of six to ten transverse rows of curved spindles may be correct. The anthocodial points consist of many spindles and needles arranged en chevron proximally, becoming longitudinal distally. The length of the spicules in crown and points is up to 0.50 mm.

The tentacles are armed with small, spiny spindles. Proximally they are larger and chevroned. A more detailed description is impossible because the tentacles are closely intertwined.

The polyparium and the barren stalk consist of a thin outermost coenenchyme surrounding wide canals separated by membranous canal walls. In consequence of this insubstantial structure, the canals are compressed and the surface of stem and stalk is deeply grooved. The outer layer of the polyparium contains small, spiny rods, mainly 0.12 to 0.16 mm long, together with some larger spicules, rarely longer than 0.50 mm; they are 0.04 to 0.07 mm wide (fig. 11a-h). In the canal walls of the polyparium the small rods are absent; there are only narrow spindles, up to about 0.50 mm long.

In the stalk the sclerites are as long as those in the polyparium, but they are much wider (fig. 11i-t).

Colour. — In alcohol the whole colony is dirty white.

Etymology. — Greek ἡπιδάριος, weak or infirm.

Remarks. — As a result of the insubstantial structure, the colony is weak and flaccid.

The species is characterized by the weakness of the colony, by the long, narrow sclerites in all parts of the colony and by the introvert, which is densely packed with sclerites.

Geographical distribution. — Philippines.

***Bellonella granulata* Gray, 1862**  
(figs. 12, 13)

*Bellonella granulata* Gray, 1862:35, 37, figure p. 34. — Pütter, 1900:445. — Utinomi, 1958a:106-107, fig. 4.

*Nidalia granulata*; Kükenthal, 1906a:34.

Not *Nidalia granulata*; Thomson & Dean 1931:35.

Material. — Australia: Bellona reefs, depth 17 fms (= 31 m); coll. Mr. Warwick; Gray's type specimen, BMNH 1935.8.16.1; two mounted slides with sclerites, from the same specimen, and four newly mounted slides.

Description. — On account of the inclined capitulum the height of the stalk is 12 mm on one side and 19 mm on the other (fig. 12). Just above the holdfast the width is 6 mm; upwards it widens. It is grooved longitudinally. The diameter of the capitulum is about 11 mm.

The polyps are partly or totally retracted within cylindrical calyces about 1.60 mm high and wide. The calyces have eight shallow furrows and their margins are eight lobed. Many of the anthocodiae protrude above the calyces; they are over 1 mm high, 1 mm wide proximally and 1.5 mm distally (fig. 13a).

The armature consists of slender, thorny needles, 0.30 to 0.40 mm long. The crown is about ten to fifteen rows deep, surmounted by eight points each consisting of ten to fifteen pairs of chevroned spicules. The introvert is 0.50 to 0.80 mm wide; it contains few, small, spiny spindles, transversely placed and 0.10 to 0.20 mm long. The tentacles are densely filled with transversely arranged sclerites; their size and shape could not be ascertained.

The calyces and the surface layer of the stalk contain thorn clubs and slender rods and spindles. The clubs (fig. 13b, d, e) are up to 0.28 mm long; the spindles may be longer, up to 0.35 mm (fig. 13c, f, g). In the interior of the stalk there are slender, spiny rods and spindles, up to 0.40 mm long (fig. 13h-m).

Colour. — In alcohol the colony is light grey.

Discussion. — Utinomi (1958:106) investigated only two mounted slides with sclerites of Gray's type specimen. The labels fixed on each of these slides read:

Slide A: "According to Kükenthal an *Erythropodium*? Schizoholotype, 1961.5.18.16 / S. J. Hickson coll. *Bellonella granulata* Gray, Type, P.Z.S. 1862, p. 35, N. Australia, 17 fms, anthostele"; in the corner of one of the labels is the number 48. We remark that: 1. We do not know where Kükenthal has written that Gray's specimen was an *Erythropodium*; 2. 1961.5.18.16 is the register number of the BMNH; 3. the labels have probably been written by Hickson; 4. P.Z.S. means Proceedings Zoological Society, and 5. the sclerites are from a calyx (= anthostele); they are clubs and slender spindles. They are represented in Utinomi's fig. 4b and in our fig. 12b-g.

Slide B. This slide also has two labels. They read: "1935.8.16.1 / purchd. of Mr. Warwick. *Bellonella granulata* Gray, Bellona reefs, figd. by Gray, P.Z.S. 1862, p. 34, L. [?] W.". The part of the colony from which these sclerites have been taken is not given. Utinomi (l.c) apparently thought the sclerites are from the polyps (see his fig.4A). We found, however, that they are from the interior of the stalk (see our fig.13h-m). The anthocodial sclerites are slender spindles,

pointed at both ends.

Remarks. — Gray's unique type specimen described above is too small to permit sampling the sclerites from the various parts of the colony for examination by SEM, so we are able to give only drawings.

The small specimen mentioned by Thomson & Dean (1931: 35) cannot be identified with *B. granulata*; see Utinomi, 1958:106-107.

Geographical distribution. — Bellona reef, off NW coast of Australia.

***Bellonella molokaiensis* spec. nov.**

(figs. 14a, b; 15)

Material. — Hawaiian Islands, SW of Molokai: 21°09.7'N., 157°24.9'W., depth 100 fms (= 183 m), NMFS R/V Thomas Cromwell sta. 25, 5 May 1968. USNM 57078, one specimen, holotype.

Description. — The small colony, which is attached to a horny gorgonian axis, is 45 mm in height; basally the width is 4 to 5 mm, distally 2 mm. A label with it reads: "unbranched, 4.5 cm tall, cut in two to examine canal system, canal-wall sclerites; KMM, June 1978" (fig. 14a, b).

On the thin, longitudinally grooved polyparium the calyces are irregularly distributed. In a longitudinal direction the centers of the calyces are 3.0 to 4.5 mm apart. They are more or less conical, 0.90 mm tall and 0.90 mm in diameter at the distal tip. The margin shows eight lobes.

All anthocodiae are retracted within the calyces. The armature consists of weakly thorned spindles less than 0.40 mm long. The crown is 15 rows deep; the spindles in the points radiate fan-shaped from eight places along the upper ridge of the crown. The introvert contains numerous small spindles with two girdles of low thorns; the length in 0.04 to 0.07 mm.

In the calyces and in the surface layer of the polyparium there are short, wide, warty spindles up to 0.42 mm long, covered with thorns and simple, high warts (fig. 15a-f). The surface layer of the stalk has warty spindles and irregularly shaped sclerites less than 0.27 mm long (fig. 15g, m). The interior of the stalk contains thin rods and spindles up to 0.50 mm long, having tiny thorns; the smaller spindles have higher prominences.

Colour. — Light brick red in alcohol.

Etymology. — Named for the island of Molokai in the Hawaiian Islands.

Remarks. — The colony has no spectacular characteristics. The fact that it was found in Hawaii is most remarkable, as this region is so poor in soft corals.

Geographical distribution. — Hawaiian Archipelago.

***Bellonella petila* spec. nov.**

(figs. 5i, j; 14c, 16)

**Material.** — Philippines, Sombrero Island: 13°52'22"N, 120°46'22"E, depth 118 fms (= 216 m), USFC Steamer Albatross, Sta.D-5117, 21 January 1908; two specimens, the longer one (USNM 57581) is the holotype; the smaller one is paratype (RMNH Coel. 17417). Philippines, Northern Mindanao: 8°45'30"N, 123°33'45"E, depth 169 fms (= 309 m), USFC Steamer Albatross, Sta. D-5517, 9 August 1909; USNM 49851, one colony, paratype; 8°48'N, 123°31'E, depth 200 fms (= 366 m); USFC Steamer Albatross, Sta.D-5518, 9 August 1909; USNM 49887, one colony, paratype. Philippines, Jolo I.: 6°02'55"N., 120°53'E., depth 200 fms (= 366 m), USFC Steamer Albatross, Sta.D-5173, 5 March 1908; USNM 57582, one colony, paratype.

