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Cheilostomata Anasca (Bryozoa) collected by Prof. Dr. Sixten Bock's expedition to Japan and the Bonin Islands 1914.

By

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With 183 text-figures and 9 plates.

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Preface.

My studies on the Bryozoa collected by Professor Dr. SIXTEN BOCK in Japan and the Bonin Islands were begun as early as the year 1934 at the Zoological Institute of the University of Uppsala. But soon my interest became attached to another problem namely the polymorphism of the Bryozoa (SILÉN 1938). Thus the greater part of the present work was made in the years 1939—1940 at the Invertebrate Department of the Swedish State Museum, Stockholm.

I am indebted to Professor S. BOCK, Stockholm, and Professor T. GISLÉN, Lund, for their kindness in placing at my disposal the collections of Bryozoa made during their Japanese expeditions. Professor N. VON HOFSTEN, the director of the Zoological Institute at Uppsala, helped me in every way during my stay there, and I wish to express my sincere thanks to him for his unwavering interest. Professor S. BOCK, the director of the Invertebrate Department of the State Museum, made it possible for me to accomplish my work; he provided me with a place of work at his institution and with material, and he has never ceased to encourage my work in every possible manner. For all his kindness I wish to express my

deep gratitude. Owing to his kind negotiation Mr. S. Svedén, the preparator at his institution, made the photographs and Miss Dagny Berg has helped me by going through the text-figures, for which services I am deeply obliged to them both.

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Introduction.

The researches made in an earlier work of the author (Silén 1938) were to some extent founded on a collection of *Cheilostomata Anasca* from Japan. At that time the systematic examination of the collection was omitted, with the exception of the description of two new species. In the following this collection will be described from the systematic point of view.

The collections under examination include that of Professor Dr. S. Bock, Stockholm, 1914 (by far the largest, and owned by the Zoological Institute, Uppsala); that of the »Vega»-expedition of 1879 (owned by the State Museum of Natural History, Stockholm); and that of Professor Dr. T. Gislén, Lund, 1930 (distributed between the institutes already named). In addition other small samples are examined.

The localities at which specimens were collected have been compiled into the following list. In the description of a species, under the heading of »locality», is given the geographical region or regions and the depth in which it was found, and one or more numbers referring to this list, where more detailed data are to be found.

Locality.

»Vega»-exp., 1879.

1. Japan, Tokyo Bay, 115 m., mud. $^{11}/_{10}$.
2. » Kiuschiu, Mitsu, 3—7 m. $^{20}/_{10}$.
3. » shells.
4. East China Sea, between Nagasaki and Hongkong, 90 m., mud. $^{30}/_{10}$.
5. Malacca Str., long. 103° E., lat. 1° 30′ N., 35 m., grey gravel. $^{4}/_{12}$.

Captain Suensson, 1890—1893.

6. South China Sea, long. 108° 50′ E., lat. 11° 5′ N., 45 m. Bottom temp. + 26° C.
7. South China Sea, 15 miles off Hongkong, 40 m.
8. Coast of China, on a telegraph-cable.
9. Formosa Str., long. 120° 50′ E., lat. 26° N., 80 m. Bottom temp. +23° C. $^{2}/_{8}$ 1890.

Locality.

10. Japan, Kiuschiu, Hirado Str., long. 129° 18′ E., lat. 33° 10′ N. Bottom temp. + 11° C.

11. Japan, Kiuschiu, long. 129° 15′ E., lat. 33° 15′ N., 80 m. 1893.

Prof. S. Bock, 1914.

12. Sumatra, Sabang, 1 m. $^{26}/_{2}$.

13. Japan, unknown localities.

14. » Kiuschiu, Kagoshima, Bonomisaki, 9 miles W.—N., $^{1}/_{2}$ mile N., 200 m., shells and sand. $^{13}/_{5}$.

15. Japan, Kiuschiu, Goto Islands, Osesaki, 23 miles NW., $^{3}/_{4}$ mile W., long. 128° 14′ E., 175 m. Bottom temp. + 13,7° C. $^{14}/_{5}$.

16. Japan, Kiuschiu, Goto Islands, 200—300 m. $^{15}/_{5}$.

17. » » » » Pallas Rock, 5 miles E.—S., long. 128° 12′ E., the coral reef, 135 m. $^{15}/_{5}$.

18. Japan, Kiuschiu, Goto Islands, 28 miles N. $^{1}/_{2}$ mile E. from the lighthouse of Shirase, long. 128° 50′ E., lat. 33° 41′ N., 110 m., sand. Bottom temp. + 15,9° C. $^{17}/_{5}$.

