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THE GORGONACEA OF THE SIBOGA EXPEDITION

III. THE MURICEIDÆ

Siboga-Expeditie
XIIIb

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GORGONACEA OF THE SIBOGA EXPEDITION

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BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

MARINE BIOLOGICAL LABORATORY
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With 22 plates

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Introductory note.

The author desires to express his satisfaction in being given the opportunity to study the superb collection of Gorgonacea secured by the Siboga Expedition.

The series of *Muriceidæ* is undoubtedly the most extensive that has ever been collected by any one expedition, or treated of in a single report; the number of species being more than three times as great as was secured by the justly famous Challenger Expedition.

Notwithstanding the gratification naturally felt in having the privilege of reporting on such a notable collection, the writer can not refrain from expressing his sincere regret that it has seemed necessary for Dr. VERSLUYS to forego the completion of his work so auspiciously inaugurated by the production of his masterly monographs on the *Chrysogorgiidæ* and the *Primnoidæ*, works which, in the opinion of the present writer, are not surpassed in completeness and manner of presentation by any other publication on the Alcyonaria.

The responsibility of taking up the task thus laid down, and of attempting to hold up the standard of excellence thus set before him, is keenly felt by the author.

It is a pleasure to bear testimony to the excellent condition of the collection and the care taken in preserving the records and securing the safety of the specimens themselves. The

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whole collection bears strong testimony in behalf of the faithful manner in which the members of the expedition performed their duties.

The writer also desires to express his sincere thanks to Professor MAX WEBER for the honor of being asked to collaborate in so monumental a work, and for the unfailing courtesy extended during the progress of the preparation of this report.

Thanks are also due to Dr. VERSLUYS for a number of rare papers concerning the Alcyonacea, and for many courtesies in the way of suggestions and information.

State University of Iowa,
June 7th, 1909.

Family Muriceid.e Verrill.

Muricea Lamouroux, Exposition Méthodique, 1821, p. 36.
Muricea Milne Edwards and Haime, Histoire naturelle des Coralliaires, 1857, Vol. I, p. 142.
Muriceadæ Studer, Monatsber. d. k. preuss. Akad. d. Wiss., Berlin, 1878, p. 641.
Muriceidæ Verrill, Bull. Mus. Comp. Zool., XI, N° 1, 1883, p. 30.
Muriceidæ Wright and Studer, Challenger report, Alcyonaria, 1889, p. 92.
Muriceidæ Hiles, Gorgonacea collected by Dr. Willey, 1899, p. 197.
Muriceidæ Bourne, Treatise on Zoology, Part II, Anthozoa, 1900, p. 28.
Muriceidæ Hickson, Cambridge Natural History, Vol. I, 1906, p. 355.

Axis cylinder horny, not divided into segments; water-vascular canals not in a regular series arranged around the axis; calyces of various shapes, but never with their margins turned towards the branch or stem. A pseudo-operculum is almost always present consisting of spicules borne on the dorsal surfaces of the tentacles; there being eight segments to the operculum, each segment usually consisting of three spindles which form an acute-angled triangle with its apex directed towards the centre of the mass of infolded tentacles. A well-marked collaret lies below the operculum, and consists of one or more transverse rows of spindles. The spicules vary exceedingly in size and pattern, but are never in the form of greatly flattened scales with radiating costæ produced into marginal points. The cœnenchyma usually has a bristling appearance, due to the projecting points of spicules.

This family seems to be a fairly natural one; but it intergrades on the one hand with the Primnoidæ, and on the other with the Plexauridae. It differs from the former in not having a true operculum emplanted on the calyx margin, but instead, has a pseudo-operculum of eight segments, each segment being composed of several spicules, instead of one as in the Primnoidæ. There is an approach to the primnoid type of spicule in some of the scale-like plates of *Placogorgia*; but without radiating costæ.

The relationship of the *Muriceidæ* seems closest with the *Plexauridæ*, the superficial resemblance being such as to deceive any one, especially as in such species as *Placogorgia cryptotheca* which greatly resembles *Plexauroides* not only in general appearance, but also in form and arrangement of spicules.

The main difference between the two families is shown by a study of a cross section of the stem. In a plexaurid such a section will reveal a thick cœnenchyma enveloping the axis; while around the latter is a symmetrical series of distinct round or oval openings, sections of the primary water-vascular canals. In a muriceid a similar section would show a thinner cœnenchyma, and no regular series of canals, these being irregular both in section and disposition.

The classification of the Muriceidæ.

This group, containing as it does by far the greatest number of species of all the families of *Alcyonaria*, has always offered unusual difficulties to the systematist; and the great number of new forms in the Siboga collection makes a thorough revision necessary at this time. Any naturalist who has worked with the *Gorgonacea* will recognize the perplexities that thus confront the writer.

The aim has been to preserve a conservative course so far as is consistent with scientific accuracy, and a strong effort has been made to retain as many as possible of the established genera, but one new genus (**Versluysia**) being added.

But, in many cases, while the names of the established genera have been retained it has been found necessary to modify the definitions to meet the conditions presented under the great increase of our knowledge since the original definitions were proposed.

In modifying generic definitions the writer has persued the policy of obtaining, wherever possible, accurate descriptions of the type species of each genus, being greatly aided by the work of Kölliker[1], who describes the spicules of the types of several of the older genera, the original descriptions of which are entirely inadequate, indeed useless, for the purposes of the present work.

With an accurate description of the type species of a genus at hand, the writer has used in his generic description any character found in the type that, in his opinion, will serve as a good diagnostic character of the genus. Such characters he has often used to the exclusion of the generic characters used in the original descriptions of the genus. Thus it will be seen that he has retained the names of most of the genera, but modified the definitions in many cases; being careful, however, to introduce no character in his modified genera that is not found in the generic types.

As is almost universally the case, the earlier writers used the most obvious external characters in defining the zoological groups of the *Alcyonaria*. Hence the form of the colony and shape of the calyces were regarded as of prime importance, while we now know that, except in a comparatively few cases, these features are practically valueless when applied to the genera of the *Muriceidæ*. A little after the middle of the last century the spicules were recognized as of great importance in the writings of two authors who were mainly instrumental in placing the classification of this group on a much more satisfactory basis. Kölliker and Verrill were among the first to examine carefully these curious structures, and they based their generic characters almost exclusively on the form and disposition of the spicules.

Subsequent writers have fully recognized the importance of such characters; but have not hesitated to avail themselves of others, such as the mode of branching and shape of calyces, in formulating their generic definitions. Wright and Studer, in their masterly report on the *Alcyonaria* collected by the Challenger expedition, persued this method with very satisfactory results.

[1] Kölliker. Icones Histologicæ. Vol. II, 1885. Special reference is here made to the descriptions of the spicules of the types of *Echinogorgia*, *Villogorgia* and *Thesea*.

There is no doubt that the spicules form by far the most important structures for dividing the *Muriceidæ* into generic groups, and it is impossible to properly identify species, or to place them in their genera, without a microscopic examination of carefully cleaned spicules. In order to test this point, the writer, when beginning work on the muriceids of the Siboga Expedition, attempted to divide the great mass of new and unfamiliar material into genera by the use of external characters, such as manner of branching, shape and disposition of calyces, and a superficial examination with a dissecting lens of the spicules in situ. The result was a lamentable failure, except in the case of some particularly well marked genera such as *Acanthogorgia* or *Acis*. In many cases one could have done just about as well by assorting the material when blind-folded.

It thus becomes evident that superficial characters are comparatively useless in defining the genera of the *Muriceidæ*, and this leads inevitably to the conclusion that it is exceedingly hazardous to attempt to identify the old and long know species by the figures and descriptions of the earlier writers; for these men used exclusively those characters which were superficial and thus of little value for our present purpose. It is only when some subsequent writer has had access to the type specimen and given it a careful technical description that these old species can be safely identified. It thus appears impossible to identify with any certainty many of the long known species, for many of the types are lost or inaccessible.

The writer has, in such cases, preferred to carefully describe a species as new whenever he is not reasonably sure that it should be referred to an already described form, rather than to call it by an old name merely on account of some superficial resemblance. In such cases more favored naturalists, who may have access to the types, can detect the error by comparing the detailed descriptions and figures in the present work with the type. He can then, if necessary, relegate the supposed new species to the ranks of synonomy. In this way less harm is done than by erroneously ascribing a really new form to an old species, particularly when it involves an incorrect idea regarding distribution.

In the present work the spicules are regarded as by far the most available structures for generic diagnoses. It is only occasionally that the shape or the size of the calyces is used, and it is but rarely that the mode of branching assumes generic importance in the *Muriceidæ*.

In studying the spicules for systematic purposes it soon becomes evident that the matter is far more complex than would appear from a study of the literature of the subject. In some cases spicules of a dozen different types can be found on a single slide from a single species, while in others the spicules that are regarded as typical of a certain genus may be found in several genera. Moreover it soon becomes plain that the same spicule may assume the form of several types during the course of its individual development.

But the investigator who perseveres in his work finds that, in spite of these and other discouraging conditions, there are a number of forms of spicules that can readily be recognized as typical of certain genera. They may be associated with many other forms on a given slide; but nevertheless they are the dominant note of the composition, and can readily be detected by the experienced observer. By a study of these dominant types we are enabled to very much simplify the classification of the *Muriceidæ*, and divide that troublesome family into a fairly natural group of genera.

After the examination of a large number of forms it becomes evident that the primitive spicule is the terete form known as the spindle. That this is the original form is indicated by two lines of evidence[1].

1st. The spindle is found in all of the genera and nearly all of the species of the *Muriceidæ*, and it is the only form of spicule of which this is true.

2nd. In studying the development of spicules that are apparently far removed from the spindle in form, we find that even the most complicated of these, such as those found in **Echinogorgia**, **Acamptogorgia** and **Heterogorgia**, are originally simple spindles which during their individual development gradually assume the surprisingly complex and often beautiful forms characteristic of these genera.

It having been determined that the spindle is the basal form, it becomes possible to arrange its various modifications in different directions and thus understand fairly well the origin and relations of the various generic types of spicules.

One of the simplest of these is a slightly bent spindle, the two parts of which, below and above the bend, have become differentiated from each other. The moity which is exposed when in situ has become relatively smooth and pointed, like an icycle. The other portion, which when in situ is embedded in the cœnenchyma, is covered with warty verrucæ which in some instances may be more or less profusely branched. This type is found in its most perfect and characteristic development in the genus *Acanthogorgia*, and will therefore be called the "*Acanthogorgia type*" in this work. (See plate XIX, fig. 4*a*).

Another very typical form of spicule is produced by a process which begins in very much the same way as the above. A simple straight spindle becomes gradually differentiated into two parts, a distal and a proximal. The distal part, exposed when in situ, is straight, thorn-like and often with a smooth surface. The proximal portion sends forth a number of processes which are densely tuberculate, and more or less branched and exfoliated, often very complexly so. These branched processes are projected downward and outward, and when in situ are embedded in the cœnenchyma of the calyx wall. This form is characteristic of the genus *Echinomuricea*, and will be called the "*Echinomuricea type*". (See plate XXI, fig. 7*a*).

A third form which yields a good generic type is developed as follows: A small typical spindle, smooth and straight, becomes tuberculate. Later it bends as in **Acanthogorgia**, becoming arcuate and shows a constricted band or girdle near its centre. Nodules next appear on the convex surface, and these nodules enlarge, branch and protrude downward; finally producing much-branched, nodulated and foliated expansions which are radiate in arrangement and are embedded in the cœnenchyma when in situ. While these foliated expansions of the basal part of the spicule are developing, another series of changes commences by which lamellar expansions project upward from the centre of the spicule. These are more or less inflated and petal-like in shape, their edges being often sinuous and dentated.

This group of folia, when best developed, finally comes to resemble the half-opened bud

[1] The author must here acknowledge his indebtedness to one of his students, Miss BETH. M. PORTLOCK, for her work in studying the development of the spicules of the Alcyonaria, and in bringing to his attention a number of points that he would otherwise doubtless have missed entirely.

of a rose, the leaves of which are sometimes keeled, seated on and projecting directly above the radiated basal expansions. In some cases there may be but two of these foliated expansions, or even but one; but they can always be easily distinguished by the fact that their surfaces are smooth, instead of being notably tuberculate as are the basal expansions. The resulting spicule, then, consists of a basal set of branched or foliated, densely tuberculated expansions extending downward and outward in a radiate manner; and a distal exposed portion set immediately above the basal part, and consisting of erect inflated laminæ which are often curved or crimped, but the surfaces of which are smooth. This type is very characteristic of the genus *Echinogorgia*, and will be called the "*Echinogorgia type*". (See plate XXI, figs. 9, *a* & *b*).

A fourth form of what I call generic types of spicules is quite different from either of the preceding. A simple, rather heavy, tuberculate spindle developes rounded projections on its upper side only. These projections finally become quite pronounced and sharp-pointed, forming a more or less regular row of tooth-like points on one side of the heavy spindle. The opposite, or under, side is simply tuberculate, without pronounced tooth-like processes. These heavy unilateral spindles are characteristic of the genus *Thesea*, and will be called the "*Thesea type*". (See plate XXI, figs. 2 & 8*a*).

A fifth form, is carefully described by Wright and Studer[1] as follows: —

"The polyp spicules are remarkable: from the spindle-like bases one or two foliar expansions arise. A somewhat bent spindle is furnished with a dentate foliar expansion, from the margin of its convex side, the long axis of which slants a little obliquely to the long axis of the spindle. In most cases the spicule has become triradiate by the shooting out of several projections from about its middle.

From the place where these rays centre one or too dentate foliar expansions arise, these latter stand at an acute angle to one another, and their long axes always fall into the angle between two of the rays. These spicules are so placed on the wall of the polyp body that the stellate rays are always inserted into it, while the foliar expansions project, scale-like, over the surface".

This type, evidently allied to the *Echinogorgia* type, will be called the "*Acamptogorgia type*". (See plate XXI, fig. 12, *a* & *b*).

A sixth form is based, like the others, on the primitive spindle; but is produced by a flattening and lateral expansion into a disk-like or scale-like form which is regular in outline in some species, but exceedingly irregular in others.

It consists of a flattened centre from which complexly branched and irregularly foliate lateral expansions arise, giving the typical "Stachelplatten" of authors.

These occur in their most characteristic form in the genus *Placogorgia*, and will constitute the "*Placogorgia type*". (See plate XXII, figs. 5 & 10).

A seventh type is probably the most peculiar and distinctive found in the *Muriceidæ*. It is essentially radiate in structure, and consists in a basal expanded, or disc-shaped, or radiately branched part; and an upper or distal expanded knob or disc, the two being united by a very

[1] Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. 115.

short, thick neck. The whole resembles an ordinary collar-button, the parts of which are regularly or irregularly indented around the edges. This form also appears to originate in a simple spindle, each end of which becomes greatly expanded and takes the form of a disc. Later the whole spindle assumes the form of a double wheel which finally assumes the collar-button shape. This characterizes the genus *Bebryce*, and will be called the "*Bebryce type*". (See plate XX, fig. 8, *a*, *b*, *c* and *d*).

The eighth form is strictly radiate in its characteristic form; but, like the others, is derived from the simple spindle. The spindle at first is quite small and sparsely tuberculate. It then becomes slightly curved, and shows a median constricted band. Next, from the convex side of this band two somewhat triangular processes arise, the whole spindle at this stage being somewhat butterfly-shaped, the first, and larger, wings being the two processes just described. After this stage is reached numerous processes branch from the centre and extend on all sides in a radiate manner, finally concealing or obscuring the original spindle so that we have often quite symmetrical stars, double stars, etc. This form is best seen in the genus *Heterogorgia*, and will constitute the "*Heterogorgia type*". (See plate XXII, figs. 13, 14, 15).

A ninth form may be designated which is doubtless closely related to the last. Here again the development may be traced back to the simple spindle. This becomes, bent and constricted in the middle as before. From the convex side arises a knob-like process which may lengthen and, with the bent halves of the original spindle, form a triradiate spicule; or, as happens oftener, the knob-like process may divide, in which case it forms the smaller of the four wings of a butterfly-shaped spicule, of which the bent halves of the original spindle form the larger wings.

When the four wings are nearly of the same size a quadriradiate or cruciform spicule is produced. While these triradiate and quadriradiate spicules are the typical ones of the genus *Villogorgia*, and form the "*Villogorgia type*", there arise from the same bent spindles and in the same species, many other forms, often exceedingly complicated (see plate XXII, figs. 1 & 2). Indeed, we may find in a single slide of *Villogorgia* spicules almost all of the types just described belonging to the family Muriceidæ.

A tenth type is found in the regular spindle itself, which, although it may be greatly increased in size and also changed in outline, still retains its original terete form with tuberculate processes scattered over its surface; but without branchings, forkings, exfoliations or radiating plates or processes of any kind. (See plate XX, fig. 7*c*).

The forms in which the simple terete spindle predominates almost or entirely to the exclusion of all other types are too diversified to admit of being placed in a single genus. It is therefore necessary to break up this unwieldy mass of species by the use of some other character, or characters, in combination with those based on the spicules.

A useful character for this purpose has already been employed in generic definitions by Verrill[1] and Wright and Studer[2]. The character referred to is the disposition of the spicules so as to be placed en chevron in the calyx walls or over the tentacle bases, the spindles

[1] Verrill. Bull. Mus. Comp. Zool., XI, 1883, p. 30.

[2] Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. 93.

being placed in two rows with their distal points meeting at an angle, there being eight of these double rows on the calyx walls or over the tentacle bases, to correspond with the number of tentacles in the alcyonoid polyp.

This is not always a good generic character, but may be used in combination with others in formulating definitions for the genera of the *Muriceidæ*.

There still remain a number of muriceids with simple spindles for their type of spicule, and these are too varied in character to be placed in a single genus, even after all of those with spindles en chevron have been provided for. These all agree in having spindle-form spicules only, without a noticeable admixture of other types, although there is often a considerable modification of the spindle in the way of enlargement or in being more slender, or in being stouter, or in being arranged in layers in the cœnenchyma. Finally there are some genera in which the form of the colony seems of use in generic distinctions.

By the means above indicated it is possible to divide the very numerous species of this large family into generic groups that seem to be fairly natural ones. The writer believes that the main purpose in forming genera is to facilitate identification and classification. Our knowledge of the lower invertebrates is still far too fragmentary to permit us to indulge the hope that our work as systematists will really serve to express, in final form, the actual relationships of any large groups of animals. While a natural classification is a "consummation devoutly to be desired" we are not yet, is seems to me, in sight of it. Meanwhile we can use our genera as convenient names under which we can group species for practical purposes, being careful, however, not to abandon long established genera without good reason. Neither does it seem desirable to establish new genera so long as legitimate characters can be drawn from the type species of existing genera whereby the latter may be retained although modified to include new forms.

Key to the genera of Muriceidæ as used in this work.

Calyces bilabiate . . . . . (**Muricea**)[1]

Calyces not bilabiate.

Spindles arranged en chevron on calyx walls or tentacle bases.

Spindles en chevron on calyx walls only.

Calyx with crown of points of *Acanthogorgia* type . . . . . **Acanthogorgia**

Spindles en chevron on both calyx walls and tentacle bases.

No crown of points. Spicules all regular spindles . . . . . **Anthomuricea**

A crown of points consisting of spicules with radiating foliaceous expansions. . . . . (**Paramuricea**)

A crown of points consisting of regular spindles . . . . . **Muricella**

[1] Generic names enclosed in brackets indicate that such genera are not represented in the Siboga collection.

Spindles en chevron on tentacle bases, but not on calyx walls.
No true crown of points. Spicules not all regular spindles.
Twigs without strictly terminal polyps . . . . . **Muriceides**
A crown of points present. Spicules all spindles. . . . . **Anthogorgia**
Spindles nowhere arranged en chevron.
Spicules all in form of spindles.
Spindles very large and heavy, sometimes taking the form of enormous squarish plates or scales.
Spindles of cœnenchyma in two distinct layers, the outer layer being the larger . . . . . **Versluysia**
Spindles of cœnenchyma not in two distinct layers, their edges often fitted as in mosaic work . . . . . **Acis**
Spicules not excessively heavy or enlarged.
Colony flabellate or reticulate . . . . . **Menacella**
Colony simple or sparingly branched, not reticulate. . . . . **Elasmogorgia**

Calyces with certain forms of characteristic spicules of "Generic Types".
Calyx spicules resembling frilled collar-buttons. (*Bebryce* type). . . . . **Bebryce**
Calyx spicules with conspicuous tooth-like points on one side only. (*Thesea* type) . . . . . **Thesea**
Calyx spicules with a thorn-like distal part, and a basal mass of radiating tuberculate and branching processes (*Echinomuricea* type) . . . . **Echinomuricea**
Calyx spicules with a distal cluster of foliaceous smooth expansions, and a basal mass of radiating and tuberculate processes. (*Echinogorgia* type). **Echinogorgia**
Calyx spicules imbricating discs or "Stachelplatten", the former often with ctenate edges. (*Placogorgia* type) . . . . . **Placogorgia**
Calyx spicules with spindle-like bases from which arise one or two foliar or plate-like expansions. (*Acamptogorgia* type) . . . . . **Acamptogorgia**

Calyx spicules mostly radiate forms of several kinds.
Triradiate and quadriradiate forms predominating.
Calyces in the form of short cylinders. . . . . **Villogorgia**
Calyces very low verrucæ which are oval in cross section . . . . . **Menella**
Multiradiate spicules predominating, many being double stars.
A crown of points formed of processes from the radiate spicules of *Heterogorgia* type. . . . . **Heterogorgia**

It is not claimed that the above table will prove satisfactory in all cases; but it is hoped that it will prove a convenience in identifying genera in most cases, and thus save the time of the investigator.

Synoptic view of the species and genera of the Siboga collection of Muriceid.e.

*New species are indicated by the asterisk (*).

Acanthogorgia.

*A. ridleyi, armata, spinosa, aspera, muricata, laxa, truncata, flabellum, ceylonensis, *striata, *studeri, *turgida.*

Anthomuricea.

*A. *sanguinea, *timorensis, *brunnea, *reticulata.*

Anthogorgia.

*A. *verrilli, *aura.*

Muriceides.

*M. *javensis, *collaris, *dubia.*

Muricella.

*M. crassa, complanata, perramosa, *gracilis, *stellata, *dubia, *grandis.*

Versluysia.

*V. ramosa, ceylonensis, *rosea, *dentata, *operculata, *reticulata, *argentea.*

Acis.

*A. alba, *squamata, *solorensis, *serrata.*

Elasmogorgia.

E. filiformis.

Menacella.

M. reticularis.

Bebryce.

*B. indica, hicksoni, *thomsoni.*

Thesea.

*T. *simplex, *pallida, *immersa, *flava, *flexilis, *placoderma, *sanguinea.*

Echinomuricea.

*E. coronalis, indomalaccensis, *collaris, *spinifera, *pulchra, *cylindrica, *costata.*

Echinogorgia.

*E. aurantiaca, furfuracea, pseudosassapo, *ridleyi, *flora, *complexa.*

Acamptogorgia.

*A. *spatulata.*

Placogorgia.

*P. atlantica, *campanulifera, *pulchra, *dendritica, *cryptotheca, *dendata, *squamata, *studeri, *bebrycoides, *alternata, *reticuloides.*

Villogorgia.

*V. nigrescens, compressa, intricata, rubra, *serrata, *timorensis, *flavescens, *inermis.*

Menella.

*M. *rubescens, *grayi.*

Heterogorgia.

*H. ramosa, verrucosa, *muricelloides, *clausa, *humilis, *stellata, *magna, *reticulata, *operculata.*

An enumeration of the above list shows that the Siboga collection contains a total of 95 species of which 64, or almost exactly two thirds, appear to be new.

Systematic discussion of genera and species.

Acanthogorgia Gray (emended by Verrill).

Acanthogorgia Gray. Proceedings Zoological Society of London, 1857, p. 128.
Acanthogorgia (including *Blephrogorgia* Duchassaing et Michelotti) Verrill. Memoirs Museum of Comparative Zoology, XI, I, p. 30, 1883.
Acanthogorgia Wright and Studer. Challenger Report, Alcyonaria, 1889, p. 93.

Calyces tubular, their walls with spindles arranged en chevron, and their margins surmounted by a crown of thorns which are sometimes single and sometimes in a cluster. Each of these marginal spicules is a bent spindle with a tuberculate base embedded in the calyx wall and a thorn-like, comparatively smooth distal portion projecting from the calyx margin. Other similar spicules may occur in the walls below the margin, and spicules of various types in the cœnenchyma of the stem and branches.

The characteristic spicules described above constitute the *Acanthogorgia* type. In the species of this genus the bent spindle predominates, although several other types, such as crosses and triradiate spicules, are found in some species.

The disposition of the spicules en chevron in the calycular walls is also a very good generic character, shared, however, with the genus *Paramuricea*. This latter genus differs from Acanthogorgia in not having the *Acanthogorgia* type of spicules.

The type species of this genus is *Acanthogorgia hirsuta* Gray[1].

The genus as thus defined would include the following species: — *Acanthogorgia ceylonensis* Thomson and Henderson, *A. aspera* Verrill, *A. flabellum* Hiles, *A. hirsuta* Gray, *A. horrida* Studer, *A. inermis* Hedlund, *A. laxa* Wright and Studer, *A. longiflora* Wright and Studer, *A. media* Thomson and Henderson, *A. muricata* Verrill, *A. ramossissima* Wright and Studer, *A. ridleyi* Wright and Studer, *A. schrammi* (Duchassaing et Michelotti), *A. spinosa* Hiles, *A. truncata* Studer and *A. verrilli* Studer[2]. To these are added the new species from the Siboga collection described beyond.

1. *Acanthogorgia ridleyi* Wright and Studer.

Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 95.
Roule. Résultats scientifiques de la Campagne du "Caudan", 1896, p. 306.

Stat. 5. 7° 46′ S., 114° 30′.5 E. Madura Sea. 330 meters. Coral and stones.
Stat. 212. 5° 45′.5 S., 120° 19′.2 E. Banda Sea. 462 meters. Fine grey mud.
Stat. 259. 5° 29′.2 S., 132° 52′.5 E. near Kei Islands. 487 meters. Coral sand.

Colony straggling in habit, 16 cm. in height. The main stem divides about 1 cm. from its origin into two long, straggling branches, one of which gives off three short branchlets from its proximal portion, its distal half being unbranched. The other branch gives off four side branches, its distal half being almost unbranched. The cœnenchyma is fairly thick for this genus.

[1] Gray. Proceedings Zool. Soc. London, 1857, p. 128.

[2] Papers received since the above was written show that the following should be added to this list: *A. candida* Kükth., *A. gracillima* Kükth., *A. spissa* Kükth., *A. japonica* Kükth., *A. doflcini* Kükth., *A. angustiflora* Kükth. and *A. multispinosa* Kükth,

The calyces are long and slender, closely approximated, and set at right angles with the branches, and grow on all sides of the latter. They often tend to curve upward, especially at their distal ends. The individual calyx is about 5 mm. long, on the average, from base of calyx to base of tentacles. The greatest diameter is about 2 mm. near the distal end, and the least diameter is about 1,5 mm. The fringe of long spicules constituting the "crown" are quite conspicuous, and there are a number of other conspicuous points arising from the calyx walls and pointing upward and outward. There are also a number of bristling points projecting from the upper surface of the infolded tentacle.

These spicules, together with those of the crown, form a bristling tuft which must prove an effecting defense to the polyps.

Spicules. Almost all of the spicules are bent, warty spindles. Those around the calyx margins are decidedly longer than the others, sometimes attaining a length of 2 mm. and often placed in pairs immediately over the tentacle bases, the two of a pair being closely approximated throughout. The spicules on the calyx walls are arranged en chevron, while those on the stem and branches are longitudinally placed. The spindles are well tuberculated, the tubercles often being arranged in annular bands.

Color. The color is very light brown throughout, the tentacles appearing darker as they show between the spicules. The axis is a darker brown, and the spicules colorless.

The specimen above described has been compared directly with a portion of the type from the Challenger collection, and agrees with it quite closely, except that the calyces appear to be somewhat more closely approximated than in the type.

The type specimen of this species is in the British Museum. It was collected from off Port Grappler, Patagonia. Depth 140 fathoms.

[1]*2. *Acanthogorgia armata* Verrill. (Plate XIX, fig. 1).

Acanthogorgia armata Verrill. American Journ. Sci. and Arts, XVI, 1878, p. 376.
Acanthogorgia armata Verrill. American Journ. Sci. and Arts, XVIII, 1884, p. 220.
Acanthogorgia armata Verrill. Bull. Mus. Comp. Zool., Vol. XI, N° 1, 1884, p. 31.
Acanthogorgia armata Hickson. Alcyonaria of the Cape of Good Hope, Part II, 1904, p. 225.
Acanthogorgia armata Nutting. Alcyonaria of the Hawaiian Islands, 1908, p. 580.

West Coast of Pulu Weh, Sumatra. 40 fath. Found on cable, Aug. 17, 1908. VAN NOUHUYS don.

Colony indistinctly flabellate in form, 10 cm. in height. The main stem gives off a branch about 1,5 cm. from its base, another about 2 cm. above this, and still others above the latter point, the tendency being toward an obscure geniculation of the main stem. These branches often again branch in an obscurely alternate manner, occasional branches of the third order being seen. The calyces are set at right angles to the stem and branches, are closely approximated, and seem to be equally distributed on all sides of the stem and branches. I am unable to make out any definite spiral arrangement; but there seems to be a tendency for the calyces to arrange themselves in four rows, particularly toward the distal parts of the colony.

[1] As in former reports the species not obtained by the Siboga are indicated by asterisks.

The individual calyces are columnar in shape, but expand at base and summit, sometimes approaching an hour-glass shape. They attain a length of 3 mm. and a width of 1,5 mm. at the tentacle bases, and of 1 mm. at their middle. The margin is surrounded by a crown of thorns, there usually being two or three spicules in each point. The polyps are retracted, the tentacles being folded over the oral disk, as is usual in the Muriceidæ. The operculum consists of thorn-like spindles attached to the tentacle bases and bending toward each other.

Spicules. The spicules are slender spindles, regularly tuberculate, and almost always curved or bent at the middle. The spicules in the crown of thorns have a slender, straight, almost smooth distal portion; and a much shorter, stouter, strongly tuberculate proximal portion which may have stout foliaceous projections. This latter part is immersed in the calyx wall. There are a few triradiate spicules in the cœnenchyma of the stem and branches. The spindles in the calyx walls are bent spindles, arranged en chevron, and there are slender curved spindles on the dorsal surfaces or of the tentacles.

Color. The colony, in alcohol, is very dark umber brown, almost black. The spicules are colorless.

General distribution. Atlantic Coast of the United States, to 524 fath. (Verrill). Cape of Good Hope. 230 fath. (Hickson). Hawaiian Islands. 378 fath. (Nutting).

The calyces of the Sumatran specimens are shorter than described by Verrill; but not shorter than indicated by his figures [1].

3. *Acanthogorgia spinosa* Hiles.

Acanthogorgia spinosa Hiles. The Gorgonacea collected by Dr. Willey, 1899, p. 198.

Stat. 305. Solor Strait, off Kampong Menanga. 113 meters. Stony.
Stat. 310. 8° 3′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony strictly flabellate in form, 12 cm. in height and 9 cm. in diameter. The main stem is straight, erect, and extends through the centre of the colony. The first branch is given off 2 cm. from the base, the others are given off at varying intervals, but are never strictly opposite, The main branches curve outward and upward like candelabra, and two of them give off rows of branchlets from their outer sides only. The calyces are thickly emplanted on all sides of the main stem and branches, and are more crowded toward the distal ends, where their bases seem to be ordinairly almost contiguous.

The individual calyces are very gradually enlarged toward their distal ends, their shape being rather that of an elongated reversed cone than that of an hour-glass as described in the last species. They attain a height of 3 mm. and a diameter near the summit of 1,3 mm. Near the base the diameter is about 1 mm. The points around the margins are numerous, and inclined to project outward and upward. There is a distinct cluster of spines inserted at the base of each tentacle, each spine being curved so as to fit closely over the surface of the incurved tentacle, forming an effective pseudo-operculum.

[1] Bulletin Museum Comparative Zoology XI, N° 1, plate III, figs. 1*a*, 1*b*.

Spicules. The spicules are all slender, curved or bent spindles, much as in the preceding species. Not infrequently, however, they are doubly curved so as to resemble a cupid's bow, and occasionally a triradiate form is seen. The spicules in the calyx walls are arranged en chevron, but there are also a number of spindles of large size that are more nearly perpendicular than in the preceding species, their upper ends projecting freely from the cœnenchyma, giving a spiked appearance that is very marked, especially in a dried specimen.

Color. The specimen described is an obscurely vinaceous dark brown. Another specimen from the same station is much smaller and is apparently a younger colony. The calyces are considerably shorter, but they approximate the size of the larger specimen on the proximal parts of the colony.

General distribution. The specimen described by Ridley was found in Blanche Bay, New Britain, at a depth of 40 fathoms.

4. *Acanthogorgia aspera* Pourtalès.

Acanthogorgia aspera Pourtalès. Fauna of the Gulf Stream, 1868, p. 113.
Acanthogorgia aspera Verrill. Bull. Mus. Comp. Zool., Vol. XI, N° 1, 1883, p. 33.
? *Acanthogorgia aspera* Hedlund. Einige Muriceides, Museum Upsala, 1890, p. 3.
Acanthogorgia aspera Studer. Alcyonaires de l'Hirondelle, 1901, p. 44.

Stat. 122. 1° 58′.5 N., 125° 0.5 E. Celebes Sea. 1264 meters. Stony.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.

Colony (incomplete) roughly flabellate in form, 12 cm. in height and with a spread of about 5 cm. The main stem and lower portions of the main branches are entirely denuded of cœnenchyma. The stem forks into two portions about 2 cm. from its base. One of the resulting branches is undivided and denuded. The other gives off a number of lateral branchlets none of which again divides. The average distance between branchlets is about 4 mm. The calyces are set on all sides of the branches, being more crowded, as usual, on the terminal twigs, where they are often contiguous but sometimes as much as 1 mm. apart.

The individual calyces are columnar in form, a typical one measuring 2,5 mm. in height and 1,1 mm. in diamter, the length of the exposed part of the spicules of the crown being sometimes as much as 1,75 mm. Two or three spindles often form a single crown point. The calycular walls are filled with spicules arranged en chevron, the points seldom projecting to any appreciable extent beyond the body wall. The calyces vary greatly in shape, as is usual in this genus, according to age and extent of retraction.

Spicules. These are almost all slender curved spindles, those forming the crown being typical of the genus, having very straight smooth acute points, and a relatively much shorter basal part, bent at an angle and roughly tuberculate and even branched. The cœnenchyma is filled with very slender curved spindles, more delicate than in most species of this genus, those in the stem and branches being longitudinally arranged.

Color. The colony is very light yellowish brown. The axis is golden yellow brown, and the spicules are colorless.

General distribution. The type was from near Havana, Cuba. 494 fathoms. STUDER reports it from near the Azores. 927 fathoms. HEDLUND reports it from Amoy. 35 fathoms. STUDER, however, expresses doubt regarding HEDLUND's identification.

5. *Acanthogorgia muricata* Verrill.

Acanthogorgia muricata Verrill. Bull. Mus. Comp. Zool., XI, N° 1, 1883, p. 34.
Acanthogorgia muricata Hiles. Gorgonacean Corals at Funafuti, 1889, p. 48.
Acanthogorgia muricata Studer. The Alcyonaires de l'Hirondelle, 1901, p. 45.
Acanthogorgia muricata Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 290. (Under name of *A. muricata* var. *indica*).

Stat. 260. 5° 36'.5 S., 132° 55'.2 E. near Kei Islands. 90 meters. Sand, coral and shells.

Colony flabellate, rather straggling in habit. 9 cm. in height, and about 5 cm. in diameter. The main stem is unbranched for 1,5 cm. from its base, where it sends off a branch which is the main part of the colony, and itself bears branches and branchlets. There are no anastomoses of branches.

The calyces are more sparsely distributed than in most species, and show a tendency toward a bilateral arrangement on the stem and branches, although they are not uncommonly met with on the front and back of the colony. They are not so closely approximated as in the species already discussed, and are quite irregularly spaced.

The individual calyces are quite long and slender. While their basal portions are set at a right angle with the stem, they usually curve distinctly upward so that their margins are approximately horizontal. Their proximal and distal portions are enlarged, while their middle portion is more slender than in other species of the genus so far discussed. The calyces attain a height to 3,5 mm. with a diameter below the tentacles of 1,25 mm. and in their middle portion of .75 mm. Other, probably younger, calyces are much shorter, but fully developed ones are as described.

Spicules. The spicules forming the crown are rather long, and often two unite to form a single crown point. Their distal and proximal parts are not so much differentiated as in other species, the distal part being tuberculate and the proximal part being less expanded than is usual in the genus. The spicules on the calyx walls are arranged en chevron, but the slenderness of the calyces results in these spicules being nearly vertical, meeting in an exceedingly acute angle. Often their distal ends project spine-like from the body walls, but not at a very decided angle.

The spindles in the cœnenchyma are usually arched or bent near the middle, and are rather stout, with numerous warty tubercles.

Color. The colony is light buffy throughout. The spicules are colorless.

General distribution. Off Funafuti, HILES. Off Barbados, West Indies, VERRILL. 76 fathoms. Off the Azores, STUDER. 454 meters. Near Trincomalee, Ceylon, THOMSON and HENDERSON.

This species is much like *A. verrilli* Studer, but the calyces in the Siboga specimen are shorter than those described by STUDER.

6. *Acanthogorgia laxa* Wright and Studer.

Acanthogorgia laxa Wright and Studer. Challenger Reports, The Alcyonaria, 1889, p. 96.

Stat. 26. 8° 35'.1 S., 115° 31'.2 E. Bali Sea. Depth 305 meters. Sand.

The colony (incomplete), is strictly flabellate in form, and attains a height of 26 cm. and a spread of 27 cm. The main stem is incomplete, and the colony was originally doubtless much larger. The first branch origin is about 3 cm. from the proximal end of stem. The main stem is straight and gives off a number of strictly lateral branches in an irregularly alternate manner, and these branches again divide in the same manner. Branches of the third order sometimes result. The cœnenchyma is thin. The calyces are usually lateral, but are not seldom found on the front and back of the colony, especially on its distal parts. They are closely approximated on the sides of the branches and are set nearly at right angles with the latter. The branch terminations, when present, end in calyces.

The individual calyces are rather slender cylinders, sometimes attaining a height of 3.5 mm. and are of almost equal diameter (1.5 mm.) throughout. The crown of points is not conspicuous, and the tentacles are covered basally by bent spindles whose distal ends converge. The calyx walls are covered with spindles arranged en chevron, their points rising to a level with the tentacle bases. The spicules of the cœnenchyma are longitudinally arranged.