**Description of the holotype.** — Fig. 14 represents the whip-shaped colony at natural size. The total length measures no less than 450 mm, of which the stalk occupies 30 mm. At the base the stalk is 20 mm wide, but the distal end of the polyparium is only 1.5 mm wide.

The calyces are directed upward, with 8-lobed margins, and arise from longitudinal ridges at irregular distances. At their base they are oval in shape,  $0.70 \times 0.40$  to  $0.80 \times 0.45$  mm in cross-section; the height is only 0.30 to 0.40 mm. The calyx wall is rather thick, containing the same kind of sclerites as those in the polyparium.

The wholly retracted anthocodiae are yellowish, oval bodies about 1 mm high and 1 mm in maximum diameter. The anthocodial crown consists of ten to fifteen tiers of transverse spindles. The surmounting eight points are composed at their base of six to nine pairs of chevroned spindles ornamented with small spines; distally the spindles assume a longitudinal arrangement. The length of the spindles is 0.30 to 0.45 mm. They bear tiny spines.

Immediately below the crown the introvert contains some tiny spindles 0.07 to 0.10 mm long; more proximally the introvert seems to be devoid of sclerites. The aboral sides of the tentacles are armed with spiny spindles set *en chevron*; the proximal ones are about 0.25 mm long on the average, diminishing distally to 0.08 to 0.12 mm.

The sclerites in the surface layer of the polyparium are narrow, pointed needles and spindles up to 0.50 mm long (fig.16a-f). In the interior of the polyparium the spindles are narrower and up to 0.55 mm long (fig.16g-j).

The sclerites in the coenenehyme of the stalk are of two types: oval bodies 0.10-0.22 mm long, and wide, pointed spindles up to 0.40 mm long (fig. 16k-u). Both types have the same low, rounded or wart-like prominences often arranged in girdles.

**Colour.** — Polyparium and stalk are dirty white, the margin of the calyces is pinkish.

**Variation.** — The paratype and the other specimens mentioned above show

all the same characteristics; the colonies are long and slender and the calyces are low and arise from longitudinal ridges; the colour, too, is the same.

Etymology. — Latin *petilus*, thin or slender, in reference to the strikingly tall, slender shape of the colony.

Geographical distribution. — Philippines.

**Bellonella rubistella** (Deichmann, 1936)

*Alcyonium rubistella* Deichmann, 1936:49-50, pl.1 fig.2, pl.3 figs. 1-7.

*Bellonella rubistella*; Verseveldt, 1978a:42-45, figs. 1, 2, pl. 1.

For a description the reader is referred to Verseveldt (1978a).

Geographical distribution. — West Indian region: Lesser Antilles, the Caribbean coast of South America, and southward to Suriname.

**Bellonella variabilis** (Studer, 1891)

(fig. 17)

*Not in Key!*

*Rhodophyton variabile* Studer, 1891:89.

*Bellonella variabilis*; Studer, 1901:25, 26, pl. 2 figs. 5-9, pl. 10 figs. 4-6.

*Nidalia variabilis* = *Gersemia variabilis*; Kükenthal, 1906a:37; 1906b: 59.

*Gersemia variabilis*; J. A. Thomson, 1927:13, pl.4 fig. 9. — Pax & Müller, 1954:19, 20.

*Alcyonium clavatum* Studer, 1891:90; 1901:23, 24, pl. 2 figs. 1-4. — Deichmann, 1936: 5. — Tixier-Durivault & d'Hondt, 1974:1381.

Not *Alcyonium clavatum*; Kükenthal, 1906a:45. — Molander, 1929:52, pl.4 fig. 9. — Utinomi, 1964:3-7, figs. 1-3.

Material. — All specimens were collected at various stations by "l'Hirondelle" and are preserved in the Monaco Museum. North coast of Spain, Sta.57, 43°44'30"N., 6°12'15"W., depth 240 m; three specimens; Sta.58, depth 134 m; several specimens, the largest ones about 25 mm high, most of them ramified. Azores, east of Pico, Sta.247, depth 318 m; several small colonies and fragments. Azores, Sta. 866, depth 599 m; one unbranched colony 13 mm high. Near Monaco, Sta. 633, depth 69 m; 12 May 1896; only a holdfast is present.

Description. — Two of the specimens collected at Sta.57 have been figured by Studer, 1901, pl.2 figs. 6 and 7; the enlargement is upwards of  $\times 2.5$ . The specimen represented in Studer's fig. 7 is 27 mm tall. At half the height it has a short outgrowth, perhaps a rudimentary branch. We designate this specimen as the lectotype. All other colonies are paralectotypes.

For a detailed description the reader is referred to Studer (1901), but a few remarks may be made here. A striking feature is the shape of the closely set

calyces: their adcauline side is completely fused with the polyparium. The anthocodiae are retracted within the calyces. The anthocodial wall contains numerous thorny spindles about 0.40 mm long, densely arranged *en chevron*.

In the calyx wall, thorn clubs predominate; they are up to 0.22 mm long (fig. 17a-h; see also Studer's pl.22 fig.9, the two spiny clubs to the left below). They are conspicuous because of their high, pointed prominences. In addition to these clubs, the calyx wall contains some slender, thorny spindles up to 0.40 mm long (fig. 17i, j; Studer's pl.2 fig.9, the two slender spindles to the left above). They presumably occur mainly in the inner layer of the calyx.

The stalk contains rods and spindles up to 0.20 mm long, in the interior up to 0.27 mm (fig. 17 k-q). Especially in the shorter sclerites (fig. 17k-m) the blunt prominences are arranged in girdles.

Variation. — In the conical paralectotype (Studer, 1901, pl.2, fig. 6) the calyces are more contracted; the diameter is about 2 mm. The third sample collected at Sta.57 (the label reads, among other data, 5 Août) consists of only two fragments, about 11 mm long and 4 mm wide. The sclerites are identical with those of the other specimens. The colour is dark grey, while in the lectotype and in all paralectotypes the colonies are light coral-red with white calyces.

Studer (1901:90) considered the small specimens from the Azores to be a new species, which he named *Alcyonium clavatum*. A re-examination of this material showed us that the specimens agree in all characters with those from the Bay of Biscay.

Discussion. — Studer (1891) originally described this species as *Rhodophyton variable*, but later (Studer, 1901) referred it to *Bellonella*. Kükenthal (1906a:37) and J. A. Thomson (1927:13) assigned it to *Gersemia* von Marenzeller, in the family Nephtheidae. It is, however, impossible to include the unbranched or scarcely branched colonies of *B. variabilis*, with their retractile polyps and distinct calyces, in the family Nephtheidae. The species is closely related to other species of *Bellonella* and consequently belongs to the Alcyoniidae.

Possibly von Marenzeller (1878:374) himself caused some confusion by writing in his diagnosis of *Gersemia*: "Zoanthodem aufrecht, ästig oder knollig, *univerästelt*" (italics ours). That means: the colonies are either branched or unbranched — both possibilities in a single genus!

This does not mean that colonies in *Bellonella* are never branched (see fig.3c). In the related genus *Eleutherobia* ramified forms also occur (see fig.17g, h). However, this branching is not tree-like, with numerous branches and even small twigs as is usual in Nephtheidae.

Geographical distribution. — Bay of Biscay; Mediterranean Sea; Azores.



Genus *Eleutherobia* Pütter, 1900

*Eleutherobia* Pütter, 1900:449. [Type species, *Eleutherobia japonica* Pütter, 1900, by monotypy.]

*Nidalia* (part): Auctt. non Gray, 1835.

*Bellonella* (part): Auctt. non Gray, 1862.

*Metalcyonium* (part); Auctt. non Pfeffer, 1883.

Diagnosis. — Alcyoniidae with cylindrical polyparium, rarely branched. Polyps monomorphic. Anthocodiae retractile within calyces. Sclerites of polyparium, calyces, and stalk are eight-radiates, capstans and other double heads, rarely tuberculate spheroids, all less than 0.15 mm in length or diameter; spindles and/or rods also present.