19. Japan, Kiuschiu, Tsushima, 100 m. $^{17}/_{5}$.

20. » » Okinoshima, long. 130° 3′ E., lat. 33° 51′ N., 40 m., gravel consisting of shell-fragments. Bottom temp. + 17° C. $^{18}/_{5}$.

21. Japan, Kiuschiu, Okinoshima, long. 130° 10′ E., lat. 34° 20′ N., and long. 134° 2′ E., lat. 34° 11′ N., 90 and 85 m., shells and sand. Bottom temp. + 16,7° C. and + 16,6° C. $^{18}/_{5}$.

22. Japan, Sagami, Misaki, from above the low water mark down to 3 m., seaweed etc. April—June.

23. Japan, Sagami, Aburatsubo, from above the low water mark down to 3 m. April—July.

24. Japan, Sagami, the settlement of Fujita, 1 m. April.
25. » » the »*Metacrinus*»-shoal, 400 m. $^{5}/_{5}$.
26. » » the steep, 150 m., sand and clay. $^{5}/_{5}$—$^{6}/_{5}$.
27. » » Sunosaki, 30—60 m., gravel. $^{12}/_{6}$, $^{18}/_{6}$.
28. » » Yokuska Str., 135 m. $^{19}/_{6}$.
29. » » Okinose, 150—600 m. June—July.
30. Bonin Islands, Ogasawara, Port Loyd, diver, coral bottom. $^{23}/_{7}$—$^{27}/_{7}$.
31. » » » NW. from Otojima, 120 m. $^{31}/_{7}$.
32. » » » W. from Port Loyd, 100—110 m., shells and sand. $^{31}/_{7}$.

33. Bonin Islands, Ogasawara, E. from Chichijima, 100—135 m. $^{1}/_{8}$.
34. » » » E. from Channel, 120—150 m., gravel consisting of shell-fragments. $^{1}/_{8}$.
35. Bonin Islands, Ogasawara, Taki-no-ura, diver or 45—60 m. July—August.
36. » » » Kopepe Bay, diver, coral bottom. $^{6}/_{8}$.
37. » » » 2 miles E. from Higashijima, 135 m. $^{7}/_{8}$.
38. » » » ENE. from Anojima, 150 m. $^{15}/_{8}$.

Prof. T. Gislén, 1930.

39. Japan, Sagami, Misaki, shallow water, sand and gravel. June.
40. » » Aburatsubo, 3 m., seaweed. $^{20}/_{6}$.
41. » » Koatsiro, 3 m., stones. $^{25}/_{6}$.
42. » » Moroiso, Ebishima, 5 m., stones. $^{29}/_{6}$.
43. » » Yodomi, 100—135 m., sand. $^{3}/_{6}$.

Locality.

44. Japan, Sagami, Sen-gen-tsuka, 135 m., stones. $^{4}/_{6}$.
45. » » Okinose, 100—450 m., stones. $^{4}/_{6}$.
46. » Amakusa, Tomioka, Ebisubama, above the low water mark, stones. $^{22}/_{9}$.

Various collectors.

47. South China Sea, Hongkong. Collected by Salmin.
48. » » » 40 miles N. from Hongkong. Collected by J. Petersen.
49. China, Chihli, Peitaiho. Collected by Prof. J. G. Andersson in July 1918.
50. Japan, Sagami, Misaki, 300 m. Collected by Dr. S. Bergman 1937.
51. » the harbour of Nagasaki. Unknown collector.
52. » unknown locality. Unknown collector.
53. » Yezo, Hakodate. Collected by Hilgendorf.

Those species of the *Cheilostomata Anasca* which are represented in these collections are to be treated in this survey. They belong to 88 different species of which 29 are described as new. 5 new varieties are proposed. The species are as follows.