Spicules. These are almost all bent spindles regularly tuberculated, and of various sizes. Occasionally one is seen which is of the typical acanthogorgian form; but these are not numerous.

Color. The colony is light brown, and the spicules colorless.

General distribution. The type was taken by the Challenger off Tom Bay, Patagonia. Depth, 175 fathoms.

Although the crown of points is hardly discernible, this species agrees in most of its characters with the genus *Acanthogorgia*.

7. *Acanthogorgia truncata* Studer.

Acanthogorgia truncata Studer. Note preliminaire sur les Alcyonaires provenant des Campagnes de l'Hirondelle, 1891, p. 555.
Acanthogorgia truncata Studer. Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, p. 46.

Stat. 310. 8° 30' S., 119° 7'.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate and very profusely branched, attaining a height of 15 cm. and a spread of 16 cm. The main stem gives off a branch 1.75 cm. from its base. A little above this the main stem divides into two great branches, each of which gives off numerous lateral subalternate branchlets which themselves often divide into branches of the third and fourth orders. There are no anastomoses, but the terminal twigs are very numerous, forming dense tufts. The calyces are equally distributed on all sides of the branches, and are closely approximated. In places they tend to an arrangement in whorls of four or five, but this arrangement is by no means

constant. The whorls are only about one mm. apart. The branches end in polyps, and the cœnenchyma is thin.

These projecting points are more numerous, heavy and constant than in any of the preceding species. The polyp is very heavily armed with spicules, and does not appear to be capable of complete retraction, and when considerable expanded it is difficult to distinguish between the calyx and œsophageal part of the polyp, although there is a crown on the margin. The proximal portion of the incurved tentacles are protected by heavy longitudinal spicules, and the distal portions by lighter ones.

Spicules. There are mainly straight and curved tuberculate spindles. There are also crown spicules of the characteristic acanthogorgian type. A few forked and triradiate forms are seen, and also, but rarely, crosses.

Color. The color, in alcohol, is grayish brown. The axis is dark golden brown, and the spicules are colorless.

General distribution. The type was secured in the Gulf of Gascogne at a depth of 240 meters. No other specimens have been reported, except those secured by the Siboga-Expedition. Besides the specimen described above, another, much smaller one in poor condition was secured from the same station.

The Siboga specimens agree with STUDER's description. His figures indicate that the type was yellow in color, but his description calls it brown.

8. *Acanthogorgia flabellum* Hickson.

Acanthogorgia flabellum Hickson. The Alcyonaria of the Maldives, 1905, p. 812.

Stat. 117. 1°0′.5 N., 122°56′ E. North Celebes, 80 meters. Sand and coral.
Stat. 125. Anchorage off Sawan, Island Siau. 27 meters. Stony.
Stat. 164. 1°42′.5 S., 130°47′.5 E. West New Guinea. 32 meters. Sand and stone.
Stat. 310. 8°30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.
Stat. 315. East of Sailus Besar, Paternoster-Islands. Up to 36 meters. This is the specimen described.

Colony flabellate, loosely reticulate, attaining a height of about 12 cm. and a breadth of 7 cm. Branches and main stem about the same diameter throughout. Calyces unevenly distributed, fairly thickly emplanted; mainly on the sides of the branches, but by no means lacking on the front and back. The distribution is very uneven, there being considerable spaces destitute of calyces, while others are crowded.

The individual calyces are very small, attaining a height of but 1 mm. Their outline is dome-shaped, owing to the regularly arched tentacular surface and low walls. The operculum is composed of three spindles for each flap, and is often almost entirely concealed by the crown points. The calyx walls are covered with spicules, many of which are branched or triradiate, their points sticking upward and outward. These calycular spicules look as though they had been arranged en chevron and then, owing to the shortening of the calyx, pressed down until they lie almost horizontally, encircling the calyx. The cœnenchyma is moderately thick.

Spicules. The most numerous form is a small warty, more or less curved spindle. The crown spicules are not prominent; but are of the true *Acanthogorgia* type. Crosses and triradiate forms are common, especially in the stem and branches. Occasionally small branched spicules approach the form of "Stachelplatten".

Color. The calyces and cœnenchyma are white in alcohol, but the golden brown axis shows through the latter, giving a dusky tint.

General distribution. The type was from Adder Atoll, Maldive Archipelago. 25 fathoms.

The Siboga specimens agree very well with the original description.

9. *Acanthogorgia ceylonensis* Thomson and Henderson.

Acanthogorgia ceylonensis Thomson and Henderson. Ceylon Pearl Oyster Reports, Alcyonaria, 1905, p. 290.

Stat. 47. Bay of Bima. 55 meters. Mud with coral sand.
Stat. 144. Anchorage North of Salomakië (Damar) Island. 45 meters. Coral.
Stat. 257. In Du-Roa Strait, Kei Islands. 52 meters. Lithothamnion.
Stat. 289. 9° 0'.3 S., 126° 24'.5 E. Timor Sea. 112 Meters. Mud, sand and shells.

Colony flabellate in form, with distal branches anastomosing to a moderate degree. Height 11 cm. Breadth 14 cm. Branches rather profuse, the main branches showing a tendency to become geniculate, giving off alternate branches at the geniculations.

While the general form of the colony is flabellate, some of the branches are given off from the front of the colony. The calyces are sparsely distributed, and show a distinct tendency to a bilateral arrangement, and in places are quite regularly alternate, giving much the appearance of the hydroid genus *Sertularella*. The stems and branches are quite extensively denuded.

The individual calyces are quite small for this genus, seldom exceeding 1 mm. in height. They are columnar in form, and of almost even diameter throughout, except a sligt expansion at the tentacle bases; the diameter being about equal to the height. The crown of spicules is not conspicuous, indeed it is ordinarily scarcely evident; but can be seen on an occasional calyx. The spindles which constitute the crown curve inwards more than ordinarily, bending over, a pair to each tentacle, and forming a strong protection. The tentacles have tuberculate spindles on their exposed surfaces.

Spicules. The crown spindles are not well differentiated, being simply curved spindles without sharp distinction between the proximal and distal parts. The calyx walls are covered with tuberculate spindles en chevron, their distal ends often projecting in dried specimens. The basal portion of the walls often have spindles arranged almost horizontally. The cœnenchyma is thin, with numerous tuberculate spindles, and also crosses, triradiate forms, and irregular spindles and plates.

Color. The calyces are very light brown, almost white, in alcohol. The stem is dark golden brown proximally, fading distally to almost white.

General distribution. The type was secured off Trincomalee, Ceylon.

10. *Acanthogorgia striata* new species. (Plate 1, figs. 3, 3*a*; Plate XIX, fig. 2).

Stat. 117. 1° 0′.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 253. 5° 48′.2 S., 132° 13′ E. Banda Sea. 304 meters. Clay.

Colony straggling in habit, subflabellate in form, giving off long and irregularly disposed branches which themselves give forth irregularly disposed branchlets. Height 32 cm. In most cases the terminal branches are free from branchlets for a considerable distance, and the central stem is free from branches for its distal half. The calyces are rather closely approximated and project ordinarily at a right angle from the stem.

The individual calyces are columnar in form, and attain a height of about 3 mm.

They are usually of about the same diameter throughout, being from 1 to 1.5 mm. in diameter. The marginal points extent outward and upward, while within this crown of points other spicules point toward the centre, and still others are curved over the retracted tentacles, to which they are closely applied.

Spicules. These are all slender spindles, curved or bent, but seldom assuming the shape of a cupid's bow. The largest, which form the crown of points, are of the typical acanthogorgian shape, the distal end being straight, smooth and sharp, with the basal part much branched and tuberculate, and being bent at an angle with the distal part. The spindles of the calycine walls are arranged en chevron. Those just below the tentacle bases are almost horizontal in position.

Color. The polyps are light brown, with eight longitudinal stripes showing darker brown, thus giving the name to the species. The axis is a rich golden brown with a distinct lustre, and this shows through the cœnenchyma so that the stem and branches appear darker than the polyps.

This species is near *Acanthogorgia horrida* Studer, but the disposition of the calyx spicules does not agree with his figure [1]. It also resembles *Acanthogorgia aspera* Pourtalès, but the calyces are considerably stouter, and the vertical markings quite prominent.

11. *Acanthogorgia studeri* new species. (Plate 1, figs. 1, 1*a*; Plate XIX, fig. 3).

Stat. 47. Bay of Bima. 55 meters. Mud with coral sand.
Stat. 117. Kwandang Bay entrance, North Celebes. 80 meters. Sand and coral.
Stat. 139. 0° 11′ S., 127° 25′ E. near Batjan Island. 397 meters. Stony.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. Aru Islands. 57 meters. Sand and stones.

Colony (incomplete) flabellate in form, the branches anastomosing to a limited degree. The height is about 12 cm. The main stem is unbranched for 3 cm., where it divides into two main portions, each of which subdivides into rather numerous branches and branchlets, the latter anastomosing in places forming a rude reticulation.

The calyces are rather thickly distributed on all sides of the stem and branches, and show a tendency toward a disposition in spirals; but this is not at all constant. They are usually

[1] Studer. Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, Plate VII, fig. 2.

straight, standing at right angles to the stem and branches. They are columnar in form, expanding slightly at top and bottom. The crown of points is not very conspicuous; but that may be due to the fact that the specimen was preserved in concentrated acetic acid, which has dissolved the spicules.

The individual calyces attain a height of a little over 2 mm. and a diameter of about 1 mm. The spindles on the tentacles have been largely dissolved by acid.

Spicules. These are rather stout spindles, rather straighter that is common in this genus, without decided curve or bow-shape. The spicules forming the crown of points are tuberculate on their distal parts, which are less decidedly differentiated from the proximal portions that is usual in the *Acanthogorgia* type. The spindles in the calyx walls are large and stout, and are arranged en chevron. Just below the tentacle bases they are nearly horizontal in position, except where they project to form the crown of points. The cœnenchyma is thick, and its spicules are longitudinally placed.

Color. The colony is medium brown throughout, the calyces not differing appreciably from the stem and branches. The axis has a golden brown lustre. The spicules are colorless.

This species is near *Acanthogorgia laxa* Wright and Studer[1]; but the calyces are much smaller.

12. *Acanthogorgia turgida* new species. (Plate I, figs. 2, 2*a*; Plate XIX, fig. 4).

Stat. 204. 4° 20′ S., 122° 58′ E. near Buton Island. 75—94 meters. Sand.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Kei Islands. 90 meters. Sand, coral and shells.
Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 meters. Mud.

Colony flabellate in form, the branches rarely anastomosing. Length 11 cm., spread 15 cm. The first branch arises about 1 cm. from the base of the stem, and others arise in an irregularly alternate manner. The lateral branches are very long and profusely branched throughout their distal portions. The calyces are rather evenly distributed on all sides of the stem and branches, and are rather closely approximated. They are short and stout, and more conspicuously spiny than usual.

The individual calyces are up to 2 mm. in height and are somewhat barrel-shaped, being 1 mm. in diameter near the middle and but 1.75 mm. at the distal and proximal ends. The crown of points is quite conspicuous, the spicules being numerous and long in proportion to the size of the species. The body walls are filled with spicules arranged en chevron.

Spicules. The crown spicules are well differentiated into a long, comparatively smooth distal part, and a short basal part; set at an angle with the other portion, and having conspicuous tuberosities and often jagged processes and branches. Many of the spicules in the calyx walls have their ends projecting upward and outward, giving a very bristling appearance to the calyces. The spicules in the stem and branches are exceedingly varied in character. Small spindles are common, and there are also numerous jagged irregular plates, crosses, stars, etc.,

[1] Wright and Studer. Challenger Reports, The Alcyonaria. 1889, p. 96.

that form a sort of reticulate pattern on the dried surfaces of the branches. The spindles themselves are warty, and have prominent jagged processes and expansions.

Color. This species superficially resembles *Acanthogorgia spinosa*, but is much lighter brown, and has more slender calyces.

It also resembles *Acanthogorgia truncata* Studer, but differs from it both in color and character of spicules.

Anthomuricea Wright and Studer.

Anthomuricea Wright and Studer. Archiv. für Naturgesch., Jahrg. LIII, Bd. p. 55.
Anthomuricea Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 108.

Calyces cylindrical, margin without a crown of projecting points, walls with spindles arranged en chevron. The operculum is conspicuous, 8-rayed, with its basal portion composed of small spindles arranged en chevron. The spicules are without Stachelplatten.

The writer has here adopted the original definition without essential modification. The genus is very near to *Paramuricea*, but is easily distinguished by the spicules, which are all regular spindles instead of spiny disks.

The type species of this genus is *Anthomuricea argentea* Wright and Studer. Other known species are *Anthomuricea tenuispina* Nutting, *A. chamaeleon* Koch and the four new species in the Siboga collection.

1. *Anthomuricea sanguinea* new species. (Plate I, figs. 4, 4*a*; Plate XIX, fig. 5).

Stat. 47. Bay of Bima, near South Fort. 55 meters. Mud with coral sand.
Stat. 144. Anchorage north of Salomakië (Damar) Island. 45 meters. Coralbottom. (Fragments).

Colony flabellate in form, and with a height of 8 cm., and a diameter of 4.9 cm. The main stem is straight, the first branch being given off 1.8 cm. from the base. Above this a number of lateral branches are given off in an entirely irregular manner, 7 on one side and 3 on the other. The calyces are regularly alternate, and are inclined toward the front and toward the distal ends of the branches, where a pair of large calyces form a forked termination, the axis ending in a point between the calyces. The distance between the calyces is quite regularly 2.5 mm.

The individual calyces are truly cylindrical in shape, sometimes attaining a height of 2 mm. Their diameter is about 2 mm. The walls are filled with slender spindles which are vertically disposed, but tend to the en chevron arrangement near the margin, where they form eight blunt points opposite the tentacle bases. The polyps are completely retractile, but in many cases rest with the unusually conspicuous collaret on the calyx margin, the dome-shaped operculum resting above. Both the collaret and operculum are composed of crimson spicules, the latter being made up of very numerous slender spindles which cover the basal part of the tentacle with an en chevron arrangement, and are longitudinally arranged on the distal parts.

Spicules. These are nearly all very slender spindles, often curving or sinuous, and sometimes attaining a length of 2.2 mm. Some of these are the most slender tuberculate spindles that the writer has seen in the Muriceidæ.

Color. The color of the colony and of the spicules is a deep crimson. This is a very beautiful and symmetrical species.

2. *Anthomuricea timorensis* new species. (Plate II, figs. 2, 2*a*).

Stat. 60. Haingsi, Samau Island, Timor. 23 meters.

A mere fragment is all that was secured of this species; but it shows very well the characteristics of the genus. It consists of the end of a branch 1.3 cm. long.

The calyces are thickly crowded on all sides leaving hardly any of the cœnenchyma exposed. They are bulging at the top, where the marginal portion, together with the operculum, forms a distinct rounded knob. They are 2 mm. in height, and 1.75 mm. across the knob. The calycular walls are filled with spindless placed en chevron on their basal portions, while the tips of the tentacles are covered by two curved spindles meeting at their distal ends. The cœnenchyma is filled with rather slender straight or slightly curved spindles.

Spicules. The specimen is so small that it was thought best not to destroy a portion in order to clean the spicules for examination. From a superficial view they seem to be all spindles, evenly tuberculated. Their arrangement is almost precisely that represented in Fig. 1, plate XXIII of the Challenger Report on the Alcyonaria, representing *Anthomuricea argentea*.

Color. The color of the fragment is light yellowish brown.

This fragment can not be placed in either of the hitherto known species. The calyces are much broader in proportion to their height than in *A. argentea*, and are much more crowded. They are considerably larger than in *A. reticulata*, and much more crowded and of a different color than in *A. tenuispina*, a species described by the writer from the Hawaiian Islands; and are cylindrical, not subconical in form.

*3. *Anthomuricea brunnea* new species. (Plate II, figs. 1, 1*a*; Plate XIX, fig. 6).

East coast of Pulu Weh, Sumatra, growing on cable. 40 fathoms. Aug. 17th, 1906. Van Nouhuys leg.

Colony subflabellate in form, 10 cm. in height. The branching is exceedingly irregular, some large branches growing from the front and interfering with the flabellate manner of growth. The main stem gives off the stump of a heavy branch from its front, and less than 1 cm. from its base. At the junction of this branch with the stem a small upright branch is given off, from which originate five short branches not lying in the same plain. The main stem, just above the origin of the stump referred to above, divides into two parts, one lateral and one upright, which give off a number of laterally disposed branchlets; and some of these again divide.

The calyces arise from all sides of the stem and branches; but most of them are on

opposite sides. There is usually a polyp terminating a branch; but often this is not the case. The calyces are closely approximated on the sides of the branches, being on the average not more than 1 mm. apart. They are much more scattered on the front and back.

The individual calyces are tubular in shape, surmounted by the rounded dome of the pseudo-operculum. They project at right angles with the stem and branches. There are no distinct marginal projections, and some of them attain a height of 3 mm. to the top of the operculum; but they do not average more than 2 mm. Their maximum diameter is 1.5 mm. The sides are almost straight, except at the extreme base, where they broaden to meet the branches. Their walls are filled with spicules arranged en chevron, the point of the chevron being opposite the tentacular bases, which are themselves filled with spicules arranged en chevron, and surmounted by two bent horizontal spicules, one above the other, just below the long opercular spindles. There are four or more of these latter to each tentacle, lying along the tops of the incurved tentacles in a bundle, the lateral ones curved so as to embrace the outer basal surface of the tentacle and meeting in a point distally.

Spicules. The spicules are all typical spindles, usually slightly curved, and always strongly tuberculate.

Color. The entire colony is deep golden brown.

This species differs from the type of the genus in having terminal polyps, and in the spiculation of the operculum.

4. *Anthomuricea reticulata* new species. (Plate II, figs. 3, 3*a*; Plate XIX, fig. 7).

Stat. 50. Bay of Badjo, Flores. Up to 40 meters. Sand.
Strait of Boleng, Solor.

Colony (dried specimen) strictly flabellate and reticulate, attaining a height of 75 cm., and a diameter of 80 cm. The main stem arises from a broad expanded base and consists of several agglomerated massive stems which immediately break up into a number of branches of different sizes. Some of these pursue a tortuous course to the edge of the colony; but most of them fork so that they themselves become broken up, the resulting branchlets often forking several times before they reach the periphery of the colony. The ultimate twigs are born on all sides of the branches, especially in the borders of the colony, so that there are numerous twigs projecting from the front and back of the fan. The stem and basal parts of the branches, where decorticated, show that the axis is deeply and irregularly furrowed with longitudinal grooves. The main branches are compressed, the largest having a cross section of 13 mm. by 6.5 mm. The calyces are emplanted on all sides of the stem and branches, and are seldom contiguous, as in many other large flabellate Muriceids, but are separated, on the average, by about 1.3 mm.

The individual calyces are in the form of short cylinders, a typical one being 1 mm. high and having a diameter of 1.5 mm. The calyx walls are filled with uniform small, stout spindles which are arranged en chevron on the upper parts, and have a circular disposition on the lower parts of the walls. The collaret and operculum are very well developed, the latter

being high dome-shaped, and having nearly all of the spindles arranged en chevron, the ends of the tentacles only being provided with longitudinal spindles. The polyps are not fully retractile, all of them resting with the collaret on the calyx margin so closely that it is hard to tell where the calycular spindles end and the opercular spindles begin, the collaret being practically concealed.

Spicules. The spicules of the stem and branches are spindles like those of the calyx walls. They are, in general, longitudinal in position; but encircle the bases of the calyces.

Color. The dried specimen is a dull woody brown, the axis is black, when clean, and the spicules are light yellowish brown.

This is one of the handsomest specimens in the collection.

Anthogorgia Verrill.

Anthogorgia Verrill. American Journal of Science and Art, XLV, 1868, p. 413.
Anthogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LIII.
Anthogorgia Studer. Challenger Reports. Supplementary Report on the Alcyonaria, 1889, p. 12.

The original definition of this genus, which is here adopted, is as follows: —

"It is characterized by very prominent tubular cells, eight-rayed at summit: a thin cœnenchyma containing embedded fusiform spicula: those of the cells long, fusiform, thorny, embedded at various angles in the surface, but not imbricated".

The genus is separated from *Paramuricea* by the fact that the spicules of the calyx are not arranged en chevron, from *Anthogorgia* by the same character in addition to the absence of a crown of points, from *Villogorgia* by the fact that its spicules are all true spindles, from *Anthomuricea* by the calycular and opercular spicules not being arranged en chevron, and from *Muriceides* by a totally different operculum.

The type species of this genus is *Anthogorgia divaricata* Verrill. The other previously known species is *Anthogorgia japonica* Studer. Two new species are described beyond.

1. *Anthogorgia verrilli* new species. (Plate III, figs. 2, 2*a*; Plate XIX, fig. 8).

Stat. 305. Mid channel in Solor Strait, off Kampong Menanga. 113 meters. Stony.

Colony flabellate, 14 cm. high, and with a spread of 16 cm. The main stem sends off a small branch about 1 cm. from its base and a little above this it forks, sending off a longer lateral branch and a shorter erect branch. Each of these divides into subalternate branches, and some of these latter again divide, making branchings of the third and fourth orders. The calyces are usually lateral in position, and in some of the branches they are quite regularly alternate. A few calyces are on the front of the branches, particularly on the distal portions of the colony. They are quite evenly spaced, being usually from 3 to 4 mm. apart on the sides of the branches. They stand stiffly at right angles to the branches, and show little tendency to curve toward each other, as in *Anthogorgia aurea*.

The individual calyces are about 4 mm. high and 1.5 mm. in diameter. They are strictly tubular, enlarging somewhat toward their summits. Their walls are filled with heavy tuberculate spindles irregularly disposed, but tending to be vertical. There are eight marginal points, formed by the main opercular spindles which are more slender than in *A. aurea*. They are formed by two large spindles with their proximal ends divaricated and their distal ends approximated. A third spindle is laid across outside of the basal ends of the two already mentioned. Below these the polyp is surrounded by a circlet, more or less incomplete, of spindles. There seem to be two layers of spindles in the calicular walls and cœnenchyma, but they do not imbricate. The marginal points of the calyx project well above the folded tentacles, which do not form an elevated dome, as in the next species.

Spicules. The spicules are all rather stout, gently curved and tuberculate spindles, with the tuberculations not very close.

Color. The colony is light brown throughout, without any golden or orange tinge. The spicules are colorless.

2. *Anthogorgia aurea* new species. (Plate III, figs. 1, 1*a*; Plate XIX, fig. 9).

Stat. 15. 7° 2′.6 S., 115° 23′.6 E. Bali Sea. 100 meters. Coral sand.
Stat. 144. Anchorage North of Salomakië (Damar) Island. 45 meters. Coral bottom.

Colony flabellate in form, attaining a height of 24 cm. and a diameter of 15 cm. The main stem has a diameter of 4 mm., and branches about 3 cm. from its base. The branches are irregularly alternate, and the branching continues until branches of the fifth order are produced. There are no terminal calyces; but they are lateral in position, and tend to be subopposite. Sometimes, however, there is a tendency to form spirals of three, particularly on the distal branchlets. The calyces on a given side are not in the same plane, but are inclined alternately to the front and back of the stem or branch. They are very irregularly spaced, but are usually rather distant, those on a given side being from 1.5 to 4 mm. apart.

The individual calyces are cylindrical in form, and are often curved. A typical one measures 4 mm. in length, and 2 mm. in diameter, and is of nearly the same diameter throughout. Their walls are filled with large fusiform spindles irregularly disposed, but most often lengthwise. On the margin there is a series of eight blunt points, each corresponding to a tentacle base. The retracted tentacles form a dome-shaped mass resting within the margin. The upper surfaces of the tentacles are filled with small spindles arranged en chevron, and the collaret is inconspicuous, represented by an ill defined ring of slender spindles.

Spicules. These are all large, stout, straight or curved, very warty spindles. The tubercles are thickly and evenly packed on the surface, but are small. Those on the stem and branches are longitudinally disposed.

Color. The colony is a rather bright orange brown, the calyces being somewhat lighter, and the stem darker. Many of the spicules are of this golden or orange color.

Muriceides Wright and Studer (emended).

Muriceides Studer + *Clematissa* Studer. Archiv. f. Naturgesch. Jahrg. LIII, Bd. 1, pp. 54, 55.
Muriceides Wright and Studer + *Clematissa* Wright and Studer. Challenger Reports, the Alcyonaria 1889, pp. LII, LIII, 105, 106.

Calyces cylindrical, or in the form of truncated cones, their walls filled with vertically placed spindles, often modified into clubs, discs, or triradiate forms vertically placed; but not en chevron, and not forming a true crown of points around the margin. The opercular spindles are placed en chevron on the tentacle bases.

The coenenchyma contains spicules of various forms, and the branches may, or may not, end in calyces.

The union of the two genera *Muriceides* and *Clematissa* of Wright and Studer seems called for on account of the failure of the character that was most emphasized by their describers in separating them. The fact that in one species herein described some of the branches end in calyces, while others do not, destroys the value of this distinction for even specific description. They also intergrade in the character of the spicules, Stachelplatten being found in both, though more predominent in *Muriceides*.

By thus combining the two genera we have a fairly homogenious genus, characterised by vertically arranged spindles not en chevron in the calyx walls, and opercular spindles en chevron; while the margin does not show the crown of points characteristic of the genus *Paramuricea*.

The type species of this genus is *Muriceides fragilis* W. and S. The other known species are *M. furcata* Studer, *M. obtusa* (W. and S.), *M. robusta* (W. and S.). *M. sceptrum* (Studer), *M. verrilli* (W. and S.), *M. alba* (Nutting), *M. tenuis* (Nutting), and the new species herein described.

1. *Muriceides javensis* new species. (Plate IV, figs. 1, 1*a*).

Stat. 7. 7° 55′.5 S., 114° 26′ E. (Near Java). 15 meters, and over. Coral.

Colony rudely flabellate in outline, about 32 cm. in height, and with a spread of 35 cm. The root is not present, and the specimen appears to be but one of the main branches of a very large specimen. This branch sends forth most of its branches from its upper side, there being but one from the lower side. These side branches are regularly curved upward and outward, and themselves give off ultimate branchlets from their proximal portions; the distal parts often being unbranched for a considerable distance. The main branch is round in section, and is 5 mm. in diameter. The other branches are often flattened in the plane of the colony. The branches arising from the main branch are about 2.25 cm. apart, and often, but not always, end in calyces. The cœnenchyma is thick. The calyces are almost all lateral and alternate, but sometimes approach a loose spiral in arrangement. There are, however, a number scattered along the front and back of the branches at wide and irregular intervals.

At the end of the branch there is often a triangular expansion with a calyx at each outer angle. While this is usually the case, there are branches that distinctly terminate in calyces, or rather in a single calyx. The calyces are 3 to 5 mm. apart.

The individual calyces are in the shape of truncated cones, set at a right angle to the branches, and compressed in the plane of the branch. They are usually about 2 mm. in height to the bases of the tentacles, and about 4 mm. broad at the base. The tentacles, when folded, form a high, almost conical, dome about 2 mm. in height, resting on the calyx margin, and showing a well-marked collaret. The spicules of the operculum are longitudinally disposed on the distal portions, and small spindles disposed en chevron on the basal parts.

Spicules. These are all spindles of various forms and sizes. They are usually terete, straight, and very densely tuberculated. They are of about the same types on calyces and cœnenchyma of stems and branches.

Color. The colony (in alcohol) is a light creamy white. The axis is horn color, and the spicules colorless.

The character of the branch terminations of this species was the one that made it necessary to combine the old genera *Muriceides* and *Clematissa*. It is possible that where there are two terminal calyces on the triangular expansion of a branch, the branch was destined to fork.

2. *Muriceides collaris* new species. (Plate IV, figs. 3, 3*a*; Plate XIX, fig. 10).

Stat. 253. 5° 48′.2 S., 132° 13′ E. near Kei Islands. 304 meters. Clay.

Colony straggling in habit, 22 cm. in height. The main stem is unbranched for about 7 cm., where it bifurcates; or rather sends off a branch about as large as the main stem, which branch divides dichotomously. The main stem gives off two other lateral branches on each side, one of which divides dichotomously. All of the branches turn upward shortly after they leave the main stem or branch, and become erect and parallel. The main stem is about 4 mm. in diameter near its base, and the distal ends of the branches 2 to 3 mm. The branches do not end in calyces. The calyces are quite unevenly distributed, but most of them are placed on the sides of the branches. They are, on an average, about 2 mm. apart. The cœnenchyma is thick.

The individual calyces are in the shape of truncated cones upon the summits of which rest the collarets of the retracted polyps. They are about 1 mm. in height, to the collaret, and about 1.5 mm. in diameter at the summit, and 2 mm. in diameter at the base. The calyx walls are filled with longitudinally placed spicules which are not en chevron, some of their points projecting slightly above the margin. The operculum is highly arched, almost conical, and each flap has several long spindles on the distal portion, and a few spindles placed en chevron on the basal part of the tentacle.

Spicules. These are usually straight, tuberculate spindles. Sometimes, however, they are curved, and, rarely, branched. Occasional lobed, triradiate forms are seen, sometimes taking the form of Stachelplatten; but the great majority are straight or curved spindles.

Color. The entire colony is ivory white in alcohol.

This species has some resemblance to *Clematissa verrilli* Wright and Studer; but the calyces are smaller, the color different, and the spiculation of the calyces quite distinct.

3. *Muriceides dubia* new species. (Plate IV, figs. 2, 2*a*; Plate XIX, fig. 11).

Stat. 274. 52° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.

Colony subflabellate in form, 11 cm. high, and 7.5 cm. in diameter. The main stem is tortuous, giving forth alternate individual branches 1 to 2 cm. apart, the branches bending outward and upward like candalabra. The stem and branches are round, and have a uniform thickness of about 4 mm. The calyces are crowded, and in places contiguous. They are inserted on all sides of the stem and branches, the latter terminating in calyces. The cœnenchyma is thick.

The individual calyces are verruciform or dome-shaped, the polyps being completely retracted and obliterating the orifice of the calyces. They are 2.5 mm. high and of about the same diameter. Rarely they are much larger and more slender, being 4.5 long and 2.5 mm. in diameter. Their walls are closely packed with large fusiform spindles vertically disposed. The points of these spicules are gathered together at the margin, so as to entirely obliterate the opening of the calyx. There are a few spicules on the polyp walls beneath the collaret, which is represented by an irregular, broken row of transversely placed spindles. The operculum is weak, consisting of a few longitudinally disposed spicules, placed obscurely en chevron basally. The tentacles, when retracted, are so closely approximated that they form a mass in which the individuals are hard to see.

The spaces between the calyces are covered with a minute, parasitic tubularian hydroid.

Spicules. These are all fusiform spindles, closely tuberculated and of various sizes. Those on the calyx walls are often imbricated.

Color. The colony is almost white in alcohol. The axis is brown, and the spicules colorless.

This species is somewhat doubtfully referred to the genus *Muriceides* on account of the ill defined character of the operculum.

Muricella Verrill (emended).

Muricella (Subgenus) Verrill. Transactions Connecticut Acad., Vol. 1, 1869, p. 450.
Muricella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 123.
Muricella Ridley. Zoological Collections of H. M. S. Alert, 1884, p. 335.

Verrill originally proposed the name *Muricella* for a "group" of the genus *Muricea*, and described it as follows:

"This division includes those species which have a rather thin cœnenchyma, filled with long spindles, with low, subconical verrucæ arising from between the large spicula and usually standing at right angles to the surface, and covered with much smaller and shorter spindles".

This author has also called attention to the near relationship of this genus to *Acis* which differs in having scale-like spicula covering the verrucæ.

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The present writer would define the genus *Muricella* as follows: Calyces in the form of truncated cones or rounded verrucæ. The spicules are all spindles, those of the cœnenchyma very large, arranged longitudinally. The upper portion of the calyces with smaller, vertical spindles often forming eight marginal points by the convergence of their upper ends, thus forming a sort of approximation to an en chevron arrangement. The tentacle bases have the spindles arranged en chevron.

The genus thus differs from *Muriccides* in having very large spindles, from *Paramuricea* in the form of the calyces, and from *Authomuricea* in having the spindles of calyx walls not en chevron.

The type species of this genus is *Muricella flexuosa* (Koll.).

The known species belonging to this genus are *M. ceyloneusis* Thomson and Henderson, *M. complanata* W. and S., *M. crassa* W. and S., *M. nitida* Verrill, *M. perramosa* Ridley, *M. ramosa* T. and H., *M. rubra* Thomson, *M. tenera* Ridley, *M. tuberculata* (Esper) and *M. umbraticoides* Studer. To these must be added the three new species described beyond.

1. *Muricella gracilis* Wright and Studer.

Muricella gracilis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 129.

Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.

Colony roughly pinnate, straggling in habit, 5.2 cm. in height, and with a spread of about 2 cm. The main stem gives off six short simple branches from one side, and one bifurcated one from the other. The distance between branches is about 5 mm. The calyces are arranged in a long spiral, and the branches end in a polyp. The distance between calyces is about 2 mm. on the average.

The individual calyces are tubular in form, and a typical one is a little over 1 mm. in height, and about as broad as long. Its walls are filled with vertical spindles, there being usually a fairly regular basal set between the distal ends of which are fitted smaller spindles that reach to and surround the margin. In some cases these latter tend to arrange themselves en chevron. The polyps are entirely retractile, and the operculum is composed of a number of small spindles which seem to be arranged in no definite manner, although there is a tendency toward an en chevron disposition. The cœnenchyma is filled with large spindles characteristic of this genus.

Spicules. These are all spindles of various sizes, some of which attain a length of 2 mm. They are rather more slender than is usual in this genus, and their edges are closely approximated in the cœnenchyma. They are covered with small, closely set tubercles.

Color. The colony is a bright coral red throughout, and the spicules are of the same tint.

General Distribution. Admiralty Islands. 16—20 fathoms.

The spindles of this species resemble those of the genus *Acis* in the way in which their edges are fitted together.

2. *Muricella crassa* Wright and Studer.

Muricella crassa Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 131.

Stat. 117. 1° 5′ N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.

Colony flabellate and reticulate, 18 cm. in height, and with a spread of 13.5 cm. The main stem gives off a number of lateral branches, unequally spaced and tending to be alternate; and these branches send off numerous branchlets which are subalternate, and about 5 mm. apart. Occasionally these branchlets divide, making branches of the fourth order. The main stem is 4 mm. in diameter at the base, while the ultimate branchlets are but 1 mm. in diameter. The calyces are pretty evenly distributed on all sides of the branches, being very closely approximated, even contiguous in places, while they are as much as 2 mm. apart in other parts of the colony.

The individual calyces are verruciform or dome-shaped, the dome being formed, however, by the high operculum. They are usually less than 1 mm. in height, and have a diameter of 1.5 mm. The calycular walls are filled with short, blunt spindles disposed in a very irregular manner and at all angles, there being a tendency, however, to an en chevron arrangement on the upper parts of the walls, and a vertical arrangement on the lower parts. The margin is surrounded with eight not very well marked points. The polyps are retractile, the spicules around the margin being closed over the retracted polyps. The operculum is composed of three spindles forming an acute angled triangle, the point directed toward the centre. In addition to these three spindles, there are a number of smaller ones on the basal part of each tentacle arranged en chevron, and longitudinally arranged on the distal parts.

Spicules. These are all very stout warty spindles of moderate size for this genus, there being less difference in size between the calycular spindles and those of the cœnenchyma than is usual. Very rarely small forked spindles are seen.

Color. The colony is almost white, in alcohol, except where the very dark brown axis is exposed.

General Distribution. This species was secured by the Challenger in the Arafura Sea, at a depth of 49 fathoms.

3. *Muricella complanata* Wright and Studer.

Muricella complanata Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 125.
Muricella complanata Thomson and Henderson. Ceylon Pearl Oyster Reports, Alcyonaria, 1905, p. 303.

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. 50—40 meters. Coral sand.
Stat. 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and sand.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate 5 cm. in height and with a spread of 2.3 cm. The main stem gives off four simple branches from one side, and none on the other, although there is an appearance of sprouting branches. The stem and branches are somewhat flattened, their greater diameter being 2.4 mm. and their less diameter being 1.7 mm.

The calyces are nearly all lateral and subalternate, with a few distributed on the front, but none on the back of the colony. There are no terminal polyps; the branches ending in a flat, triangular expansion with calyces at the outer corners.

The individual calyces are short tubes, or much truncated cones, a typical one measuring 1.5 mm. in height to margin, and 2.2 mm. in diameter at base. The calycular walls are filled with spindles which are unusually small in proportion to those of the cœnenchyma. They are generally vertical in position, although not infrequently they are oblique, and there is a distinct tendency toward an en chevron arrangement. There are no distinct marginal points, although the margin is often sinuous, resulting in eight low elevations. The polyps are not retractile beyond the collaret, as a general thing, and the operculum is high and dome-shaped, consisting of a number of straight, red spindles longitudinally arranged on the dorsal surface of the tentacles. These spindles lie side by side, and so completely cover the retracted tentacles that almost nothing of the real surface can be seen. On the basal part of the tentacles the spindles are arranged en chevron.

The cœnenchyma is covered with the characteristic long spindles of this genus.

Spicules. The spicules of this species are all spindles, not large or heavy for this genus, as a general thing, and those of the calyces much smaller than those of the cœnenchyma. The latter shows an occasional spindle much larger than the others, sometimes reaching 2 mm. in length, and of a deep purple color.

Color. The colony is coral red, the spicules usually scarlet, but with an occasional purple one. The axis is olive brown.

General distribution. The type of this species was secured by the Challenger off Japan, at a depth of 325 fathoms. Thomson and Henderson report it from near Ceylon.

4. *Muricella perramosa* Ridley.

Muricella perramosa Ridley. Annals and Magazine of Natural History, Series 5, Vol. X, 1882, p. 128.
Muricella perramosa Wright and Studêr. Challenger Reports, the Alcyonaria, 1889, p. 126.

Stat. 47. Bay of Bima, near South Fort. 55 meters. Mud with sand.
Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. 40—50 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Kei Islands. 90 meters.

Colony flabellate in form, 11.4 cm. in height, and with a spread of 11.6 cm. The main stem gives off three straggling stubs of branches from its basal 2.5 cm. Then it sends off a pair of subequal and opposite branches, one of which forms nearly half of the colony, sending off rudely alternate branchlets, some of which anastomose with each other. The calyces are mainly lateral in position, leaving a broad posterior, and narrower anterior median area comparatively free. The calyces are quite closely approximated, being usually but 1 mm. apart, and often less.