## Key to the species

- 1(23) Colony cylindrical or digitiform, polyparium sometimes divided into a few thick branches, never strongly flattened.
- 2(6) No armature in anthocodiae.
- 3(4) All parts of colony with tuberculate spheroids 0.05-0.08 mm in diameter . . . . . *E. rotifera* (J. S. Thomson).
- 4(5) Interior of polyparium and stalk with very small 8-radiates 0.03-0.04 mm long, ornamented with prominences having star-like heads; calyces with 8-radiates 0.05-0.06 mm long . . . *E. albiflora* (Utinomi).
- 5(4) Interior of colony with branched rods 0.12-0.18 mm long, together with other forms including spindles and capstans . . . . .  
. . . . . *E. grayi* (Thomson & Dean).
- 6(2) Anthocodiae with crown and points.
- 7(10) No spindle-like sclerites in stalk.
- 8(9) Double stars, 0.08-0.12 mm long, predominate in interior of stalk .  
. . . . . *E. flava* (Nutting).
- 9(8) Interior of stalk with capstans, barrels, rectangular forms and crosses, usually less than 0.15 mm long . . . . .  
. . . . . *E. sumbawaensis* spec. nov.
- 10(7) Sclerites in interior of stalk usually pointed, girdled spindles.
- 11(12) Interior of stalk with thin spindles and needles up to 0.35 mm long, with sparse girdled spines; introvert without sclerites . . . . .  
. . . . . *E. studeri* (J. S. Thomson).
- 12(15) Interior of stalk with warty, often girdled spindles, the warts joined in the wide middle part of the spindle; ends of spindles are sharp, nearly smooth points.

- 13(14) Anthocodiae bell-shaped; anthocodial points consists of 5-6 pairs of spindles; introvert with few spindles 0.10-0.35 mm long; calyces with double heads and double cones with distinct waist .....  
 ..... *E. dofleini* (Kükenthal).
- 14(13) Anthocodiae dome-shaped; anthocodial points consist of 2-3 pairs of wide spindles; introvert with many spindles 0.05-0.10 mm long; calyces with double heads and rectangular forms with very short waist .....  
 ..... *E. duriuscula* (Thomson & Dean).
- 15(18) Interior of stalk with warty spindles, the warts scattered over the whole sclerite, not concentrated in its middle part.
- 16(17) Calyces on abcauline side 1.20 mm high, cylindrical, 0.80-1.00 mm wide; anthocodial crown about 10 rows deep; sclerites of calyces 8-radiates 0.06-0.09 mm long, and spindles less than 0.48 mm long, with two girdles of higher prominences at midlength .....  
 ..... *E. somaliensis* spec. nov.
- 17(16) Calyces up to 4.5 mm tall; anthocodiae bulb-shaped, 2.10 mm tall and 1.90 mm wide; anthocodial crown 20 or more rows deep; calyces with many clubs up to 0.15 mm long .....  
 ..... *E. splendens* (Thomson & Dean).
- 18(19) Coenenchymal sclerites, especially those in the interior of the stalk, are branched spindles and other forms (see Bayer et al., 1983, Trilingual Glossary: fig. 151).
- 19(20) Introvert with many spindles 0.08-0.14 mm long; calyces 1.2 mm tall; anthocodial points consist of 8-10 pairs of spindles *en chevron*; crown 6-8 rows deep; interior of stalk with branched spindles up to 0.32 mm long, and numerous flattened, branched, double star-like sclerites 0.13-0.25 mm long .....  
 ..... *E. unicolor* (Kükenthal).
- 20(19) Introvert with no sclerites or only a few in the basal part.
- 21(22) Calyces 2-3 mm tall and wide, usually slightly swollen; introvert devoid of sclerites .....  
 ..... *E. rigida* (Pütter).
- 22(21) Calyces low, dome-shaped, less than 1 mm tall but 2 mm wide; introvert devoid of sclerites except the basalmost part where clubs up to 0.10 mm long are present .....  
 ..... *E. rubra* (Brundin).
- 23(1) Colony strongly flattened laterally, stalk short; polyps large, extending up to 11 mm beyond the eight-lobed edge of the calyx; introvert transparent owing to the sparseness of red sclerites .....  
 ..... *E. grandiflora* (Kükenthal).

***Eleutherobia albiflora* (Utinomi, 1957)**

*Bellonella albiflora* Utinomi, 1957a:159-161, fig.6, pl.10, fig.8. — Imahara, 1977:33-34, fig.2.

Material of this species was not available, but the descriptions by the above authors are sufficient to convey a good idea of its characteristics.

The absence of sclerites in the transparent white polyps and the presence of small capstans and 8-radiates in all parts of the coenenchyme are important.

In comparing the dimensions of the sclerites as shown in Utinomi's fig.6 and Imahara's fig. 2, a discrepancy immediately becomes evident. In a private letter, Imahara wrote that the enlargement of his drawings must be  $\times 500$  instead of  $\times 200$ . This clarification solves the problem.

***Eleutherobia dofleini* (Kükenthal, 1906)  
(figs. 19, 20)**

*Nidalia dofleini* Kükenthal, 1906a: 27, figs. 18-19, pl. 2 figs. 8-9; 1906b: 35. — Utinomi, 1954: 45, fig. 2.

*Bellonella dofleini*; Utinomi, 1957: 161-162, pl. 10 fig. 12; 1958c: 100; 1960: 5, pl. 1 figs. 3-4; 1962: 106 (listed only). — Utinomi & Harada, 1958: 388 (listed only).

Not *Nidalia dofleini*; Thomson & Dean, 1931: 34-35, pl. 5 fig. 5, pl. 25 fig. 5. [= *Eleutherobia sambawaensis* sp. nov. See p. 43.]

Material. — Japan: Sagami Bay, depth 150 m, leg. Doflein, 1906; MZW. 61. The lectotype.

Description of the lectotype. — The colony has been illustrated by Kükenthal (1906: pl. 2, fig. 8), enlarged slightly over three times. Our fig. 19a shows it at natural size. It is a small colony, only about 27 mm high. It is branched, like the specimens described by Utinomi (1954: 45). We designate this specimen as the lectotype.

Regarding the distribution of polyps, we refer to the illustrations given by Kükenthal (1906a) and Utinomi (1954). The calyces (Kükenthal's "Kelche" or "Polypenkelche") are rather distant. They are directed obliquely upward; on the abcauline side the height is 2 mm, and on the adcauline side 0.08 to 0.12 mm; the distal part, slightly swollen, is 1.80 mm wide.

When expanded, the anthocodiae are cup-shaped, widening toward the margin and thus more bell- or beaker-shaped (fig. 20a). The armature consists of a crown about 10 rows deep, and points each consisting of 5-6 pairs of curved spindles up to 0.60 mm long and 0.05 mm wide. Between the points there are two intermediates. The neck zone below the crown contains few spindles, 0.10 to 0.35 mm long, transversely placed.

The calyx walls contain warty ovals, capstans and capstan-like double heads 0.10-0.14 mm long, and double cones and spindles with a thick middle part and tapering, pointed ends; they measure up to 0.27 mm in length (fig. 19b-j, 20b-e). The majority have a median waist. The surface layer of the polyparium contains the same kind of sclerites.

In the surface layer of the stalk are small oval bodies and rectangular, warty sclerites 0.08-0.11 mm long (figs. 20f-h), double heads, double stars up to 0.16 mm long, and short, thick spindles up to 0.19 mm long, the larger ones usually with a median constriction.

In the interior of the stalk there are warty double heads, double cones and girdled spindles with a median waist; the latter are up to 0.24 mm long (fig. 19k, l, fig. 20i, j).

Colour. — Creamy in alcohol.

Remarks. — The specimens identified as *Nidalia dofleini* by Thomson & Dean (1931: 34-35) appear to belong to a new species, *E. sumbawaensis* (see p. 43).

Geographical distribution. — Japan.

***Eleutherobia duriuscula* (Thomson & Dean, 1931)**  
( figs. 18b, 21, 22c, d)

*Nidalia duriuscula* Thomson & Dean, 1931: 36, pl. 1 fig. 8, pl. 25 fig. 6.