		Page.
1.	*Acanthodesia bocki* n. sp.	20
2.	*A. limosa* (Waters)	19
3.	*A. savartii* (Aud.)	19
4.	*Aetea anguina* (L.)	12
5.	*A. boninensis* n. sp.	12
6.	*A. truncata* (Landsb.)	13
7.	*Amastigia rudis* (Busk)	80
8.	*Antropora erecta* n. sp.	44
9.	*Beania cupulariensis* Osburn	98
10.	*B. discodermiae* (Ortm.)	95
11.	» » var. *boninensis* nov.	95
12.	*B. hexaceras* (Ortm.)	94
13.	*B. magellanica* (Busk)	94
14.	*B. mirabilis* Johnst.	98
15.	*B. petiolata* Harmer	97
16.	*B. vegae* n. sp.	97
17.	?*Brettia gisleni* n. sp.	14
18.	*Bugula dentata* (Lamx.)	105
19.	*B. longicauda* Harmer	108
20.	*B. neritina* (L.)	108
21.	*B. pugeti* Rob. var. *kiuschiuensis* nov.	106
22.	*B. pugeti* Rob. var. *umbelliformis* Yanagi & Okada	107
23.	*B. subglobosa* Harmer	105
24.	*Caberea boryi* (Aud.)	81
25.	*C. bursifera* Ortm.	87
26.	*C. hataii* Okada	82
27.	*C. lata* Busk	81
28.	*C. megaceras* Yanagi & Okada	85
29.	*C. sagamiensis* n. sp.	84
30.	*Caleschara levinseni* Harmer	22
31.	*Callopora canui* n. sp.	34
32.	*Camptoplites tubifera* n. sp.	111
33.	*Canda foliifera* Harmer	90
34.	*C. pecten* Thornely	90
35.	*C. pecten* var. *scutata* Harmer	90
36.	*Caulibugula bocki* n. sp.	109
37.	*Cauloramphus costatus* n. sp.	31
38.	*C. japonicus* n. sp.	33
39.	*Cellaria boninensis* Silén	70
40.	*C. punctata* (Busk)	70
41.	*Chaperia acanthina* (Lamx.)	46
42.	*Ch. transversalis* Canu & Bassler	46
43.	*Ch. transversalis* var. *boninensis* nov.	48
44.	*Colletosia radiata* (Moll)	121
45.	*Conopeum reticulum* (L.)	18
46.	*Copidozoum transversum* n. sp.	41
47.	*Crassimarginatella crassimarginata* (Hincks) var. *japonica* Ortm.	23
48.	*C. kumatae* (Okada)	24
49.	*C. spinifera* n. sp.	25
50.	*Crepis longipes* Jullien	69
51.	*Cribralaria curvirostris* n. gen. n. sp.	122
52.	*Cupuladria guineensis* (Busk)	61
53.	*Dendrobeania birostrata* (Yanagi & Okada)	102
54.	*D. japonica* (Ortm.)	103
55.	*Electra tenella* Hincks	18
56.	*Ellisina canui* (Sakakura)	37
57.	*E. latirostris* n. sp.	36

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58.	*Farciminellopsis gracilis* n. gen. n. sp.	92
59.	*Figularia figularis* (JOHNST.) var. *japonica* nov.	115
60.	*F. multipora* (SAKAKURA)	117
61.	?*F. ortmanni* n. sp.	120
62.	»*Flustra*» sp.	56
63.	*Hiantopora intermedia* (KIRKP.)	45
64.	*Membranipora tuberculata* (BOSC)	17
65.	*Microporina articulata* (FABR.)	67
66.	*M. elongata* (HINCKS)	65
67.	*M. okadai* n. sp.	68
68.	*Monoporella nodulifera* (HINCKS)	64
69.	*Nellia oculata* BUSK	49
70.	*Onychocella angulosa* (REUSS)	61
71.	*Pseudolepralia ellisinae* n. gen. n. sp.	39
72.	*Pyrulella boninensis* n. sp.	26
73.	*P. tubulata* HASTINGS var. *triangulata* nov.	28
74.	*Sarsiflustra japonica* SILÉN	55
75.	*Scrupocellaria diadema* BUSK	89
76.	*S. maderensis* BUSK	89
77.	*S. spatulata* (D'ORB.)	89
78.	*Semikinetoskias dubia* n. gen. n. sp.	114
79.	*Siphonoporella aviculifera* n. sp.	62
80.	*Spiralaria incrustans* n. sp.	59
81.	*S. serrata* (MAC GILL.)	57
82.	*S. vegae* n. sp.	59
83.	*Steganoporella magnilabris* BUSK	62
84.	*Synnotum aegyptiacum* (AUD.)	90
85.	*Tegella incrustata* n. sp.	29
86.	*Terminoflustra sagamiensis* (OKADA)	55
87.	*Thalamoporella lioticha* (ORTM.)	64
88.	*Tricellaria dubia* n. sp.	78
89.	*T. longispinosa* (YANAGI & OKADA)	74
90.	*T. occidentalis* (TRASK)	79
91.	*T. sympodia* (YANAGI & OKADA)	76
92.	*T. ziczac* n. sp.	76

This list of species calls for a few zoogeographical remarks.

The following species proposed as new are limited to Japan and its vicinity: 1, 5, 8, (11), 16, 17, (21), 29, 32, 36, 37, 38, 39, (43), 46, 49, 51, 57, 58, (59), 71, 72, (73), 74, 78, 79, 80, 82, 85, 88, 92. Regarding the distribution of their relatives the following from among these species seem to point decidedly southwards: 16, 32, 36, 43, 46, 49, 57, 58, the following ones eastwards: 21, 85.