The individual calyces are conical in shape, the cones leaning towards the distal ends of the branches. Their walls are filled with rather slender spindles which are usually vertical in position with their distal points projecting a short distance above the margin. There is a

tendency toward the formation of eight marginal projections by the aggregation of several of these points into bundles. This occurs quite regularly in cases where the polyp is partially expanded, thus spreading open the apex of the cone. There is a distinct collaret of red spicules, and an operculum of slender red spindles arranged en chevron. The distal parts of the infolded tentacles also bear a few longitudinal spindles.

Spicules. These are all typical tuberculate spindles, the largest of which are embedded in the cœnenchyma of the stem and branches and sometimes attain a length of 2.5 mm.

Color. The colony is deep crimson red throughout, including the spicules.

General distribution. The type was secured from near the Mauritius Islands, at a depth of 90 fathoms. The Challenger specimens were from the Hyalonema grounds, off Japan. Depth 345 fathoms.

5. *Muricella stellata* new species. (Plate V, figs. 1, 1*a*).

Stat. 65ª. Very near 7° 0′ S., 120° 34′.5 E. 300—400 meters. Pale gray sand, changing during haul into coral bottom.

Colony (incomplete and much broken) flabellate in form, 9.8 cm. in height and with a spread of 9.6 cm. The basal part of the specimen is missing. The remainder divides 9 cm. from its proximal end into two very unequal parts, one being a short forked branch, and the other giving off two large compound branches which form by far the greater part of the colony. These branches are sinuous, and even slightly geniculate; the lower one giving off three branchlets from its upper side, and the other bifurcating 1.2 cm. from its origin, the resultant branchlets giving off irregularly disposed twigs mostly from their outer sides. In one case branchings of the fifth order are attained. The calyces are lateral in position, and rather regularly alternate, being spaced by a distance of about 2 mm. on the average. The branches end in polyps.

The individual calyces are conical in shape when lateral, and tubular when terminal. The former measure about 1.3 mm. in height and 1.7 mm. in diameter at base. The terminal calyces are quite long and tubular, being apparently coextensive with the branch termination itself. They attain a length of 2.8 mm. and a diameter of 1.5 mm. The calyx walls are filled with regular spindles irregularly placed, but most often vertical in position, the spindles being smaller than those in the cœnenchyma of the stem and branches. The polyps are retractile, but ordinarily rest with the collaret on the calyx margin, where the tentacle bases form a high rosette-shaped mass. The polyp body is armed with vertical spindles. The collaret is formed of a single circlet of spindles, while the operculum is in the form of an eight-pointed star, when viewed from above. It is composed of relatively heavy spindles arranged en chevron on the basal parts of the tentacles, and covering the distal parts with longitudinally disposed spicules.

Spicules. These are all densely tuberculated spindles, those in the cœnenchyma being very stout and fitting together as they often do in *Acis*. They sometimes attain a length of 2.7 mm. and a diameter of .8 mm.

Color. The colony is dark scarlet. The spicules are bright scarlet, except those in the polyps, where they are colorless.

This species can easily be distinguished from its nearest allies by the character of its operculum.

6. *Muricella dubia* new species. (Plate V, figs. 2, 2*a*; Plate XIX, fig. 13).

Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony (fragmentary) flabellate in form, 9.1 cm. in height and with a spread of 2,2 cm. The main stem is denuded for 2.7 cm. of its basal portion, and then gives off a simple curved branch, and above this two other branches are given off from the same side. These latter branches give off one and three branchlets respectively. The stem and branches are less flexible than in other species of the genus. The calyces are borne almost exclusively on the sides and front of the stem and branches, where they are closely approximated and often contiguous.

The individual calyces are verruciform, when the polyp is entirely retracted, covering the latter completely; and in the shape of very low cones when the operculum is uncovered. The calyx walls attain a height of 1.1 mm. and a diameter of 2 mm. They are filled with rather small warty spindles irregularly placed, but tending to a vertical disposition, their points forming a circlet of low blunt projections, shown only when the polyp is partly expanded. The operculum is usually sunk below the level of the margin, and is of the usual *Muricella* type, there being numerous longitudinal spindles arranged en chevron over the tentacle bases. When viewed from above the operculum forms quite a regular rosette.

Spicules. These are all warty spindles of medium size, densely tuberculate, and rather short and stout. Those of the calyx walls are in two layers, and not appreciably smaller than those on the stem and branches.

Color. The colony is very light brown, almost white, the axis is dark brown and the spicules colorless.

This species tends to connect the genera *Muricella* and *Versluysia*. The spicules of the cœnenchyma are in two layers, as in *Versluysia*, while the arrangement of the spindles on the calyx walls and opercula is typical of *Muricella*, to which genus it seems more closely allied.

7. *Muricella grandis* new species. (Plate V, figs. 4, 4*a*; Plate XIX, fig. 12).

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo bank. 50—40 meters. Fine coral sand.
Stat. 117. 1° 0′.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 144. Anchorage north of Salomakië (Damar) Island. 45 meters. Coral bottom.
Stat. 204. 4° 20′ S., 122° 58′ E. Buton strait. 75—94 meters. Sand.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Kei Islands. 90 meters. Sand, coral and shells.
Stat. 305. Solor Straits, off Kampong Menanga. 113 meters. Stony.

Colony roughly flabellate and straggling in habit, 24.5 cm. in height and with a spread of about 18 cm. The main stem is 7 mm. in diameter, and above its base it sends off a very

large branch which forms the main part of the colony. About 8 cm. above this the stem is broken off. The branch which remains forks about 3 cm. above its origin into two long branches, each of which gives off several side branches in a straggling and irregular manner which rebranch until branchings of the fifth order are attained. The main branches are more or less flattened. The polyps are pretty evenly distributed on the sides and front of the colony; but the back is almost completely bare. On the terminal twigs there is a tendency toward a regularly alternate arrangement of the calyces, the average distance from summit to summit being about 3 mm.

The individual calyces are conical in shape, and vary greatly in size in different colonies, attaining a height of 2.1 mm. and a diameter of 3 mm. in the largest specimen, which is the one described. The summits are inclined toward the distal ends of the branches. The calyx walls are filled with vertically disposed spindles which do not imbricate perceptibly, and the points of which project slightly above the margin. Sometimes single spindles reach from base to margin.

The polyps are completely retractile, but a number of them are not retracted in the type specimen, standing well above the calyx with the tentacles folded over the mouths. The collaret is formed of red spindles, above which the operculum rests with a number of small, bar-like spindles arranged en chevron over the tentacle bases. The ends of tentacles are armed with similar spindles placed transversely.

Spicules. These are all spindles of various sizes, the largest being embedded in the cœnenchyma and attaining a length of 2 mm. They are densely tuberculated and their edges are closely fitted, as in the genus *Acis*.

Color. The colony is deep crimson throughout, the spicules being of the same color.

This very handsome species is quite variable, some specimens differing from the type, particularly in the size of the calyces. For instance the specimen from Station 80 has calyces that are seldom more than 1.5 mm. in height and 2 mm. in diameter. While the type, from Station 117, has calyces of the maximum size mentioned above. There seems to be no specific difference between the specimens, however.

Versluysia new genus.

Muricella of authors, in part.

Calyces conical, subconical or verruciform. Spicules all in the form of spindles which sometimes are modified in the form of oblong disks; those of the the calyx walls and tentacle bases not arranged en chevron, and not regularly forming eight points around the margin. The spindles of the cœnenchyma are usually very large, and in two layers, the outer being composed of large spindles that are often not in contact, thus exposing a layer of smaller spindles beneath.

The type of this genus is *Versluysia (Muricella) ceylonensis* (Thomson and Henderson).

A division of the old genus *Muricella* seems necessary in order to separate such widely divergent forms as *Muricella nitida* Verrill on the one hand, and *Muricella ceylonensis* Thomson

and Henderson on the other. These seem surely generically distinct, and the new genus *Versluysia* is instituted to accommodate those species that are more closely allied to the latter.

The genus as thus defined would include *Versluysia ceylonensis* (Thomson and Henderson), *Versluysia ramosa* (Thomson and Henderson), and probably *Gorgonia tuberculata* (Esper.) although it is impossible to determine this species by the original figures and descriptions.

To the above species must be added the five new species described in the present work.

1. *Versluysia ceylonensis* (Thomson and Henderson).

Muricella ceylonensis Thomson and Henderson, Ceylon Pearl Oyster Fisheries. Supplementary Reports, N° XX, the Alcyonaria, 1905, p. 302.

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud and sand.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. Kei Islands. 90 meters. Sand, coral and shells.
Stat. 289. 9° 0'.3 S., 126° 24'.5 E. Timor Sea. 112 meters. Mud, sand and shells.
Stat. 305. Mid channel, Solor Straits, off Kampong Menanga. 113 meters. Stony.

Colony flabellate in form, 14.4 cm. in height and with a spread of 7.5 cm. The main stem is erect and sinuous, and more sharply differentiated from the branches than usual in this family, being 2.1 mm. in diameter, while the strongest branch is but 1 mm. The branches are roughly alternate in proximal parts of the colony, and regularly so in the distal parts, the average distance between them being about 5 mm. The calyces seem to be alternate on some parts of the colony, and tend to arrange themselves in spirals of three or four in others. They are irregularly spaced, the average distance between them being about 2 mm. There are no terminal polyps, the branches ending in a triangular expansion with calyces at the outer angles.

The individual calyces are usually inclined towards the distal ends of the branches. They are conical in form, usually quite pointed, but often truncated and sometimes a short cylinder, according to the state of expansion of the polyps.

The basal portion of the calyx is armed with heavy spindles which are bent around the calyx wall in a low ascending spiral, sometimes approaching the horizontal position. The distal part of the calyx is armed with bent, but erect spindles which are smaller than those on the proximal part, and their distal ends project in a series of prominent points around the margin. The calyces measure about 1 mm. in height. The polyps are retractile, and the operculum is composed of an irregular mass of spindles which are small in comparison with others in this species, but very large for opercular spicules, thus differing from the next species. There are two layers of spicules in the cœnenchyma.

Spicules. These are all spindles, often curved, and sometimes attaining a length of 3 mm. They are disposed in two layers in the cœnenchyma of the stem and branches, and are more slender, as a rule than in *Versluysia ramosa*.

Color. The stem and main branches are dusky, covered with spicules which give them a silvery appearance. The smaller branches and calyces are nearly white.

General distribution. Gulf of Manaar.

The specimen from Station 305 is much larger than that described, and the branches sometimes anastomose.

2. *Versluysia ramosa* (Thomson and Henderson).

Muricella ramosa Thomson and Henderson. Ceylon Pearl Oyster Fisheries. Supplementary Reports, N⁰ XX, 1905, p. 301.

Stat. 305. Mid channel, Solor Straits, off Kampong Menanga. 113 meters. Stony.

Colony flabellate and moderately reticulate, 17 cm. in height and with a spread of 28 cm. Two stems arise apparently from the same root. A considerable portion of one side of the larger stem is devoid of calyces and covered with a sponge. The main stem is erect and sends off a number of large roughly alternate branches, between which a number of smaller twigs are borne. The average distance between the branches is about 5 cm. The branching is quite profuse, the twigs anastomosing to form a loose reticulation, particularly in the middle portions of the colony. The calyces are almost all of them lateral, and tend to an alternate arrangement. The twigs do not end in polyps.

The individual calyces are quite varied in size, some being scarcely 1 mm. in height, while others almost 2 mm., with a diameter of 1 mm. Their walls are composed almost entirely of large spindles set on in a hap-hazard way, but tending to a horizontal arrangement on basal portions of the calyx, while the distal portion is filled with large vertical spindles which rise far above the calyx margin. Sometimes two of these latter spindles have their distal ends approximated to form a single point, and occasionally this results in eight marginal projections.

The tentacles are not regularly and symmetrically infolded, as in most muriceids, but seem to be tucked in irregularly. There is no true operculum, and but a few very small irregularly disposed spindles are found on the tentacles.

The cœnenchyma has two layers of spicules of the stem and branches; an inner layer of smaller spindles such as are found in the calyx walls, and an outer layer of very large, often bent and twisted, spindles lying lengthwise of the branch. The outer layer only partially covers the inner, leaving the latter exposed in many places, and giving the appearance of having been artificially stuck on by a careless hand.

Spicules. These are all warty spindles of various sizes, the largest being very conspicuous and in some instances attaining a length of 3 mm.

Color. The colony is dark umber brown, the axis almost black, and the spicules colorless.

General distribution. The type specimens were found in deep water in the Gulf of Manaar, and off the west coast of Ceylon.

3. *Versluysia rosea* new species. (Plate VI, figs. 4, 4*a*; Plate XX, fig. 3).

Stat. 204. 4° 20′ S., 122° 58′ E. near Buton Island. 75—94 meters. Sand.
Stat. 305. Mid channel in Solor Straits, off Kampong Menanga. 113 meters. Stony.

The specimens consist of fragments, the largest of which is 9 cm. in height and sends off one lateral branch which originates 1.5 cm. from its base and is 3.5 cm. in length. The calyces are nearly all lateral and alternate in position, and there is a strong tendency for those on a given side to be inclined alternately towards the front and back of the branch. They are about 3 mm. apart from summit to summit.

The individual calyces are strictly conical in form, and their walls are filled with spindles which tend to lie in a horizontal position on the basal part and in a vertical position in the upper parts of the calyx. They attain a height of 2 mm. and a diameter of 2.5 mm. at their bases. The polyps are entirely retractile, the calyces closing over them in retraction, and becoming true cones. When the polyps are expanded, in preserved specimens, they rest on the summit of the calyx walls, showing a delicate but quite evident collaret, and an operculum composed of two bent spindles divaricated at their proximal, and meeting at their distal ends. There are a number of other spindles lying along the dorsal surface of the tentacles, but they are not arranged en chevron.

Spicules. These are all curved or straight tuberculate spindles, those on the stem and branches being much larger than those on the calyces, some of the former attaining a length of 2.5 mm. The cœnenchyma has two layers of spindles, the under layer being composed of smaller spindles which are pink in color.

Color. The calyces and smaller branches are white, when the outer spicules are not rubbed off. The proximal portion of the stem and main branches are pink. The large spicules are colorless, but the under layer is pink.

4. *Versluysia dentata* new species. (Plate VI, figs. 3, 3*a*; Plate XX, fig. 2).

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. near New Guinea. 118 meters. Sand.
Stat. 204. 4° 20′ S., 122° 58′ E. near Buton Island. 75—94 meters. Stony.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Kei Islands. 90 meters. Sand, coral and shells.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.

Colony (incomplete) flabellate in form, but straggling and irregular in habit, not reticulate. Almost 2 cm. from its base the main stem gives origin to two opposite branches, and two others are given off almost at its base. The left one of the opposite pair becomes the main part of the colony, sending off branchlets mainly from its left side about 1 cm. apart. These branchlets often again divide, producing branchings of the 4th order. The calyces are placed on all sides of the branches, but tend to be lateral and opposite. They are about 1.5 mm. apart, on the average.

The individual calyces are verruciform to conical in form, usually a low cone with a truncated summit surrounded by a circlet of low vertical points. They are about 1 mm. high and 2 mm. broad at the base. The calyx walls are armed with oval warty spindles that are sometimes disk-shaped and inclined to overlap, as in the genus *Placogorgia*. The polyps are completely retractile, but a few are protruded in the type specimen. These show a delicate collaret, and an operculum composed mainly of three spindles in the usual position.

Spicules. Heavy, very warty spindles predominate, which are occasionally flattened and broadened until they become oblong disks. The spindles which are on the calyx margin are less tuberculate than the others, but there are none of the *Echinomuricea* type. The spindles of the stem are longitudinally disposed; but the two layers are not well differentiated.

Color. The colony is grayish, the axis dark brown, and the spicules colorless.

This species resembles superficially an *Echinomuricea*, but the spicules are quite different.

5. *Versluysia operculata* new species. (Plate VI, figs. 2, 2*a*).

Stat. 220. Anchorage off Pasir Pandjang, west coast of Binongka. 55 meters, close to reef.

Colony slender, flabellate in form, 16.5 cm. high and about 7 cm. in diameter. The main stem is sinuous, with the first branch origin 2.4 cm. above its base, and another large branch is given off 2.6 cm. above the first. The colony is denuded of calyces throughout its proximal half. The distal portion gives off a number of subalternate branches, the average distance between them being about 6 mm. Some of these branches again divide, but branchings of the third order are not seen. The calyces are irregularly distributed over all sides of the colony, the distance between them varying from 1 to 2 mm. There are no terminal polyps.

The individual calyces are subcylindrical in form, sometimes taking the form of truncated cones, usually projecting at a right angle from the branch. On the distal parts of the terminal branches, however, they incline toward the twig terminations. They are only about .75 mm. in height to the very prominent operculum, and have a diameter of 1.5 mm. The calycular walls are beset with spindles which are exceedingly irregular in arrangement, sometimes being horizontal, but usually vertical in position, with all gradations between. There is a tendency, however, for the proximal parts of the wall to have the spicules arranged horizontally, and the distal parts to have the spicules vertically placed. The crown of points around the margin is sometimes prominent and sometimes scarcely evident. The polyps are only partially retractile. The operculum is a high dome, sometimes exceeding the calyx in height, and has relatively heavy spindles which lie in longitudinal bundles along the dorsum of the tentacles. The cœnenchyma is rather thin, but the spindles are spaced so that the inner layer of spindles is often exposed.

Spicules. These are all spindles, very warty, and the largest attain a length of 2 mm.

Color. The colony is light silvery brown or grayish. Axis dark brown.

6. *Versluysia reticulata* new species. (Plate VI, figs. 1, 1*a*; Plate XX, fig. 4).

Stat. 272. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellata and reticulate, 11.9 cm. in height and with a spread of 11.1 cm. The first branch arises 1.7 cm. from the base of the colony, and a stub of a branch is seen almost opposite it. .9 cm. above this arise another pair, one being a short stub and the other a large branch. Another large branch arises 3 mm. above the last. Distal to this the main

stem gives origin to a number of small irregularly alternate branches, averaging about 4 mm. apart. The main branches divide in the same manner, except that one of them gives off several pairs of branchlets. There is extensive anastomosis of the branches and twigs, producing a loose reticulation.

The calyces are closely approximated, and are distributed on all sides of the branches, the distance between them being from .5 to 1 mm. There are no terminal calyces.

The individual calyces are low verrucae or truncated cones, rarely attaining a height of 1 mm. and averaging not much more than .5 mm., with a diameter of .9 mm. The calyx walls are filled with spindles, a few basal ones being horizontal, while the remainder are vertical and project in conspicuous points around the margin. Often the calyx wall will be occupied by a single row of spindles arranged vertically and extending above the margin to form the points. They are more closely approximated than in *V. operculata*. The polyps are completely retractile. An irregular operculum is formed by bundles of large spindles bending inward from the calyx margin and covering the tentacle bases.

Spicules. Here, as in other species of the genus, the spicules are all in the form of warty spindles. Those of the stem and branches are in two layers, and are not greatly larger than in the calyx walls; but an occasional spindle of the outer layer measures as much as 2 mm. The outer layer is more closely packed than in the last species.

Color. The colony is light yellowish brown, the axis very dark brown, and the spicules colorless.

Specimens from Station 272 are closely reticulated and the calyces are more crowded than in the type from Station 310.

7. *Versluysia argentea* new species. (Plate V, figs. 3, 3*a*; Plate XX, fig. 1).

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.

The type of this species is a fragmentary specimen, probably a single branch, 8.7 cm. in height. About 3 cm. from its proximal end it divides into two parts each of which sends forth irregular branchlets, the terminal ones being about 6 cm. in length. There are no terminal polyps. The calyces are unevenly distributed on all sides of the branches, tending, however, to be lateral in position. They are quite closely approximated on the sides of the branches, where they are about 1 mm. apart.

The individual calyces are in the form of low cones or tubercles, usually less than 1 mm. in height and with a diameter of about 1.5 mm. The proximal part of the calyx walls is encircled by quite heavy bent spindles, sometimes short and almost oval in form. Above these a number of considerably smaller spindles stand erect, their ends forming a crown of points around the margin. Within this margin, and sunk considerably below its level, is an operculum which is much more definite and symmetrical than is usual in this genus. It is in the form of a low cone, each opercular flap being distinct from the others and an elongated triangle in shape, consisting mainly of two long curved longitudinal spindles. Below the proximal ends of these is a distinct collaret composed of a single row of slender spindles encircling the tentacle bases.

Spicules. These are all warty spindles, many of which are curved. Some of the spindles in the cœnenchyma of the branches are the largest of any in the genus, attaining a length of 4 mm. They are all heavy, closely tuberculated and opaque. Those in the outer layer of the cœnenchyma are longitudinally disposed and close set, leaving little vacant space between them. Their edges, however, are not closely fitted as in some species of *Acis*.

Color. The colony is light brown, silvered by the spicules. Axis dark brown, spicules colorless.

Acis Duchassaing et Michelotti. (Modified).

Acis Duchassaing et Michelotti. Mémoire sur les coralliaires des Antilles, 1860, p. 19.
Acis Ridley. Annals and Magazine of Natural History, Series V, Vol. 10, 1882, p. 126.
Acis Kölliker. Icones Histologicæ, Part. II, 1865, p. 136.
Acis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 111.
Acis Thomson and Henderson. Ceylon Pearl Oyster Reports, Alcyonaria, p. 299.

The original definition for this genus is as follows: —

"Ce genre, que nous croyons nouveau, est destiné à renfermer les espèces dont le sclérenchyme est composé par trois gros spicules fusiformes et découverts. Les loges sont subalternes, séparées entre elles, squameuses, pustuliformes avec une ouverture terminale radiée".

Wright and Studer modify the genus as follows: —

"The colony is branched, the polyps are small, with wart-like verrucæ usually placed at considerable intervals on the sides of the main stem and branches. The cœnenchyma is armed with immense spicules in the form of either smooth or warty spindles, of which some six or seven, placed side by side in a longitudinal manner, surround the periphery of the stem and branches. These spicules often reach to a length of 1—3 mm., so that they are quite perceptable to the unassisted eye. . . . . .

"On the polyps the spicules are smaller, forming rings round their bodies. These calcareous spicules are scale- or disc-like".

For the purposes of the present work, the genus may be defined as follows: —

Colony branched, calyces verruciform, subconical or tubular. Spicules on calyx walls and tentacle bases not arranged en chevron; those of the cœnenchyma being very heavy spindles, or irregular plates with their edges dentated and usually fitted as in a mosaic; those of the calyx walls smaller and sometimes scale-like and overlapping somewhat, but not regularly imbricating.

The type species of this genus is *Acis guadalupensis* D. & M. The other known species are *Acis alba* T. and H., *A. ceylonensis* T. and H., *A. indica* T. and H., *A. nutans* D. and M., *A. orientalis* Ridley, and *A. pustulata* W. and S., in addition to the three new species described in this work.

1. *Acis alba* Thomson and Henderson.

Acis alba Thomson and Henderson. Ceylon Pearl Oyster Reports, Alcyonaria, 1905, p. 299.

Stat. 305. Mid channel in Solor Strait, of Kampong Menanga. 113 meters. Stony.

Colony flabellate in form, 11.4 cm. in height, and with a diameter of 5.9 cm. The main stem is tortuous, but the bends are all in the same plane. Seven simple branches and stubs of branches are given off from the proximal 4 cm. of its course, and above these the stem divides into two flabellate branches. Each of these gives off a number of simple lateral branchlets and a few that again divide into branches of the 3rd order.

The calyces are emplanted on all sides of the branches, but are almost absent on the proximal parts of the colony. On the distal parts they are more thickly approximated on the sides than on the front and back, and are unevenly spaced, the distance between them varying from nothing to 1.8 mm.

The individual calyces are very low subconical verrucæ, a typical one measuring about .8 mm. in height and 1.5 mm. in diameter. The calyx walls are surrounded distally by comparatively small, stout vertical spindles, the points of which form blunt projections around the margins. The lower part of the wall is composed of a mosaic of larger irregular plates, the edges of which are usually nicely fitted together, but sometimes imbricate. The polyps are retractile. The operculum is composed of slender spindles, two of which lie along the dorsal surface of each tentacle with a shorter one between their bases. The collaret is well developed.

Spicules. These are in the form of irregular plates, usually with rounded angles, of the typical Acis pattern and attain a length of 1.5 mm. Their edges are often ctenate, and their surface is covered with granules which may represent very small verrucæ. There is a distinct layer of smaller spindles underlying the outer layer of plates.

Color. The colony, in alcohol, is almost white, the axis brown, and the spicules colorless.

General distribution. Off Ceylon. Deep water.

The type specimen, described by Thomson and Henderson, seems to have had somewhat larger spicules than those in the Siboga specimen.

2. *Acis squamata* new species. (Plate VII, figs. 2, 2*a*; Plate XX, fig. 5).

Stat. 65ª. 7° 0′ S., 120° 34′.5 E. near Saleyer Island. 400 meters. Mud and coral.
Stat. 253. 5° 48′.2 S., 132° 13′ E. near Kei Islands. 304 meters. Clay.
Stat. 305. Mid channel, Solor Strait, off Kampong Menanga. 113 meters. Stony.

Colony flabellate, 14.3 cm. in height and with a spread of 4.9 cm. The main stem is round, 3.8 mm. in diameter. 1.6 cm. from its base it gives off a short branch, and from that point to near its distal end it gives off roughly alternate branches, several of which give off branchlets nearly all of which are on one side of the branch. The branches near the distal end of the colony are more symmetrical in their branchings than the more proximal ones. The calyces are borne almost exclusively on the sides and front of the stem and branches, where they are unevenly distributed, varying from .5 mm. to 2.2 mm. in the distance between them.

The individual calyces are short tubes averaging about 1.5 mm in height, and about the same in diameter. Their walls are composed of plate-like or scale-like spicules of various

shapes; but fitted to each other, although they sometimes overlap somewhat. The ends, or edges, of the distal row form a scalloped border around the calyx margin. There seems to be no regularity whatever in the disposition of these calyx spicules. They are also exceedingly irregular in shape, being squarish oblong with rounded corners, rudely triangular, or irregular polygons of various sorts. The ones on the basal part of the calyx are usually larger than those on the distal part. The polyps are retractile, but it is doubtful if the calyx walls can completely cover the operculum. The latter is composed of relatively heavy spindles or bar-like forms. Two of these are often closely fitted together and curved over a tentacle to form a solid opercular segment or flap.

Spicules. Some of the largest spicules of the Gorgonacea are found in this species. Those covering the cœnenchyma are closely and exactly fitted together along all their contiguous edges. They are squarish or oblong plates of various forms, and attain a length of 5 mm. and a diameter of 2 mm. Typical spindles are rarely seen. The edges of the spicules are often regularly but minutely ctenate, and their surface is covered with fine granules.

Color. The entire colony is ivory white in alcohol. The axis is light yellowish gray, and the spicules are colorless.

The spicules of this species are the most massive that the author has encountered in the *Alcyonaria*, and the species illustrates the highest development of the genus *Acis* that has yet been encountered.

3. *Acis solorensis* new species. (Plate VII, figs. 3, 3*a*; Plate XX, fig. 6).

Stat. 289. 9° 9′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.
Stat. 305. Mid channel in Solor Straits, off Kampong Menanga. 113 meters. Stony.

Colony flabellate, 8.5 cm. high, and with a diameter of 6.4 cm. The main stem forks almost immediately above its base and each of the resultant branches bifurcates 1 cm. and 1.9 cm., respectively, above its origin. The ultimate branchings are irregular. The calyces are almost entirely lateral in position, altough a few are anterior in position on the distal parts of the colony. They are very unequally spaced, although they are rather distant, as a rule, being from 2 mm. to 3 mm. apart.

The individual calyces are conical in shape, typical ones measuring 1.4 mm. in height and 1.9 mm. in diameter at the base. Their walls are filled with variously shaped plate-like spicules, forming a mosaic, the parts of which usually are nicely fitted; but sometimes the edges overlap slightly. The larger spicules are on the basal part of the cone, where they are often horizontal in position; and the smaller ones are on the distal part, where they are usually vertical in position. Their points do not project beyond the calyx margin to any noticeable degree. The polyps are retractile and the calyx is capable of entirely closing over them. The operculum is composed of a number of small spindles, the disposition of which seems indefinite.

Spicules. These are much as in *Acis squamata*, being exceedingly irregular in shape;

but they are not so large, being not over 3 mm. in length. Those in the cœnenchyma of the stem and branches are the largest, and their edges are nicely fitted, forming an even mosaic surface which is finely granulated.

Color. The colony is orange yellow, the axis light gray, and the spicules orange, rarely white.

Two specimens from Station 289 are referred with some doubt to this species. One is bright red, and the other is almost white. The spicules agree with the above description.

4. *Acis serrata* new species. (Plate VII, figs. 1, 1*a*; Plate XX, fig. 7).

Stat. 204. 4° 20′ S., 122° 58′ E. near Island Buton. 75—94 meters. Sand.

The colony (incomplete) is rudely flabellate in form, 10.3 cm. in height and 5.7 cm. in diameter. The basal part is lacking. The main stem gives off a large simple branch 1.4 cm. from the proximal end, which amastomoses with a branch higher up.

A very small branch is given off a little above the first, but on the opposite side. About 4 mm. above this another branch is produced, which gives off two branchlets; and on the opposite side of the main stem and 9 mm. above the last mentioned branch a large forked branch is given off, one of the forks breaking up distally into a palmate structure. The main stem breaks up into a similar flabellate structure about 5 cm. from its proximal end. The calyces are mainly lateral in position, those on a given side being inclined alternately backward and forward like the teeth of a saw, and are about 2.5 mm. apart from summit to summit. The branches are slightly flattened, and appear to be more so than they really are, on account of the lateral position of the teeth. The branches end in calyces.

The individual calyces are regularly conical in form, a typical one measuring 2 mm. in height, and having a basal diameter of 2.2 mm. The calyx walls are filled with broad spindles, most of which are vertical in position, although some extend from near the base to the margin. The polyps are retractile, the tentacle bases being provided with slender spindles with their proximal ends divaricated. Several of these sometimes tend toward the en chevron arrangement.

Spicules. These are spindles, rather than the irregular plates found in most other species of the genus *Acis*. Those in the cœnenchyma are heavy, with their edges nicely fitted and ordinarily longitudinal in position; but not uniformly so, especially near the bases of the calyces. They rarely exceed 2.3 mm. in length. The calyx spindles are smaller than those of the cœnenchyma, and sometimes appear to be regularly imbricated. But on other calyces on the same branch they have their edges fitted as in a mosaic.

Color. The colony is almost white, the axis grayish proximally and fading to almost white on the distal parts.

This species intergrades perceptably with the genus *Muriccila*, but seems to be more like *Acis* than that genus, especially in the nicely fitted edges of the spindles.

Elasmogorgia Wright and Studer (Emended).

? *Filigella* Gray. Annals and Magazine of Natural History, Series 4, Vol. II, 1868, p. 443.
Elasmogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 132.

It must remain a question whether this genus is synonymous with *Filigella* or not. Gray's description very closely coincides with the one given for *Elasmogorgia* by Wright and Studer. Gray thought that his *Filigella* led a free life, there being no indication of attachment. Although the present writer thinks it extremely likely that Gray had in hand a specimen that would probably go into the genus *Elasmogorgia*, he feels that he can not prove this view and therefore retains the latter name, and would characterize the genus as follows: —

Colony simple, or sparingly branched; branches very slender, flexible; calyces very low and comparatively distant verrucæ. Spicules all medium sized spindles, not attaining the dimensions of those in *Muricella* or *Acis*.

The type species of this genus is *Elasmogorgia filiformis* W. and S. The only other known species is *E. flexilis* Hickson, from the Maldive Archipelago.

1. *Elasmogorgia filiformis* Wright and Studer.

Elasmogorgia filiformis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 133.
Elasmogorgia filiformis Nutting. Alcyonaria of the Californian Coast. Proceedings of the U. S. National Museum, Vol. XXXV, 1909, p. 717.

Stat. 289. 9° 0'.3 S., 126° 24'.5 E. Timor Sea. 112 meters. Mud, sand and shells.

Colony (incomplete) consisting of a long straight, or gently curved, unbranched stem 6.3 cm. in length and with a diameter of 1.5 mm. The calyces are on all sides of the stem, but are more numerous on two opposite sides. The distal end of the colony being absent, it can not be determined whether there are terminal calyces or not.

The individual calyces are very low rounded verrucæ inclined somewhat toward the distal end of the stem. They are more distant than usual in this family, and are unequally distributed, being about 3 mm. apart, on the average. Their height is less than .5 mm. Their walls are filled with rather short, stout spindles which are disposed so as to encircle the basal portion; but the upper part of the calyx is armed with spindles which tend to be vertical, but are often oblique. In some cases their disposition is practically that given in the figures accompanying the original discription of this species. The polyps are retractile, and are entirely concealed by the calyx walls in complete retraction. The operculum is composed of two curved spicules that meet in a point distally and have their proximal ends divaricated, while between their bases is a much smaller spindle, the eight segments of the operculum corresponding to the eight tentacles, and forming a rosette-shaped figure when viewed from above. There is a delicate but well-marked collaret.

Spicules. These are all spindles which are usually short and thick, often oblong-oval in outline; or oblong, squarish forms with their angles rounded. Those on the stem are the largest, often attaining 1 mm. in length. The smallest ones are on the upper parts of the calyx walls.

General distribution. The type was found in Arafura Sea, 49 fathoms.

Color. The colony is grayish brown in alcohol, axis dark brown, and the spicules are colorless.

Menacella Gray, (Emended).

Menacella Gray. Annals and Magazine of Natural History, Series 4, Vol. V, 1870, p. 406.
Menacella Ridley. Annals and Magazine of Natural History, Series 5, Vol. IX, 1882, p. 191.
Menacella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LV.

Gray's original definition for this genus is as follows: —

"Coral very much branched, fan-shaped, irregularly reticulated; stem simple. Bark very thin, formed of numerous very slender fusiform spicules in bundles placed in different directions. Polyp cells short, cylindrical, covered with spicules like the bark, with a smooth convex 8-rayed lid, placed close together on the sides of the branchlets, and more scattered and further apart on the sides of the branches".

Ridley examined the type of *M. reticularis* Gray, and decides that Gray was wrong in identifying that species with *Gorgonia reticulum* Pallas. He also says that the spicules are black. This appears to the present writer to be due to some chemical change, or stain, rather than representing the original condition; black spicules being unknown in this family. It also seems probable that such a unique character would be noted and mentioned by Gray, were it the condition of the specimen as seen by him.

For our present purpose a definition for this genus may be constructed by merely condensing that of Gray by leaving out certain characters not of generic value, as follows: —

Menacella. Colony flabellate and reticulate, calyces short cylinders, spicules all spindles irregularly disposed in the calyx walls.

The type, and only known species in *Menacella reticularis* Gray.

1. *Menacella reticularis* Gray.

Menacella reticularis Gray. Annals and Magazine of Natural History, Series 4, Vol. V, 1870, p. 406.
Menacella reticularis Ridley. Annals and Magazine of Natural History, Series 5, Vol. IX, 1882, p. 191.

Stat. 28. 8° 43'.7 S., 115° 19'.5 E. Bali Sea. 143 meters. Coral bottom.

The specimen is almost entirely denuded of calyces and cœnenchyma and consists of the ramifications of the axis cylinder bearing numerous cysts occupied by parasitic barnacles. These are oval, brown in color, and the whole specimen bears a striking resemblance to a piece of *Sargassum* with its globular cysts.

The colony is 20 cm. high and about 17 cm. in diameter; is strictly flabellate in form, and reticulate to a slight degree. The axis of the main stem is 3.5 cm. in diameter. The colony is unilateral, most of the branches being on one side of the main stem. The average distance between branches is about 4.8 mm. The calyces are irregularly distributed on all sides of the branches, being more crowded towards the tips of the twigs where they form a clump or cluster; while they are over 1 mm. apart in other places.

The individual calyces are verruciform or dome-shaped when the polyps are retracted, and short cylinders when they are expanded, averaging about .8 mm. in height and 1.5 mm. in diameter. The walls are filled with warty spindles most of which tend to a horizontal position, a few near the margin being vertical. There are no decided points around the margin, which is capable of being drawn over the calyx mouth so as to entirely conceal the polyp in retraction. The operculum is reduced to an exceedingly delicate tracery of the ordinary pattern, the spindles being mere transparent threads without verrucæ, there being the ordinary arrangement of three spindles to form an acute-angled triangle on each tentacle. The collaret is composed of a single irregular circlet of attenuated spindles.

Spicules. These are all warty spindles of about the same size on calyces and cœnenchyma. Rarely branched forms are seen, but these are so few as not to be a characteristic feature.

Color. The small portion of the type that is not denuded is almost white (in alcohol) while the axis is deep brown, lightening distally. The cysts occupied by the barnacles are formed of an excessive growth of the material which forms the axis cylinder.

General distribution. The type locality appears to be unknown.

Bebryce Philippi, (modified).

Bebryce Philippi. Archiv. für Naturgesch. Bd. I, 1842, p. 35.
Bebryce Kölliker. Icones Histologicæ, II, 1887, p. 137.
Bebryce Koch. Fauna und Flora des Golfes von Neapel, XV, 1887, p. 54.
Bebryce Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LV.
Bebryce Hickson. Alcyonaria of the Maldives, III, 1905, p. 815.
Bebryce Thomson and Henderson. Ceylon Pearl Oyster Fisheries Reports; Supplementary Reports, N° XX, 1905, p. 294.

The original description of this genus is inaccessible to the writer. KÖLLIKER, however, has examined and rediscribed the type with his usual discrimination, and the following is a somewhat free and condensed translation of his description, which will be regarded as the definition used in the present work.

Cœnenchyma very thin, the outer layer composed of characteristic spicules which are scales with more or less toothed or scalloped margins, and with a longer or shorter vertical process arising from their centres.

Often these characteristic spicules greatly resemble a collar-button with beautifully scalloped edges. They are plainly imbricated when in position, and usually show a darker central, and a lighter marginal, area when viewed *in situ* with reflected light.

The type of this genus is *Bebryce mollis* Philippi. Other known species are *Bebryce hicksoni* Thomson and Henderson, *B. indica* Thomson, *B. philippi* Studer, *B. Studeri* Whitlegge, *B. sp.?* Hickson, and the two new species in the Siboga collection.

1. *Bebryce hicksoni* Thomson and Henderson.

Bebryce hicksoni Thomson and Henderson. Ceylon Pearl Oyster Fisheries. Supplementary Reports, N° XX, 1905, p. 294.