Material. — Kei Islands, off Kur Island: 5°28.4'S, 132°0.2'E, 204 m; Siboga Expedition Sta. 251, 8 december 1899. ZMA Coel. 2974, one colony, the holotype. Molo Strait, Flores, 69-91 m; Siboga Expedition Sta. 51, 19 April 1899. ZMA Coel. 2974 (with the holotype). This small specimen was only tentatively included in the species, hence is ineligible for type status.

Description of the holotype. — The slightly curved, finger-shaped colony is 30 mm tall and 6-7 mm wide, including the calyces (fig. 18b). A distinct stalk is absent. The calyces are somewhat distant from one another; they are low, 0.70-0.90 mm high measured along the adcauline side. They are not club-shaped as Thomson & Dean's figure (1931: pl. 1, fig. 8) may suggest. Most anthocodiae are retracted within the calyces. The anthocodial crown is composed of 7-11 rows of curved spindles. Each anthocodial point consists of 2-4 pairs of rather straight, thick spindles, up to 0.40-0.50 mm long and 0.09 mm wide; they are covered with a few small thorns (fig. 22c). The introvert contains many small, spiny spindles 0.05-0.10 mm long.

The calyces and the surface layer of the polyparium contain tuberculate ovals and spheroids up to 0.19 mm in length or diameter and provided with a

usually short waist (fig. 21b, h). In addition to these, there are some more or less rectangular or capstan-like sclerites (fig. 21i, j). In the surface layer of the stalk there are capstans and rectangular forms about 0.15 mm long (fig. 21k, m). The majority of the sclerites in the thin, translucent canal walls consist of curious sclerites of which the shorter ones are oval, with a longer point at one end of the sclerite; they measure on the average 0.45 mm in length. The longer, more fusiform sclerites are up to 0.30 mm long, wide in the middle and tapering to a long, sharp point at each end (fig. 21n-p); the pointed ends have a few small prominences, but the wider median part bears warts often arranged in transverse zones.

Colour. — Grey in alcohol, the anthocodiae brownish red.

Variation. — Thomson & Dean's figure (1931: pl. 1, fig. 8) shows the small specimen from Sta. 51; it is only 8 mm in height.

Remarks. — As Thomson & Dean (1931: 36) mentioned, the sclerites of the outer layer of the colony "resemble those figured by Kükenthal [1906: text-figs. 18, 19] for *N. dofleini*" (= *Eleutherobia dofleini*). The remarkable pointed spindles in the interior of *E. dofleini* and *E. duriuscula* (our fig. 21s-w) have been recorded neither by Kükenthal nor by Thomson & Dean; Utinomi (1954: fig. 2j, k, m) gave a few, albeit indistinct, drawings of them, as they are found in *E. dofleini*.

Geographical distribution. — Indonesia.

***Eleutherobia flava* (Nutting, 1912)**  
(figs. 18d, 23, 33c)

*Bellonella flava* Nutting, 1912: 23, pl. 2 fig. 4, 4a; pl. 18 fig. 3.

Material. — Japan: Ose Zaki Light, N. 41°E. 5 miles, 95 fathoms (= 174 m), USFC steamer Albatross Sta. 4894, 9 August 1906. USNM 30089, one specimen, Nutting's holotype.

Description of the holotype. — The colony is shown at natural size in fig. 18d. The stalk is very short, about 5 mm high. The surface of the stalk and the narrow spaces between the calyces have thin longitudinal and transverse grooves producing a pattern of small squares. The calyces are low, dome-shaped, 2.10-2.50 mm in diameter at the base and 1.10 mm high; their margins are eight-lobed.

The small anthocodiae (fig. 33c), which are completely retracted within the calyces, are more or less dome-shaped; at the base they are 1.00-1.20 mm in diameter; the height is also 1.00-1.20 mm. The introvert contains numerous small spindles 0.06-0.08 mm long, with two whorls of spines at the middle. The

crown consists of about 10-12 rows of transversely placed spindles. It is superposed by eight points each consisting proximally of 10-12 pairs of spindles set closely *en chevron*; at first sight the spindles seem to radiate fan-wise; distally they are longitudinally arranged. The spindles of the crown and points, up to 0.40 mm long, are sculptured with small thorns. In the basal part of the tentacles the flat, curved sclerites are closely set *en chevron*. Their length is 0.15-0.20 mm, becoming smaller distally.

The walls of the calyces and the surface layer of the polyparium and stalk contain capstans, 8-radiates and dumb-bells, 0.06-0.10 mm long (fig. 23a-f). In addition to these there are, especially in the polyparium, narrow, pointed spindles up to 0.20 mm long, provided with two girdles of higher prominences (fig. 23g-i).

The thin canal walls of stem and stalk are armed with small, wide bodies 0.08-0.13 mm long, with two whorls of pointed prominences separated by a long waist, and at the ends a terminal point or small wart (fig. 23o, p, r, s). In addition, the interior of the polyparium contains some slender, pointed spindles, which also have two whorls of spines separated by a long waist (fig. 23n, q, t). In the interior of the stalk, typical spindles are practically absent.

Colour. — In alcohol the colony is grey; the sclerites of the anthocodiae are reddish brown.

Geographical distribution. — Japan.

### ***Eleutherobia grandiflora* (Kükenthal, 1906)**

*Nidalia grandiflora* Kükenthal, 1906b: 24-26, figs. 13, 14; pl. 1 figs. 6, 7.

*Bellonella grandiflora*: Utinomi, 1957a: 152-153, fig. 2; pl. 9 figs. 5, 6.

Remarks. — For a description of this species we refer to the authors cited above. In particular, Kükenthal's coloured illustrations (1906b: pl. 1 figs. 6, 7) are beautiful and informative.

According to Kükenthal (l.c.), the calyces contain numerous small clubs and 8-radiates 0.06 mm long. Utinomi (1957a: figs. 2b, c) gave more drawings of the sclerites from the calyces. Especially in his fig. 2b a few capstans and 8-radiates can be seen in addition to more spindle-shaped forms. Sometimes the latter are slightly wider at one end, as Kükenthal shows in his fig. 13, but they can scarcely be called real clubs. The main types of sclerites in the calyces are warty 8-radiates and spindles, ranging in length from 0.06 to 0.13 mm.

Geographical distribution. — Japan.

***Eleutherobia grayi* (Thomson & Dean, 1931)**  
(figs. 24, 25)

*Nidalia grayi* Thomson & Dean, 1931: 37, pl. 2 fig. 2.

Material. — Between Misool and Irian, New Guinea: 1°42.5' S, 130°47.5' E, 32 m, Siboga Expedition Sta. 164, 20 August 1899, ZMA Coel. 2976, one specimen, lectotype. Off western end of Sumbawa: 8°30' S, 119°7.5' E, 73 m, Siboga Expedition Sta. 310, 12 February 1900, ZMA Coel. 2976, one specimen, paralectotype (stored with the lectotype). Ryukyu Islands: Mifuga, Kume, 26°23.5' N., 126°45.5' E., depth 30 m, 21 April 1983; coll. Dr. Katherine Muzik, USNM 75589.

Description of the lectotype. — We here designate the syntype from Sta. 164 as lectotype. According to a label with the specimen, this colony is represented in Thomson & Dean's plate 2 fig. 2. It is not clear what happened to the specimen, for it is not at all like the figure. In our fig. 24a we give a drawing of it in its present condition. It is now strongly shrivelled, showing deep irregular furrows. Furthermore, in Thomson & Dean's illustration, the polyps are placed too close together and the colour is different; it is now light brown. The paralectotype is somewhat smaller, also shrivelled and its colour is light brown as well.

The small anthocodiae do not contain sclerites, as Thomson & Dean already ascertained.

As to the sclerites in the other parts of the colony, Thomson & Dean distinguished six types. Unfortunately, they neither illustrated these nor stated exactly in which parts of the colony they occur. They only mention: "The canal-walls show a large number of small spicules". From this one would infer that spicules are found only in the canal walls, but this is not so.