The following species known before are limited to Japan and its vicinity: 12, (22), 25, 26, 28, (47), 48, 53, 54, 56, 60, 61, 67, 86, 87, 89, 91. Of these species only 53 and 54 point more decidedly north- and eastwards.

It is surprising how numerous are the species common to HARMER's work (1926) dealing with the Cheilostomata Anasca of the Malayan Archipelago. They are 2, 3, 4, 6, 7, 9, 10, 13, 14, 15, 18, 19, 23, 24, 27, 30, 33, 34, (35), 40, 41, 44, 45, 52, 55, 63, 64, 68, 69, 70, 75, 76, 77, 83, 84. Some of these species, however, have a wide distribution, mostly in warm seas. The following species not recorded by HARMER also seem to point southwards: 31, 42, (47), 48, 66, 81.

On the other hand it is surprising how few species there are which point to a connection with the west coast of North America. Including those already pointed out above they are: 21 + 22, 53 + 54, 85, 90.

One northern species is recorded: 65. In northern Japan, however, northern species surely are more common (cf. for instance OKADA 1933), and we must assume that it is the conditions as to the temperature of the sea water which limit their distribution southwards.

Species with a very wide distribution are: 3, 4, 6, 14, 20, 44, 45, (59), 64, 70, 83.

Much more could be said about the details of the relations of the Japanese Bryozoan fauna, but I think these few words will be sufficient to reveal the main features of its composition: a very evident strong southern and a surprisingly small northern and eastern influence. The number of species known from Japan only is great, but from the present position of our knowledge it is difficult to say which of them are really endemic.

The system of the Cheilostomata Anasca.

As is well known the system of the Cheilostomata is still very uncertain and imperfect. We can distinguish natural groups of related species but the relationships of these groups to each other are often difficult to state. It is hardly possible to place with certainty many of the species anywhere in the system. Thus the system is in great need of an adjustment before it can be said to be a natural one. It is very important how that adjustment is made. If it seems evident that a group of species has been placed together with species to which they are not related, some authors seem to think it necessary to place that group immediately in another part of the system, even though they have no reasons at all for placing it exactly in that new position; to bring about a change seems to be all that is required! CANU and BASSLER have done a great deal of work on Bryozoa in the later years, and a great number of new facts have undoubtedly come forward through their work. But they seem to have held this view: the position of a species or a group of species, which has been wrongly placed in the system, must be changed even if there are no facts available to designate its real position. It is my opinion that, owing to this method of handling the system, the authors named, in spite of their great amount of work, have made it worse than it was before. And several bryozoologists seem, unfortunately, to follow their system. BORG (1926) and HARMER (1931) have, however, criticized them severely.

In my opinion the following course is the best one. If the position of a species is evidently wrong we have to see if there are any facts pointing to its real position in the system. If there are such facts all is well; if there are not, we have to draw attention to the facts showing that its position is wrong but to let the species stay in its present position. The system will then be partly an artificial one, but everyone will know at what points it is artificial. Perhaps some other author will later on find facts showing its real position. Thus, as is shown below (p. 71), the divisio *Cellularina* is evidently composed of, at least, two different groups; the real position of these groups is, however, uncertain, and therefore I prefer not to divide that divisio at present.

From this point of view HARMER, in his excellent work on the Siboga-Bryozoa (1926, etc.), seems to have the most reasonable system, and in this work of mine I have built mainly upon his system, making any changes that I have found legitimate and necessary.

The *Membraniporidae* are, in my opinion, undoubtedly the central group of the *Cheilostomata.* Several groups of species which have been developed in different directions can be discerned within the family. Some authors (for instance CANU & BASSLER) have tried to divide Membraniporidae into different families, but their observations seem to have been too superficial and no clarity has been gained by them. HARMER retains it under the name of »Superfamily», which course seems to be the right one until a very thorough and severe revision of almost every species has been made.