Stat. 154. 0° 7′.2 N., 130° 25′.5 E. Bougainville Strait. 13 meters. Muddy sand.
Stat. 257. Du-roa Strait, Kei Islands. Up to 52 meters. Coral.
Stat. 289. 9°.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.
Stat. 305. Mid channel in Solor Strait, off Kampong Menanga. 113 meters. Stony.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony rudely flabellate in form, 6.7 cm. high and with a spread of 3 cm. The main stem forks 6 mm. above its base into two approximately equal upright branches, each of which is branched in a pinnate manner. These branches send off a very few branchings of the third order, and one twig of the fourth order. The calyces are mainly lateral in position, although a few are scattered along the front and back of the colony. Their distance from summit to summit varies from 2 to 4.5 mm. There are no terminal calyces.

The individual calyces vary in shape from subconical to nearly tubular. Some are dome-shaped, in complete retraction of the polyps. A typical one measures 1.2 mm. in height and 1.5 mm. in diameter at the base. Their walls are filled with small closely set imbricating discs with minutely ctenate edges, each scale having a well-defined darker area in its centre and lighter edges. The polyps are completely retractile, but in many cases they rest with the collaret immediately above the margin and the acorn-shaped operculum rising well above it. The operculum is composed of the usual typical elements, two bent spindles with a third shorter one lying between their divaricated bases. There are often smaller longitudinal spindles on the distal portion of each tentacle. The spindles do not cover the tentacles, and the opercular flaps leave a rosette-shaped bare space when viewed from above.

Spicules. These are of the typical *Bebryce* form, being round discs with an elevated central portion. In shape they greatly resemble a collar-button with a very short broad connection between the expanded portions. There are also stars and multiradiate forms based on the typical forms just described; and a few small spindles, oval discs, etc.

Color. The colony is very light brown, the axis white, and the spicules colorless.

General distribution. The type was secured from the Gulf of Manaar.

Several specimens from Station 305 are considerably larger, one being 12 cm. × 10.5 cm. in measurement, and strictly flabellate in form.

2. *Bebryce indica* Thomson.

Bebryce indica Thomson. Ceylon Pearl Oyster Reports, Alcyonaria, Appendix, 1905, p. 175.

Stat. 305. Mid channel in Solor Strait off Kampong Menanga. 114 meters. Stony.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony obscurely flabellate in form, 8 cm. in height. The main stem is unbranched for 3 cm. above its base, where it divides into two approximately equal parts, each of which gives off two branches. One of these latter is anterior instead of lateral in position. The calyces are distributed over the whole surface of the stem and branches, there being about as many on the front and back as on the sides. They are very unevenly spaced, however, being from 2 to 3 mm. apart.

The individual calyces are verruciform or dome-shaped, 1.5 mm. high and 2 mm. broad at the bases. The polyps are entirely retractile, the margin closing in around them so as to leave but a small aperture. The calyx walls are covered with small oval scales or plates which have a darker centre and a lighter margin. They are imbricated near the margins, but seem to be separated on the lower parts of the calyx. The operculum is of the same type as in the last species, and the collaret is well marked.

Spicules. These are less symmetrical than in the last species, but the typical *Bebryce* form is common, consisting of a thick warty disc from the centre of which arises a warty mass of varying shape and size, much more irregular than in *B. hicksoni*. The disc has a jagged outline which in many cases becomes star-shaped, multiradiate or cruciform.

Sometimes the whole spicule is rudely dumb-bell-shaped, and at others it takes the form of a double star.

Color. The colony is dark purplish brown, with a vinaceous tinge. The spicules are colorless.

General distribution. The type was taken from the Gulf of Manaar.

This species, although secured at two of the same stations as the preceding, is very distinct, especially in color and the shape of the spicules.

3. *Bebryce thomsoni* new species. (Plate VII, figs. 4, 4*a*; Plate XX, fig. 8).

Stat. 50. Bay of Badjo. West coast of Flores. Up to 40 meters. Mud and sand.
Stat. 258. Tual anchorage, Kei Islands. Down to 22 meters. Lithothamnion.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. Kei Islands. 90 meters. Sand, coral and shells.

Colony closely branching, pinnate in form, 5.7 cm. in height and with a spread of 3 cm. The main stem is straight and rigid, and sends forth an undivided branch 3.8 cm. from its base, another one 3 cm. above the first and on the opposite side, and still another on the same side as the first and 6 mm. above it. Each of the two upper branches gives off a short side branch near the end. The stem and branches are round and about 1.2 mm. in diameter. The calyces are distributed mainly on three sides of the colony, and are about 1.5 mm. apart, on the average.

The individual calyces are almost entirely included, being represented by slight swellings only, and these are oval in section, their longest diameter being 2 mm. at the base. Their walls are filled with imbricating discs which often seem to be arranged in regular transverse rows or whorls, and have ctenate edges. The whole colony is covered with a thin coating of sponge which greatly obscures the details. The polyps are entirely retractile, and the calyx closes over them so as to obliterate the opening. The details of the operculum are very difficult to ascertain. It seems to be of the ordinary pattern, but composed of very slender spindles.

Spicules. These are remarkably uniform in size and structure, being small round bodies, each covered with smooth bead-like tubercles, and each bearing a comparatively large elevated disc-shaped body rising from its centre and attached to it by a very short peduncle. The shape of the entire spicule is much like that of a mushroom with an expanded disc-shaped

root; or it may be likened to two round biscuits of unequal size connected by a short stout pillar. Their true shape can only be seen when they lie on the side, an exceptional position as they appear on the slide.

Color. The colony is light grayish brown, the axis is dark brown, and the spicules colorless.

The species can at once be distinguished from others in the collection by the spicules, which are beautifully symmetrical and regular. A much larger specimen than the one described as the type was secured at Station 258, and is somewhat darker in color.

Thesea Duchassaing et Michelotti, (modified).

Thesea Duchassaing et Michelotti. Mémoire sur les Coralliaires des Antilles, 1860, p. 18.
Thesea Kölliker. Icones Histologicae, II, 1865, p. 137.
Thesea Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LVI.
Echinogorgia (in part) Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 120.

The original definition for this genus is, in itself, inadequate for use under present conditions of our knowledge. It is as follows: —

"Le genre renferme les espèces dont l'écorce formée de squammules contient des spicules tant à la surface qu'intérieurement. Les cellules sont pustuliformes, disposées d'une manière subalterne sur les rameaux et ayant leurs parois formées par des squammes et une ouverture terminale radiée".

The writer goes on to explain that the genus is intermediate between *Muricea* and *Primnoa*, as originally defined.

Kölliker has studied the spicules of the type species, *Thesea exserta* (Ellis and Solander) and has based his description of the genus on what he regards as the typical form of spicules. His definition is as follows: —

"Das Cœnenchym zeigt oberflächlich grosse warzige schuppenartige Spindeln, die an der Aussenseite mit grossen warzig-stacheligen Höckern besetzt sind, in der Tiefe kleinere warzige Spindeln. Die Kelche sind wenig vortretend von Warzenform und zeigen ähnliche, nur etwas kleinere Spicula als die Rinde. Deckel ähnlich wie bei *Paramuricea* nur klein, ganz flach und wenig vortretend".

The definition adopted in the present work is as follows: —

Muriceids with low verruciform calyces, the walls of which are filled with broad scale-like spindles, each of which is armed with thorn-like precesses on one side only, while the opposite edge is merely tuberculate. These scales often have the appearance of imbrication, the toothed sides of the spicules being uppermost and overlapping the lower edges of others. Heavy ordinary spindles are also usually present.

The type species of this genus is *Thesea exserta* (E. and S.).

Other known species are *Thesea (Echinogorgia) ramulosa* (Gray), *Thesea (Muricea) umbraticoides* (Studer) and the seven new species in the Siboga collection.

It is altogether likely that other species included in the original genus *Muricea* by the earlier writers belong here; but the present writer is unable to identify them by the descriptions.

Thesea gemmata Verrill[1] would not be included in the genus as defined here. The genus *Thesea* is separated from *Muricea* as at present defined by not having calyces with a bilobed margin.

1. *Thesea simplex* new species. (Plate VIII, figs. 2, 2*a*; Plate XX, fig. 9).

Stat. 49ª. 8° 23′.5 S., 119° 4′.6 E. Sapeh Strait. 69 meters. Coral and shells.
Stat. 108. 6° 10′.3 N., 121° 32′ E. Sulu Sea. 73 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Near Kei Islands. 90 meters. Sand, coral and shells.

Colony (fragmentary) consisting of two long disconnected branches 19.5 cm. and 16.7 cm. in length. They are but 1.2 mm. in diameter, and both are incomplete. The calyces are irregularly distributed on all sides of the branches, the intervals between them varying from less than 1 mm. to more than 2 mm.

The individual calyces are rounded verrucæ or domes, averaging 1.5 mm. in height and the same in diameter. The calyx walls are beset with thorny points which are processes from rather large unilateral spindles and discs which are embedded in the cœnenchyma in such a way that the upper expanded thorny side overlaps the inner and lower side of the spicule above. These thorny points tend to encircle the wall in whorls. The polyp is wholly retractile, so much so that the calycular margin closes over them entirely, leaving no evident opening. The operculum is rather feebly developed, consisting of slender spindles disposed longitudinally along the dorsal surfaces of the infolded tentacles. There is a very delicate collaret, apparently composed of a single circlet of slender spindles. The cœnenchyma is thin and filled with horizontally disposed spindles which average longer than those in the calyx walls, but are more slender.

Spicules. The most characteristic forms are the unilateral spindles or discs, which are unsymmetrical, having one side produced into spinous processes of various sorts. Clubs, stars, and double stars are also present, as well as regular spindles. There are a few forms characteristic of the genus *Acamptogorgia*, but they are small, and form an insignificant feature of the spiculation.

Color. The colony, in alcohol, is light buffy brown, the axis very dark brown, and the spicules colorless.

In two other specimens the spicules are light yellowish.

2. *Thesea pallida* new species. (Plate VIII, figs. 3, 3*a*; Plate XX, fig. 10).

Stat. 204. 4° 20′ S., 122° 58′ E. near Island Buton. 75—94 meters. Sand.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony (incomplete) flabellate in form, 10.6 cm. in height, and with a diameter of 3.3 cm. The portion not denuded of calyces consists of one of the main branches given off 1.9 cm. from the base of the stem, projecting at right angles with the stem but afterwards bending abruptly unwards. It gives off three denuded stubs of branches from its proximal part, the first

[1] American Journal of Science and Arts, Vol. XLVIII, 1869, p. 428.

branch with cœnenchyma arising 2 cm. above the bend. This branch gives origin to several lateral branchlets, most of which come from its outer side. The main stem also gives off several simple branchlets and, near its distal end, two larger branchings which themselves give off branchlets, the average distance between branches being 5.6 cm. The calyces are distributed more or less on all sides of the colony, but tend to be lateral in position. They are very unevenly placed, sometimes being contiguous and again being as much as 2 mm. apart. There are no strictly terminal polyps.

The individual calyces are low verrucæ, a typical one measuring somewhat less than .5 mm. in height and 1.5 mm. in width at the base. The calyx walls are filled with irregular plates from the sides of which sharp points arise, a crown of such points being on the margin, and the edges of the plates are imbricated. The polyps are retractile, and the operculum is usually well below the margin. The operculum consists of spindles arranged in the ordinary way; but the spindles are delicate.

Spicules. There are numbers of the typical unilateral forms characteristic of this genus. Besides these there are many of the *Echinomuricea* type, consisting of a sharp thorny point arising from an expanded and foliaceous base. There are also irregular heavy plates with rounded angles, oval discs, etc.; but the most numerous and characteristic spicules are the unilateral ones described above. The plates in the cœnenchyma of the stem and branches are often imbricated as in *Acamptogorgia*.

Color. The colony is almost white, in alcohol, the axis is brown, and the spicules are colorless.

3. *Thesea flava* new species. (Plate VIII, figs. 1, 1*a*).

Stāt. 50. Bay of Badjo, west coast of Flores. Up to 40 meters. Mud and sand.
Stat. 105. 6° 8′ N., 121° 19′ E. Sulu Sea. 275 meters. Coral bottom.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand and stones.
Stat. 273. East coast of Aru Islands. 13 meters. Sand.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.

Colony strictly flabellate in form. 10.5 cm. in height and with a spread of 14 cm. The main stem is 3 mm. in diameter, and is unsymmetrically branched, sending off two large branches to the right, and but one large branch to the left. They send off branchlets which are irregularly alternate and average about 5 cm. apart. These branchlets are constricted at the base and somewhat enlarged and flattened at their distal ends. There are a number of gall-like enlargements on the colony enclosing parasitic barnacles. The calyces are thickly crowded over the entire surface, being often contiguous and seldom more than 1 mm. apart.

The individual calyces are low rounded verrucæ, usually less than .5 mm. high and about 1.3 mm. broad at the base. The calyx walls are bristling in appearance, being beset with thorny projections borne on the sides of the unilateral spicules, which here reach their typical development. These form a circlet of points around the calyx margins and also irregular whorls of upward and outward projecting points lower down, the whorls themselves giving the appearance of imbrication. The polyps are completely retractile. The operculum is exceedingly

delicate, but of characteristic structure for this family, being formed by a mere skeleton of slender spindles. The collaret also is very delicate. The cœnenchyma is packed with irregular plates, many of which are of the same pattern as those in the calyx walls and usually of larger size.

Spicules. By far the most numerous and conspicuous spicules are of the unilateral type characteristic of the genus, having one side edged with a row of thorn-like projections which are lacking on the opposite side. There are also irregular plates, stars, multiradiate forms. A few delicate spindles are found, usually forming the opercula.

Color. The colony is a decided greenish yellow, the axis dark brown and the spicules yellow. The specimen from Station 105 is brighter yellow than the others.

A specimen from Station 274 has much more slender branches than the one above described, but is otherwise like it.

4. *Thesca immersa* new species. (Plate VIII, figs. 4, 4*a*; Plate XXI, fig. 4).

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.

The type specimen in incomplete, and is apparently a branch of a much larger colony. It is flabellate in form, rather straggling in habit, 14 cm. high and 15 cm broad. The main stem, or branch, bifurcates 2.5 cm. from its proximal end, but these branches reunite by anastomosis about 4.2 cm. above their origin. Above this they send off irregularly disposed lateral branchlets which, in most cases, divide dichotomously. Two other cases of anastomosis are seen in the colony. The calyces are quite regularly and evenly distributed on all sides of the stem and branches. Being very low verrucæ it is very difficult to tell where their walls join the general surface of the cœnenchyma. They are about 1.9 mm. apart from summit to summit.

The individual calyces are exceedingly low verrucæ, almost entirely immersed in the cœnenchyma of the stem and branches, with nothing but the crown of points appearing above the general level. The diameter of the margin is about 1.3 mm. The calyx walls are studded with jagged triangular points and sometimes foliaceous projections from the unilateral spicules, and the margin is surmounted by a crown of points. The verrucæ are so low that the calyx walls are insensibly blended with the general surface, which is itself studded with the same angular projections. The polyps are completely retractile, but the calyx margin does not fold over them. The operculum is thus exposed and is of the typical form, each flap being composed of three slender spindles, two being much longer and more conspicuous than the third which lies between their bases.

Spicules. The typical unilateral forms, although numerous, are not so abundant as in the last species. The are also numerous stars, crosses, multiradiate forms, etc., the stars preponderating. There are a few true symmetrical spindles.

Color. The colony, in alcohol, is pallid, almost white. The axis is brown and the spicules colorless.

5. *Thesea flexilis* new species. (Plate IX, figs. 4, 4*a*; Plate XXI, fig. 3).

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Kei Islands. 90 meters. Sand, coral and shells.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. Timor Sea. 34 meters. Mud and coral.

Colony an unbranched flexible stem 40.5 cm. long. The calyces are sparsely distributed throughout its length, being from 1 mm. to 3 mm. apart. The stem is about the same diameter throughout, being about 1.2 mm. in thickness and round in section. It is exceedingly flexible, and it is difficult to tell its proximal from its distal end.

The individual calyces are low verrucæ, sometimes dome-shaped or even conical. They are about .9 mm. in height and have a diameter of 1.4 mm. at the base. Their walls are ornamented with numerous sharp, vertical thorn-like points arising from the sides of unilateral spicules, the other sides being comparatively devoid of such points, although densely tuberculate. The polyps are completely retractile, and the calyx margins can fold over them so as to conceal them. The condition of the operculum is hard to determine in the specimens at hand; but it is feebly developed, as is the collaret.

Spicules. These are of two distinct types. 1st. The unilateral spindles and scales with conspicuous jagged points projecting from one side. 2nd. Comparatively large and heavy spindles, usually symmetrical, but not seldom showing a tendency to being unilateral. These lie longitudinally in the cœnenchyma of the stem and branches, and remind one of the large spindles found in the genus *Muricella*. Besides these two predominating forms there are a few clubs, branched and radiate forms, and occasionally one of the characteristic *Acamptogorgia* type.

Color. The color is a rather bright yellow, and the spicules are the same. This species bears a great superficial resemblance to *Muricella*, but the unilateral spicules indicate that it should be placed here.

6. *Thesea placoderma* new species. (Plate IX, figs. 3, 3*a*; Plate XXI, fig. 2).

Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate in form, 7.5 cm. in height and with a spread of 6.4 cm. A large branch has evidently been broken off near the base of the main stem, and 9 mm. above this the main stem forks into two approximately equal portions. Each of these branches in a flabellate manner until branchings of the fourth order are attained. The average distance between branches is about 4 mm. The calyces are distributed on all sides of the branches, are quite closely approximated and often contiguous. They are seldom more than 2 mm. apart. The branch terminations are swollen with thickly crowded calyces, none of which appear to be terminal.

The individual calyces are roughly conical or verruciform, their shape being obscured by the very conspicuous and irregular spicules in their walls. The height of a typical calyx is 1.1 mm. and its diameter at the base is 1.5 mm. The walls are composed mainly of large plate-like imbricating spicules from the upper sides of which very heavy thorn-like processes project upward and outward. These plates are so large and irregularly disposed as to greatly distort the shape of the calyx. The margin is surrounded by the thorny processes mentioned

above, but they are sometimes spatulate or flattened at their ends. In some cases the young polyps project between the plates of the cœnenchyma without any appearance of calyces.

The polyps are not completely retractile and rest with their collarets on the calyx margins. The collaret and operculum are exceedingly heavy, the latter being composed of two heavy spindles extending along the whole length of the infolded tentacle and a third shorter one lying between their bases. The cœnenchyma is filled with irregular plates with thorny edges, placed hap-hazard, not matched as in the genus *Acis*, but looking as if they had been thrown together without any method or regularity whatever.

Spicules. These are of the most characteristic *Thesea* type that the writer has seen. They are rather plates than unilateral spindles, however, and in some cases have a basal tubercular portion from which a cluster of smooth slender foliaceous projections arise, which approximate the *Acamptogorgia* type.

Color. The colony is grayish brown, the axis dark brown and the spicules colorless.

7. *Thesea sanguinea* new species. (Plate IX, figs. 5, 5*a*; Plate XXI, fig. 1).

Stat. 60. Haingsisi, Island Samau, Timor. 23 meters. Coral bottom.
Stat. 125. Anchorage off Sawan, Siau Island. 27 meters. Stony.
Stat. 273. East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion.

Colony flabellate in form, 5 cm. in height, and with a spread of 3.6 cm. The main stem is straight and without branches to a point 1.7 cm. from its base. Above this it gives forth lateral branches in an irregular manner, each branch curving outward and upward. The average distance between branches is about 7 mm. The branches are round, or but slightly flattened and are of approximately equal diameter (1 mm.) throughout, except at the ends where they are distinctly turgid. The calyces are rather evenly distributed on all sides of the branches, except that they are more closely approximated on the distal parts of the colony. They are from 1 mm. to 1.5 mm. apart.

The individual calyces are very low verrucæ or very short cylinders, their walls being mere bands rising but slightly above the general level of the cœnenchyma. Their margins are about 1.1 mm. in diameter, and are armed with a distinct circlet of blunt but prominent points. The calyx walls are so low that this crown of points is about all that rises above the level of the cœnenchyma. The polyps are completely retractile, and when retracted are disc-shaped from the shallowness of the calyces. The operculum and collaret are evident, but weakly developed . .

Spicules. There are two well defined layers of spicules, the inner one being composed of small spindles. The outer layer is composed of larger spicules of two types. One of these is of the regular *Thesea* type of unilateral spindles with jagged points on one side. The other kind are much larger and stouter spindles, some of which are also unilateral. These latter are embedded in the cœnenchyma of the stem and branches. Besides these preponderating forms there are a few crosses, stars, triradiate forms and, rarely, a small spicule of the *Acamptogorgian* type.

Color. The colony is a deep crimson red, sometimes bright scarlet. The spicules are of the same color. The axis is a greenish brown.

Echinomurica Verrill, (modified).

Echinomuricea Verrill. American Journal of Science and Arts, XLVII, 1860, p. 285.
Echinomuricea Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 112.
Echinomuricea Hedlund. Einige Muriceiden der Gattungen Acanthogorgia, Paramuricea und Echinomuricea im Zoologischen Museum der Universität Upsala, 1890, pp. 12—15.

Verrill was the first author to recognize this genus which he based on a new type of spicules found in *Acanthogorgia coccinea* (Stimpson), which he made the type of the new genus *Echinomuricea*. He describes the spicules as follows: —

"The cells are surrounded by numerous deep, red, prominent, imbricated spines, their outer ends long and sharp, but irregularly branched at their bases, forming thus a cluster of short, secondary spines".

Wright and Studer accept the genus as defined by Verrill, and without modification. Hedlund adds to the description a further character, asserting that the polyps are without the collaret so characteristic of the muriceids. To this the present writer can not agree, as he has found a well marked collaret in several species of this genus in the Siboga collection.

The definition for the genus *Echinomuricea* adopted in this work is as follows: —

Muriceids with wart-like or cylindrical calyces the margins of which are surrounded by a more or less prominent row of points, each point consisting of the exposed portion of a spicule which has a distal, strong, straight, spine-like portion which is often smooth; and a proximal, profusely exfoliated portion the processes of which radiate outward and downward from the base of the spine.

The type of this genus is *Echinomuricea coccinea* (Stimpson). The other known species are *Echinomuricea brunnea* Nutting, *E. coronalis* Germanos, *E. indomalaccensis* Ridley, *E. ceylonensis* Thomson and Henderson, *E. philippinensis* Hedlund, and the new species about to be described from the Siboga collection.

1. *Echinomuricea coronalis* Germanos.

Echinomurica coronalis Germanos. Gorgonaceen von Ternate, Abhandl. der Senckenbergischen naturforschenden Gesellschaft, Band XXIII, Heft I, 1896, p. 165.

Stat. 71. Near Makassar. Up to 32 meters. Sand.
Stat. 117. 1° 0′.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. New Guinea. 32 meters. Sand and stones.
Stat. 166. 2° 28′.5 S., 131° 3′.3 E. near New Guinea. 118 meters. Hard sand.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. Timor Sea. 34 meters. Mud and coral.

Colony of straggling habit, 30 cm. in height and 31 cm. in spread. The general form is flabellate. A small branch has its origin 2.3 cm. from the base of the stem, and above this there are five branches variously spaced and on the same side. From about the middle of the main stem, and upward, all of the branches arise from the opposite side. Three of the

branches bear branchlets, all from their lower or outer sides. The calyces are very thickly distributed on all sides of the branches, often being contiguous, and rarely being more than 1.5 mm. apart. The branch endings are often somewhat swollen, but there are no true terminal polyps.

The individual calyces are very low verrucæ, or exceedingly short cylinders not more than .7 mm. in height and 1.5 mm. in diameter. They are often oval in section, their longer diameter being parallel to the branch. The wide margin is beset with erect spines, or points of spicules which have their foliaceous bases embedded in the cœnenchyma of the calyx wall. These occur in several apparently imbricating ranks in the upper portions of the walls, becoming less prominent as they near the base. The polyps are entirely retractile, but the calyces do not close over them. The operculum is horizontal and countersunk below the margin, and is but feebly developed, being represented by a very few delicate spindles.

Spicules. The spicules are small, the most characteristic being of the type of this genus. They have long, thorny, comparatively smooth points, and rough, expanded, foliaceous bases. There are also many crosses, triradiate forms, daggers, small Stachelplatten and irregularly branched forms.

Color. The colony is a light brown throughout, the axis very dark brown basally, fading to yellowish distally. The spicules are colorless.

General distribution. The type was secured near Ternate.

The specimens of the Siboga collection here referred to this species agree but imperfectly with the original description of Germanos. The characteristic spicules however, agree quite closely with his figure, and the specimens are referred to *Echinomuricea coronalis* with considerable doubt.

*2. *Echinomuricae indomalaccensis* Ridley.

Echinomuricea indomalaccensis Ridley. Zoological Collections of H. M. S. Alert, 1884, p. 386.
Echinomuricea indomalaccensis Hedlund. Einige Muriceiden im Museum Upsala, 1890, p. 15.
Echinomuricea indomalaccensis Thomson and Henderson. Ceylon Pearl Oyster Report, the Alcyonaria, 1905, p. 291.

Pulu Missa near Flores, de Siso don.

Colony flabellate and loosely reticulate, 34.5 cm. in height and 39.5 cm. in spread. The main stem gives off a large branch immediately above its base, which bifurcates immediately above its origin, its parts ultimately anastomosing with branches from the main stem and with eachother. The main stem gives off a few lateral branches, but loses its identity about 12 cm. from its base. The main branches do not radiate symmetrically towards the edges of the colony, but lose their identity towards the margin and give off numerous ultimate twigs which are all lateral and often anastomose with eachother and with other branches, thus forming a loose web. The ultimate twigs are swollen at their ends. The stem and larger branches are laterally compressed, their larger diameter being 4 mm. and their smaller less

than 2 mm. The calyces are distributed over the whole surface of the colony, but not so thickly as in most reticulate muriceids, being usually about 1 mm. apart.

The individual calyces are small and verruciform, less than .5 mm. in height and 1 mm. in diameter. The margin is surrounded by a crown of rather sharp, often flattened points which project from spicules whose branched and foliaceous bases are embedded in the calyx walls. The lower parts of the walls are filled with spindles which are usually transversely placed. The polyps are retractile, but often rest, even in the dried specimen, with the collarets just above the calyx margin.

Both the operculum and collaret are well developed, the former being elevated and conical and composed of the usual three spindles, two long and longitudinally placed on the upper surface of the tentacle, and the third lying between their bases.

Spicules. The most prominent form is the typical *Echinomuricea* one, each consisting of a basal portion with forked, tuberculate, foliaceous expansions; and a distal single point, which is often flattened in the present species. There are also many stellate forms, clubs, daggers, etc., and a few large regularly tuberculate spindles.

Color. The color of the dried specimen is dull brown, the axis brown and the spicules yellowish red.

General distribution. RIDLEY reports this species from Port Curtis, 5 fathoms; Port Molle, 12—20 fathoms; and Warrior Reef, Torres Straits, Australia. THOMSON and HENDERSON report it from the Pearl Banks, Gulf of Manaar.

3. *Echinomuricea collaris* new species. (Plate IX, figs. 1, 1*a*; Plate XXI, fig. 5).

Stat. 280. 8° 17′.4 S., 127° 30′.7 E. Banda Sea. 1224 meters.

The type specimen is but a fragment 3 cm. in length, forking about 5 mm. from its proximal end. Both forks show sprouting branches. The calyces are distributed thickly on all sides of the branches, especially on the distal portions, where they are so closely approximated that it is very difficult to ascertain whether there is a terminal polyp or not. The calyces are usually set at a right angle to the branch on its proximal part, but are inclined distally on the terminal part

The calyces are columnar in shape, varying greatly in height, but averaging about 2 mm. to the margin, with a diameter of about 1.5 mm. Their walls are covered with imbricating spicules which project in a crown of points around the margin. Each of these points is the distal end of a spicule, the proximal portion of which is expanded into a series of radiating, foliaceous processes which are embedded in the cœnenchyma. The polyps rest, in retraction, on the strongly marked collaret which is surmounted by the high dome-shaped operculum. The basal portion of each opercular flap consists of three spindles arranged in an acute triangle pointing towards the apex of the dome. The distal portion of the dorsal surface of each tentacle is covered with longitudinal spindles, some of which are bent to include the points of the triangles.

Spicules. The most conspicuous form is the one characteristic of the genus *Echinomuricea*, being strong, sharp spindles with the basal ends expanded into foliaceous projections, sometimes resembling Stachelplatten. These projections are often profusely forked and lobulated in various ways. Spindles are not uncommon, both straight and curved, their surfaces covered with fine spiny points, rather than the rough tubercles usually found.

Color. The colony is light yellowish brown. The spicules are colorless.

4. *Echinomuricea spinifera* new species. (Plate IX, figs. 2, 2*a*; Plate XXI, fig. 6).

Stat. 164. 1° 42'.5 S., 130° 47'.5 E. New Guinea. 32 meters. Sand and stones.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. near Aru Islands. 57 meters. Sand and Stones.

The colony (incomplete) is straggling in habit and 7.8 cm. in height. The main stem is destitute of polyps and covered with an encrusting bryozoon for nearly its proximal half. 3 cm. from its base it gives off a branch which bifurcates; one of the resulting branches giving off a lateral branchlet, and the other being unbranched. The other main branch gives off one short lateral 1 cm. from its origin. The calyces are very thickly emplanted on all sides of the branches, being so closely set as to be usually almost contiguous.

The individual calyces are very short cylinders expanded at the margins. They are about 1 mm. high and 1.8 mm. in diameter at the margin. There is a very distinct crown of marginal points, their number having no apparent relation to the number of tentacles, nor their emplacement to the tentacle bases. The calyx walls are beset with spiny points, some of which are almost as conspicuous as the marginal points. The crown consists of more than one circlet of points, the inner circlets bending over the incurved tentacles so that their ends often form a tuft of needle-like points rather than a circlet, the inner ones being attached to the tentacle bases over which they bend when the tentacles are infolded. The distal portions of the tentacles are armed with smaller longitudinal spindles.

Spicules. These are of exceedingly various forms. The most common and conspicuous is the regular *Echinomuricea* type with long smooth sharp points, and bases expanded into various foliaceous processes with complicated frills and lobes. There are also numerous Stachelplatten, crosses, stars, butter-fly-shaped forms, and a few simple small spindles. Indeed most of the known forms of spicules found in the Muriceidæ are represented, but the characteristic ones are those of the calyx as described above.

Color. The colony is light brown, the axis golden brown, and the spicules colorless.

Several larger colonies from Station 274 agree well in their details with the type.

5. *Echinomuricea pulchra* new species. (Plate X, figs. 3, 3*a*: Plate XXI, fig. 7).

Stat. 240. Banda Anchorage. 9—45 meters. Lithothamnion.

The colony is fragmentary, flabellate in form, 12.2 cm. in height and with a spread of about 7.3 cm. The main stem, or branch, is denuded, 2.8 mm. thick. 1.9 cm. above its proximal end arises the branch which bears the only portions with calyces.

This branch divides 2 cm. above its base into two parts, and one of these again forks about 5 mm. above its origin. There are thus three long, undivided terminal branches, the longest being 7.4 cm. in length and having a diameter of 3.2 mm. The calyces are emplanted as thickly as possible on all sides of the branches, which have a velvety appearance owing to the very numerous spicules projecting from the calyx margins.

The individual calyces are very short cylinders, usually less than 1 mm. high and with a diameter of 1.5 mm. The margin is crowned with a circlet of conspicuous, thorn-like projections which are the icycle-like ends of spicules the expanded basal parts of which are buried in the cœnenchyma of the calyx walls. The entire surface of the latter bristle with similar points projecting upward and outward. The polyps are retractile, but the margins of the calyces do not close over and conceal them. The opercular spicules are more numerous than usual, there being several longitudinal spindles in addition to the two usually seen on each opercular flap. The collaret is strongly marked, and the cœnenchyma of the branches thick.

Spicules. The most characteristic spicules are beautifully typical examples of the *Echinomuricea type*, being composed of a smooth, slender spine whose base is surrounded by intricate foliaceous expansions of beautiful patterns. There are also a few radiate forms, crosses and stars. Rarely simple spindles are found.

Color. The colony is a rich crimson, axis deep brown, and the spicules rich crimson or wine-color.

6. *Echinomuricea cylindrica* new species. (Plate X, figs. 2, 2*a*).

Stat. 266. 5° 56′.5 S., 132° 47′.7 E. near Kei Islands. 595 meters. Mud with stones.

The specimen consists of merely the tip of a branch 7 mm. long from which a lateral branch is budding. The calyces are rather thickly crowded on all sides of the branch, although in some instances there is a space between them of 1.3 mm.

The individual calyces are tubular, tending to a club-shape as their distal ends are swollen and the operculum unusually high, giving the outline of a very short, stout indian club. A typical calyx measures 2.7 mm. in height and 1.9 mm. in diameter at the margin. The calyx walls are bristling throughout with long sharp spines pointing outward and upward. These spines being white, or colorless, show in conspicuous contrast to the raw sienna brown of the cœnenchyma. The margin is surrounded with similar thorn-like points, which often bend over the operculum. The polyps are incompletely retractile and rest with their collarets above the calyx margins. The collaret is very strong and conspicuous, consisting of three of four rows of transverse spicules encircling the polyp. The operculum is highly arched and dome-shaped, and its spicular pattern is different from any other that I have seen. Each flap is armed with a pair of bowed spindles which have their proximal and distal ends approximated and their middle portions divaricated, leaving a terete space between them. They are quite heavy and white, showing conspicuously against the brown dorsal surface of the tentacles.

Spicules. Those which arm the calyx walls are of the regular *Echinomuricea* type,

being composed of a richly branched and exfoliated basal part from which arises a long thorn-like projection which, in this species, is covered with fine serrations, and projects upward and outward from the calyx walls when in situ. There are also the bowed spindels of the operculum, besides regular spindles, triradiate and quadriradiate forms and a few small Stachelplatten.

Color. The cœnenchyma and polyps are rich sienna brown, the spicules are colorless, but appear white when in situ and seen by reflected light.

This is a very striking form, quite different in color from any other species of the genus *Echinomuricea* that I have seen.

7. *Echinomuricea costata* new species. (Plate X, figs. 1, 1*a*; Plate XXI, fig. 8).

Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 meters. Mud.

The type specimen is incomplete and much broken up by the tangles. It is 13 cm. in height and has a spread of 14.5 cm. 2.5 cm from its base it divides into two main branches, and these again divide into two each about 1 cm. from their origin. One of these secondary branches sends forth four branchlets from its outer side at intervals averaging about 5 cm., there being but one branchlet on the opposite side. Another fork of the main branch gives off five branchlets from its outer side. The other secondary branches are irregular in their branching, branchlets of the 4th and 5th order being produced. All of the branches tend to curve upward like candalabra. The branches terminate in polyps. The calyces are thickly emplanted on all sides of the branches, but are more closely crowded laterally, where they are about 2 mm. apart.

The individual calyces are in the form of short cylinders or truncated cones. They are about 1.2 mm. in height and 1.7 mm. broad at the margin. Their sides are armed with jagged points projecting vertically, their roughened ends reaching beyond the margins and their jagged sides are ornamented with spinules, which produce rib-like effects on the calyx walls. There are often a few horizontally disposed spindles around the bases of the calyces. The collaret of the polyps is very heavy, and the operculum arises above it in a regular cone composed of two comparatively heavy, longitudinal spindles reaching from the collaret to the apex of the cone.

Spicules. The most conspicuous type is the heavy, warty spindle with foliaceous base, characteristic of the genus *Echinomuricea*. There are also a few of the *Thesea* type of unilateral spindles. Regular spindles and triradiate forms are also seen.

Color. The specimen, when clear of debris and tangle material, is a yellowish brown. The spicules are colorless.

This species shows an approximation to the genus *Thesea* in having a few of the *Thesea* type of spicules, but these are much less numerous and conspicuous than those of the regular *Echinomuricea* type.

Echinogorgia Kölliker (in part).

Echinogorgia Kölliker. Icones Histologicæ, II, 1856, p. 136.
Echinogorgia Verrill. Transactions of the Connecticut Academy of Science, Vol. I, part 2, 1867—71, p. 419.
Echinogorgia Kent, Wm. S. Monthly Microscopical Journal, Feb. 1870, p. 84.
Echinogorgia (in part) Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 118.

The original definition of this genus, as given by Kölliker, is as follows:

"Primnoaceen mit horniger Axe, kleinen oberflächlichen stacheligen Kalkkörpern von eigenthümlicher Form und wenig oder kaum entwickelten Kelchen".

The other writers cited above have accepted this genus without modification. Wright and Studer describe with some care the spicules of the genus.

In the illustrations given by Kölliker of the typical spicules, nearly all of the figures represent what appears to the present writer to be the real characteristic form which marks the genus. They are all modifications of a type which consists essentially of a basal portion which is embedded in the cœnenchyma, and an exposed portion which stands free. The former part is an irregular mass of tuberculated projections often assuming a radiate arrangement, pointing outward and downward. The exposed part is usually composed of foliaceous projections, which are more or less inflated and have a smooth surface, and project directly upward from the centre of the basal portion. These inflated leaf-like expansions are often so clustered as to resemble a half opened tulip or rose.

Saville Kent has correctly figured and described this form of spicule, and recognizes it as the characteristic form for the genus *Echinogorgia*.

Aside from this, there is another widely different form in the genus as defined by Wright and Studer. This is the unilateral spindle from which project, from one side, a number of conspicuous, heavy, thorn-like processes; the typical spicules of the genus *Thesea*, as accepted by the present writer, who would include in the genus *Echinogorgia* only those species having the peculiar spicules described above and figured by Kölliker as characteristic of the type species of the genus.

The definition for the genus *Echinogorgia* adopted in this work is as follows: — Muriceids with verruciform calyces the walls of which contain spicules which consist of a basal mass of foliaceous, irregularly branched, tuberculate projections radiating from a common centre, above which arises the distal portion composed of one or more leaf-like expansions, which are more or less inflated, and have a smooth surface without definite branches or tuberculations.

The type of the genus is *Echinogorgia pseudosassapo* Kölliker. Other species would be *Echinogorgia aurantiaca* Verrill, *E. cerea* (Esper), *E. furfuracea* (Esper), *E. umbratica* (Esper), *E. coarctica* (Lamk.), *E. fungifera* (Lamk.), *E. stricta* (Lamk.), *E. granifera* (Lamk.), *E. multispinosa* Thomson and Henderson, *E. danaides* (Val.), and the five new species found in the Siboga collection.

1. *Echinogorgia aurantiaca* (Val.).

Plexaura aurantiaca Valentine. Compte-rendu, XII, p. 557.
Leptogorgia aurantiaca Edwards et Haime. Histoire naturelle des Coralliaires, Vol. I, 1857, p. 182.

Echinogorgia aurantiaca Verrill, Notes on Radiata, 1867—71, p. 557.

Stat. 60. Haingsisi, Samau Island, Timor. 23 meters. Coral bottom.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand and stones.
Stat. 204. 4° 20′ S., 122° 58′ E., near Buton Island. 75—94 meters. Sand.