The outer layer of calyces and polyparium (the surface between the calyces) contains 8-radiates 0.06-0.08 mm long (figs. 24i-k, 25a-h). Other forms are (1) triradiates, 0.03-0.04 mm in diameter (fig. 24b, c); (2) quadriradiates of which the tubercles lie in one plane (i.e., crosses; fig. 24g) or with three tubercles in one plane and the fourth arising vertically from the center (fig. 24d-f); and (3) rods with some high processes (fig. 24n-p). In fig. 25a-h, sclerites from the calyx wall are also represented. In the surface layer of the stalk, the same kinds of sclerites are found, although they usually are slightly larger.

The interior of the colony contains Thomson & Dean's type 6: "irregularly branched, relatively smooth rodlets" (fig. 25i-r) reaching 0.18 mm in length.

Variation. — In the paralectotype, the irregularly branched rodlets just mentioned are scarce and smaller, but we agree with Thomson & Dean that "no systematic importance can be attached to the relative numbers of different types of spicule, especially when they are nearly related in their main structure".

The specimen collected by Dr. Muzik in the neighbourhood of Okinawa is a red, curved colony 45 mm high, 12 mm wide at the base, and tapering upwards. The calyces are so low, hardly 0.5 mm high, that the surface appears smooth. The polyps are from 1.70 to 2.60 mm apart. Their transparent anthocodiae extend for a distance of up to 3 mm beyond the surface. The tentacles may be short and curved, but usually they are extremely elongated, even thread-like, 2.50 mm long. On either side there is one row of 12 or 13 oblong pinnules. The sclerites closely resemble those of the lectotype. In the surface layer of the colony, the 8-radiates are the commonest sclerites, and in the interior the branched spindles predominate.

Geographical distribution. — Indonesian Archipelago; Ryukyu Islands.

### *Eleutherobia rigida* (Pütter, 1900)

(figs. 26, 27, 28)

*Bellonella rigida* Pütter, 1900: 448-449, pl. 29, fig. 1. — Utinomi, 1957: 156-157, pl. 10 fig. 9; 1960: 4-5, pl. 1, figs. 1, 2; 1962: 106 (listed only). — Utinomi & Harada, 1958: 388 (listed only). — Jun-Im Song, 1976: 53-54, pl. 1, figs. 10-17.

*Eleutherobia japonica* Pütter, 1900: 449-500, pl. 29, figs. 2, 11.

*Nidalia rigida*; Kükenthal, 1906a: 33; 1906b: 29-30. — Utinomi, 1954: 43-45, fig. 1.

*Nidalia pellucida* Kükenthal, 1906a: 35; 1906b: 27-29, figs. 20-22, pl. 2 fig. 10.

*Bellonella pellucida*; Utinomi, 1957: 157-159, fig. 5, pl. 10, fig. 7; 1962: 106 (listed only).

*Nidalia gracilis* Nutting, 1912: 22, pl. 3, fig. 3, 3a; pl. 18 fig. 2a-c. — Utinomi, 1957: 147 (no description).

Material. — Japan (?), ZMH C2456, one colony. We designate this specimen as the lectotype (fig. 26). Japan: Fukuura, Sagami Bay, 150 m, leg. Dr. Haberer, 1-2 March 1903. ZMW no. 4695, one colony; Okiko Jima N.31°E., 4 miles (label reads "Kagoshima Gulf"), 39 fath. (=71 m), U.S.F.C. steamer Albatross Sta. 4946, 20 August 1906, USNM 30101, two (of seven) syntypes of *Nidalia gracilis* Nutting; Diakoku Saki, N.63°W. 4.25 miles, 25-27 fath. (=45-49), USFC steamer Albatross Sta. 3768, 5 June 1900, nine specimens, 7 USNM 76996, 2 RMNH Coel. 17435; Kinkwansen Light, Honshu, N.81°W. 5.4 miles, 81 fath. (=146 m), USFC steamer Albatross Sta. 3774, 5 June 1900, eight specimens, 7 USNM 76997, 1 RMNH Coel. 17436; Noma Saki, N.18°E., 8.8 miles, 13 fathoms (=24 m), USFC steamer Albatross Sta. 3725, 15 May 1900, USNM 49817, one small colony; Japan, leg. Drasche, NHMW 2342, three specimens.

Description of the lectotype. — The colony has a total height of about 90 mm. The grooved stalk is 10-15 mm long; its holdfast is oblique and membranously expanded. The polyparium is bent and hook-shaped, widest a little below the middle where it measures 11 mm including the calyces (fig. 26).

The crowded calyces are 1.60 to 2.00 mm wide and 2 mm high. Their outer surface sometimes shows a few longitudinal furrows, and the margin is eight lobed (fig. 27c).

The anthocodiae may be completely retracted within the calyces or more or



less extended, in which case the total length of introvert, anthocodia and the partly extended tentacles may be as much as 4 mm, of which 2.20 mm is occupied by the introvert. The anthocodiae proper are 1.00-1.20 mm long and 0.80-1.00 wide. They are armed with needles up to 0.50 mm long and 0.03 mm wide bearing inconspicuous thorns. Occasionally the basalmost needles lie transversely, forming a crown about 6 rows deep (fig. 27b), but sometimes all are arranged *en chevron* so a crown is not formed (fig. 27a).

The spiculation of stem and stalk agrees well with the descriptions and figures given by Pütter (1900), Kükenthal (1906) and Utinomi (1957, 1960). As in other species of *Eleutherobia*, the thin calyx wall consists of two layers having different kinds of sclerites. The outermost layer (and the outermost layer of polyparium and stalk) contains 8-radiates and girdled spindles 0.06-0.11 mm long (fig. 28a-e, h-j). The layer just beneath it (and also the interior of the polyparium) has spiny spindles up to 0.34 mm long; some are slender, others wider (fig. 28f, g). In addition to these sclerites, the interior of the stalk contains branched spindles, irregular in shape, with high, often bilobed prominences; they are up to 0.40 mm long (fig. 28k, l).

Colour. — Grey in alcohol; the anthocodial sclerites light red.

Remarks. — Pütter (1900: 449) correctly observed that *E. rigida* is related to *E. rubra* (*E. cinerea* has been synonymized with *E. rubra*) but, as Pütter found, the calyces are different: in *E. rubra* they are low and dome-shaped, but in *E. rigida* they are taller and wider, with a thin flabby wall, and appear to be inflated. The sclerites in the stalk are also different.

Variation. — There is a close resemblance to *Nidalia pellucida* Kükenthal, 1906, to such a degree that we decided to synonymize it with *E. rigida*. The most important difference is the distribution of the calyces, closer together in *E. rigida* than in *E. pellucida*. But, in the material at our disposal, it is impossible to decide to which of these species a given specimen belongs in respect to the distribution of calyces; intermediate forms are common, and the degree of contraction of colony and calyces also plays a part.

In the U.S. National Museum of Natural History there are several colonies labelled "*Bellonella* sp.", which we assign to *E. rigida*. The same is true for the specimens from Kagoshima Gulf, Japan (USNM 30101), which were described as *Nidalia gracilis* Nutting, 1912; however, that species, like *N. pellucida*, also must be synonymized with *E. rigida*.

A striking feature in most colonies examined is the uniformity of colour. In practically all specimens the stalk is white, the polyparium and calyces pink with white margins; the anthocodial needles are pink as well.

Geographical distribution. — Japan.

***Eleutherohia rotifera* (J. S. Thomson, 1910)**  
(figs. 18c, 29)

*Alcyonium rotiferum* J. S. Thomson, 1910: 573-575, pl. 1 figs. 3, 4, pl. 4 fig. 38.

*Nidalia morifera* Tixier-Durivault, 1954: 128-129, figs. 3, 4. — Utinomi, 1958a: 112.

Material. — NNE of Durban, South Africa: 28°28'S, 32°25.8'E, depth 27m, R/V *Africana* 1028 I, 15 May 1948; MNHN, one colony.