From that group many others may easily be derived. Thus the *Flustridae* seem to be closely related to *Membranipora membranacea* and to other species deprived of a gymnocyst as well as of a cryptocyst. The divisio *Cribrimorpha* is intimately connected with *Conopeum* and other species with well developed spines but without a cryptocyst; the difference between *Membraniporella* and some true *Membraniporidae* is very small. The Malacostegan family *Onychocellidae*, the divisio *Coelostega* and the divisio *Pseudostega* may be derived from *Membraniporidae* with an extensively developed cryptocyst, such as *Caleschara.* As to the Malacostegan genus *Cupuladria* and the Coelostegan *Cupularia* I think that almost all the facts point to a close relationship between them; in the eyes of the bryozoologists, the development of the cryptocyst in *Cupularia* has become of too great an importance; it may probably be a rather accidental structure. The divisio *Cellularina* is certainly derived from Membraniporid or Flustrid forms, but the direct connection is not quite clear in this case. Then there are one or two groups, referred to the *Cheilostomata Anasca*, the position of which is very vague. The relationship of the members of the divisio *Inovicellata* to other *Anasca* as well as all other *Bryozoa* is certainly very distant. The genus *Scruparia* is generally referred to *Malacostega*. It has, however, many characteristic features among which I think the following, hitherto overlooked, one very important: it is the one member of the *Cheilostomata* in which a frontal budding of autozoids has been observed. A frontal budding of avicularia is very common in the *Cheilostomata*, and it can be derived from the budding of autozoids (SILÉN 1938, p. 316, etc.). Thus the frontal budding of autozoids is a primitive feature, and owing to that and other characteristic features in the structure of the zoid and the zoarium I propose the new divisio *Scrupariina* to *Scruparia*.

CANU & BASSLER (1929) refer the divisio *Cribrimorpha* to *Cheilostomata Ascophora*. It is true that several members of that divisio actually have an ascus. But from that fact it is not necessary to draw CANU & BASSLER's conclusion and refer it to the *Ascophora*. The *Cribrimorpha* stand, as already mentioned, in intimate connection with some *Membraniporidae*, and their close relationship with those is beyond doubt. They possess a hard frontal wall through the uniting of spines. The development of this hard frontal wall makes it necessary for an ascus to be formed; otherwise the polypide could not be protruded. Then the formation of an ascus takes place as a necessity to the functions of the animal In my opinion the presence or absence of an ascus has been very much exaggerated in its importance as a systematic factor. If we imagine that the hard frontal wall common to all *Ascophora* may have been developed in different ways within different groups, and the different types of frontal walls that we find in the *Ascophora* speak in favour of it being so, it follows that these different groups have got their hard frontal walls independently of each other; and since the formation of the ascus depends upon the development of a hard frontal wall, asci have been developed at different points in the system independently of each other. When the ascus has lost so much of its systematic value, what happens to the division of the *Cheilostomata* into *Anasca* and *Ascophora?* Ascophora can not be regarded as a natural group of related species, standing apart from the Anasca. It is a collection of groups which are entirely unlike one another and have no intimate relations with one another, a conclusion which, I think, will not surprise anybody who has studied that group. A close study will perhaps reveal that at least several of those groups may be derived, directly or indirectly, from the *Membraniporidae*. In the meantime, however, the groups *Anasca* and *Ascophora* must be retained for the maintenance of a practicable system.

As seen in the above I do not look upon the problem of the arrangement of the groups of the *Anasca* as a linear but as a spherical one. In other words, the different groups can not be placed in a row, the subsequent group deriving from the preceding one. The *Membraniporidae* form a centre and from that centre the other groups radiate in different directions, some of them directly from the *Membraniporidae*, others indirectly, from the more closely related ones. Thus *Membraniporidae* ought to be placed as the first group in the system. Nevertheless I place the divisio *Inovicellata* first for the sake of tradition, and after it the new divisio *Scrupariina*, its mode of budding showing its primitive position. Moreover, these two divisions have, as noted, no clear relationship to *Membraniporidae* and in this way they are put on one side so that they might not disturb the »Membraniporid system».

The arrangement of the Anascan divisions will be as follows. (For definitions and other details concerning the following divisions see HARMER 1926).

Divisio 1. *Inovicellata*. The *Aetea*-species have no close affinities to any other *Anasca* and must at present be put aside.

Divisio 2. *Scrupariina*. HARMER (1926, p. 197) proposes the family *Scrupariidae*, including the genera *Scruparia*, *Eucratea* and *Brettia*, and refers it to the divisio *Malacostega*. His definition of the family is: »The Scrupariidae are a Family of doubtful affinities, but I am inclined to place them among the more primitive Cheilostomes, — — —. The Family is characterised by the erect, frequently uniserial habit of its members, by the tendency of the zooecia to have a tubular form (perhaps a primitive feature), and by the correlated restriction of the opesia to a part of the frontal surface. The proximal ends of the zooecia are simple, not equitant as in most of the Bicellariellidae. Hyperstomial ovicells occur in some species, but there is no evidence that avicularia have been evolved in the Family as I understand it». Thus the primitive features of the members of this family, according to HARMER, necessarily place them at the beginning of the Anascan system. Here he is certainly right, but later he hesitates when making his final decision and places it among the *Malacostega*, to the members of which it undoubtedly has no close relationship. Already from the facts mentioned it is evident that it has an independent position. And in *Scruparia chelata* we see another peculiar feature which has been overlooked: the frontal budding of autozoids, a mode of budding which does not occur in other *Anasca*. This feature is decidedly primitive, as already pointed out (p. 8; Silén 1938, p. 316), and is, in my opinion, of great importance. I do not hesitate then to propose the new divisio *Scrupariina* for the sake of *Scruparia*. *Brettia* seems to be allied to *Scruparia* and is included in that division. The affinities of *Eucratea* seem to me to be doubtful, perhaps it has nothing to do with *Scruparia*.