Colony (incomplete) a slender stem 30 cm. long, with a single simple branch arising 7.3 mm. from its base and attaining a length of 8.5 cm. Diameter of stem 2.4 mm. The calyces are closely but unevenly distributed on all sides of the stem and branch. They are often contiguous, but sometimes as much as 1.7 mm. apart.

The individual calyces are low rounded verrucæ, a typical one measuring 1.1 mm. in height and 1.5 mm. in diameter at the base. The calyx walls are covered with projections which are flattened, smooth and imbricating. They are the exposed portions of spicules which have a foliaceous, expanded base embedded in the cœnenchyma of the walls. Some of these glassy projections reach slightly above the calyx margin, but they are not conspicuous. The polyps are retractile, the calyx walls being capable of enclosing and covering them completely. The collaret and operculum are extremely delicate, both being formed of very slender spindles arranged in the usual way.

Spicules. The *Echinogorgia* type of spicule is prominent, consisting of a multiradiate base which is distinctly tuberculate and from which arise one or several clear, smooth, flattened or foliaceous expansions. Often there is but one such expansion, in which case the spicule resembles the *Acamptogorgia* type. Sometimes there are very evident keels on one or both sides of these expansions; but the ordinary type in this species has but one often lobed or slightly frilled plate, which is exposed on the surface of the calyx. There are also a number of ordinary spindles, clubs, etc.

Color. The colony (in alcohol) is a rather dull yellow, the axis is brown and the spicules bright yellow.

General distribution. The type specimen was from Callao, Peru.

2. *Echinogorgia furfuracea* (Esper).

Gorgonia furfuracea Esper. Pflanzenthiere, II, Plate XLI, 1744.
Echinogorgia furfuracea Kölliker. Icones Histologicæ, II, 1856, p. 136.
Echinogorgia furfuracea Studer. Alcyonarien aus der Sammlung Naturhist. Museums Lübeck, 1896, p. 111.

Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate in form, 10.5 cm. in height and 8.5 cm. in diameter. The main stem is erect and sinuous, and gives off a pair of unequal and subopposite branches about 1 cm. above its base, and another subequal pair 7 mm. above the first. The branches above this are lateral but unequally disposed. The main branches are unequally divided and give off branchlets to the fourth order. The main stem is slightly flattened basally, but the remainder of the stem and branches are round and approximately equal in thickness. The basal part of stem is 3 mm.

in its greater diameter, while the other parts are about 2 mm. thick. The calyces are closely approximated, usually contiguous, and are equally distributed on all sides of the stem and branches. The branchlets end in a close cluster of polyps, neither of which is certainly terminal.

The individual calyces are dome-shaped verrucæ within which the polyps are capable of complete retraction. The walls of the calyces are crowded with the very remarkable spicules which characterize the genus. Each spicule has its tuberculated basal part immersed in the wall, while its foliaceous expansions form a small whorl of thin processes surrounding a central space, which is often tubular. Often these tubular spaces are not evident, being closed above by the approximation of the expansions. The relatively small polyps have the usual operculum composed of two bent spindles which have their proximal ends divaricated and their distal portions contiguous, while a third, much smaller, spindle lies between their bases. This latter spindle is not always evident and then the divaricated ends of the other two rest immediately upon the collaret.

Spicules. These are remarkable both for their form and uniformity. Each consists of a basal part composed of several ray-like densely tuberculate points radiating from a common centre. Above this centre arises a cluster of smooth, more or less convoluted, leaf-like expansions enclosing a central space. Each of these expansions is heavily keeled, the keel being its most conspicuous part and having its free edge finely dentate. The central space is bounded by the bases to which the keels are attached, and when these are closely approximated the space is obliterated and a very heavily ribbed dome is formed, the ribs being meridional and very conspicuous. Besides these there are relatively few triradiate forms, crosses, double stars, etc., and a few ordinary spindles

Color. The colony is light pinkish brown, the cœnenchyma somewhat darker than the calyces. The axis is dark brown and the spicules colorless.

General distribution. The type was from the Indian Ocean. STUDER reports it from Northwest Australia from a depth of 50 fathoms.

The specimens secured by the Siboga Expedition, and which I have referred to this species, agree quite well with the figure given by ESPER, although the writer would hesitate to identify it were it not for the further agreement with the figures of spicules given by KÖLLIKER.

3. *Echinogorgia pseudosassapo* Kölliker.

Echinogorgia sassapo var. *reticulata* Esper. Pflanzenthiere, II, 1794, p. 48, plate IX*a*.
Echinogorgia pseudosassapo Kölliker. Icones Histologicæ, II, 1856, p. 136.
(?) *Echinogorgia pseudosassapo* Wright and Studer, Challenger Reports, the Alcyonaria, 1889, p. 119.
Echinogorgia pseudosassapo Thomson and Henderson. Ceylon Pearl Oyster Reports, Alcyonaria, 1905, p. 292.

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. From 50—40 meters. Coral sand.
Stat. 273. Jedan Island, east coast Aru Islands. 13 meters. Sand and shells.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.
*Pulu Missa near Flores de Siso don.
*Aru Islands Dr. J. W. R. KOCH leg. Dutch New Guinea Expedition 1904.

The colony chosen for description is a magnificent flabellate and reticulate structure 37 cm. in height and with a spread of 40 cm. The main stem is 7 mm. in diameter near its base. 1.5 cm. from the base its breaks up into three main branches and these send forth lateral branchlets which form a radiating pattern extending from the base of the colony like the ribs of a fan, and often reaching the periphery. These branches are strongly compressed so that their least diameter is in the plane of the colony, their diameters being 5 mm. and 2 mm. From these radiating ribs very numerous side branchlets arise that usually curve outward and upward, their free ends being club-shaped. In many cases, however, they anastomose with neighboring branchlets, forming a reticulation which is more extensive than in any other species of the genus that the writer has seen. The calyces are closely and evenly packed over the whole surface of the colony.

The individual calyces are small rounded verrucæ about .5 mm. high and with a basal diameter of 1.2 mm. Their walls are filled with the imbricating foliaceous expansions of spicules the proximal ends of which are embedded in the walls. Superficially these expansions look like imbricating discs or scales, resembling those of the genus *Bebryce*. The polyps are completely retractile, the calyx walls being capable of closing entirely over them. Often, however, the polyps rest with the collaret immediately above the calyx margin. The operculum is a high cone, the pattern of the spicules being the same as that described in the last species.

Spicules. These are exceedingly varied. The most characteristic ones, however, being composed of the usual two parts; a base consisting of a number of radiating, tuberculate processes from the centre of which arises the distal part composed of comparatively smooth, foliaceous expansions. There are also foliaceous clubs, ordinary spindles, stars, crosses, etc. Indeed almost any type of spicule found in the Muriceidæ might be found in a single slide from this species.

Color. The colony is a very beautiful deep crimson throughout, a fact that led the older writers to call this the "blood-red coralline". The axis is dark brown and the spicules scarlet. A number of large dried specimens referred to this species are rusty brown in color.

General distribution. The type specimens were from the Indian Ocean. Thomson and Henderson report it from Ceylon, Wright and Studer found specimens which they refer to this species in Torres Strait.

The specimens in the Siboga collection are much larger than any heretofore reported. Some of the dried colonies being as much as 50 cm. in height. The great compression of the branches is probably due largely to the size of the colonies, as smaller specimens show the branches but slightly compressed.

4. *Echinogorgia ridleyi* new species. (Plate X, figs. 4, 4*a*; Plate XXI, fig. 9).

Stat. 164. 1°42'.5 S., 130°47'.5 E. near New Guinea. 32 meters. Coral bottom.

The colony is incomplete, the basal portion being lacking. It is flabellate in form and the branches to a limited degree. There are a number of small twigs that project outward and

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upward from the front of the colony. It is difficult, or impossible to distinguish the main stem and branches from the others because they are of nearly uniform size. Height of colony 10.8 cm., spread 12.5 cm. In general the origins of the branches and branchlets are alternate, the distance between them averaging about 7 mm. The branch terminations are slightly enlarged and occupied by a group of low calyces, none of which appears to be strictly terminal. The calyces are evenly distributed over the whole surface, and are closely approximated, even contiguous.

The individual calyces are small, very low verrucæ about .6 mm. in height and 1.2 mm. in diameter. Their walls are filled with jagged upward-projecting points of the foliaceous expansions of spicules, and their margins are furnished with a fringe of similar points, which give a serrated appearance when viewed laterally. These points appear to be imbricated. The polyps are completely retractile, the margins bending inward so as to completely conceal the polyps. Even when the calyces are open the polyps are sunken much below the margins. The polyps are very small, and are disc-shaped when retracted within the low calyces. The operculum is composed of flattened plates over the tentacle bases, and of one or more spindles lying lengthwise of the infolded tentacle.

Spicules. While not so regular as in some of the preceding species, the dominant spicule in this species is of the usual type for *Echinogorgia*, being composed of two usually distinct parts. The basal portion is made up of a number of radiating tuberculated processes, and the distal part is composed of a cluster of foliaceous expansions. Sometimes these expansions form a tulip-like structure resting on the star-like basal part. While these spicules are by far the most numerous, there are also comparatively large, terete, densely tuberculate spindles, stars, and a few triradiate forms.

Color. The colony is a deep dull red, the spicules a brick red. The axis is an olive brown, lightening to a distinct green on the distal branchlets.

5. *Echinogorgia flora* new species. (Plate XI, figs. 2, 2*a*; Plate XXI, fig. 10).

Stat. 164. 1°42′.5 S., 130°47′.5 E. near New Guinea. 32 meters. Coral bottom.

Colony very straggling in habit, 16.5 cm. in height. It gives off a short, slender branch 1.8 cm. from its base, and a large branch, which gives off two simple branchlets, 1.4 cm. above the first. 2.2 cm. above this (the second branch) the remaining large branch is given off on the opposite side, and this gives off two simple branchlets. The main stem is broken off above the last branch. The calyces are on all sides of the branches, which are round in section, and are often contiguous. Owing to the complete insertion of the calyces the branches look smooth, as in *Plexaurella*.

The individual calyces are entirely immersed in the cœnenchyma, their presence being indicated merely by scarcely evident swellings not easily seen without magnification. Under a low power of magnification, however, the calyces are indicated in profile by low, mound-like swellings, and in vertical view by concentric whorls of leaf-like projections from spicules pointing upward; the appearance being much like that of a rose seen from above. The whole surface, when viewed from above, looks as if it were packed full of minute roses, the leaves being

formed by the petal-like projections from spicules the bases of which are embedded in the cœnenchyma. The polyps are completely retractile. The operculum is very low, sometimes being actually depressed in the centre, and is composed of very delicate spindles longitudinally disposed.

Spicules. These are of the characteristic *Echinogorgian* type, except that the distal portion is composed of but one, instead of several, leaf-like expansions. The proximal portion is composed of a branched mass of densely tuberculate projections. From this mass usually a single, oval orbicular, smooth, thin, transparent, often somewhat crimped plate arises.

These thin plates are what form the "rose leaves" described above. A few small spindles, triradiate forms, crosses, etc., are seen.

Color. The colony is very light brown, the axis dark brown and the spicules colorless.

Were it not for the fact that the axis cylinder is devoid of calcareous matter the writer would be much tempted to place this species in the genus *Plexaurella* of the family Plexauridæ. It would not, however, go into this genus according to the definition given by its describers [1].

6. *Echinogorgia complexa* new species. (Plate XI, figs. 1, 1*a*; Plate XXI, fig. 11).

Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Coral bottom.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate and reticulate in form, 18.5 cm. in height and with a spread of 15 cm. The main stem gives off two subopposite branches 3.1 cm. above its base. Higher up it gives off three branches on one side and two on the other, the upper two being opposite and 6.2 cm. from the base. The main branches bend outward and upward and send off branchlets which anastomose freely with others, forming a loose reticulation. The branches are of equal diameter throughout. The calyces are equally distributed on all sides of the branches, and are so closely packed as to be generally contiguous. The twig terminations are slightly swollen.

The individual calyces are very low verrucæ .5 mm. in height and with a diameter of about 1.1 mm. Their walls are filled with foliaceous projections which look like imbricating scales; but are really the smooth, expanded processes from spicules whose bases are embedded in the cœnenchyma of the calyx walls. A circlet of these points form a low crown around the margin. The polyps are completely retractile, but ordinarily the collaret rests above the calyx margin, with the high operculum rising above i_t. The opercular spindles are arranged in the ordinary manner, forming an acute-angled triangle. The cœnenchyma of the stem and branches is studded with foliaceous points similar to those of the calyx walls.

Spicules are of the regular *Echinogorgian* type, consisting of a multiradiate, foliaceous basal portion which is distinctly tuberculated; and a group of fairly smooth, lamellar expansions arising vertically from the centre of the basal part. This cluster of folia seems to be composed of a greater number of leaves than is found in the other species in the collection.

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[1] Wright and Studer. Challenger Reports, the Alcyonaria, 1899, p. 138.

Color. The colony is medium brown, the axis very dark brown, and the spicules colorless.

Three fine specimens from Station 164 measure up to 21 cm. in length.

Acamptogorgia Wright and Studer.

Acamptogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, pp. LV, 115.

Although species belonging to this genus have been described by several of the later writers, the genus itself is not discussed.

The original description of the genus is as follows:

"The colony is branched, with tubular, cylindrical short polyp calyces, which are usually given off alternately from each side of the axis. The spicules are foliaceous clubs, the folia project beyond the cœnenchyma, but the triradiate bases are embedded in the cœnenchyma. In most cases bidentate folia, at right angles to one another, originate from a tripartite base. Besides these there are warty curved spindles and clubs. The tentacular opercula are well developed".

In a more detailed description of the genus, found on page 115 of their Report on the Challenger Alcyonaria, the describers say:

"In most cases the spicule has become triradiate by the shooting out of several projections from about its middle. From the place where these rays centre one or two dentate foliar expansions arise, these latter stand at an acute angle to one another, and their long axes always fall into the angle between two of the rays. These spicules are so placed on the wall of the polyp body that the stellate rays are always inserted into it, while the foliar expansions project, scale-like over the surface. The collaret consists of bent spindles, spiny, and upon which the opercular spicules abut. Each of the eight rays of the opercular covering consists of but three fairly broad and somewhat flattened spicules".

The type species of this genus is *Acamptogorgia arbuscula* (Gray, MS.). Other species are *Acamptogorgia alternans* Wright and Studer, *A. atra* Thomson and Henderson, *A. bebrycoides* von Koch, *A. gracilis* Thomson, *A. spinosa* Hiles, *A. tuberculata* Hiles, *A, fruticosa* Germanos, *A. acanthostoma* Germanos, and the species about to be described.

"*Acamptogorgia horrida*" Hiles seems to the present writer to belong to the genus *Echinomuricea*.

1. *Acamptogorgia spatulata* new species. (Plate XIV, figs. 2, 2*a*; Plate XXI, fig. 12).

Stat. 117. 1° 0.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 166. 2° 28′.5 S., 131° 3′.3 E. near New Guinea. 118 meters. Hard sand.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, sand and shells.

Colony flabellate in form, not reticulate, 8.5 cm. in height and with a spread of 9.4 cm. The main stem is bare for 2.2 cm. above its base, and the remainder gives off branches in a roughly pinnate manner. The branches themselves are pinnately divided, and branchings of the third order are found. The branches are about 7 mm. apart, on the average. The calyces

are mainly lateral in position, but are also scattered sparsely on the front and back of the colony. In some places there is a distinct tendency toward a spiral arrangement of the calyces. They are spaced very irregularly, being, however, about 1 mm. apart on the average.

The individual calyces are short cylinders in form, a typical one measuring .8 mm. in height and 1.4 mm. in diameter. Their walls are bristling with flattened or spatulate projections. These points often tend to arrange themselves in vertical lines on the calyx walls. They project from a triradiate base embedded in the walls.

The polyps are but partially retractile, and rest with the collaret on the margin of the calyx. The operculum is a typical one for the genus, being formed of two curved longitudinal spindles with a third shorter one lying transversely at their proximal ends. The operculum is rather high and the spicules well developed. The collaret is weak.

Spicules. These are large and conspicuous, the predominant form being composed of a foliaceous, triradiate base from which arises a spatulate or flattened smooth projection, which often seems to be more or less split or splintered at the distal end. Besides these there are smaller spicules with oval or scale-like projections of the typical *Acamptogorgia* form, triradiate spicules and ordinary spindles are also present.

Color. The colony is grayish brown, axis dark brown, and the spicules colorless.

The spicules of this species very closely resemble those of *Acamptogorgia fruticosa* Germanos; but that species is described as being of a red color.

The genus is doubtless closely allied to the following, *Villogorgia*.

Villogorgia Duchassaing et Michelotti, (emended).

Villogorgia Duchassaing et Michelotti. Mémoire sur les coralliaires des Antilles, 1860, p. 32.
Baorella Gray. Annals and Magazine of Natural History, 4th. Series, Vol. 5. 1870, p. 406.
Villogorgia (+ *Paramuricea* Kölliker) Ridley. Annals and Magazine of Natural History 5th. Series, Vol. 9, 1882, p. 187.
Villogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LIII.

The original description of this genus is entirely inadequate, as is so often the case with the definitions of the earlier writers, and contains a very serious error in stating that the species of the genus *Villogorgia* are without spicules. The feature is made the main distinguishing mark, separating the genus from *Muricea*, *Thesea*, *Acis*, etc.

Ridley gives a careful discussion of the genus, and the following is condensed from his definition:

Colony flabellate, reticulate, cœnenchyma thin, calyces cylindrical, emplanted on all sides of the stem and branches. The spicules of the cœnenchyma are large, 4—8 pointed, and spindles. Those of the calyces tuberculate, fusiform and Stachelplatten.

Ridley, however, included Kölliker's genus *Paramuricea* in the genus *Villogorgia*, a mistake pointed out by Wright and Studer, who retained both genera on account of the difference in the opercula. Their definition is practically adopted in the present work, and the salient points included in the following definition.

Colony flabellate, often reticulate: cœnenchyma thin; calyces short cylinders with an operculum composed mainly or entirely of three spindles forming an acute-angled triangle. Spicules mainly triradiate and quadriradiate, or Stachelplatten.

The type species is *Villogorgia nigrescens* Duchassaing and Michelotti. Other known species are *Villogorgia compressa* Hiles, *V. flabellata* (Gray), *V. (Paramuricea) gracilis* (Studer), *V. intricata* (Gray), *V. (Acamptogorgia) rubra* (Hiles), also the new species found in the Siboga collection and described beyond.

The genus is doubtless closely allied to *Paramuricea*, but is separated from it by the arrangement of the opercular spindles, which are en chevron in *Paramuricea* but form an acute triangle in *Villogorgia*.

1. *Villogorgia nigrescens* Duchassaing et Michelotti.

Villogorgia nigrescens Duchassaing et Michelotti. Mémoire sur les coralliaires des Antilles, 1862, p. 32.
Paramuricea nigrescens Kölliker. Icones Histologicæ, II, 1865, p. 136.
Villogorgia nigrescens Ridley. Annals and Magazine of Natural History, Series 5, Vol. 9, 1882, p. 187.
Villogorgia nigrescens Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 110.

Stat. 154. 0° 7'.2 N., 130° 25'.5 E. Bougainville Strait. 83 meters. Muddy sand.

Colony flabellate, not reticulate, attaining a height of 16.5 cm. and a width of 17 cm. The main stem is 5 mm. thick, and divides 6 mm. above its base into three large branches, one of which has been broken off short. The other two send off an intricate system of large and small branchlets that are lateral and tend to be alternate and about 5.5 mm. apart on an average. These branches are quite numerous and produce an apparently reticulate pattern, although there are no anastomoses. The calyces are distributed pretty evenly on all sides of the branches, but appear to be alternate, and sometimes are really so on the ultimate twigs. They are sometimes arranged in spirals of three or four to the turn, and are a little more than 1 mm. apart.

The individual calyces are short cylinders about 1 mm. high and as wide as high. Their sides are nearly parallel, and the margin is surrounded by a fringe of blunt, jagged, irregular points above which rise the sharp spindles of the operculum which are almost vertical in position. The calyx walls are filled with spicules which constitute a sort of rude mosaic of irregular pieces, sometimes with an appearance of imbrication, the blunt points of the plates projecting upward and outward. The operculum is well marked, and of the form characteristic of the genus, each flap being composed of three spindles forming an acute-angled triangle. The operculum is much more elevated than ordinary, however, its longitudinal spindles being easily mistaken for the crown of thorns such as appear in *Acanthogorgia*. The cœnenchyma is filled with spicules in mosaic pattern, sometimes appearing to be imbricated.

Spicules. These are of various forms. The triradiate form predominates, although there are many crosses, stars, butterfly forms, Stachelplatten, and a very few spindles. Indeed almost all of the forms found in the genus can be found on a single slide from this species.

Color. The colony is very dark brown with a maroon or wine-color cast. The axis is almost black. Spindles pink, sometimes white.

General distribution. The type was secured near Guadeloupe, West Indies. The Siboga specimen agrees fairly well with the descriptions, especially the very clear one given by Ridley.

2. *Villogorgia compressa* Hiles.

Villogorgia compressa Hiles. Willey Reports, the Gorgonacea, 1899, p. 200.

Stat. 117. 1°0′.5 N., 122°56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 154. 0°7′.2 N., 130°25′.5 E. Bougainville Strait. 83 meters. Muddy sand.
Stat. 310. 8°30′ S., 119°7′.5 E. Flores Sea. 73 meters. Sand.
*Pulu Missa near Flores. 36 meters. de Siso don.

Colony strictly flabellate and reticulate, 10.2 cm. in height, and with a spread of 13.3 cm. The main stem is 2.3 mm. in diameter and gives off a branch 5 mm. from its base, above which the main branches are roughly alternate in position and somewhat compressed, each dividing and then anastomosing with others, forming a regular reticulate pattern. The twigs forming the reticulation are about 5 mm. apart. The calyces are very unequally spaced and are emplanted on all sides of the stem and branches, at times being closely crowded and at others being 1 mm. apart. There are numerous gall-like swellings caused by parasitic barnacles.

The individual calyces are short cylinders 1.2 mm. in height and 1 mm. in diameter. The walls are studded with triangular points projecting upward and outward and sometimes apparently imbricating. The margin is armed with a circlet of thorny points which are more prominent than usual in this genus. The polyps are retractile, and furnished with a well developed operculum which is composed of the characteristic elements, there being two long, bent spindles longitudinal to the dorsal surface of each tentacle, and a third shorter one lying across their bases. The operculum is elevated well above the margin, but not usually above the points of the crown spicules.

Spicules. The most characteristic forms are triradiate spicules and crosses. There are also multiradiate forms, stars, butterflies and Stachelplatten. The spicules resemble those of *Heterogorgia*; but the preponderance of triradiate forms, together with the form of the calyx and operculum, seems to justify its being placed here.

Color. The colony is a decidedly yellowish light brown. The axis is brown and the spicules colorless.

General distribution. The type of this species was found in Blanche Bay, New Britain.

A very large dried specimen labeled "Pulu Missa", 20 fathoms, de Siso don., I refer with some doubt to this species. It is about 50 cm. in height and 60 cm. in diameter. The operculum is more heavily spiculated. The spicules in general are of the same type character as the specimen described above, but somewhat more slender.

3. *Villogorgia rubra* (Thomson).

Acamptogorgia rubra Thomson. Ceylon Pearl Oyster Reports, Appendix to Alcyonaria, 1905, p. 178.

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. 50—40 meters. Coral sand.
Stat. 81. Pulu Sebangkatan, Borneo Bank. 34 meters. Coral bottom.
Stat. 220. Anchorage off Pasir Pandjang, west coast of Binongka. 55 meters. Coral sand.

Colony flabellate, 11.3 cm. in height and with a spread of 6.5 cm. The main stem divides 1 cm. from its base into two unequal portions, one of which gives forth five lateral branches from the outer side and three from the inner side. The other main branch gives off two very prominent lateral branches from its inner side and three smaller ones from its outer side. The branches are placed about 8 mm. apart.

Branchings of the fourth order are attained. The calyces are scattered pretty evenly over the stem and branches, but are more numerous on the sides, where they are about 1 mm. apart on the average, although they are closely crowded, even contiguous on the distal parts of the twigs.

The individual calyces are short cylinders which at first glance appear to be rounded warts; but their sides, though short, are vertical. A typical calyx measures about .75 mm. in height and about 1.2 mm. in diameter. The calyx walls are filled with imbricating angular projections which do not extend far from the surface as in *Acamptogorgia*, but look like loosely set, irregular but angular cobble-stones.

The operculum is sunken below the calyx margin, within which it forms a low dome, the point of which is raised above the level of the margin. The operculum itself is very characteristic, consisting of two long straight spindles lying parallel to each other along the top of each tentacle, a third and shorter spindle being placed crosswise between the slightly divaricated proximal ends of the former. The collaret is well marked.

Spicules. These are exceedingly varied in type, but are mostly triradiate and multiradiate Stachelplatten, stars, crosses, butterflies, and some approaching the *Acamptogorgian* type. They are all quite small. The triradiate forms and unilateral spindles seem more abundant in the calyces, while the stars and multiradiate forms are more common in the cœnenchyma of the stem and branches.

Color. A deep wine color, or crimson. Spicules bright red, almost scarlet. The axis is a greenish brown.

General distribution. The type is from the Ceylon Seas.

The Siboga specimens agree quite closely with the description and figure of the type as given by Thomson. It seems, however, to the present writer that the species should be placed in the genus *Villogorgia* rather than in *Acamptogorgia*.

4. *Villogorgia intricata* (Gray).

Brandella intricata Gray. Cat. Lithophytes in the British Museum, 1870, p. 80.
Villogorgia intricata Ridley. Annals and Magazine of Natural History, Series 5, Vol. 9, 1882, p. 188.

Villogorgia intricata Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 111.
Villogorgia intricata Hiles. Willey Reports, the Gorgonacea, 1899, p. 199.

Stat. 274. 5° 28'.2 S., 134° 53'.9 E. near Aru Islands. 57 meters. Sand and stone.
Stat. 305. Mid channel, Solor Strait, off Kampong Menanga. 113 meters. Stony.
Stat. 310. 8° 30' S., 119° 7'.5 E. Flores Sea. 73 meters.

Colony flabellate and reticulate, 8 cm. in height and 9.5 cm. in spread. The anastomoses are rather extensive in places. The branch origins are from 3 mm. to 8 mm. apart. The calyces are distributed on all sides of the colony, but are more numerous on the lateral sides, where they are quite closely approximated, being but .5 mm. apart, on an average. The branches terminate in a group of calyces neither one of which seems strictly terminal.

The individual calyces are cylindrical in form and are set at a right angle to the branches. They are 1 mm. in height and 1 mm. broad, on the average. The calyx walls are filled with triradiate and multiradiate Stachelplatten, presenting the cobble-stone effect described in the discussion of the preceding species, the "stones" being angular instead of rounded. There is some appearance of imbrication in the calyx spicules, the foliaceous expansions of Stachelplatten overlapping so that their exposed edges project upward and outward. The operculum is high, although in the retraction of the polyp its periphery is sunken below the level of the margin, the summit of the opercular cone being considerably above the margin. The opercular spicules are arranged as in others of the genus, there being three spicules forming an acute-angled triangle on the surface of each tentacle. The collaret is well marked, but concealed by the retraction of the polyps.

Spicules. These are much as in *Villogorgia rubra*, but the predominating form is a butterfly-shape in which the fore wings are represented by two spindle-shaped processes arising from a common base from which the much smaller hind wings also arise. These latter are often foliaceous expansions approaching *Acamptogorgia* type. There are also many triradiate forms, crosses, stars, etc. All of the spicules are small.

Color. The colony is light brown, with a very slight suggestion of a pinkish cast. The spicules are white, or rather, colorless.

General distribution. The type of this species was from Bass's Strait.

The Challenger secured it between the Fiji Islands and the New Hebrides at a depth of 145 fathoms. Hiles reports it from Sandal Bay, 30 to 40 fathoms.

5. *Villogorgia serrata* new species. (Plate XIII, figs. 3, 3*a*; Plate XXI, fig. 14).

Stat. 274. 5° 28'.2 S., 134° 53'.9 E. near Aru Islands. 57 meters.

Colony strictly flabellate and reticulate in form 9.4 cm. in height and with a spread of 10 cm. The branches anastomose rather extensively. The distance between branch origins varies from 2 to 8 mm., the average being about 4 mm. The various branches are of about the same diameter (1.5 mm.) throughout. The calyces are thickly and evenly distributed on all sides of the branches, their walls being usually contiguous.

The individual calyces are low verrucæ, or rounded low domes, seldom exceeding 1 mm. in height and with a diameter of 1.5 mm. The margin is ornamented with a fringe of blunt serrated points, and the walls are covered with rough imbricating projections of the same character. The polyps are completely retractile, and in some cases the calyx walls are drawn together over them so as to obliterate the aperture.

Usually, however, the operculum and the infolded tentacles are visible from above, but are sunken well below the margin. The operculum shows the two parallel spindles with a third between their divaricated bases characteristic of this genus. The cœnenchyma is thick and is filled with irregular radiate spicules, crosses, etc.; but there are scattered here and there a number of comparatively enormous spindles which appear out of place, but really belong to the species.

Spicules. These are much like those of *V. intricata*, there being many crosses, tripartite forms, stars and double stars. There are others that intergrade with the *Acamptogorgia* type. The most remarkable, however, are the large spindles referred to above. They are so apparently foreign to the others that it is hard to persuade one's self that they are not accidently present. They occur quite constantly and in place.

Color. The colony is a light pinkish brown in color. The spicules are colorless.

6. *Villogorgia timorensis* new species. (Plate XIV, figs. 3, 3*a*; Plate XXII, fig. 3).

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. near New Guinea. 118 meters. Sand.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Kei Islands. 90 meters. Sand.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 meters. Mud, Sand and shells.

Colony flabellate and somewhat reticulate, growing from the calyx of a simple coral. Height 8 cm. Diameter 8.5 cm. The main stem sends off two small twigs near its base, and a large branch 12 mm. above its proximal end. 7 mm. above this branch the main stem divides into two parts, one of which anastomoses with the first branch. The other gives off branches mainly from its outer side, but anastomoses through branchlets with its fellow. The branches are about 5 mm. apart, on the average.

The calyces are emplanted on all sides of the stem and branches, but are very unevenly spaced, being sometimes very closely approximated and at others as much as 3 mm. apart. The twigs usually terminate in a pair of calyces.

The individual calyces are distinctly tubular, usually standing at a right angle to the branch. A typical one measures 1.6 mm. in height and 1.2 mm. in diameter.

Their walls are studded with blunt points directed upward and outward. These are projections from spicules with expanded, usually triradiate, bases embedded in the cœnenchyma. There is a low crown of points around the calyx margin. The polyps are retractile, but the operculum is very high, its spicules standing almost vertically in the preserved specimens, making a tent-like whorl of even and almost parallel spindles encircling a round aperture.

Spicules. These are mainly of two sorts. There are large, pointed, spindle-shaped forms with an expanded usually triradiate base, approaching very closely to the *Echinomuricea*

type. There are also numerous stars, crosses and multiradiate forms, besides Stachelplatten and an occasional *Acamptogorgia* type.

Color. The colony is a deep crimson red, and the spicules are of the same tint.

This species bears considerable resemblance to *Villogorgia rubra*, but the calyces are considerably larger and of different proportions from those of that species.

7. *Villogorgia flavescens* new species. (Plate XIV, figs. 1, 1*a*; Plate XXII, fig. 1).

Stat. 38. 7° 35′.4 S., 117° 28′.6 E. near Paternoster Islands. 521 meters. Coral.
Stat. 117. 1° 0′.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 256. 5° 26′.6 S., 132° 32′.5 E. Kei Islands. 397 meters. Mud.

Colony (incomplete) flabellate and typically reticulate, 17 cm. in height and with a diameter of 13.3 cm. It was doubtless much larger originally. The main stem is tortuous, sending off very irregular branches which anastomose extensively. There are three main branches on one side and four stubs of branches on the other. The three main branches send off irregular branchlets which form the reticulate pattern.

The calyces are lateral in position, as a rule, and tend to be alternate, the average distance between them being about 1.6 mm.

The individual calyces are tubular in form, and are set at a right angle with the branches. A typical one measures .8 mm. in height and 1 mm. in diameter. The walls are often quite straight, but not infrequently they are somewhat expanded at the margin. The walls are filled with very small spicules of complicated patterns, and their surface is smoother than in other species of this genus. There is a slightly developed crown of points around the margin. Both the calyx walls and cœnenchyma appear to be finely felted under a low magnification, and this appearance is due to the small size and delicate structure of the spicules. The polyps are only partly retractile, and rest with their collarets on the calycular margin. The operculum is high, and is composed of the usual three spindles.

Spicules. These are quite small tri-partite forms, crosses, daggers, butterflies and multiradiate forms, as well as irregular Stachelplatten of various patterns. Simple spindles are seldom seen. The spicules remind one of the *Heterogorgia* type, in many instances, but the triradiate forms and butterfly-shapes predominate.

Color. The colony is light buffy, in alcohol. The axis is brown and the spicules are colorless.

8. *Villogorgia inermis* new species. (Plate XIV, figs. 4, 4*a*; Plate XXII, fig. 2).

Stat. 299. 10° 52′.4 S., 123° 1′.1 E. Rotti Island. 34 meters. Mud and coral.

Colony (incomplete) flabellate and slightly reticulate in form, the basal part being missing. The portion remaining is 8.9 cm. in height and has a width of 8.3 cm. The branches are irregularly alternate, and they give off alternately disposed branchlets many of which produce clavate terminal twigs. There is a moderate degree of anastomosis, resulting in a loosely

reticulate pattern. The average distance between branches is about 7 mm. The calyces are thickly and rather unevenly distributed on all sides of the branches. They are often contiguous, but may be as much as 1.5 mm. apart.

The individual calyces are low verrucæ when the polyps are completely retracted and the margins infolded; but very short cylinders whose walls are mere circular bands when, as is ordinarily the case in the type, the walls are not drawn in at the top. A typical calyx measures about .3 mm. in height and 1.4 mm. in diameter. The margin is surrounded by a ring of short blunt points. The walls appear quite smooth under a hand lens, but a greater magnification shows them to be studded with small blunt points similar to those around the margin. The polyps are completely retracted, but ordinarily the calyx margin is widely open, showing the infolded tentacles below the level of the margin. The operculum is rudimentary, being represented by a few very small spindles on the tentacle bases, and not efficient functionally.

Spicules. The typical form is a quadripartite one in which one part is larger than the others, conical or thorn-shaped and more or less tuberculate. 3 to 5-rayed unsymmetrical forms, in which one point is considerably larger than the others, are common. Symmetrical stars, crosses and multiradiate forms are also seen. Spindles are rarely encountered.

Color. The colony is very light brown. The axis is a dark golden brown with a very distinct iridescence.

On account of the small size of the spicules, this species has a surface much like that of the preceding form. The shape of the calyces of the two, are, however, quite distinct.

Placogorgia Wright and Studer (emended).

Placogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 113.

As is apt to be the case when a new genus is founded on a single specimen, the original describers of the genus *Placogorgia* included a number of details which were not of generic importance, and some of them hardly good specific characters.

For this reason a shorter or more condensed description is preferable.

The Siboga material contains a relatively large number of species that can properly be included in this genus, and an examination of this series of forms enables us to select the characters mentioned by Wright and Studer that appear to be of real generic importance, and to add one other feature that appears necessary. In this way the following definition is formed: —

Placogorgia. Colony flabellate, seldom reticulate; calyces low cones or verrucæ, their walls filled with imbricating discs or Stachelplatten; operculum composed of three spindles arranged in an acute-angled triangle.

The type, and only known species up to the present time, is *Placogorgia atlantica* Wright and Studer.

This genus differs from *Bebryce*, to which it often bears a superficial resemblance, in not having the characteristic spicules of that genus, i. e. the disc with a central elevated, knob-like process. There is also some resemblance of this genus to *Echinogorgia* in the overlapping of

the calyx spicules; but here, again, there is a wide difference between the characteristic spicules of the two genera.

Perhaps the closest relationship, however, is with the genus *Acis*, with which *Placogorgia* almost intergrades in some cases by possessing large scales that approach the size of those found in *Acis*, as in the case of *Placogorgia squamata*. In this species, however, there is a more evident imbrication of the calyx spicules than is found in *Acis*.

1. *Placogorgia atlantica* Wright and Studer.

Placogorgia atlantica Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 114.

Stat. 15. 7° 2′.6 S., 115° 23′.6 E. near Kangeang Islands. 100 meters. Coral sand.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Kei Islands. 90 meters. Sand, coral and shells.

Colony flabellate in form, 7.4 cm. in height and 10.3 cm. in width. The main stem gives off a short branch 9 mm. from its base, and another on the same side about 1 cm. above the first. Shortly above this latter it divides into three parts, the central one being erect and unbranched, the others being lateral, branched in a rudely alternate manner, and sometimes reaching the fifth order of branching.

The calyces are mainly lateral and roughly alternate in position, and are ordinarily about 1 mm. apart, although in some places the branches are bare for as much as six mm.

The individual calyces are subconical in shape, a typical one measuring a little less than 1 mm. in height and 1.5 mm. in diameter. The calyx walls are filled with imbricating thin plates or Stachelplatten with jagged irregular edges projecting outward and upward. The distal row of these plates sends up a jagged irregular row of processes around the calyx margin. The polyps are retractile, and when retracted the operculum rests well below the margin. The collaret is slender and the operculum is composed of the ordinary three spindles, which are small in size, and therefore the different flaps of the operculum leave well-marked spaces between them. The whole of these spaces form a rosette-shaped figure when viewed from above. The cœnenchyma of the stem and branches is filled with short spindles, blunt at the ends, which lie generally in a longitudinal direction.

Spicules. These are mainly of two types. The first kind is found in the calyx walls, and consists of variously branched plates, the lobular or sharp projections from the sides forming the points seen in the calyx walls, the remainder of each spicule being buried. The second sort of spicule is the blunt-ended spindle found mainly in the cœnenchyma of the stem and branches. Besides these two main types there are a few crosses, stars, daggers, etc.

Color. The colony is dark grayish brown, the axis dark brown, the spicules colorless.

General distribution. The type and only previously known specimen, was secured at St. Paul's Rock, Atlantic Ocean. Depth 80 fathoms.

2. *Placogorgia campanulifera* new species. (Plate XI, figs. 3, 3*a*; Plate XXI, fig. 13).

Stat. 47. Bay of Bima. 55 meters. Mud with sand.