Remarks on Thomson's type specimen of *Alcyonium rotiferum*. — The depository of that type specimen could not be discovered. Fortunately Thomson's description reveals characteristics enough to give a good idea of the morphology and anatomy of the species. The typical characteristics are the absence of sclerites in the anthocodiae, the slender pinnules of the tentacles, and in the coenenchyme the uncommonly minute, round sclerites called "double wheels" by Thomson (see his pl. 4, fig. 38). Moreover the stalk is short, the colony is tough and leathery, and the calyces have a diameter of 2 mm.

The colonies described by Thomson were collected at "Kuskamma Point, NE by E 5 miles" (SW of East London, see J. S. Thomson, 1924, map), at a depth of 33 fms (= 61 m).

Remarks on Tixier-Durivault's (1954) type specimen of *Nidalia morifera*. — The colony was also collected at the east coast of South Africa slightly NNE of Durban, so about 550 km from Kuskamma Point. It is represented by Tixier-Durivault, fig. 3a (enlargement  $\times 2$ ) and natural size in our fig. 18c. In most respects it agrees with Thomson's *A. rotiferum*: (1) in the anthocodiae sclerites are absent; (2) presence of the minute, round sclerites called "double wheels" by Thomson (see fig. 29); (3) the stalk is short, the colony is tough and leathery; (4) the calyces have a diameter of 2 mm; (5) the tentacles have long, narrow pinnules; their number could not be ascertained, but probably they are fewer in number, longer and more distant than is shown in Tixier-Durivault's fig. 3c.

In a few respects the colony differs from Thomson's *A. rotiferum*. The colony is wider and unbranched; Thomson's "complete" colony "consists of a number of slender cylindrical lobes, the stalks of which unite slightly together at their base". This description creates the impression that the specimen is not one colony with a number of lobes, but a group of colonies each with its own short stalk. However, the difference is of no consequence.

According to Thomson the calyces of *A. rotifera* are about 1.90 mm high; according to our own observation they are in *N. morifera* only 0.50 mm high, though Tixier-Durivault mentions that the calyces are protruding. But in both

species the diameter of the calyces is 2 mm.

Summarizing, we state that the differences do not justify maintaining these two species as distinct and that the junior name *morifera* must be dropped.

Geographical distribution. — East coast of South Africa.

### ***Eleutherobia rubra* (Brundin, 1896)**

(figs. 18e, f, 30, 31, 32c-h)

*Bellonella rubra* Brundin, 1896: 6-8, pl. 1 fig. 2, pl. 2 fig. 2. — Pütter, 1900: 447. — Utinomi, 1957: 149-152, fig. 1, pl. 9 figs. 1, 2; 1962: 106 (listed only). — Song, 1976: 53, pl. 1 figs. 1-9. — Imahara, 1977: 32-33, fig. 1c.

*Nidalia rubra*; Kükenthal, 1906a: 32-33, 1906b: 22-24, figs. 10-12, pl. 1 fig. 5, pl. 5 figs. 29, 30. — Nutting, 1912: 21-22.

*Bellonella cinerea* Brundin, 1896: 8-9, pl. 1 fig. 3, pl. 2 fig. 3. — Pütter, 1900: 447-448.

*Nidalia cinerea*; Kükenthal, 1906a: 33; 1906b: 32.

Not *Nidalia cinerea*; Tixier-Durivault & d'Hondt, 1974: 256-259, figs. 5-7.

Not *Bellonella rubra*; J. S. Thomson, 1910: 554-556, pl. 2 fig. 13, pl. 3 figs. 21a-c, pl. 4 fig. 43. — Thomson & Dean, 1931: 35-36, pl. 23 fig. 6. — ?Tixier-Durivault, 1954: 127-128.

Material. — Japan: Hirado Strait, 35°5'N, 128°16'E. UUZM 72a, one specimen, the lectotype; Hirado Strait, UUZM 63, three type-specimens of *Bellonella cinerea* Brundin; Cape Tsiuka, 41°36'12"N, 140°36'45"E, 44-47 fms (=80-86m), USFC steamer Albatross, Sta. D4807, 16 July 1906. USNM 76995, eight specimens. RNMH Coel. 17418, two specimens. California: off Pt. Pinos Lighthouse, Monterey, 70 fms. (=128 m), USFC steamer Albatross, Sta. 4515, 23 May 1906. USNM 30068, two young colonies. Western Australia: West of Port Headland, 19°04.3'S, 118°50.5'E, 83 m, bottom: sand and gravel, Sta. N.W.S. 14; coll. J. Hoover, 27 April 1983. NTMD C5080, two specimens; RNMH Coel. 17434, one specimen; 19°03.5'S, 119°03.6'E, 81 m, bottom: sand and gravel, Sta. N.W.S. 15; coll. J. Hoover, 28 April 1983. NTMD C5075, two specimens.

Description of the lectotype. — We select as lectotype the colony UUZM no. 72a, which was illustrated at natural size by Brundin (1896: pl. 1 fig. 2).

The colony (fig. 32e) is conical, slightly flattened laterally, with rounded apex. Brundin's drawing creates the impression that there are no calyces, the surface of the capitulum appearing quite smooth. However this is not the case: dome shaped calyces are present. They measure about 2 mm in diameter at the base and 1 mm in height. The opening of the calyces is slightly offset toward the top of the colony. The margin is 8-lobed (fig. 30y).

All anthocodiae are retracted within the calyces. The armature of the anthocodia consists of crown and points (fig. 30a). The sclerites in these are not distinguishable from each other (fig. 30 l-m); the length is up to 0.45 mm. The crown is eight to twelve rows deep. The points are wide, so the interstices between the points are narrow. In each point the proximal sclerites are sloping; more distally they are longitudinally arranged. Arrangement *en chevron* of all point sclerites as shown in Imahara's (1977) fig. 1c is not correct.

In the tentacles there are different types of sclerites: (1) thin, transparent, sometimes antler like scales, 0.08 to 0.16 mm long (fig. 30f, g); (2) clubs, 0.10 to 0.27 mm long (fig. 30h-j) and (3) thorny, often curved rods, up to 0.34 mm long (fig. 30k). Of course, the longer sclerites lie in the rachis of the tentacle.

The distal part of the introvert is devoid of sclerites. The most proximal part contains some capstan like rods (fig. 30r) but the majority are clubs, up to about 0.10 mm long (fig. 30n-g). This accumulation of sclerites in the basalmost part of the introvert is clearly visible in Imahara's fig. 1c.

The calyces consist of two layers. The outermost one contains (1) eight-radiates, often oval and 0.06-0.08 mm long (figs. 30b, e; 31a, b), and (2) slightly larger sclerites, sometimes double cones, measuring up to about 0.15 mm in length (figs. 30c, d; 31c-e). In the inner layer of the calyces, longer spiny spindles are found, up to 0.30 mm long (fig. 31f, g). They are transitional forms to the still longer spindles in the interior of the polyparium; they may reach a length of 0.40 mm (fig. 31h-j).

In the surface layer of the short stalk the sclerites are somewhat larger than those in the outer layer of the calyx. The dumb bells and 8-radiates are 0.07 to 0.11 mm long (figs. 30s-u, 31k-m); the spindles and the numerous irregular forms measure up to 0.18 mm in length (figs. 31n-q).

The interior of the colony contains slender spindles, up to 0.40 mm long (figs. 28h-j, 30v, x); they are ornamented with high projections, which may be either truncated or branched and split at the top. In addition there are thorny bodies. In the interior of the stalk forms such as spiny, rod-like sclerites predominate; the length is up to 0.15 mm. There are also spindles up to 0.32 mm long, provided with high prominences (fig. 31s).

Colour. — In alcohol the surface of the polyparium and stalk is light brick red, the tips of the calyces are darker red; in fig. 30y an attempt has been made to show this by means of darker stippling.

Variation. — Fig. 18e, f, illustrates two colonies collected at Albatross Sta. D-4807.