Divisio 3. *Malacostega*. As mentioned above *Malacostega* is the central group of the *Anasca* from which the following divisions derive. Most of them are enclosed in the family *Membraniporidae*, some species, however, have been enclosed in smaller families, *Flustridae*, *Onychocellidae*, etc. But it is evident that within the *Membraniporidae* different types can be discerned which differ from each other at least as much as *Flustridae* differs from them. To bring order to the mass of Membraniporid species is, however, a very difficult task, which can not be done without very detailed study. And it will always be precarious to draw the lines between the different families into which the *Membraniporidae* are to be divided. They emanate from the same point in different directions and the more primitive species of the different series must be very similar. We find in *Flustridae* some species which are hardly discernable from primitive *Membraniporidae* (cf., for instance, »*Carbasea*» *serrulata*, *Membranipora membranacea*, etc.). Thus the development has already gone different ways within the *Malacostega*, and following those directions we arrive at the following divisions.

Divisio 4. *Coelostega*. This divisio is a natural and well defined group of species. When we look for its ancestors the fact that Canu & Bassler (1929, p. 123) place the Malacostegan family *Onychocellidae* in the *Coelostega* is significant. From these, or similar Malacostegan forms with an extensively developed cryptocyst the *Coelostega* must derive. Where the borderline between the two divisions is to be drawn is a difficult question; here I follow Harmer's direction referring *Onychocellidae* to the *Malacostega*. Doubtlessly, however, the *Onychocellidae* have performed rather a long way from the more primitive *Malacostega*. As the first beginning of the developmental line here discussed I think we must consider *Caleschara* and the like within *Membraniporidae*. It seems to be significant that Jullien refers to *Onychocella* a new species, which doubtlessly belongs to *Ellisina* (cf. below, p. 37): and that Canu & Bassler propose the new species *Onychocella* (?) *inarmata* which certainly belongs to *Caleschara* (cf. below, p. 22).

Divisio 5. *Pseudostega*. The members of this divisio have acquired their characteristics from a further development along the same line as the *Coelostega;* or naturally it is possible that they have gone another but analogous way, but there are no facts directly pointing to this last possibility.

Divisio 6. *Cellularina*. A detailed discussion of this divisio is given below (p. 71), and from that it is evident that this divisio is composed of at least two entirely different groups, represented by *Scrupocellariidae* and *Bicellariellidae* respectively. Those groups have no close affinities to each other and must have arrived at their present stage of development in different ways. Nevertheless I propose that this divisio is retained at present for the sake of conveniance. It is impossible to name exactly the ancestors of the two groups, though they no doubt are to be found in the *Malacostega*, and thus their real position can not be stated. *Farciminariidae* has a particular position, at which we are only able to make guesses. Can it be, that it represents a more primitive stage of development lying between, for instance, *Scrupocellariidae* and *Flustridae?*

Divisio 7. *Cribrimorpha*. As already pointed out above, the members of this divisio are very close to some *Malacostega* with well developed spines (cf. Levinsen 1909, p. 158). It is significant that Jullien, who proposed this divisio, referred two new species to the genus *Membraniporella* which no doubt belong to *Spiralaria* (cf. below, p. 59). *Cribrimorpha* has got its main characteristics by the uniting of the spines along the margin of the aperture field to a hard shield. And the formation of that shield has necessitated the formation of an ascus to make the movements of the polypide possible. Thus the *Cribrimorpha* show the way in which the *Ascophora* have emanated from the *Anasca*. Some *Ascophora* certainly have developed in the same way as the *Cribrimorpha*, or have perhaps even developed from that group. But certainly many *Ascophora* must have developed differently as is shown by the peculiar, but imperfectly known, structure of their hard frontal walls (cf. Canu & Bassler 1920). The Membraniporid *Hianthopora intermedia* (p. 45) seems to me to suggest such a different development: one single spine is enormously developed and branching, and covers almost the entire front, its branches uniting with each other.