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Colony flabellate in form, 12 cm. in height, 8.7 cm. in spread, and much overgrown with campanularian hydroids and other forms. 1.4 cm. from its base the main stem divides into three parts, one being a short branch with a single undivided branchlet; another, the central one, dividing shortly into two parts each of which gives off side branches; a third, forming the main part of the colony, is pinnately branched, the pinnæ themselves sometimes bearing terminal twigs. The calyces are distributed on all sides of the branches, but are quite irregularly spaced. Perhaps an average distance from summit to summit would be 1.5 mm.

The individual calyces are verrucæ, a typical one measuring .7 mm. in height and 1.2 mm. in diameter at the base. Their walls are filled with imbricating oval plates which are smaller and much more slender on the distal than on the proximal parts of the calyx. In general the calyx spicules tend to be vertical in position.

The cœnenchyma is filled with similar oval plates which are larger than those of the calyx and are often irregular in outline and more or less imbricated. All of the exposed edges of spicules are minutely ctenate. The polyps are completely retractile and may be entirely concealed by the indrawn calyx margin. The operculum is very delicate, and is composed of slender spindles arranged in the usual manner.

Spicules. These are mainly oval or squarish discs or plates, varying in one direction to typical spindles and in the other to almost round plates. Many of them are oblong with rounded corners; while others have quite an irregular outline, although they never approach the irregularity of true Stachelplatten.

Color. The colony is grayish brown, the axis dark brown and the spicules colorless. Occasionally a small spicule appears to be blue in color, but this is so rare that it may be due to some accidental refractive effect.

3. *Placogorgia pulchra* new species. (Plate XI, figs. 4, 4*a*; Plate XXII, fig. 4).

Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion.

Colony straggling in habit and exceedingly irregular in shape, 7.2 cm. in height and about 3 cm. in width. About 8 cm. from its base the main stem breaks up into four branches, two short stubs and two long tortuous branches opposite each other and standing at right angles with the first pair. Each of the tortuous branches gives off three individual straggling branchlets. The main branches are round in section and about 2 mm. in diameter, except at their terminations where they are turgid.

The calyces are rather evenly distributed on all sides of the branches, where they are often contiguous, but sometimes as much as 1.5 mm. apart.

The individual calyces are very low verrucæ, about 1.2 mm. in diameter; but this point is very hard to determine as the calyx wall passes insensibly into the general surface of the cœnenchyma of the branch. The walls and cœnenchyma are filled with small, imbricating, disc-like plates with ctenate edges, those around the margins forming a scalloped border to the calyx. The polyps are completely retractile and are often concealed by the margin closing in over them. The opercular surface is flat and sunken considerably below the margin in retraction.

The operculum is represented by a mere trace of small slender spindles and is difficult to see under moderate magnification.

Spicules. These are mostly regular ctenate discs charasteristic of this genus. Often one edge is much more decidedly toothed than the other; but never with the long, jagged, tooth-like projections characteristic of the genus *Thesea*. There are a number of small spindles, and a few stars, crosses, etc.; but these are inconspicuous.

Color. The colony is intense bright crimson, the spicules are also crimson, tending toward a scarlet.

But one specimen of this very beautiful species was secured. Its beauty consists in its richness of color rather than in its form, which is by no means as graceful and symmetrical as many other muriceids.

4. *Placogorgia dendritica* new species. (Plate XII, figs. 1, 1*a*; Plate XXII, fig. 6).

Stat. 117. 1° 0′.5 N., 122° 56′ E. Kwandang Bay entrance. 80 meters (chart.). Sand and coral.
Stat. 204. 4° 20′ S., 122° 58′ E. near Buton Island. 75—94 meters. Sand.

Colony much broken up, but it was evidently originally a very large one, a portion of the proximal part of the stem being exceedingly thick and woody, measuring 3.5 cm. in diameter. But one of the main branches is preserved, and this arises from the main stem 10.2 from its proximal end, and is evidently but a small part of the original colony. Near its base it is 1.1 cm. in diameter, and it is about 20 cm. in length. It gives off a number of compound and simple branches on each side, and is flabellate in shape; but the branchlets do not anastomose. Both the stem and main branches are tortuous and irregular, giving forth irregular branchlets which are about 7 mm. apart on an average. The calyces are thickly emplanted on all sides of the twigs and branchlets, but are more sparsely scattered over the larger branches. In the former position they are often contiguous and seldom much more than 1 mm. apart. The ends of the twigs are swollen with crowded calyces.

The individual calyces are low rounded verrucæ, a typical one measuring about .7 mm. in height and about 1.2 mm. in diameter. Their walls appear quite smooth under an ordinary hand lens; but a higher power reveals the fact that they are covered with small, jagged, foliaceous projections which imbricate closely. These projections are foliaceous expansions from spicules otherwise buried in the walls. The margin is surrounded by a row of such points. The polyps are retractile, but some of them rest with the collaret above the calyx margin. Many of them, however, are completely enclosed and concealed by the calyx. The collaret and operculum are formed in the usual way, but are delicate in structure being mere skeletons of spicules in the ordinary position.

Spicules. These are all small, and show an extraordinary diversity and irregularity of outline. They are in the form of crosses, stars and multiradiate bodies. Many of them are characterized by delicately branched foliaceous expansions, and projections of exceedingly complicated outline. A very few slender, curved spindles are present.

Color. The colony is a very light, yellowish brown (in alcohol). The axis is light brown and the spicules are colorless.

This must originally have been one of the largest muriceids in the Siboga collection. Its spicules are many of them of the extreme *Placogorgia* type and of unusual delicacy and complexity.

5. *Placogorgia cryptotheca* new species. (Plate XII, figs. 3, 3*a*; Plate XXII, fig. 5).

Stat. 117. 1° 0′.5 N., 122° 56′ E. North Celebes. 80 meters. Sand and coral.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand and stones.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Kei Island. 90 meters. Sand, coral and shells.
Stat. 273. Anchorage off Jedan Island, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.

Colony (incomplete) flabellate, 10 cm. in height. It consists of a single ramified branch giving off two simple branches from its proximal portion, and breaking distally into two portions each of which gives off irregularly disposed branchlets. In one case branchings of the fourth order are attained. The ultimate branchlets are decidedly tumid distally, and the cœnenchyma is thick. The calyces are unevenly distributed on all sides of the branches, and are so inconspicuous (being entirely included) that the colony greatly resembles a specimen of *Plexaura*.

The individual calyces are indicated superficially only by their openings, which appear as oval apertures in the surface of the cœnenchyma. The latter is covered with disc-shaped imbricating scales with ctenate edges. The polyps are so completely retractile and the calyx margins so entirely close over them that there is almost no evidence of their existence on superficial view. The characters of the operculum could not be made out.

Spicules. The most abundant forms are ctenate discs, usually of an irregular outline, but ordinarily oval. They sometimes take the form of stout clubs with thorn-like projections from their larger end. Occasionally the *Echinogorgia* type is seen. Regular spindles are present, but comparatively small and few in number. The ctenate discs stand nearly upright to the branches so that their closely imbricating distal ends pack the surface of the cœnenchyma.

Color. The colony is very pale brown, almost white. The axis is dark brown, and the spicules colorless.

This species is very near to the family *Plexauridæ*, and would be placed, probably, in the genus *Plexauroides* did the axis cylinder conform to the definition for that group.

*6. *Placogorgia dentata* new species. (Plate XII, figs. 4, 4*a*; Plate XXII, fig. 1*a*).

Pulu Missa near Flores, de Siso don.

Colony (dried) flabellate, scarcely reticulate, there being but few anastomoses of the branches. Height 27.5 cm., diameter 26 cm. The main stem is flattened proximally, being 1.3 cm. × 1.6 cm. in cross section. Lateral branches are given off in an exceedingly irregular manner throughout its length, and the main stem does not loose its identity to the very edge of the fan. The branches give off roughly alternate branches and sometimes fork near their

ends, where branchings to the fifth order are sometimes attained. The stem and branches, except at the very base of the former, are not appreciably flattened. The branches vary from 4 mm. to 1.5 mm. in diameter. The calyces are emplanted on all sides of the stem and branches, but are most closely approximated on the terminal twigs and more widely separated on the main stem, their distance varying from 1 mm. on the former to 2.5 mm. on the latter.

The individual calyces are short cylinders, or greatly truncated cones in shape. They are small, a typical one measuring 1 mm. in height and also in diameter. The calycular walls are filled with the overlapping edges of spicules which are flattened discs with very irregular edges. These often appear in rather regular whorls around the calyces, being less regularly disposed in other places. The margin is surrounded by a circlet of rather prominent blunt points. The polyps are completely retractile, but in some instances they rest with the collaret on the margin. The operculum is elevated and composed of two long, bent, longitudinal spindles on the dorsal surface of each tentacle, with a third shorter one between their bases.

Spicules. Irregular flattened discs are the dominant forms, their edges being often indented and branched in a very intricate manner, forming true Stachelplatten. One edge of each is exposed on the surface of the calyces, and the other is embedded in the cœnenchyma of the walls. The cœnenchyma of the stem and branches is filled with similar spicules. Sometimes the Stachelplatten assume a radiate form, but are seldom symmetrical stars. There are few, if any, regular spindles except those forming the opercula.

Color. The dried colony is dark brown, the polyps being darker than the general surface. The axis is lighter, grayish brown, and the spicules are stained a brownish yellow, and may have been reddish originally.

7. *Placogorgia squamata* new species. (Plate XII, figs. 2, 2*a*; Plate XXII, fig. 8).

Stat. 43. Pulu Sarassa, Postillon Islands. Up to 36 meters. Coral.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate, 7 cm. in height and with a spread of 5.3 cm., rigid in habit. Main stem sinuous, nearly straight, giving off its first branch 1.6 cm. from its base. Branches rather regularly alternate, 3 mm. to 9 mm. apart. Most of the branches are simple, but some of them send off alternate branchlets. There are no branchings of the third order. The diameter of the main stem is 2 mm., and of the branches 1.5 mm. The branch terminations are club-shaped, and there are some terminal calyces. The calyces are thickly emplanted on all sides of the branches, being usually contiguous, their apices being but 1 mm. apart.

The individual calyces are very low verrucæ, often somewhat oval in cross section, their long diameter being parallel to the branch. They are not more than .8 mm. in height, with a long diameter at base of about 1.5 mm. The calyx walls are covered with quite large imbricating scales with ctenate edges, the edges of the upper row of scales making, with their toothed edges, a fringe of rather blunt small points around the margin. The polyps are completely retractile, the operculum resting well below the calyx margins. The operculum is composed of

delicate spindles arranged in the usual manner, there being two long bent ones with a shorter one between their divaricated bases. There is a delicate collaret formed of a row of slender spindles.

Spicules. The most characteristic forms are warty discs with serrated edges. Larger and more irregular scale-like spicules are embedded in the cœnenchyma, where they are usually distinctly imbricated. There are a few regular spindles and small multiradiate forms.

Color. The colony is a light grayish brown, the axis very dark brown, and the spicules colorless.

This species approximates closely to some of the forms under the genus *Acis*; but the absence of very large spindles and the imbrication of the scales on all parts seems to justify the author in placing it in the genus *Placogorgia*.

8. *Placogorgia studeri* new species. (Plate XIII, figs. 1, 1*a*; Plate XXII, fig. 9).

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. near Key Islands. 90 meters. Sand, coral and shells.

Colony flabellate, 14 cm. in height and with a spread of 8.2 cm. The main stem is erect and fairly straight, giving off a short simple branch 2.6 cm. from its base and a larger one 1.3 cm. above the first. This large branch is compound, bearing four simple branchlets on one side, and one branchlet, which forks near the end, on the other. Above this large branch the main stem bears five branches, one of which is compound, on one side; and five branches, three of which again divide, on the other. The average distance between branches is about 1 cm. The calyces are emplanted on all sides of the stem and branches, but tend to be lateral in position. They are about 2.1 mm. apart, on the average.

The individual calyces are in the form of truncated cones, a typical one measuring 1 mm. in height and 1.8 mm. in diameter at the base. The lower parts of the calyx walls are filled with imbricating ovoid scales; or stout spindles which are often transversely placed, but may be oblique or vertical. The distal part of the wall is filled with much smaller vertical spindles, the distal ends of which show as projecting points around the margin. The polyps are retractile, but many of them rest with the collaret just above the margin of the calyx. The collaret is well marked, consisting of three or more rows of transverse spindles. The operculum is composed of three spindles forming an acute-angled triangle, as is common in the family *Muriceidæ*.

Spicules. The typical form in this species is a flattened spindle, so short as to be oval in outline. Thus a scale-like outline is produced. The edges of the scales are minutely ctenate, and the edges of successive scales overlap both in the calyces and general cœnenchyma. Besides these scales there are a few short spindles of the ordinary proportions.

Color. The colony is a light grayish brown, in alcohol. The spicules are colorless.

The author takes pleasure in naming this species in honor of the veteran naturalist Professor Th. Studer, author of many important works dealing with the *Alcyonaria*.

9. *Placogorgia bebrycoides* new species. (Plate XIII, figs. 4, 4*a*; Plate XXII, fig. 11).

Stat. 164. 1°42′.5 S., 130°47′.5 E. near New Guinea. 32 meters. Sand and stones.
Stat. 274. 5°28′.2 S., 134°53′.9 E. Aru Islands. 57 meters. Sand and stones.
Stat. 305. Mid channel, Solor Straits, off Kampong Menanga. 113 meters. Stony.

Colony flabellate in form, 8.4 cm. in height and with a spread of 7.7 cm. The main stem gives off one stub of a branch at its base, another 6 mm. above this, and 6 mm. still higher up it divides into two large flabellate branches. One of these gives off three compound branchlets and two simple ones on one side, and two simple ones on the other. The other main branch gives off one compound and two simple branches on its outer side, and one compound branch on its inner side. There are some branchings up to the fourth order. The average distance between branches in about 7 mm.

The calyces are distributed on all sides of the stem and branches, are often closely approximated and seldom more than 2 mm. apart. The tips of the ultimate twigs are somewhat swollen.

The individual calyces are very low verrucæ, sometimes practically included in the cœnenchyma. They rarely attain 1 mm. in height, and are about 1.6 mm. broad at their bases. The calyx walls are covered with rather large, imbricating disc-like or oval spicules whose edges are minutely ctenate. Sometimes there are a few more attenuated spindles around the calyx margin, but ordinarily it is surrounded by a row of the protruded ctenate edges of oval or disc-like forms. The polyps are completely retractile, and are usually entirely withdrawn within the calyces. The collaret is well developed, and composed of two or three rows of encircling spindles.

The operculum is high, and its most prominent feature is the three spicules forming the acute-angled triangle common in this genus. Besides these there are accessory spindles lying along the dorsal surface of the tentacle.

Spicules. The most characteristic form is the oval, disc-like spicule, quite heavy and having its outer edge ctenate. Often the tubercles give it a ctenate appearance all the way around. These spicules are sometimes nearly round, and at others squarish. Typical spindles are very rare. The general appearance of the surface of the cœnenchyma suggests the genus *Bebryce*, but the spicules do not have the central projections characteristic of that genus.

Color. The colony is light buffy brown, the axis dark brown, and the spicules colorless.

A specimen from Station 164 is considerably larger than the one described above, being 15.5 mm. in height.

10. *Placogorgia alternata* new species. (Plate XIII, figs. 2, 2*a*; Plate XXII, fig. 7).

Stat. 204. 4°20′ S., 122°58 E. near Buton. 75—94 meters. Sand.
Stat. 305. Mid channel in Solor Strait, off Kampong Menanga. 113 meters. Stony.

Colony flabellate in habit, 16 cm. in height and 14 cm. in width. The stem is 6 mm. in diameter near its base. The main stem gives off irregularly alternate branches until it attains

a height of 6 cm., where it forks into two unequal branches; one of which bears quite regularly alternate branchlets, those on the same side being 6 mm. to 13 mm. apart. The other main branch bears branchlets on one side only, and one of these is itself alternately branched. The terminal branchlets are 2 mm. in diameter. The calyces are pretty evenly distributed over the stem and branches, and do not show a very evident tendency to a lateral position. They are ordinarily less thean 2 mm. apart.

The individual calyces are low truncated cones, usually not more than 1 mm. in height and 2 mm. in diameter at the base. Their walls are filled with the overlapping jagged edges of flat, disc-like plates, and the margin is surrounded by points from similar spicules. The calyces are surmounted by the acorn-shaped tentacular portions of the polyps, resting on a well marked collaret. The opercular covering of each tentacle consists of two long, bent spindles, divergent at their proximal ends and convergent at their distal ends, resting on a short spindle lying between their bases.

Spicules. These are of various forms, including foliaceous discs, extensively branched and tuberculate scales, some Stachelplatten, small spindles, etc. The calyx walls are covered with imbricating plates with ctenate or toothed edges, some of which project above the margin, as in *Echinomuricea*. The cœnenchyma of the stem and branches is thin and filled with warty, branched discs, and spindles set any way with the axis.

Color. The colony (in alcohol) is nearly white, the stem and branches showing grayish on account of the brown axis cylinder showing through the thin cœnenchyma.

11. *Placogorgia reticuloides* new species. (Plate XVIII, figs. 2, 2*a*).

Stat. 273. Dobo, Aru Islands. Reef.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand. (Fragmentary specimen).

Colony strictly flabellate, not reticulate, although it appears so on superficial inspection. Height 35 cm. Spread 28 cm. The main stem is 5 mm. in diameter, and the branches average 2.5 mm. in diameter. About 7 cm. from its base the main stem gives off a branch nearly as large as itself, and about 2.5 cm. above this it breaks up into several branches which are obscured by a sponge growth. The branching beyond this is quite irregular, the effect being that of a rude reticulation. The branches are all round in section, and the terminal twigs end in clavate terminations. The calyces are distributed thickly and evenly on all sides of the branches, and are practically contiguous throughout.

The individual calyces are low, dome-shaped verrucæ so nearly included in the cœnenchyma of the branches that it is hard to determine where the calyx wall passes into the general surface. Probably 2 mm. would be an average diameter of the calyces. The calyx walls are covered with imbricating plates with ctenate edges, which decrease in size toward the margin; the latter being surrounded by a roughly serrated border, the serrations being inconspicuous and not attaining the prominence of the crown of thorns found in many species of this family. The polyps are retractile, but the calyx mouth is left broadly open even when the polyps are completely withdrawn. The tentacles, in retraction, are sunken down beneath a

fold of the œsophageal portion of the polyp wall, this fold appearing as a scalloped membrane stretched across the calyx, much as the velum is stretched across the bottom of a medusa. A similar fold is seen in species of *Menella*, and also in a number of species of Plexauridæ. The operculum is either absent or so feebly developed as to escape notice.

Spicules. These are usually in the form of rounded plates or scales, thick and clumsy in appearance. They are covered with even tubercles which appear on the edges as rather regular projections, giving a ctenate aspect. These scales are of many sizes and forms, but are not decidedly branched or forked as in the type of this genus. There are a few small spindles and radiate spicules.

Color. The colony is bright orange, or terra cotta color (in alcohol) the spicules being of the same color.

Menella Gray (emended).

Menella Gray. Annals and Magazine of Natural History, 4th Series, Vol. V, 1870, p. 407.
Menella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LIII.
Menella Nutting. Hawaiian Alcyonaria. Proceedings U. S. National Museum, XXXIV, 1908, p. 584.

Like many of Gray's genera, *Menella* was not characterized with sufficient detail to enable one to be sure as to the form he had in hand. His original description was as follows:

"Coral cylindrical, end (of the branches) clavate, rounded, surface spiculose. Polyp cells on all sides of the cylindrical stem and branches, close together, forming a rough, spiculose surface with hexagonal areolæ. Polyps retractile: when retracted convex, with an oblong concavity surrounded with spicules. Axis horny, black".

Wright and Studer added nothing to the definition, but simply paraphrased it. Nutting called attention to what appeard to be the most important character, and condensed the original definition. The following represents the writer's opinion concerning the characterization of the genus:

Colony sparingly branched, the branches round, with thick cœnenchyma. Calyces very shallow, elliptical in cross section. When retracted, the polyps sink below the calyx margin, leaving an oblong depression and with their walls forming a series of eight infolded soft lobes around and inside of the margin. Spicules various, true spindles being rare.

The only known species, and type of the genus, are *Menella indica* Gray, and the two new species in the Siboga collection. The writer does not now believe that his *M. grandiflora* from the Hawaiian region should have been placed in this genus.

1. *Menella rubescens* new species. (Plate XV, figs. 1, 1*a*; Plate XXII, fig. 13).

Stat. 66. Bank between Islands of Bahuluwang and Tambolungan, south of Saleyer. 8 to 10 meters. Coral.
Stat. 71. Makassar and Surroundings. Up to 32 meters. Sand.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral.

Colony incomplete, unbranched, rod-like, attaining a height of 9 cm. It is slightly angulated

near its middle, and opposite this bend is a low, knob-like projection which may represent an incipient branch. The calyces are densely crowded over the whole surface, the colony being round in section, and small polyps in all stages of growth are intercalated amongst the larger ones.

The individual calyces are thin walled, oval in section, the walls being perpendicular, but very low, not more than 1.5 mm. in height. Their greater diameter is 2 mm. and their lesser 1.75 mm. The margin has a number of points formed of spicules which have their expanded bases embedded in the cœnenchyma, and their sides are packed with annular spicules. Inside of these points the margin is very delicate, infolded, and divided into eight rounded lobes which are easily mistaken for the infolded tentacles. These lobes are really portions of the walls of the retracted polyps. Inside of these, and retracted below them, are the eight infolded tentacles. The tentacles are almost devoid of spicules, but show a few delicate ones on their upper surface. These spindles have a reddish tinge and form two thin lines converging toward the point of each tentacle.

Spicules. These are of many forms, the most characteristic being triradiate and quadriradiate, with one point much longer and smoother than the others, being much like the characteristic spicules of *Villogorgia*. These are found on the walls of the calyces. Besides these are numerous irregularly forked plates, and spindles with many irregular processes and tubercles.

The typical spindle is rarely seen, and these may be young spicules.

The colony is pinkish brown, in alcohol, the polyps being lighter and the axis brown.

A specimen from Station 315 is much larger than the one described above, being 28 cm. high, and with alternate branches.

2. *Menella grayi* new species. (Plate XV, figs. 2, 2*a*; Plate XXII, fig. 12).

Stat. 47. Bay of Bima, near South Fort. 55 meters. Mud with sand.

Colony (incomplete) consisting of a slender stem with one simple branch. Height 11.5 cm. Length of branch 2.7 cm. Diameter of stem 1.7 mm. The calyces are rather distant and emplanted on all sides of the stem. They are very irregularly spaced, but are usually not more than 1 mm. apart.

The individual calyces are entirely included; or they might be called obsolescent verrucæ, their presence being evident by but a slight swelling, when viewed laterally, their sides fading insensibly into the general surface of the cœnenchyma. On this account no satisfactory measurements can be given of either their height or diameter. The cœnenchyma has a pitted appearance owing to the presence of a network of small triradiate and quadriradiate spicules with which it is filled. The cœnenchyma is thin. The polyps are completely retractile, but the calyx wall does not ordinarily close over them. Thus the tentacular surface is exposed, and is rendered conspicuous by the scarlet opercular spindles. These are long, slender, slightly bent, with their proximal ends but slightly divaricated. When the polyps are fully retracted the margin is lobed, the body walls being partly drawn over the infolded tentacles, as in the preceding species.

Spicules are slender and delicate. Triradiate and quadriradiate forms predominate. There are also slender, bent, tuberculate spindles, and rarely one of the *Echinogorgia* type.

Color. The colony is light grayish brown, in alcohol, with the scarlet spindles of the operculum showing in pleasing contrast. The other spicules are colorless.

Here, again, the spiculation reminds one of the genus *Villogorgia*; but the shape of the calyces is entirely different.

Heterogorgia Verrill.

(Including *Astromuricea* Germanos).

Heterogorgia Verrill. American Journal of Science and Arts, XLV, 1868, p. 413.
Heterogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LV.
Heterogorgia Verrill. Transactions Connecticut Academy of Arts and Science, Vol. I, Part 2, 1871, p. 450.
Astromuricea Germanos. Gorgonaceen von Ternate, 1896, p. 176.

The original description of this genus was very brief and not sufficient for use under the present conditions. The same writer, however, three years later, gave a detailed description which is much more adequate. Leaving out some unessential details, the definition is as follows: —

"Cœnenchyma rather thin, with granular surface; spicules quite small and inconspicuous, of various forms of roughly warted, short spindles, heads, double heads, double stars, crosses, with many irregularly shaped small rough spicula. Verrucæ rounded, somewhat prominent, smoothish below, armed at summit with long, sharp, often crooked spindles, which project from the surface around the cell in the form of sharp, divergent spindles".

Germanos, in 1896, instituted the genus *Astromuricea*. A condensed translation of his definition is as follows: —

"Spicules of the cœnenchyma stars, double stars, double wheels and star-shaped plates, and often thick warty plates on the surface of the branches. These spicules are interlocked by their processes, forming a superficial layer enclosing cruciform spaces, or of intermingled large warts. There are occasionally spicules with flattened thorny processes. The cœnenchyma is thick, calyces tubercular, with circular crown of upright spicules with superficial long spindles at their bases".

It seems to the present writer that the earlier genus, *Heterogorgia*, will plainly include the forms which Germanos places in the genus *Astromuricea*. The following short definition will serve to give the diagnostic features.

Cœnenchyma moderately thick; calyces verruciform, or in the form of short tubes, with a marginal crown of sharp spicules. Spicules of the calyx walls stars, double stars, heads and double heads, double wheels, etc., forming a felted mass on the surface. The cœnenchyma of the stem and branches often with large spindles.

The genus is somewhat allied to *Villogorgia*, but lacks the characteristic triradiate spicules of that genus. The spicules are much smaller, and multiradiate forms predominate.

The type of the genus *Heterogorgia* is *Heterogorgia verrucosa* Verrill. Other known species are *Heterogorgia (Astromuricea) ramosa* (Thomson and Henderson), *H. papillosa* Verrill,

H. (Astromuricea) theophilasi (Germanos), *H. tortuosa* Verrill, *H. verrilli* Thomson and Henderson, and the new species in the Siboga collection.

1. *Heterogorgia ramosa* (Thomson and Henderson).

Heterogorgia ramosa Thomson and Henderson. Ceylon Pearl Oyster Report, the Alcyonaria, 1905, p. 291.

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand, shells.
Stat. 165. Anchorage on North-east side of Daram Island (False Pisangs), East coast of Misool. 49 meters. Coral.
Stat. 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters. Coral.
Stat. 257. In Duroa Strait, Kei Islands. To 52 meters. Coral and Lithothamnion.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion.
Stat. 273. Jedan Island, Aru-Islands. 113 meters. Sand and shells.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. Aru Islands. 57 meters. Sand and stones.

Colony flabellate and reticulate in form, 15.5 cm. in height and 12 cm. in width. The main stem is straight for the greater part of its length, slightly flattened, its greater diameter being 4 mm. It gives off a pair of opposite branches 2.6 cm. from its base, and a number of other lateral branches above this, some of which are alternate and some opposite. These branches themselves divide into branches of the fifth order. The branches average about 8 mm. apart, and the twigs terminate in swollen ends. The calyces are thickly distributed on all sides of the stem and branches, are often contiguous and seldom more than .5 mm. apart.

The individual calyces are verruciform or dome-shaped, a typical one measuring .8 mm. in height and 1.4 mm. in diameter. Its walls are studded with blunt points projecting upward and outward, and the margin is surrounded by a circlet of such points. The polyps are completely retractile and the margins of the calyces can be drawn together so as to conceal them; but ordinarily the tentacles are visible. The collaret and operculum are composed of very slender and delicate spindles, the latter covering but a small portion of the base of each tentacle and leaving the greater part of the tentacular surface bare.

Spicules. The spicules are of various types, as is usual in this genus, the most characteristic forms being stars and multiradiate forms, often more or less unsymmetrical, one of the rays being longer and smoother than the others and projecting from the cœnenchyma when in situ. Occasional regular spindles occur which are much larger than the other spicules. These lie in the cœnenchyma between the calyces.

Color. The colony is dull dark red. The spicules are bright scarlet.

General distribution. The type was found in the Ceylon Sea.

Dried specimens of this form are found in the Siboga collection, in one case attaining a height of 24 cm. and a spread of 22 cm. The specimens agree well with the original description of the species and the figures of the spicules.

*2. *Heterogorgia verrucosa* Verrill.

Heterogorgia verrucosa Verrill. American Journal of Science and Arts, XIV, 1868, p. 414.

Heterogorgia verrucosa Verrill. Transactions Connecticut Academy of Arts and Sciences, Vol. I, part 2, 1867—71, p. 451.

Pulu Missa near Flores; de Siso don.

Colony flabellate, not regularly reticulate, although there are a few anastomoses. Height 25.5 cm. Spread 29.5 cm. The main stem is round and decorticated basally, 2.5 cm. in diameter. It gives off a large branch 1.6 cm. from its base, and another, on the opposite side, 9 mm. above this. 6 mm. above this latter branch the stem breaks up into three parts and looses its identity. The branches are thicker than in other species of the genus, being about 4 cm. in diameter, and are tortuous. They give off numerous side branches which continue to divide until branches of the sixth order are sometimes attained. Most of the twigs end in swollen terminations. None of the branches are appreciably flattened. The calyces are distributed on all sides of the colony, and are about 1.5 mm. apart, on the average.

The individual calyces are conical in shape, and a typical one measures 2 mm. in height and 3 mm. in diameter at the base, thus being larger than in most species of the genus. The calyx walls are comparatively smooth, but a close inspection under a moderate magnification shows that they are studded with small points projecting upward and outward from stellate and radiate spicules, those around the margin not being more conspicuous than the others. The spicules are not so compactly placed as is often the case, thus giving greater flexibility to the branches. The polyps are retractile, but often rest with their collarets above the margins. The operculum is usually high, subconical, and composed of the usual elements, except that there are more than the usual three spindles to each opercular flap. The collaret is composed of strong spindles disposed in two or three interrupted transverse rows.

Spicules. All the spicules of this species are small; crosses, stars and multiradiate forms predominating. The rays of the stars are strongly tuberculate, and sometimes branched. A few small, curved spindles are seen, but they are probably from the collarets and opercula.

Color. The dried specimen is ashy gray. The axis is dark brown. The spicules are light yellowish, almost colorless.

General distribution. The type was found in the Bay of Panama.

This handsome species differs from others in the collection in the size of the calyces, which are much larger than in any other species of this genus in the Siboga material.

3. *Heterogorgia muricelloides* new species. (Plate XV, figs. 3, 3*a*; Plate XXII, fig. 18).

Stat. 47. Bay of Bima, near South Fort. 55 meters. Mud with sand.

Colony consisting of a very long slender stem, 43 cm. in length, giving off four straight simple branches at great but unequal distances from each other and projecting at right angles from the stem. The stem and branches are of about the same diameter throughout. The calyces are found on all sides of the stem and branches, but are very unequally spaced. In general they are distant, averaging perhaps 2 mm. apart.

The individual calyces are shallow or low verrucæ, or truncated cones, averaging less than

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.5 mm. in height and with a diameter of 1.5 mm. The margins are ornamented with vertical points that are broad and sharp, and the entire walls present broad, saw-tooth-like points projecting outward and upward, and often imbricating. These points are projections from stellate spicules partly embedded in the cœnenchyma. The polyps are completely retractile and capable of being concealed by the calyx walls. The collaret is well marked and the operculum is formed in the usual way, the pair of longitudinal spindles on each opercular flap being broader than usual. The cœnenchyma is filled with heavy fusiform spindles of the *Muricella* type.

Spicules. The most conspicuous spicules are the large spindles of the cœnenchyma just mentioned. They are often wavy or sinuous, and sometimes attain a length of 2.5 mm. The star-like spicules of the calyx walls are very much smaller. Very rarely they show a few projecting points on one side as in *Acanthogorgia*, but this can not be deemed a characteristic feature.

Color. The colony is a deep coral red, approaching crimson. The spicules are scarlet, and the axis is greenish brown.

4. *Heterogorgia clausa* new species. (Plate XV, figs. 4, 4*a*).

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. 50—40 meters. Coral sand.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand and stones.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and stones.
Stat. 305. Mid channel, Solor Strait, off Kampong Menanga. 113 meters. Stony.

Colony flabellate, 7.2 cm. high and 5.5 cm. wide. The main stem is 3 mm. in diameter, and gives off a branch 1.4 cm. from its base. This branch curves outward and upward, giving off branchlets from its outer side only. Two of these branchlets bear branches of the third order in an irregularly alternate manner. Above the origin of the first branch the main stem divides into two parts, each part bearing branches in an irregular manner. The average distance between branchlets is about 5 mm. One branch is much swollen by the presence of a parasitic annelid between the axis and the cœnenchyma. The calyces are regularly distributed on all sides of the colony. In many places they are contiguous, and are rarely more than 1 mm. apart

The individual calyces are low, evenly rounded verrucæ with small apertures. Their walls are packed with small spicules which look like disks on surface view, but which are really the imbricating jagged edges of irregular spicules embedded in the cœnenchyma. The margin is marked by small inconspicuous points. The calyces are about 1 mm. in height and diameter. The polyps are retractile, the calyces closing over them so as to leave but a small aperture. The operculum is very delicate, but consists of the ordinary three spindles forming an acute-angled triangle. The collaret is present, but delicate.

Spicules. The must abundant forms are stars and other radiate forms. A few small crosses, clubs, daggers, etc. are also seen.

Color. The colony is grayish brown, the axis dark brown and the spicules colorless.

A small specimen from Station 274 is placed with this species with doubt. It shows a number of comparatively large spindles mixed with the other spicules in the cœnenchyma.

5. *Heterogorgia humilis* new species. (Plate XVII, figs. 1, 1*a*; Plate XXII, fig. 14).

Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand.

Colony flabellate in form, 4.7 cm. in height and with a spread of 2.4 cm. The main stem bears a small lateral 5 mm. from its base, and another, on the opposite side, 1 cm. from the base. A little above this the main branch divides into two unequal parts, both of which are alternately branched in an irregular manner, the average distance between the branchlets being about 5 mm. In some cases branches of the third order are produced. The branches are about 1 mm. in diameter, and the tips are turgid. The calyces are irregularly disposed on the stem and branches, being more crowded on the sides than on the front and back. They are about 1 mm. apart, on the average.

The individual calyces are very low verrucæ, almost included, showing but a small portion of their walls above the general level of the cœnenchyma. They are about 1.2 mm. in diameter. The margins are surrounded by a circlet of blunt but prominent points, and other similar points project upward and outward from the walls.

The polyps are completely retractile, but the margin does not close over them in retraction. The operculum is well developed, each flap being composed of the ordinary three spindles arranged in an acute-angled triangle.

Spicules. These are of exceedingly varied types, as is characteristic of this genus. They are all small, and take the form of crosses, stars, double stars, daggers, and irregular forms with all sorts of points and projections. Many are small Stachelplatten. A very few small spindles are seen, some of which are curved.

Color. The colony is light brown, with a yellowish cast. The axis is almost black proximally, lightening distally. The spicules are colorless.

A specimen from the same station is much larger than the one described. It is 7.6 cm. high, and more thrifty and vigorous in growth. The calyces are more crowded than in the type.

6. *Heterogorgia stellata* new species. (Plate XV, figs. 5, 5*a*; Plate XXII, fig. 16).

Stat. 60. Haingsisi, Samau Island, Timor. 23 meters. Coral.

Colony (incomplete) rudely flabellate in form, 8.4 cm. high and 4.8 cm. wide. The main stem is broken off 3.2 cm. from its base, leaving but two short branches and one large one that forms almost the entire type specimen. This branch arises 2 cm. from the base of the main stem, curves outward and then upward, and bears branchlets in a rudely pinnate manner. These again divide until branchings of the 4th order are sometimes produced. The average distance between branches is about 5 mm. The branches are slender, being but a little over 1 mm. in diameter. The calyces are so completely included and covered that it is difficult to ascertain their distribution, particularly as the specimen is in poor condition. They seem, however, to be sparsely distributed on all sides of the branches.

The individual calyces are so completely immersed in the cœnenchyma that they admit of but little description, especially as the type is in such poor condition that but few of them

are intact. In a few instances they appear to be scarcely perceptible swellings, the margins being surrounded by blunt points. A few ill-defined whorls of similar points can be seen surrounding and overlapping those forming the marginal projections. The polyps are completely retractile, but the nature of the operculum can not be determined. The cœnenchyma of the branches contains a number of relatively large spindles.

Spicules. These are mostly of the radiate type, regular five-pointed stars being not uncommon. They are usually unsymmetrical, however, one ray often being considerably larger than the others and projecting from the surface of the cœnenchyma when *in situ*. There are also a number of relatively large, densely tuberculate spindles.

Color. The colony is light yellowish brown, the axis dark brown with a distinct iridescence, and the spicules light yellow.

In many respects this species is much like *Heterogorgia ramosa*, but differs in the complete inclusion of the calyces and in the color of the spicules.

7. *Heterogorgia magna* new species. (Plate XVI, figs. 1, 1*a*; Plate XXII, fig. 15).

Stat. 299. Cyrus Bay, Island Rotti. 30 meters. Mud, coral and Lithothamnion.
Stat. 313. East of Dangar Besar, Saleh Bay. Up to 36 meters.
*Pulu Missa, near Flores, de Siso don.

Colony (dried) flabellate in form, loosely reticulate, the meshes being large and irregular. Height 25.5 cm. Diameter 35 cm. Two large stems grow from a common base, each of which bifurcates a short distance above its base, the resultant branches either dividing again or sending off lateral branchlets which proceed in a similar manner toward the edge of the fan. All of the branches send off short lateral branchlets which either end in a club-shaped termination or anastomose with other branches.

The average distance between branches is more than 1 cm. The main branches are moderately compressed, their diameters being 4 mm. × 2 mm. The calyces are crowded over the whole surface of the colony.

The individual calyces are very small, verruciform, crowded so as to be in general contiguous. They are about .3 mm. in height and 1.2 mm. in diameter. Their walls are filled with the projecting points of stellate spicules which have their lower edges buried in the cœnenchyma of the walls and their upper edges exposed and imbricating. The margin is crowned with a ring of rather blunt points which are rays of spicules buried in the walls. The polyps are completely retractile, but the aperture of the calyx is seldom closed in dried specimens. The character of the operculum can not be made out in a satisfactory manner.

Spicules. Typical stars are the most characteristic forms, there being many of five rays, the rays being more slender and symmetrical than in other species examined. Triradiate forms, crosses, and multiradiate stars are also found, as well as a few small slender spindles.

The slenderness of the rays of the stars at once distinguishes this species from others in the collection.

Color. The colony (dried) is dull sandy brown. The axis is black and the spicules are colorless.