Remarks. — Kükenthal (1906a, 1906b) included Brundin's *Bellonella cinerea* (Kükenthal's *Nidalia cinerea*) within *B. (N.) rubra*. He regarded the difference in colour as an insufficient reason for establishing a new species. The study of the three type specimens of *B. cinerea* Brundin revealed that Kükenthal was correct. No distinct anatomical difference could be ascertained; only the greyish colour is different.

Thomson & Dean (1931: 35-36) recorded the presence of two specimens in the collection of the Siboga Expedition, Sta. 289. They did so "with some hesitancy". Investigation of the very poor material and comparison with the present specimens show that it cannot be assigned to *E. rubra*: calyces are

absent and the sclerites are different. Further determination of the specimens was impossible.

Geographical distribution. — Japan; N.W. Australia.

***Elcutherobia somaliensis* spec. nov.**

(figs. 18g, h; 33b; 34)

Material. — Indian Ocean off coast of Somalia, vicinity of Ras Mabber: 09°33'N., 50°59'E., depth 70-80 m; R/V Anton Bruun Sta.9-442, 16 December 1964; USNM 77003, one colony, the holotype; 09°25'N., 50°54'E., depth 85-95m; R/V Anton Bruun Sta.9-437, 16 December 1964; two paratype colonies, one USNM 77004, the other RMNH Coel.17419; 09°36'N., 51°01'E., depth about 80m; R/V Anton Bruun Sta.9-444, 16 December 1964; three paratype colonies, two in USNM 77005, one in RMNH Coel.17420.

Description of the holotype. — The stiff colony attached to a stone is 67 mm high (fig. 18h). The stalk is about 10 mm long and 14 mm wide, surmounted by the branched polyparium. The stem reaches its greatest width of 22 mm at a height of 20 mm, where it bears a branch 20 mm long; somewhat higher up it divides into two branches, which slightly taper distally.

The calyces are conical with a rounded or pointed eight-lobed top, irregularly scattered on stem and branches, but in some places more or less longitudinally arranged in rows, between which there are deep grooves. In a vertical direction they are rather far apart; the intervals between the centres of the calyces are 2.40 to 2.70 mm, but sometimes as much as 3.20 mm.

Most of the anthocodiae are retracted within the calyces; when projecting, they are 1 mm wide and 1.00 to 1.20 mm high. The armature consists of crown and points. The crown consists of horizontally placed spindles, about 10 rows deep (fig. 33b). It is superposed by eight points of converging spindles; each row has eight to ten spicules. The latter are 0.33 to 0.42 mm, sometimes up to 0.50 mm long, and covered with loosely arranged thorns. The tentacles are retracted; they are 1.20 mm long and armed with two rows of distally diverging, flat, marginally toothed sclerites at the base of the tentacle 0.25 mm long. In the introvert many small spindles 0.06-0.10 mm long are present.

The thick walled calyces and the outermost layer of stem and branches contain small eight-radiates about 0.10 mm long (fig. 34a-d). Slightly deeper in the coenenchyme and also in the distal parts of the calyces, the spicules are larger and more fusiform, 0.16 to 0.37 mm in length, sometimes approaching the shape of clubs (fig. 34e, f); they bear numerous high warts. The thin canal walls of the branches contain long, narrow spindles and needles up to 0.58 mm long and provided with high thorns and wart-like processes (fig. 34g-i). A few

short, wide, irregularly shaped forms also occur.

In the surface layer of the stalk there are 8-radiates, which resemble those in the stem (fig. 34k-m), but slightly deeper most of the sclerites are thick-set capstans and more rounded bodies 0.13 to 0.17 mm long (fig. 34j,n); also many crosses are present. The thin canal walls in the stalk contain warty spindles resembling the spindle in fig. 34f, but usually they are wider; they are 0.21 to 0.30 mm long, a few as long as 0.40 mm.

Colour. — In alcohol the colony is creamy light brown.

Variation. — In one of the colonies from Sta. 9-437 the crooked stem bears three branches which lie in one plane (fig. 18g). Two of the colonies from Sta. 9-444 are unbranched, but the third has one lateral branch. One colony is yellowish and another is brownish red instead of the prevalent light brown.

Remarks. — The new species is characterized by the anthocodial armature, the intervals between the calyces and the typical coenenchymal sclerites.

Geographical distribution. — Coast of Somalia.

### ***Eleutherobia splendens* (Thomson & Dean, 1931)**

(figs. 18a, 33a, 35, 36c)

*Nidalia splendens* Thomson & Dean, 1931: 38, pl. 1 fig. 7, pl. 6 fig. 9, pl. 25 fig. 8.

Material. — Kei Islands: 5°28.4'S., 132°0.2'E., depth 204 m on hard coral sand; Siboga Expedition, Sta. 251, 8 December 1899; ZMA Coel. 2980, holotype. Philippines: between Negros and Siquijor; 9°15'45"N., 123°22'00"E., depth 279 fms (= 511 m); USFC steamer Albatross, Sta. D-5536, 19 August 1909; two specimens, one USNM 60411, the other RMNH Coel. 17421.

Description of the holotype. — Thomson & Dean (1931: pl. 6 fig. 9) gave a handsome picture of this beautiful colony; our fig. 18a shows the same colony at natural size. Rather striking is the height of the calyces; on their abaxial side they are 3.50 to 4.50 mm in height; their width is 3.50 to 3.80 mm.

The anthocodiae project beyond the calyces for a distance of up to 4 mm. The height of the anthocodiae is 3.50 mm; the width varies from 3.00 to 3.40 mm. In the comparatively large anthocodiae the armature is strongly developed. The crown is comprised of more than 20 rows. The points are more than 2 mm high (fig. 33a) and consist of numerous closely placed spiny spindles up to 0.60 mm long, arranged *en chevron*. In the contracted state of the polyps, the introverts are densely filled with brick-red thorny clubs, spiny rods and spindles, usually 0.12-0.17 mm long.

The tentacles are curved inward and in this condition are slightly more than 1 mm long. The rachis contains many warty rods more or less longitudinally

arranged. On both sides of the rachis numerous curved, stout, flattened sclerites diverge toward the pinnules; the length of these sclerites is less than 0.40 mm, the width 0.05-0.06 mm.

In the outer layer of the calyces the majority of the sclerites are thorn clubs, 0.10-0.15 mm long, their handles with two or three girdles of warts; in addition there are 8-radiates (fig. 35a-k). Spindles and rods about 0.20 mm long are transitional forms to the sclerites in the inner layer of the calyx. The latter are narrow, pointed spindles up to 0.40 mm long, covered with girdles of high spines (fig. 35 l-s).

The surface layer of the polyparium has the same kind of sclerites as the calyces, but the spindles may be wider.

As contrasted with the spiculation of the calyces, the majority of the sclerites in the outer layer of the stalk are 8-radiates 0.06-0.08 mm long. Somewhat longer sclerites have one end wider owing to an accumulation of warts; such sclerites can be considered as forms intermediate between 8-radiates and clubs. The interior of the stalk contains warty spindles up to 0.3 mm long; they resemble the spindle shown in fig. 35n; their width varies from 0.05 to 0.08 mm.

Colour. — The polyparium, stalk, and proximal parts of the calyces are white; distally the calyces are light red. The anthocodial spindles also are red, but the tentacles are white.

Variation. — The specimens collected by the Albatross are rather small; they differ from the holotype also in colour: one of the specimens is brown, the other light greyish brown, but the margins of the calyces and the anthocodiae are browner.

Geographical distribution. — Indonesia, Philippines.

### ***Eleutherobia studeri* (J. S. Thomson, 1910)**

(figs. 33e; 36a, b; 37)

*Bellonella studeri* J. S. Thomson, 1910: 550-554; pl. 1 fig. 1; pl. 3 fig. 23; figs. 45a-e; 1921: 171; 1924: 48, 50, 71.

*Metalcyonium clavatum*: J. S. Thomson, 1910: 556-559, pl. 1 fig. 7; pl. 2 fig. 9; pl. 3 figs. 17, 19; pl. 4, figs. 35-37; 1924: 52.