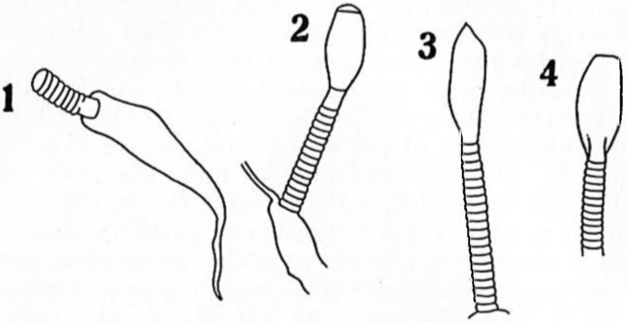
Divisio 1. *Inovicellata.*

Fam. Aeteidae Smitt.

Aetea Lamx.

1. Ae. anguina (L.).

Sertularia anguina, Linné 1758, p. 816; *Aetea anguina*, Lamouroux 1812, p. 184; Friedl 1918, p. 230 (references); Marcus 1921 b, p. 114, text-fig. 15; Prenant & Teissier 1924, p. 13; Harmer 1926, p. 194, Pl. 13 figs. 3—4 (Japan; references); C. H. & E. O'Donoghue 1926, p. 39; Calvet 1928, p. 5; Okada 1929, p. 16, text-fig. 4 (Japan); Hastings 1932, p. 408; Marcus 1938 b, p. 199 (references).



Figs. 1—4. *Aetea boninensis* n. sp. 44 ×.

Fig. 1: The proximal repent part of the zoid. — Fig. 2: The distal erect part of the zoid in frontal, Fig. 3: in lateral, Fig. 4: in basal view.

Localities: South China Sea (6), Japan (29, 44), Bonin Islands (33, 34, 35, 37); 45—600 m.; on algae and hydroids.

2. Ae. boninensis n. sp. (figs. 1—4).

Locality: Bonin Islands (33 [type]); 100—110 m.; on a hydroid.

The proximal part of the zoid is repent (fig. 1). Proximally it is very narrow, then it becomes broader and at the broadest part it passes, almost at right angles, into the free erect distal part. This part, the peristome (figs. 2—4), is straight. Its proximal part ($^2/_3$ of the peristome) is narrow and contracted at the upper end; then it passes into the distinctly confined distal part where the aperture is placed. This is broad, spadeformed; the distal end is square. The attached proximal part and the distal part of the peristome are even. The proximal part of the peristome is undulated, each undulation having a breadth of about 0.02 mm. The entire zoid is of a translucent whitish colour.

This species can be placed in the *Ae. anguina*-group: the peristome is long and narrow; it is distinctly defined from the distal part which is spadeformed. The species can be distinguished from the other of the group by the following facts: the peristome is entirely straight; it is contracted instead of dilated at the border between the proximal part and the distal part and thereby the latter is very sharply defined; and, more especially, the annulation of the peristome is peculiar. The annulation that we find in *Ae. anguina* is very different from this and, figured in the same scale as figs. 1—4, one would only see it as a very narrow streakiness.

3. Ae. truncata (Landsb.).

Anguinaria truncata, Landsborough 1852, p. 288, Pl. 16 fig. 57; *Aetea truncata*, Smitt 1863, p. 19; Osburn 1914, p. 186 (references); Friedl 1918, p. 230; Prenant & Teissier 1924, p. 12; Canu & Bassler 1925, p. 17; Harmer 1926, p. 196, Pl. 13 figs. 5—7 (references); Calvet 1927 b, p. 7; Hastings 1932, p. 408; Sakakura 1935 a, p. 6 (Japan, pleistocene); Sakakura 1935 b, p. 106 (Japan); Silén 1935, p. 2; Okada & Mawatari 1938, p. 448 (Japan); Marcus 1938 a, p. 11, Pl. 1. fig. 4 (references).

Locality: Japan (21); 85—90 m.; on a hydroid.

Divisio 2. *Scrupariina.*

Fam. Scrupariidae Harmer.

As shown by Harmer (1923, pp. 307, 310, 316; 1926, p. 197) *Eucratea chelata* auctt. must be called *Scruparia chelata*. Thus the name of the family, of which this species is the type, must be *Scrupariidae* instead of *Eucrateidae* auctt. This family encloses, according to Harmer, the genera *Scruparia* and *Brettia;* he does not mention the genus *Eucratea* (*Gemellaria* auctt.).

Canu & Bassler (1929, p. 57) pay no regard to Harmer's investigation. They place the three genera mentioned above in two different families: *Eucrateidae* enclosing the genus *Scruparia* (*Eucratea* auctt., called *Eucratea* by Canu & Bassler), and *Gemellariidae* enclosing the genera *Eucratea* (*Gemellaria* auctt., called *Gemellaria* by Canu & Bassler) and *Brettia*. As shown by Harmer the firstnamed family must be called *Scrupariidae* and the genus *Gemellaria* auctt. *Eucratea*. Thus the family *Gemellariidae* must be named *Eucrateidae*.