Some of the specimens of this species are among the largest in the collection. One from Stat. 313 is 55 cm. high and has a spread of 43 cm.

*8. *Heterogorgia reticulata* new species. (Plate XVII, figs. 2, 2*a*; Plate XXII, fig. 17).

Ternate, collected by the Dutch North New Guinea Expedition, 1903. Aug. 1903.
Pulu Missa near Flores, de Siso don.

Colony (dried) strictly flabellate and reticulate, 24.5 cm. in height and 28 cm. wide, growing on a pearl oyster shell. The main stem is 5 mm. in diameter near the base, but soon becomes flattened like the branches, the larger diameter being at a right angle with the plane of the colony. From 2 to 3 cm. from its base it bears lateral branches, and above this soon looses its identity by breaking up into several vertical branches. These, and the laterals, spread in a fan-shaped form, radiating toward the periphery of the colony and sending off numerous short curved branchlets with swollen ends, except where they anastomose with other branches to form a reticulate pattern. The radiating branches are all laterally compressed so that they present their lesser diameter when the colony is viewed from in front. Their diameters are 4×2.2 mm. The average distance between twigs is 4 mm. The calyces are distributed on all sides of the stem and branches, but are less numerous on the front and back of the proximal parts, and more numerous on the distal parts of the colony, where they are thickly crowded and usually contiguous.

The individual calyces are rather low verrucæ, 1 mm. in diameter and less than .5 mm. in height. They are probably shrunken considerably in the dried specimen, and the calycular apertures are all widely open. The walls are filled with spicules that are stellate or multiradiate in form. They often appear superficially as irregular disks with jagged edges which sometimes imbricate. The calyx margin is surrounded by a number of jagged lobular prominences, or edges of these disks.

The polyps are retractile. The operculum has sunk to the bottom of the calyces, and is of the ordinary muriceid type, with two long curved spindles lying along the dorsal surface of each tentacle.

Spicules. Stars, multiradiate forms and disks with irregular jagged edges predominate. Double stars and double crosses are also found with an occasional ordinary spindle.

Color. The specimen is dull ashy brown, in the dried state. The axis is dark brown and the spicules colorless.

This species is evidently allied to *Heterogorgia ramosa* T. and H., but differs from it in color, in the marked compression of the branches, and in the fact that ordinary spindles are abundant in *H. ramosa*, forming a conspicuous feature on the slide of spindles, while they are rare in *H. reticulata*.

9. *Heterogorgia operculata* new species. (Plate XVIII, figs. 1, 1*a*).

Stat. 117. 1°0′.5 S., 122° 56′ E. Kwandang Bay entrance, North Celebes. 80 meters. Sand and coral.

Colony flabellate and reticulate, 33 cm. in height and with a spread of 29 cm. The width of the colony would be much greater but for the fact that a part of the specimen is folded over across the front, and anastomoses with it. The main stem divides about 3 cm. from its base into two main branches, and these anastomose in a meshwork in such a way that they can not successfully be traced. The web is rather loose, and the branches delicate, averaging about 2 mm. in diameter. The proximal portion of the main branches are compressed, and the remainder of the branches are round in section. The calyces are thickly emplanted over the whole surface of the colony.

The individual calyces are low, dome-shaped verrucæ, about 1.5 mm. in diameter. Their walls are filled with the erect projecting points of radiate spicules, the points forming more or less regular whorls around the calyx walls. The margins are crowned with a circlet of blunt points. The polyps are completely retractile and the operculum is composed of two relatively heavy spindles lying almost paralell to each other on the dorsum of each tentacle, with a third, shorter, one between their bases. The collaret is strong, consisting of several rows of encircling spindles.

Spicules. As is usual in this genus the spicules are mainly stellate forms. Few of them, however, are very symmetrical stars. There are also many crosses, butterfly-shaped forms, multiradiate spicules, and a few rather slender curved spindles.

Color. The colony is a dull orange, or bright terracotta. The axis is a strong, dark olive brown, lightening distally, and the spicules are orange.

This handsome species differs greatly in color from any of the other specimens of *Heterogorgia* in the Siboga collection. Although superficially resembling other reticulate species of the genus, it differs from *H. magna* in its heavy operculum and collaret; from *H. ramosa* in color, and in the fact that the latter species has large tuberculate spindles; from *H. reticulata* in color and character of the spicules, there being no butterfly-shaped forms in the last mentioned species.

DISTRIBUTION OF THE MURICEIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Muriceidæ were collected by the Siboga Expedition, and a List of Species collected at each Station.

STATION 5. 7° 46′ S., 114° 30′.5 E. 330 meters. Mud. *Acanthogorgia ridleyi.*

STATION 7. 7° 55′.5 S., 114° 26′ E. 15 meters and more. Coral with stones. Near Reef of Batjulmati (Java). *Muriceides javensis.*

STATION 15. 7° 2′.6 S., 115° 23′.6 E. 100 meters. Fine coral sand. *Anthogorgia aurea, Placogorgia atlantica.*

STATION 26. 8° 35′.1 S., 115° 31′.2 E. 305 meters. Black sand. *Acanthogorgia laxa.*

STATION 28. 8° 43′.7 S. 115° 19′.5 E. 143 meters. Hard, coral bottom. *Manacella reticularis.*

STATION 38. 7° 35′.4 S. 117° 28′.6 E. near Paternoster Islands. 521 meters. Coral. *Villogorgia flavescens.*

STATION 43. Anchorage off Pulu Sarassa, Postillion Islands. Up to 36 meters. Coral. *Placogorgia squamata.*

STATION 47. Bay of Bima, near South Fort. 55 meters. Mud, with patches of fine coral sand. *Acanthogorgia ceylonensis, A. studeri, Anthomuricea sanguinea, Heterogorgia muricelloides, Menella grayi, Placogorgia campanulifera.*

STATION 49. 8° 20′.5 S., 119° 4′.5 E. 369 meters. Coral and shells. *Thesea simplex, Bebryce thomsoni.*

STATION 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand and shells, according to locality. *Bebryce thomsoni, Heterogorgia ramosa, Thesea flava, Versluysia ceylonensis, Anthomuricea reticulata.*

STATION 60. Haingsisi, Samau Island, Timor. 23 meters. Lithothamnion in 3 meters and less. Reef. *Anthomuricea timorensis, Echinogorgia aurantiaca, Heterogorgia stellata, Thesea sanguinea.*

STATION 65ª. Very near 7° 0′ S., 120° 34′.5 E. From 400 to 120 meters. Pale grey mud, changing during haul into coral bottom. *Muricella stellata.*

STATION 66. Bank between Islands of Bahuluwang and Tambolungan, South of Saleyer. 8 to 10 meters. Dead coral, Halimeda, Lithothamnion. *Menella rubescens.*

STATION 71. Makassar and surroundings. (Pulu Barang, Samalona, Ley-Ley). Up to 32 meters. Mud, sand with mud, coral. *Echinomuricea coronalis, Menella rubescens.*

STATION 80. 2° 25′ S., 117° 43′ E. Borneo Bank. From 50—40 meters. Fine coral sand. *Echinogorgia pseudosassapo, Heterogorgia clausa, Muricella complanata, M. grandis, Villogorgia rubra.*

STATION 81. Pulu Sebangkatan, Borneo Bank. 34 meters. Coral bottom, and Lithothamnion. *Villogorgia rubra.*

STATION 105. 6° 8′ N. 121° 19′ E. Sulu Sea. 275 meters. Coral bottom. *Thesea flava.*

STATION 108. 6° 10′.3 N., 121° 32′ S. Sulu Sea. 73 meters. Hard, probably coral. *Thesea simplex.*

STATION 117. 1° 0′.5 N., 122° 56′ E. Kwandang Bay entrance, North Celebes. 80 meters. Sand and coral. *Acamptogorgia spatulata, Acanthogorgia flabellum, A. striata, A. studeri, Echinomuricea coronalis, Heterogorgia operculata, Muricella crassa, M. grandis, Placogorgia cryptotheca, C. dendritica, Villogorgia compressa, V. flavescens.*

STATION 122. 1° 58′.5 N., 125° 0′.5 E. near Menado, Celebes. 1264—1165 meters. Stone. *Acanthogorgia aspera.*

STATION 125. Anchorage off Sawan, Siau Island. 27 meters. Stone and some Lithothamnion. *Acanthogorgia flabellum, Thesea sanguinea.*

STATION 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand. *Muricella complanata.*

STATION 139. 0° 11′ S., 127° 25′ E. Molluca Passage. 397 meters. Mud, stones and coral. *Acanthogorgia studeri.*

STATION 144. Anchorage north of Salomakië (Damar) Island. 45 meters. Coral bottom and Lithothamnion. *Acanthogorgia ceylonensis, Anthogorgia aurea, Anthomuricea sanguinea, Muricella grandis.*

STATION 154. 0° 7′.2 N., 130° 25′.5 E. Bougainville Strait. 83 meters. Gray muddy sand with dead shells, Lithothamnion. *Bebryce hicksoni, Villogorgia compressa, V. nigrescens.*

STATION 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand small stones and shells. *Acanthogorgia flabellum, Echinogorgia aurantiaca, E. complexa, E. flora, E. ridleyi, Echinomuricea coronalis, E. spinifera, Muricella perramosa, Placogorgia bebrycoides, P. cryptotheca, Thesea flava.*

STATION 165. Anchorage on Northeast side of Daram Island, (False Pisangs) East coast of Misool. 49 meters. *Heterogorgia ramosa.*

STATION 166. 2° 28′.5 S., 131° 3′.3 E. near Misool. 118 meters. Hard, coarse sand. *Acamptogorgia spatulata, Echinomuricea coronalis, Versluysia dentata, V. timorensis.*

STATION 204. 4° 20′ S., 122° 58′ E. from 75—94 meters. Between Islands of Wowoni and Buton; North entrance of Buton Strait. Sand, with dead shells. *Acanthogorgia turgida, Acis serrata, Echinogorgia aurantiaca, Muricella grandis, Placogorgia alternata, P. dendritica, Thesea pallida, Versluysia dentata, V. rosea.*

STATION 212. 5° 54′.5 S., 120° 19′.2 E. Banda Sea. 462 meters. Fine gray and green mud. *Acanthogorgia ridleyi.*

STATION 220. Anchorage off Pasir Pandjang, west coast of Binongka. 278 meters. Coral sand. *Versluysia operculata, Villogorgia rubra.*

STATION 240. Banda Anchorage. 9—45 meters. Black sand, coral, Lithothamnion bank in 18—36 M. *Echinomuricea pulchra.*

STATION 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters. Coral and Lithothamnion. *Heterogorgia ramosa.*

STATION 253. 5° 48′.2 S., 132° 13′ E. Arafura Sea. 304 meters. Grey clay, hard and crumbly. *Acanthogorgia striata, Acis squamata, Muricella collaris.*

STATION 256. 5° 26′.6 S., 132° 32′.5 E. near Kei Islands. 397 meters. Greyish green mud, coral. *Villogorgia flavescens.*

STATION 257. In Du-roa Strait, Kei Islands. To 52 meters. Coral. *Acanthogorgia ceylonensis, Behryce hicksoni, Heterogorgia ramosa.*

STATION 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Behryce thomsoni, Placogorgia pulchra, Heterogorgia ramosa.*

STATION 259. 5° 29'.2 S., 132° 52'.5 E. near Kei Islands. 487 meters. Coral sand and dead coral. *Acanthogorgia ridleyi.*

STATION 260. 5° 36'.5 S., 132° 55'.2 E. near Kei Islands. 90 meters. Sand, coral and shells. *Acanthogorgia muricata, A. turgida, Behryce thomsoni, Muricella grandis, M. perramosa, Placogorgia atlantica, P. cryptotheca, P. studeri, Thesea flexilis, T. simplex, Versluysia ceylonensis, V. dentata, Villogorgia timorensis.*

STATION 266. 5° 56'.5 S., 132° 47'.7 E. near Kei Islands. 595 meters. Grey mud with coral and stones. *Echinomuricea cylindrica.*

STATION 273. Anchorage off Jedan Island, East coast of Aru Islands, (Pearl Banks). 13 meters. Sand and shells. *Placogorgia cryptotheca, Thesea flava, T. sanguinea, Versluysia reticulata.*

STATION 274. 5° 28'.2 S., 134° 53'.9 E. near Aru Islands. 57 meters. Sand and shells, stones. *Acanthogorgia studeri, Echinomuricea spinifera, Heterogorgia clausa, H. ramosa, Muriceides dubia, Muricella gracilis, Placogorgia bebrycoides, P. cryptotheca, P. squamata, Thesea flava, T. pallida, Villogorgia intricata, V. serrata.*

STATION 280. 8° 17'.4 S., 127° 30'.7 E. Timor Sea. 1224 meters. Dredge brought up glossy black manganese nodules. *Echinomuricea collaris.*

STATION 285. 8° 39.1 S., 127° 4'.4 E. Timor Sea. 34 meters. On the limit between mud and coral, Lithothamnion. *Echinomuricea coronalis, Thesea flexilis.*

STATION 288. 9° 0'.5 S., 126° 31'.2 E. Timor Sea. 869 meters. Bottom hard, not obtained. *Acanthogorgia aspera.*

STATION 289. 9° 0'.3 S., 126° 24'.5 E. Timor Sea. 112 meters. Mud, sand and shells. *Acamptogorgia spatulata, Acanthogorgia ceylonensis, Acis scolorensis, Bebryce hicksoni, Elasmogorgia filiformis, Thesea immersa, Versluysia argentea, V. ceylonensis, Villogorgia timorensis.*

STATION 297. 10° 39' S., 123° 40' E. Timor Sea. 520 meters. Soft grey mud, with brown upper layer. *Acanthogorgia turgida, Echinomuricea costata.*

STATION 299. 10° 52'.4 S., 123° 1'.1 E. Cyrus Bay, Rotti Island. 30 meters. Mud, coral and Lithothamnion. *Villogorgia inermis, Heterogorgia magna.*

STATION 305. Mid channel in Solor Strait, off Kampong Menanga, 113 meters. Stony. *Acanthogorgia spinosa, Acis alba, A. solorensis, A. squamata, Anthogorgia verrilli, Bebryce hicksoni, Heterogorgia clausa, Muricella grandis, Placogorgia alternata, P. bebrycoides, Versluysia ceylonensis, V. ramosa, V. rosea, Villogorgia intricata.*

STATION 310. 8° 30' S., 119° 7'.5 E. Flores Sea. 73 meters. Sand, with few pieces of dead coral. *Acanthogorgia flabellum, A. spinosa, A. truncata, Bebryce hicksoni, B. indica, Echinogorgia complexa, Echinomuricea furfuracea, Heterogorgia humilis, Muricella complanata, M. dubia, Placogorgia reticuloides, P. squamata, Thesea pallida, T. placoderma, Versluysia reticulata, Villogorgia compressa, V. intricata.*

STATION 313. Anchorage east of Dangar Besar, Saleh Bay. Up to 36 meters. Sand, coral and mud. *Heterogorgia magna.*

STATION 315. Anchorage East of Sailus Besar, Paternoster Islands. Coral and Lithothamnion. Up to 36 meters. *Acanthogorgia flabellum, Menella rubescens, Thesea sanguinea.*

The following species were collected by others, but presented to the Siboga Expedition and incorporated in its collection.

Pulu Missa, near Island of Flores; DE SISO don. *Echinomuricea indomalaccensis, Echinogorgia pseudosassapo, Heterogorgia magna, H. reticulata, H. verrucosa, Placogorgia dentata, Villogorgia compressa.*

Strait of Boleng, Solor, collected by a pearl fisher. *Anthomuricea reticulata.*

Ternate, collected by the Dutch North New Guinea Expedition 1903. *Heterogorgia reticulata.*

East coast of Pulu Weh, Sumatra, 40 fathoms. VAN NOUHUYS don. *Acanthogorgia armata, Anthomuricea brunnea.*

Aru Islands, collected by Dr. J. W. R. KOCH of the Dutch New Guinea Expedition 1904. *Echinomuricea pseudosassapo.*

It appears from the above list that Muriceidæ were collected at 52 of the stations occupied by the Siboga Expedition. An examination of the data furnished regarding these stations shows that there were about 212 successful hauls from the bottom, and so it may be said that specimens of Muriceidæ were brought up from about one fourth of the stations where the bottom was successfully reached.

The richest haul was from Station 310, where no less than 17 species of Muriceidæ were secured, a really phenomenal yield. Other notable stations were Station 305, where 14 species were secured; Stations 260 and 274, where 13 species were brought up from each; Stations 117 and 164, each yielding 11 species; and Stations 204 and 289, each producing 9 species.

On the other hand there were 22 stations that yielded but a single species each.

Of the eight stations yielding more than 10 species, none were at a depth of less than 32 meters, and none was over 113 meters. This may indicate, in a general way, the richest zone for muriceid life; but such generalizations must be made with great caution, as a few lucky hauls in an unusually rich spot may materially and unduly effect the result. It should also be born in mind that most of the explorations of the bottom made by the Siboga Expedition were in comparatively shallow water, and a thorough investigation of the deeper waters of the same region would be likely to demonstrate a profuse muriceid life at greater depths.

The deepest soundings at which specimens of this family were secured was probably at Station 280, 8° 17′.4 S., 127° 30′.7 E., in Timor Sea where *Echinomuricca collaris* was brought up from a depth of 1224 meters. *Acanthogorgia aspera* was dredged from Stat. 122 at a depth of 1264—1165 meters, and it is therefore possible that it came from a depth of 1264 meters.

During the cruise of the U. S. Bureau of Fisheries Steamer Albatross in the Hawaiian region in 1902 the deepest haul which secured a Gorgonacean was at a depth of 1,161 fathoms, where a chrysogorgian, *Pleurogorgia militaris* Nutting was secured.

The deepest water from which a muriceid was dredged by the Challenger was 700 fathoms, where *Acanthogorgia longiflora* W. and S. was secured. From the information available to the writer, it thus appears that *Acanthogorgia longiflora* secured by the Challenger Expedition is the inhabitant of the deepest water of all known muriceids.

Table showing the bathymetric and geographic distribution of the Muriceidæ of the Siboga Expedition.

	BATHYMETRIC.					GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	200 to 500 meters	Over 500 meters	
Acanthogorgia ridleyi	.	.	.	*	.	Patagonia.
Acanthogorgia spinosa	*	*	*	.	.	New Britain.
Acanthogorgia armata	.	*	*	*	*	Atl. coast, U.S., Cape of Good Hope, Hawaiian Isl.
Acanthogorgia aspera	.	?*	*	.	*	Cuba, Azores, Ceylon.
Acanthogorgia muricata	.	*	*	.	*	West Indies, Azores, Ceylon.
Acanthogorgia laxa	.	.	.	*	.	Patagonia.
Acanthogorgia truncata	.	*	.	*	.	Bay of Gascogne.
Acanthogorgia flabellum	*	*	.	.	.	Maldive Archipelago.
Acanthogorgia ceylonensis	*	*	*	.	.	Ceylon.
Acanthogorgia striata	.	*	.	*	.	
Acanthogorgia studeri	.	*	.	*	.	
Acanthogorgia turgida	.	*	.	.	*	
Anthomuricea sanguinea	*	*	.	.	.	
Anthomuricea timorensis	*	.	.	.	.	
Anthomuricea brunnea	*	.	.	.	.	
Anthomuricea reticulata	(no data)	.	.	.	.	
Anthogorgia verrilli	.	.	*	.	.	
Anthogorgia aurea	*	*	.	.	.	
Muriceides javensis	*	.	.	.	.	
Muriceides collaris	.	.	.	*	.	
Muriceides dubia	.	*	.	.	.	
Muricella crassa	*	*	.	.	.	
Muricella complanata	*	*	.	.	*	Off Japan, Ceylon.
Muricella perramosa	.	*	*	.	*	Off Japan, Mauritius Islands.
Muricella gracilis	.	*	.	.	*	Off Ceylon.
Muricella stellata	.	.	.	*	.	
Muricella dubia	.	*	.	.	.	
Muricella grandis	*	*	*	.	*	
Versluysia ramosa	.	.	*	.	*	Gulf of Manaar, Ceylon.
Versluysia ceylonensis	*	*	*	.	.	Gulf of Manaar.
Versluysia rosea	.	*	*	.	.	
Versluysia dentata	.	*	*	.	.	
Versluysia operculata	.	.	.	*	.	
Versluysia reticulata	*	*	.	.	.	
Versluysia argentea	.	.	*	.	.	
Acis alba	.	*	.	.	.	
Acis squamata	.	.	*	*	.	
Acis solorensis	.	.	*	.	.	
Acis serrata	.	*	.	.	.	
Elasmogorgia filiformis	.	*	*	*	.	Calif.
Menacella reticularis	.	.	*	.	.	?
Bebryce indica	*	*	*	.	.	Gulf of Manaar.
Bebryce hicksoni	.	*	*	.	.	Gulf of Manaar.
Bebryce thomsoni	*	*	.	.	.	
Thesea simplex	.	*	.	*	.	
Thesea pallida	.	*	.	.	.	
Thesea immersa	.	.	*	.	.	

	BATHYMETRIC.					GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	200 to 500 meters	Over 500 meters	
Thesea flava	*	*	.	*	.	
Thesea flexilis	*	*	.	.	.	
Thesea placoderma	.	*	.	.	.	
Thesea sanguinea	*	.	.	.	.	
Echinomuricea coronalis	*	.	.	.	.	Near Ternate.
Echinomuricea indomalaccensis	*	.	.	.	.	Australian coasts, Torres Str., Gulf of Manaar.
Echinomuricea collaris	.	.	*	.	.	
Echinomuricea spinifera	*	*	.	.	.	
Echinomuricea pulchra	*	.	.	.	.	
Echinomuricea cylindrica	.	.	.	.	*	
Echinomuricea costata	.	.	.	.	*	
Echinogorgia aurantiaca	*	*	.	.	.	Peruvian Coast.
Echinogorgia furfuracea	*	*	.	.	*	Indian Ocean, N.W. Australia.
Echinogorgia pseudosassapo	*	.	.	.	.	Indian Ocean, Ceylon. Torres Straits.
Echinogorgia ridleyi	*	.	.	.	.	
Echinogorgia flora	*	.	.	.	.	
Echinogorgia complexa	*	*	.	.	.	
Acamptogorgia spatula	.	*	*	.	.	
Placogorgia atlantica	.	*	*	.	.	St. Pauls Rock, S. Atlantic.
Placogorgia campanulifera	.	*	.	.	.	
Placogorgia pulchra	*	.	.	.	.	
Placogorgia dendritica	.	*	.	.	.	
Placogorgia cryptotucca	*	*	.	.	.	
Placogorgia dentata	*	.	.	.	.	
Placogorgia squamata	*	*	.	.	.	
Placogorgia studeri	.	*	.	.	.	
Placogorgia bebrycoides	*	*	*	.	.	
Placogorgia alternata	.	*	*	.	.	
Placogorgia reticuloides	.	*	.	.	.	
Villogorgia nigrescens	.	*	.	.	.	West Indies.
Villogorgia compressa	*	*	.	.	.	
Villogorgia intricata	*	*	*	*	.	Fiji Isl. New Hebrides, Bass' Str. Loyalty Isl.
Villogorgia rubra	*	.	.	*	.	Off Ceylon.
Villogorgia serrata	.	*	.	.	.	
Villogorgia timorensis	.	*	*	.	.	
Villogorgia flavescens	*	*	.	.	.	
Villogorgia inermis	*	.	.	*	.	
Menella rubescens	*	*	.	.	.	
Menella grayi	.	*	.	.	.	
Heterogorgia ramosa	*	*	.	.	.	Near Ceylon.
Heterogorgia verrucosa	?	.	.	.	.	Bay of Panama.
Heterogorgia muricelloides	.	*	.	.	.	
Heterogorgia clausa	*	*	.	.	.	
Heterogorgia humilis	.	*	.	.	.	
Heterogorgia stellata	*	.	.	.	.	
Heterogorgia magna	*	.	.	.	.	
Heterogorgia reticulata	*	.	.	.	.	New Guinea.
Heterogorgia operculata	(no data)	.	.	.	.	
Total number of species found in each of the above bathymetric zones.	44	60	27	15	15	

The above table appears to show that muriceid life is most abundant at a depth of 50 to 100 meters, and that there is abrupt falling off below the 100 meters line.

An element too often neglected in such tables, and one that has lead to considerable error in the discussions of bathymetric distribution in the past, is the actual number of hauls of the dredge, or other appliance for securing bottom-living specimens, that was made in each of the bathymetric zones under discussion. While it is impracticable to ascertain the exact number of successful hauls made in each of the above zones during the investigations made by the Siboga Expedition, a fair approximation of the relative numbers can be arrived at by noting the entire list of stations, and the depth recorded for each. In this way we can to a great extent eliminate the error mentioned above. We find that there were about 100 stations where the depth was from 1 to 50 meters, and that 44 species were collected at these stations. There were about 36 stations between 50 and 100 meters, and 60 species collected. Between 100 and 200 meters there were but 15 stations, while the relatively large number of 27 species was collected. There were about 50 stations between 200 and 500 meters, and here but 15 species were secured. A proportionally large number, about 130 stations, found a depth of over 500 meters (many of which however did not secure specimens from the bottom) and but 12 species were secured.

The difference in the vertical extent of the zones adopted in the table must also be taken into consideration. If we combine the first and second and consider them as one zone for purposes of comparison with the third, we find that they include 136 stations at which 109 species were secured. That is, there were just about 80 species to each 100 stations. Turning our attention to the third zone (100 to 200 meters) we find but 15 stations, but these 15 stations yielded 27 species the rate per 100 stations being 180. Thus we see that the third zone is really the richest of all, yielding more than twice as many species per station as were found in the combined 1st and 2nd zones.

There seems to be a rather abrupt falling off below the depth of 200 fathoms, as but 15 species were collected from about 50 stations at depths of from 200 to 500, a zone of three times the vertical extent of the third. The diminution is still more marked at depths below 500 fathoms, where a relatively large number of stations were explored (about 130) and but 12 species secured.

The diminution is not so abrupt, however, as it appears from the table, on account of the large number of stations at the greater depths at which no dredge or trawl was used. Thus out of the 50 stations between 200 and 500 meters, 22 appear not to have been explored with appliances for securing the animal life of the bottom. Taking this fact into consideration, it appears that there were 28 stations effectively explored for animal life at the bottom at depths between 200 and 500 fathoms, and that 15 species were secured, or about 1 to each two stations. This still indicates a rather abrupt diminution of species below the 200 meters line, and the evidence is the same for depths below 500 meters.

It thus appears that the Muriceidæ are much less abundant in the deep sea of the region explored by the Siboga than in the shallower portions with a depth of less than 200 meters, and that the maximum development in species is in the zone between 100 and 200 meters.

Regarding the geographical distribution of the Muriceidæ collected by the Siboga Expedition, it will be noted that but 29 of the 95 species are known to occur outside of the region explored by the members of the party. 12 of these are confined to the East Indian Region, namely *Acanthogorgia spinosa*, *A. flabellum*, *A. ceylonensis*, *M. gracilis*, *Versluysia ceylonensis*, *V. ramosa*, *Bebryce indica*, *B. hicksoni*, *Echinomuricea coronalis*, *Villogorgia rubra*, *Heterogorgia ramosa* and *H. reticulata*.

The following species have been found in the Indian Ocean: — *Muricella complanata*, *M. perramosa*, *Echinogorgia furfuracea* and *E. pseudosassapo*.

Four species are known to inhabit the waters near Australia, i. e. *Echinomuricea indomalaccensis*, *Echinogorgia furfuracea*, *E. pseudosassapo* and *Villogorgia intricata*. Three species are known to occur on the eastern shores of the Pacific: — *Menacella reticulata*, *Echinogorgia aurantiaca* and *Heterogorgia verrucosa*. There are three species also from the West Indies, namely: — *Acanthogorgia armata*, *A. muricata* and *Villogorgia nigrescens*.

Two species, *Muricella complanata* and *M. perramosa* are known from the Japanese coasts; two, *Acanthogorgia ridleyi* and *A. laxa*, from Patagonia; one, *Acanthogorgia armata*, from the Atlantic coast of the United States; one, *Placogorgia atlantica*, from mid Atlantic; one, *Acanthogorgia armata*, from the Hawaiian Islands in mid Pacific; and one, the same species (*Acanthogorgia armata*) from the Cape of Good Hope.

There is one species represented in the Siboga collection that was previously described, but the locality in which it was found seems to be unknown. Reference is here made to *Menacella reticularis*.

It appears that *Acanthogorgia armata* has the widest geographical distribution of all of the species in the collection, as well as a very extensive bathymetric range. The genus *Acanthogorgia* seems to be very extensively dispersed over the sea bottom of the world. *Elasmogorgia filiformis* has a very unusual known distribution, being found in the East Indies and off the Californian coast.

The writer does not feel justified in discussing at this time the general distribution of the genera of the Muriceidæ. Many of the earlier described species are of such uncertain identification that little confidence can be felt in generalizations based in a considerable degree on these questionable identifications; and the types being in most cases inaccessible to the writer, he is unable to ascertain points necessary to identification of many long known species.

Again, there is so little uniformity among modern writers as to what constitutes a species, especially among the lower metazoa, that conclusions regarding distribution are rendered still more unsatisfactory. Conservative writers often lump together a number of forms, that would be regarded as certainly distinct by others, in a single species. Thus the apparent geographical and bathymetric range of such species is greatly extended; whereas other writers, with a tendency to "hair-splitting" would divide the same forms into many species, thus restricting the apparent range of the species discussed.

Concerning another aspect of the question, the author has elsewhere said:[1]

[1] Proceedings of the U. S. National Museum, vol. XXXIV, p. 546.

"Our knowledge of the *Alcyonaria* as a whole is far too incomplete to warrant us in being dogmatic in our conclusions regarding their distribution, either geographic or bathymetric. When we consider how little of the ocean bottom has been explored with any thoroughness, the vast extent of practically unknown regions, and the host of species yet to be discovered, it becomes evident that our conclusions are tentative at best, and very likely to be rendered valueless by further exploration and study. The ocean floor has been but scratched here and there by the dredge and trawl, and the absence of species from our collections will by no means warrant us in saying that they are really absent from the regions explored".

The writer, then, feels that he is doing the best service by simply recording the facts regarding the distribution of species in the Siboga collection, without a general discussion of the distribution of all of the so-called species of the Muriceidæ.

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CORRIGENDA.

Page 11, eleven lines from top, for *aura* read *aurea*.

Page 57, fifteen lines from bottom, for *Echinomuricae* read *Echinomuricea*.

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EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. Otto F. Kampmeier.

PLATE I.

Fig. 1. *Acanthogorgia studeri* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Acanthogorgia turgida* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Acanthogorgis striata* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Anthomuricea sanguinea* n. sp. Natural size. 4*a*, part of branch × 5.

2
2a
4
4
3

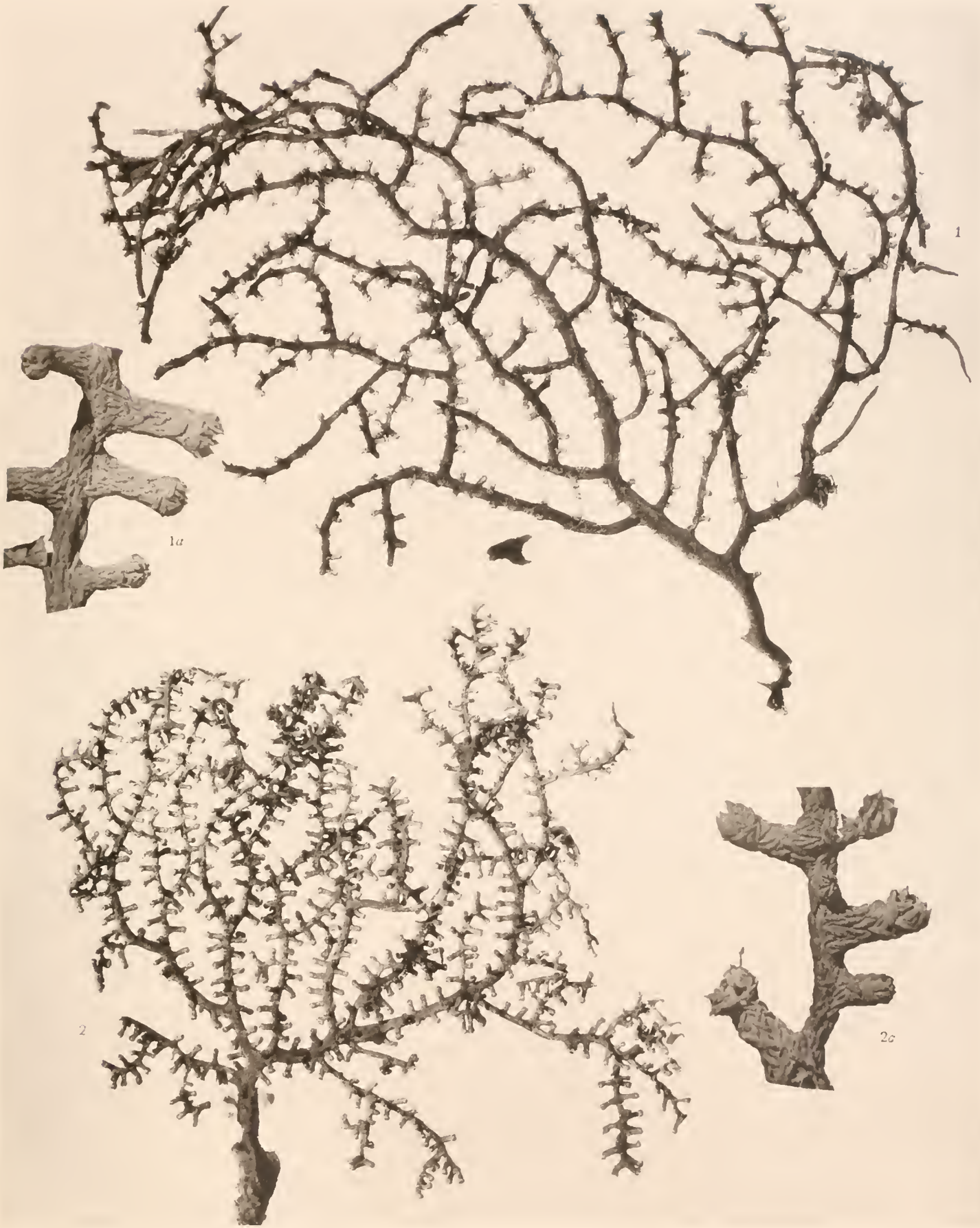
PLATE II.

Fig. 1. *Anthomuricea brunnea* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Anthomuricea timorensis* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Anthomuricea reticulata* n. sp. Natural size. 3*a*, part of branch × 5.

1
1a
2
2a
3
3a

PLATE III.

Fig. 1. *Anthogorgia aurea* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 2. *Anthogorgia verrilli* n. sp. Natural size. 2*a*, part of branch × 5.


1
1a
2
2a

MARINE BIOLOGICAL
WOODS
LIBR
MA

PLATE IV.

Fig. 1. *Muriceides javensis* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Muriceides dubia* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Muriceides collaris* n. sp. Natural size. 3*a*, part of branch × 5.

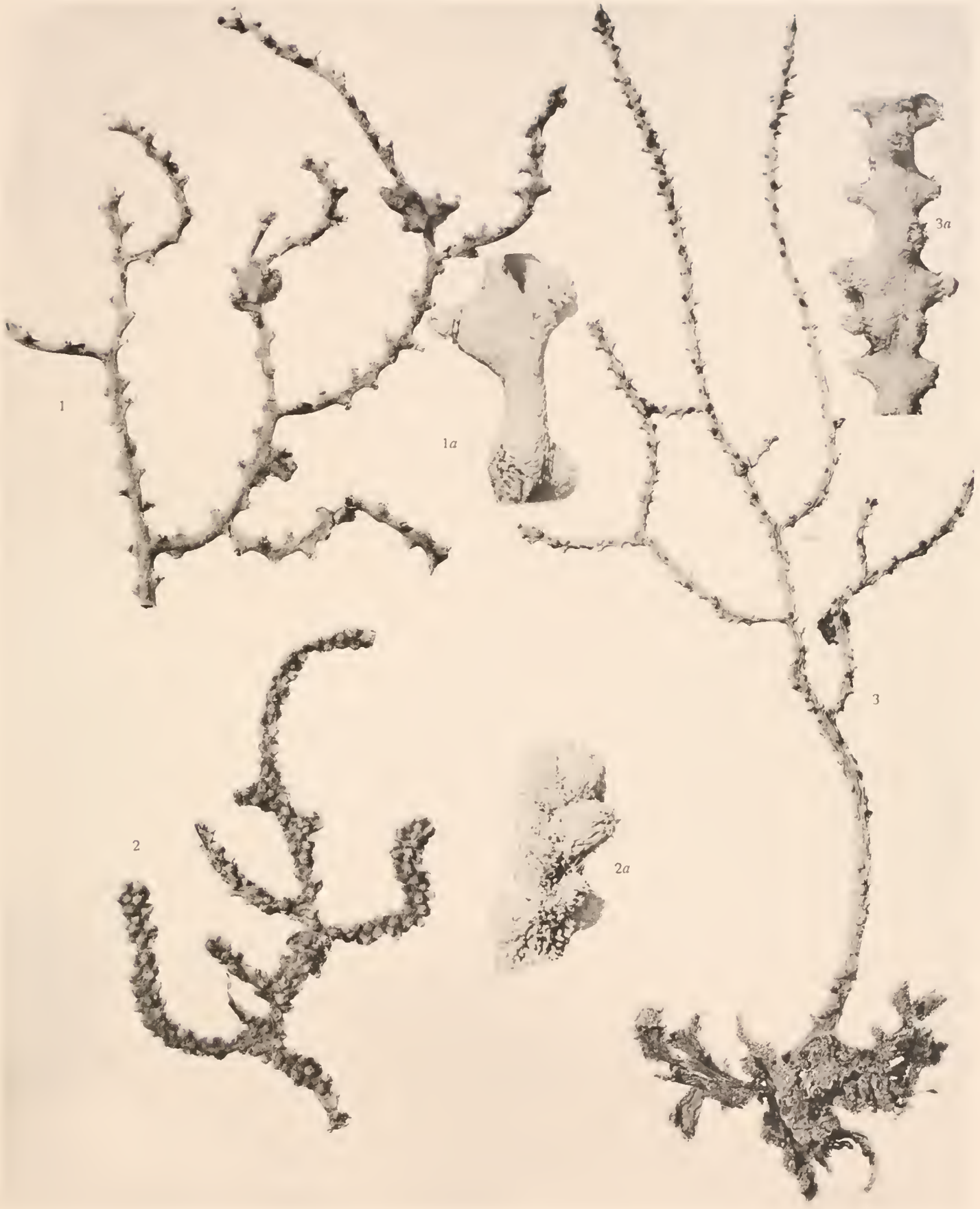

1
1a
2
2a
3
3a

PLATE V.