Material. — St. Francis Bay, Cape Province, South Africa, R/V Pieter Faure Sta. P.F. 18831. 3 May 1906; SAM H1249; Thomson (1910: 554) gave the following additional data: Noors Kloof Point, NW by W 1/4 W to NW by W 1/2 W, 8-10 miles, depth 23-35 fms (= 42-64 m); one specimen, the holotype; The same locality and depth, P.F. 12479; BMNH 1962.7.20.31. "cotype".

Description of the holotype. — As Thomson (1910) explicitly stated to have based his original description on a single specimen (1910: 551), which was

illustrated (1910: pl. 1, fig. 1), and mentioned no other material, this specimen can only be the holotype. Our figure illustrates the same colony. The specimen in the British Museum (Natural History) designated as "cotype" therefore can have no legal status as either syntype or paratype.

Thomson's description needs some additions. The closely set calyces are cylindrical or slightly conical, the largest measuring 3 mm in diameter at their base and 1.20 to 1.70 mm in height. Between the larger calyces there are smaller ones, which differ distinctly from each other in size, so they cannot be regarded as siphonozooids.

The retracted anthocodiae are visible in the apertures of the calyces as eight lobed, small hummocks formed by the tentacles, which are curved inward. Extended polyps measure up to about 7 mm in length.

The number of pinnules on each side of a tentacle presumably amounts to eight or ten but the exact number could not be established; in the contracted state they are conical, 0.11 mm high and 0.09 mm wide at their base. The rachis contains numerous chevroned, thorny sclerites.

The anthocodiae are 1.60 to 1.90 mm high, armed with crown and points. The crown consists of loosely arranged, transversely placed spindles, about 6-10 rows deep. In the points the basalmost spicules are arranged *en chevron*, distally becoming longitudinal. They are narrow, pointed spindles, up to about 0.40 mm long, and red in colour. It stands to reason that the sclerites lie closer together in retracted anthocodiae, and that the number of rows in the crown may be more than 10.

The introvert is transparent, destitute of sclerites, 3.50 to 4.50 mm long. Basally it passes into the calyx, which has a weakly eight lobed margin.

The outer layer of the calyces, the surface layer of the coenenchyme between them, and the surface layer of the stalk contain small, brownish 8-radiates and capstans, 0.07-0.10 mm long (fig. 37a-e, h, i, m-r). In addition, in the calyces there are a few clubs about 0.11 mm long (fig. 37f, g). The inner layer of the calyces and the interior of the colony are provided with some thorny rods, in the calyx up to 0.20 mm long (fig. 37j-l), in the stalk up to 0.27 mm long (fig. 37u-v). In addition, in the stalk there are some needles, often almost smooth, up to 0.35 mm long, but the majority of the sclerites are slender, pointed spindles with girdles of distant, high spines at the middle, up to 0.30 mm long (fig. 37s, t).

Colour. — In alcohol the specimen is light red.

Variation. — The cylindrical colony of the "cotype" mentioned above (fig. 36b) measures 45 mm in total height, of which 20 mm comprise the stalk; the width is 11 mm. The walls of the low calyces are a little bulb-shaped. Otherwise it agrees with the holotype.



Discussion. — The following measurements given in Thomson's (1910: 551, 552) description were found to be wrong. The "minute, yellow, irregular spicules" occurring in the tentacles cannot measure "0.085 mm in length by 0.165 mm in breadth", for in that case the width would be almost twice the length. The spicules occurring in the "crown and tentacles" (the anthocodial sclerites are meant) are not 0.49 by 0.05 mm to 0.75 by 0.06 mm, and the dimensions of the spicules in the internal part of the calyx wall are not 0.50 by 0.03 to 0.75 by 0.03 mm. We found that the spindles in crown, points, calyces and interior of stalk are not longer than 0.40 mm.

Thomson's (1910) pl. 1 fig. 7, which illustrates a polyp of "*M. clavatum*" is a convincing representation of a polyp of *E. studeri*, but pl. 3 fig. 23, with its very small anthocodial sclerites, does not agree with the text.

Thomson (1910: 556) described four specimens of "*Metalcyonium clavatum* Pfeffer" from the South African east coast and enumerated (1910: 558-559) points of similarity and points of difference with Pfeffer's South American specimens. After our examination of Pfeffer's colonies it appears that the most striking differences between specimens from the two regions exist in the sclerites. In Pfeffer's species small capstans and capstan-like sclerites are lacking, but in Thomson's specimens they are numerous in calyces and stalk surface; cf. fig. 9 and fig. 37. The similarity in shape between the "cotype" of *E. studeri* and the colonies of Thomson's "*M. clavatum*" (1910, fig. 9) is surprising. The sclerites also are nearly the same. See also the discussion of *B. clavata* in this paper (p. 18).

Geographical distribution. — East coast of South Africa.

### ***Eleutherobia sumbawaensis* spec. nov.**

(fig. 32d, 33d, 38)

*Nidalia dofleini*; Thomson & Dean, 1931: 34, pl. 5 fig. 5; pl. 25 fig. 5.

Not *Nidalia dofleini*; Kükenthal, 1906a: 27, figs. 18-19; pl. 2 figs. 8, 9.

Material. — Sapeh Strait between Sumbawa and Komodo: 8°23.5'S, 119°4.6'E, 69 m. coral and shells; Siboga Expedition Sta. 49a, 14 April 1899. ZMA Coel.2973, one colony (holotype) and several smaller complete colonies and fragments (paratypes). ?China Sea. Itzerodt . . ., Kükenthal 1917; depth and date unrecorded, locality uncertain. ZMH C1648, three colonies.

Description of the holotype. — The conical colony is 45 mm in height (fig. 32d), of which the stalk occupies 7 mm. The colony is widest immediately above the stalk, where it is 12 mm wide and laterally flattened. The polyparium is grooved longitudinally and has fine cross-lines. Polyps arise on the ridges between the grooves. The anthocodiae are retracted within dome-shaped

calyces less than 1 mm high, with eight-lobed margins; the centers are 1.90-4.40 mm apart.

The anthocodial armature consists of a crown, 12-14 rows deep, and eight points. Proximally each point consists of 4-6 pairs of spiny spindles up to 0.40 mm long (fig. 38a, b), arranged *en chevron*. Distally the spindles are arranged longitudinally (fig. 33b). Between the points there are two intermediates. The introvert contains many spindles 0.08-0.10 mm long.

The walls of the calyces, surface layer of the polyparium and stalk, and the thin canal-walls contain warty capstans, double heads ("barrels"), rectangular bodies and crosses, usually 0.13-0.15 mm long (fig. 38c-f, r-v), but smaller sclerites of the same forms are also common (fig. 38g-k). Sometimes the latter have a longer waist, more closely approaching dumb-bells and double stars (fig. 38n-q). In the calyces and outer layer of the polyparium there are a few double cones up to 0.20 mm in length (fig. 38 l-m).

Colour. — The colony is brick red, the distal parts of the calyces dirty white.

Variation. — The other colonies vary in colour from brick red to dirty white; some have a whitish polyparium and reddish stalk. Sometimes the double-headed sclerites are covered with stalked warts, in which case the waist is less distinct.

The colonies kept in the Hamburg Museum have the same shape and colour. Their calyces are somewhat closer together, but in spiculation there are no distinct differences.

Remarks. — Thomson & Dean (1931: 34) identified their specimens as *Nidalia dofleini* Kükenthal, 1906 (= *Eleutherobia dofleini*). A re-examination of the type specimen of *E. dofleini* revealed the incorrectness of that identification. Differences are: (1) In *E. sumbawaensis* the calyces contain few double cones, which are up to 0.18 mm long; in *E. dofleini* such sclerites are up to 0.27 mm long. (2) In *E. sumbawaensis* the surface layer of the stalk and the canal walls have no double cones, whereas in *E. dofleini* they have. (3) In *E. sumbawaensis* the introvert of the polyps contains many small spindles, whereas in *E. dofleini* it has few but longer spindles. (4) In *E. sumbawaensis* the anthocodiae are oval in shape, whereas in *E. dofleini* they have the shape of church bells.

Geographical distribution. — Indonesia.