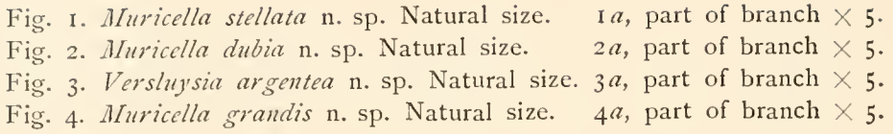


Fig. 1. *Muricella stellata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Muricella dubia* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Versluysia argentea* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Muricella grandis* n. sp. Natural size. 4*a*, part of branch × 5.

1
1a
2
2a
3
3a
4
4a

MARINE BIOLOGICAL LABORATORY
WOODS HOLE

PLATE VI.

Fig. 1. *Versluysia reticulata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Versluysia operculata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Versluysia dentata* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Versluysia rosea* n. sp. Natural size. 4*a*, part of branch × 5.

1
1a
2
2a
3
3a
4
4a

PLATE VII.

Fig. 1. *Acis serrata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Acis squamata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Acis solorensis* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Bebryce thomsoni* n. sp. Natural size. 4*a*, part of branch × 5.

1a
1
2
2a
3
3a
4
4a

PLATE VIII.

Fig. 1. *Thesea flava* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Thesea simplex* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Thesea pallida* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Thesea immersa* n. sp. Natural size. 4*a*, part of branch × 5.

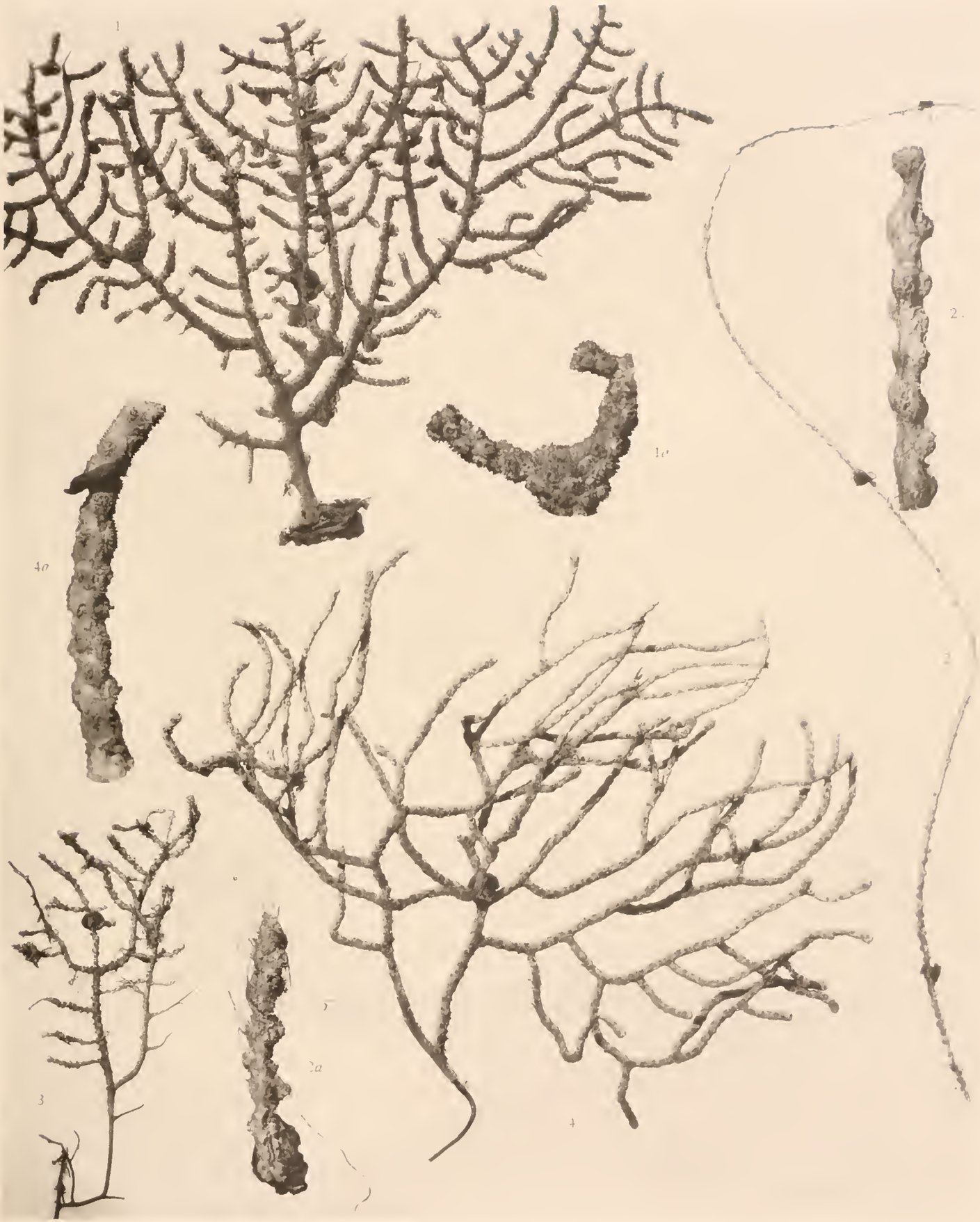

1
1a
2
2a
3
4
4a
5

PLATE IX.

Fig. 1. *Echinomuricea collaris* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Echinomuricea spinifera* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Thesea placoderma* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Thesea flexilis* n. sp. Natural size. 4*a*, part of branch × 5.
Fig. 5. *Thesea sanguinea* n. sp. Natural size. 5*a*, part of branch × 5.

1
1a
2a
2
3
4
4a
3a
5
5a

PLATE X.

Fig. 1. *Echinomuricea costata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Echinomuricea cylindrica* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Echinomuricea pulchra* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Echinogorgia ridleyi* n. sp. Natural size. 4*a*, part of branch × 5.

1
1a
2
2a
3
3a
4
4a

PLATE XI.

Fig. 1. *Echinogorgia complexa* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Echinogorgia flora* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Placogorgia campanulifera* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Placogorgia pulchra* n. sp. Natural size. 4*a*, part of branch × 5.

1
1a
2a
2
3a
3
4a
4

PLATE XII.

Fig. 1. *Placogorgia dendritica* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Placogorgis squamata* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 3. *Placogorgia cryptotheca* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Placogorgia dentata* n. sp. Natural size. 4*a*, part of branch × 5.

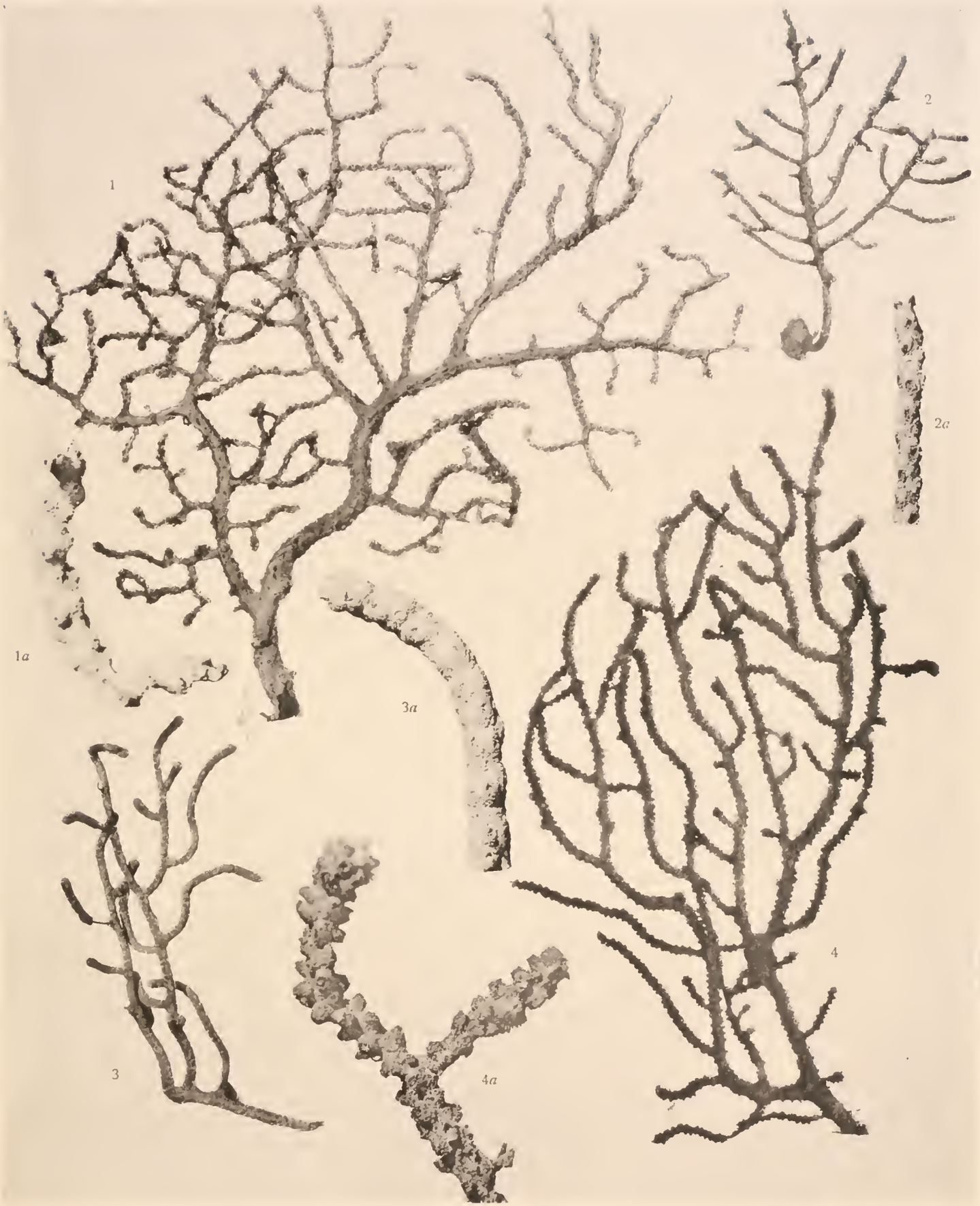

1
2
2a
1a
3a
4
3
4a

PLATE XIII.

Fig. 1. *Placogorgia studeri* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Placogorgia alternata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Villogorgia serrata* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Placogorgia bebrycoides* n. sp. Natural size. 4*a*, part of branch × 5.

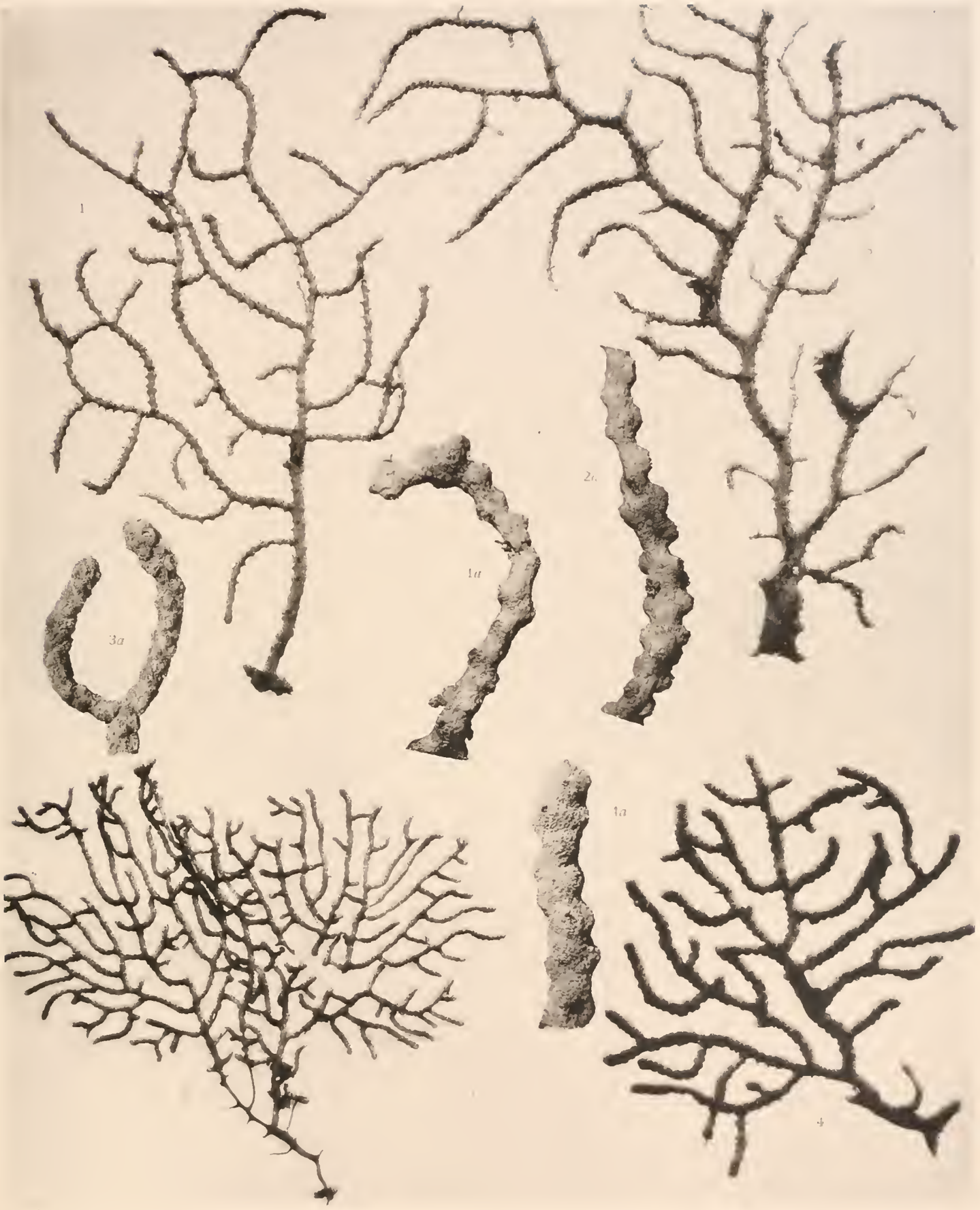

1
1a
2
2a
3a
4
4a

PLATE XIV.

Fig. 1. *Villogorgia flavescens* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Acamptogorgia spatulata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Villogorgia timorensis* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Villogorgia inermis* n. sp. Natural size. 4*a*, part of branch × 5.

1
1a
2
2a
3
3a
4
4a

PLATE XV.

Fig. 1. *Menella rubescens* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Menella grayi* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Heterogorgia muricelloides* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Heterogorgia clausa* n. sp. Natural size. 4*a*, part of branch × 5.
Fig. 5. *Heterogorgia stellata* n. sp. Natural size. 5*a*, part of branch × 5.

1
2a
2
3a
1a
5a
3
4a
5
4

PLATE XVI.

Fig. 1. *Heterogorgia magna* n. sp. Natural size. 1*a*, part of branch × 5.

1a
1

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PLATE XVII.

Fig. 1. *Heterogorgia humilis* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Heterogorgia reticulata* n. sp. Natural size. 2*a*, part of branch × 5.

1a
2a
2

PLATE XVIII.

Fig. 1. *Heterogorgia operculata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Placogorgia reticuloides* n. sp. Natural size. 2*a*, part of branch × 5.

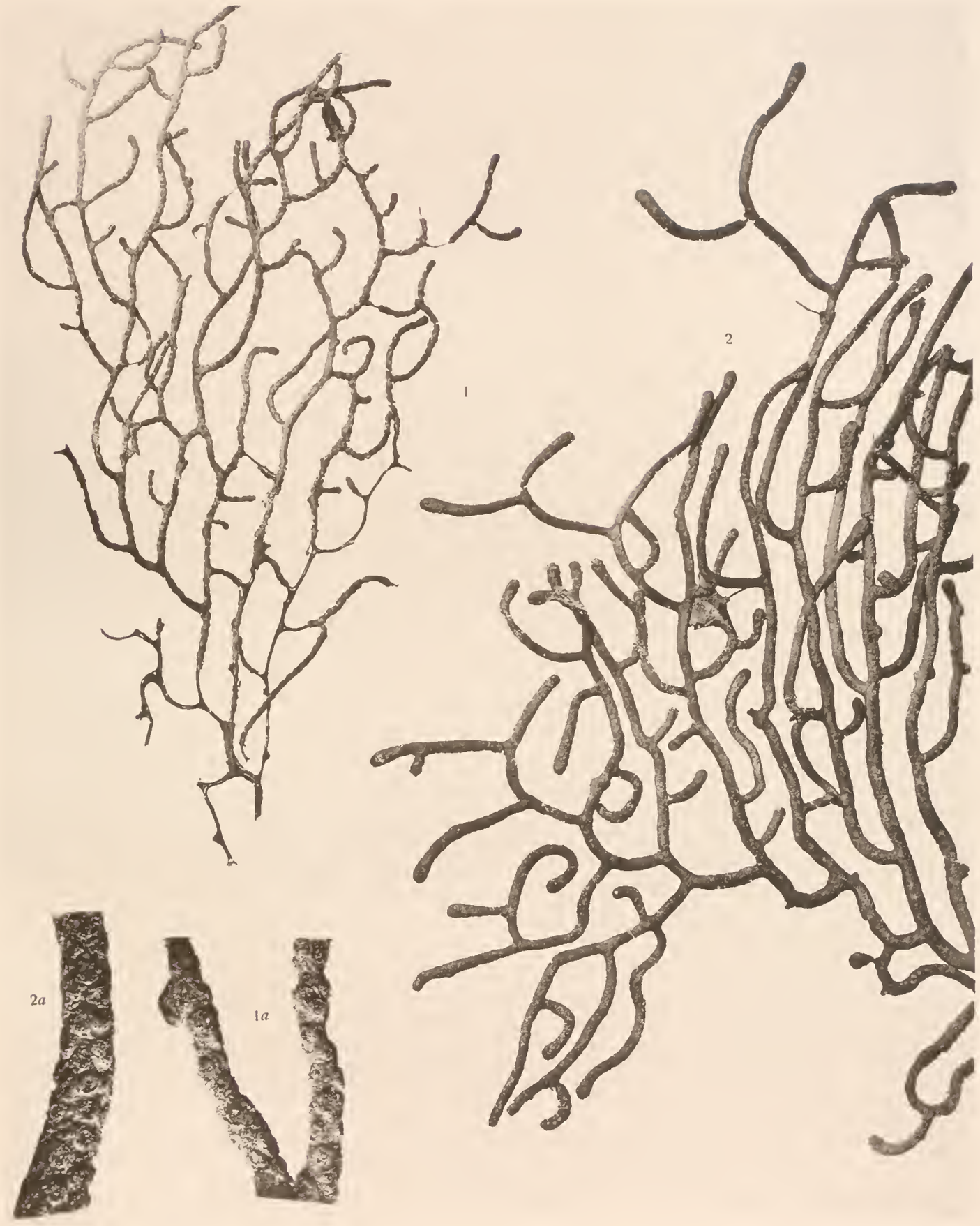
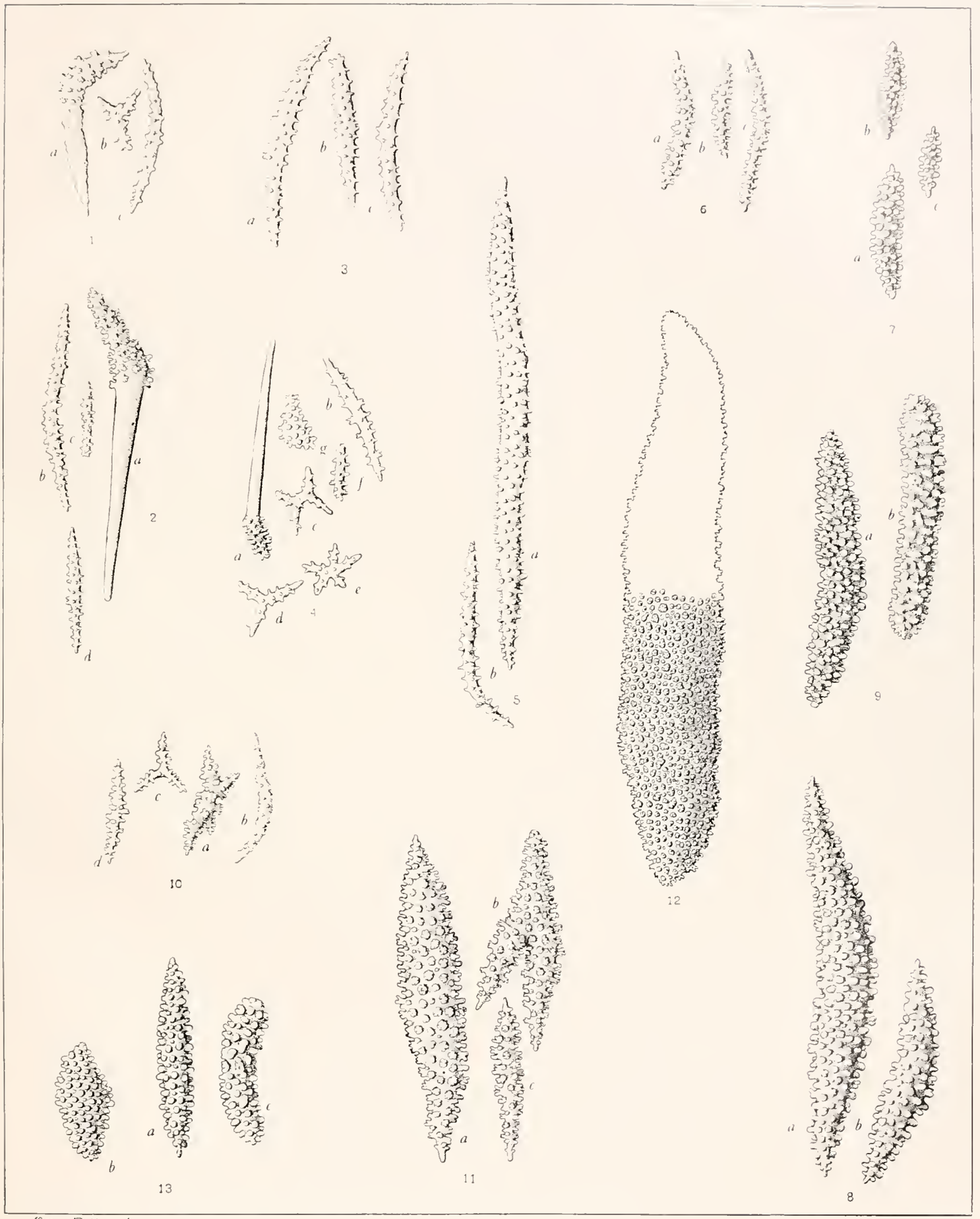

1
2
1a
2a

PLATE XIX.

Fig. 1. *Acanthogorgia armata* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 2. *Acanthogorgia striata* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 58.
Fig. 3. *Acanthogorgia studeri* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 4. *Acanthogorgia turgida* n. sp. Group of six spicules, *a*, *b*, *c*, *d*, *e* and *f*. × 58.
Fig. 5. *Anthomuricea sanguinea* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 6. *Anthomuricea brunnea* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 7. *Anthomuricea reticulata* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 8. *Anthogorgia verrilli* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 9. *Anthogorgia aura* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 10. *Muriceides collaris* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 58.
Fig. 11. *Muriceides dubia* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 12. *Muricalla grandis* n. sp. A single spicule. × 58.
Fig. 13. *Muricella dubia* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.



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MASS

PLATE XX.

Fig. 1. *Versluysia argentea* n. sp. Two spicules, *a* and *b*. × 58. Only $^1/_4$ of *a* is drawn.
Fig. 2. *Versluysia dentata* n. sp. Two spicules *a* and *b*. × 58.
Fig. 3. *Versluysia rosea* n. sp. A single spicule. × 58.
Fig. 4. *Versluysia reticulata* n. sp. Half of a single spicule. × 58.
Fig. 5. *Acis squamata* n. sp. A spicule. × 58.
Fig. 6. *Acis solorensis* n. sp. A single spicule. × 58.
Fig. 7. *Acis serrata* n. sp. A group of three spicules, *a*, *b* and *c*. × 58.
Fig. 8. *Bebryce thomsoni* n. sp. A group of four spicules, *a*, *b*, *c* and *d*. × 58, except "a" which is magnified 154 diameters.
Fig. 9. *Thesea simplex* n. sp. A group of three spicules, *a*, *b* and *c*. × 58.
Fig. 10. *Thesea pallida* n. sp. A group of three spicules, *a*, *b* and *c*. × 58.

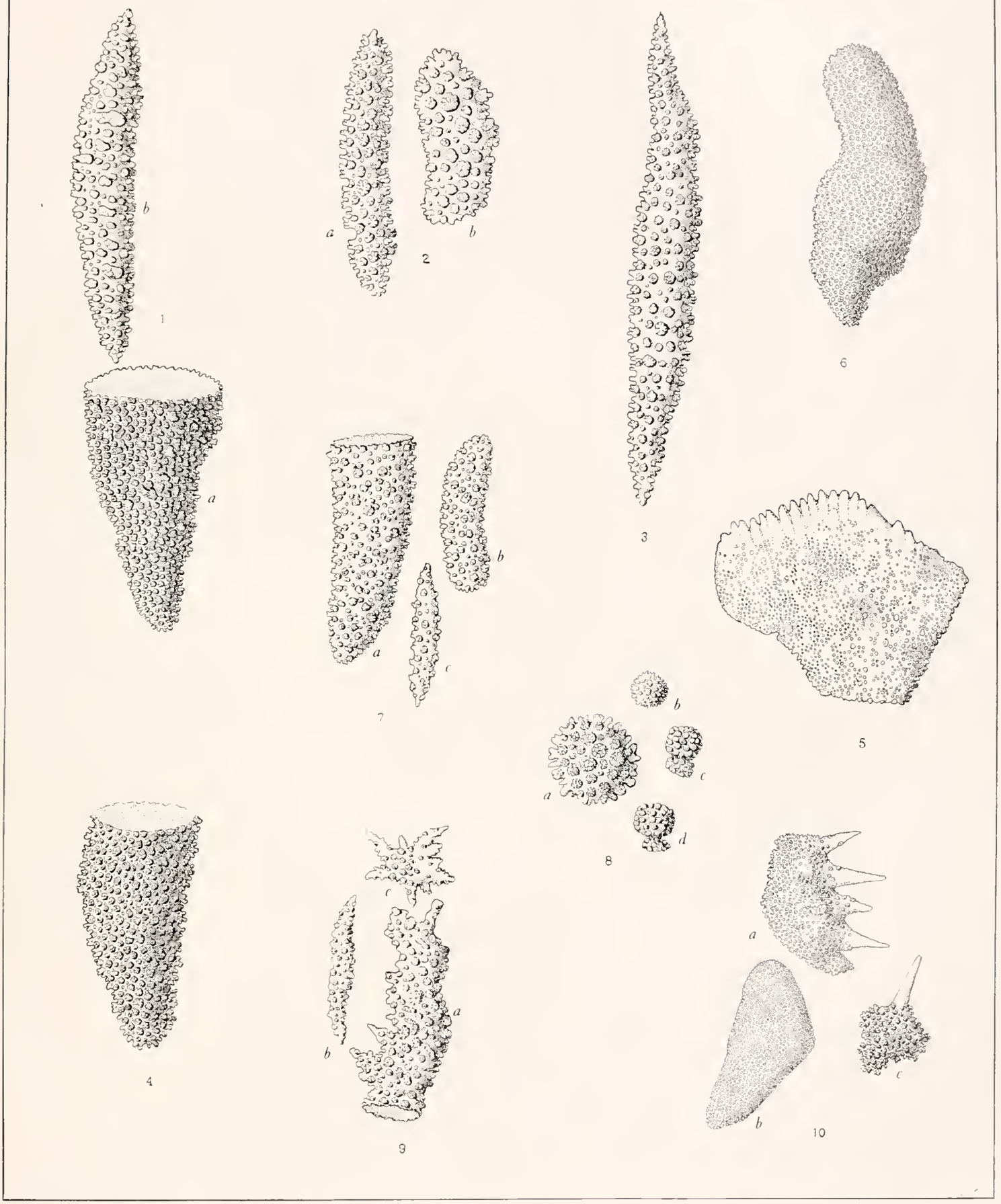

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PLATE XXI.

Fig. 1. *Thesea sanguinea* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 2. *Thesea placoderma* n. sp. A single spicule. × 58.
Fig. 3. *Thesea flexilis* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 4. *Thesea immersa* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 5. *Echinomuricea collaris* n. sp. Two spicules. × 58.
Fig. 6. *Echinomuricea spinifera* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 7. *Echinomuricea pulchra* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 8. *Echinomuricea costata* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 9. *Echinogorgia ridleyi* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 10. *Echinogorgia flora* n. sp. A single spicule. × 58.
Fig. 11. *Echinogorgia complexa* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 12. *Acamptogorgia spatulata* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 13. *Placogorgia campanulifera* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 14. *Villogorgia serrata* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.

1

2

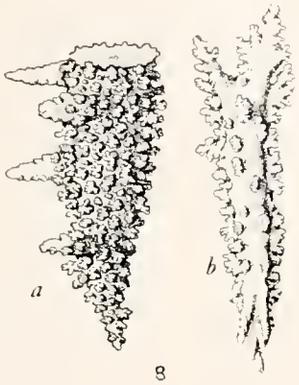
3

4

5

6

7



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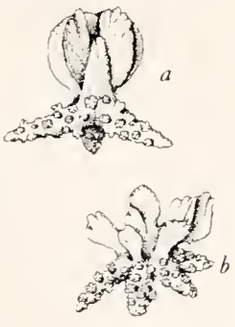

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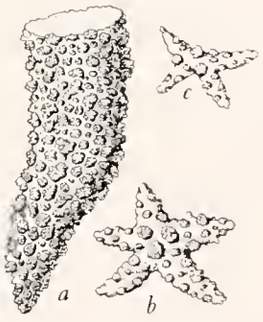

14

10

12

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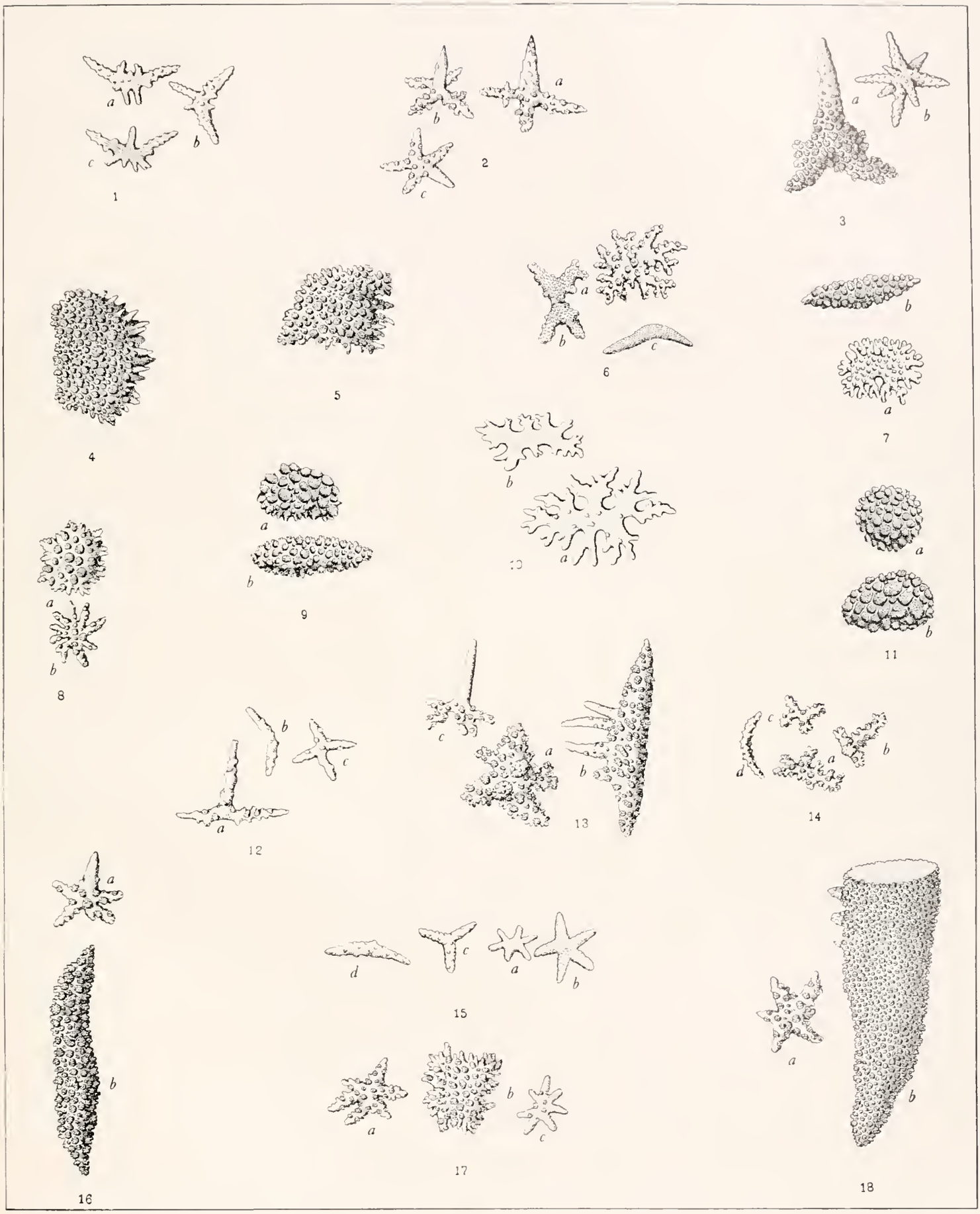
PLATE XXII.

Fig. 1. *Villogorgia flavescens* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 2. *Villogorgia inermis* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 3. *Villogorgia timorensis* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 4. *Placogorgia pulchra* n. sp. A single spicule. × 58.
Fig. 5. *Placogorgia cryptotheca* n. sp. A single spicule. × 58.
Fig. 6. *Placogorgia dendritica* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 7. *Placogorgia alternata* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 8. *Placogorgia squamata* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 9. *Placogorgia studeri* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 10. *Placogorgia dentata* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 11. *Placogorgia bebrycoides* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 12. *Menella grayi* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 13. *Menella rubescens* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 14. *Heterogorgia humilis* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 58.
Fig. 15. *Heterogorgia magna* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 58.
Fig. 16. *Heterogorgia stellata* n. sp. Two spicules, *a* and *b*. × 58.
Fig. 17. *Heterogorgia reticulata* n. sp. Group of three spicules, *a*, *b* and *c*. × 58.
Fig. 18. *Heterogorgia muricelloides* n. sp. Two spicules, *a* and *b*. × 58.



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RÉSULTATS DES EXPLORATIONS
ZOOLOGIQUES, BOTANIQUES, OCÉANOGRAPHIQUES ET GÉOLOGIQUES
ENTREPRISES AUX
INDES NÉERLANDAISES ORIENTALES EN 1899—1900,
à bord du SIBOGA
SOUS LE COMMANDEMENT DE
G. F. TYDEMAN
PUBLIÉS PAR
MAX WEBER
Chef de l'expédition.

*I. Introduction et description de l'expédition, Max Weber.
*II. Le bateau et son équipement scientifique, G. F. Tydeman.
*III. Résultats hydrographiques, G. F. Tydeman.
IV. Foraminifera, F. W. Winter.
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*VI. Porifera, G. C. J. Vosmaer et I. Ijima [1]).
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*VIII. Stylasterina, S. J. Hickson et Mlle H. M. England.
*IX. Siphonophora, Mlles Lens et van Riemsdijk.
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*XI. Scyphomedusae, O. Maas
*XII. Ctenophora, Mlle F. Moser.
*XIII. Gorgonidae, Alcyonidae, J. Versluys, S. J. Hickson et
XIV. Pennatulidae, S. J. Hickson. [C. C. Nutting [1]).
XV. Actiniaria, P. Mc Murrich.
*XVI. Madreporaria, A. Alcock [1]) et L. Döderlein.
XVII. Antipatharia, A. J. van Pesch.
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*XXX. Ostracoda, G. W. Müller.
*XXXI. Cirrhipedia, P. P. C. Hoek [1]).
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*XLIV. Holothurioidea, C. Ph. Sluiter.
*XLV. Ophiuroidea, R. Köhler.
XLVI. Asteroidea, L. Döderlein.
*XLVII. Solenogastres, H. F. Nierstrasz.
*XLVIII Chitonidae, H. F. Nierstrasz.
*XLIX[1]. Prosobranchia, M. M. Schepman [1]).
*XLIX[2]. Prosobrauchia parasitica, H. F. Nierstrasz et M. M.
*L. Opisthobranchia, R. Bergh. [Schepman.
*LI. Heteropoda, J. J. Tesch.
*LII. Pteropoda, J. J. Tesch.
LIII. Lamellibranchiata. P. Pelseneer et Ph. Dantzenberg.
*LIV. Scaphopoda, Mlle M. Boissevain.
LV. Cephalopoda, L. Joubin.
*LVI. Tunicata, C. Ph. Sluiter et J. E. W. Ihle [1]).
LVII. Pisces, Max Weber.
LVIII. Cetacea, Max Weber.
LIX. Liste des algues, Mme A. Weber.
*LX. Halimeda, Mlle E. S. Barton. (Mme E. S. Gepp).
*LXI. Corallinaceae, Mme A. Weber et M. Foslie.
LXII. Codiaceae, A. et Mme E. S. Gepp.
LXIII. Dinoflagellata. Coccosphaeridae, J. P. Lotsy.
LXIV. Diatomaceae, J. P. Lotsy.
LXV. Deposita marina, O. B. Böggild.
LXVI. Résultats géologiques, A. Wichmann.

Publié Février 1910

* Les numéros avec un astérique ont déjà paru; ceux marqués 1) seulement en partie

Siboga-Expeditie

THE

GORGONACEA OF THE SIBOGA EXPEDITION

III. THE MURICEIDÆ

BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

With 22 plates

Monographie XIII*b* of:

UITKOMSTEN OP ZOOLOGISCH, BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED

verzameld in Nederlandsch Oost-Indië 1899—1900

aan boord H. M. Siboga onder commando van
Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
LEIDEN

Voor de uitgave van de resultaten der Siboga-Expeditie hebben bijdragen beschikbaar gesteld:

De Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën.

Het Ministerie van Koloniën.

Het Ministerie van Binnenlandsche Zaken.

Het Koninklijk Zoologisch Genootschap »Natura Artis Magistra" te Amsterdam.

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