But, disregarding Canu & Bassler's nomenclature, it seems to me that they are right on one point: *Scruparia* and *Eucratea* show such differences in all features that they at least must be placed in different families. I think it is very uncertain if *Eucratea* has any closer relation to *Scruparia*, perhaps it ought to be placed in quite another position in the system. But *Brettia* shows so great a similarity to *Scruparia* that HARMER ought to be followed thus placing it in *Scrupariidae*.

Brettia DYSTER.

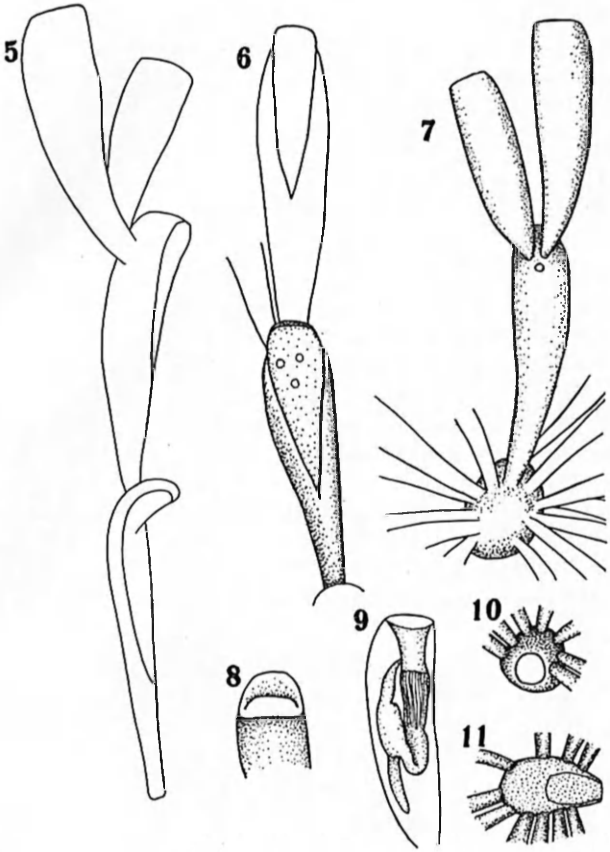
In the collection treated here there are numerous zoaria of *Brettia ijimai* OKADA (1921, p. 25, textfig. 4; OKADA & MAWATARI 1935, p. 129). It is evident that this species does not belong to *Brettia* but to *Halysisis* NORMAN (1909, p. 296) of the family *Catenariidae*.

?**B. gisleni** n. sp. (figs. 5—11).

Locality: Japan (39); shallow water; 3 zoaria growing around the mouth of a sea urchin (*Clypeaster japonicus* DÖDERL.).

The zoaria are delicate, tuft-shaped. The ancestrula is oval, one end is a little pointed, the other rounded. It rests with its flattened basal side upon the substratum. Its frontal side is convex. At its pointed end there is a large opening. A great number (10—15) of autozoids emanate from the ancestrula. Their starting-points lie in a circle around the frontal centre of the ancestrula. The autozoid is long and slender. It has the shape of a tube which widens towards its distal end. On its front there is a distinct aperture field; it is pointed proximally, gets broader distally and reaches the distal margin of the zoid. The other parts of the walls are calcified and smooth. They are of a yellow colour, but it is possible that that colour is not the original one but that it has come from the sea urchin. The aperture is situated at the distal end of the zoid. I have not been able to discern a true operculum. The aperture is enclosed by two lips; when closed, it appears as a semicircular slit, when open, it is circular. The polypide is clearly seen through the transparent zoid walls. It does not show any peculiar features. There are no spines, avicularia, ooecia or other appendages. — The old basal zoids have no polypides. Their fronts are sunken, the other walls are more strongly calcified than those of the young zoids.

The autozoid gives rise to 2 or 3 daughter zoids, one or two of which are often detached; the position of a detached zoid is indicated by a circular mark. The daughter zoids emanate from the distal part of the basal side of the mother zoid. When two, their starting-points lie in the median line of the mother zoid; when three, they are placed in a triangle,



Figs. 5—11. ?*Brettia gisleni* n. sp. 45 ×, fig. 8 70 ×.

Fig. 5: Zoids in lateral view; the proximal one deprived of the polypide. — Fig. 6: Zoids in frontal view. — Fig. 7: Zoids emanating from the ancestrula; the branch consisting of three zoids in basal view; on the back of the proximal zoid a mark of a third daughter zoid is seen. — Fig. 8: The aperture. — Fig. 9: Polypide in lateral view. — Fig. 10: Ancestrula seen from its pointed end. — Fig. 11: Ancestrula in basal view.

two lying distally in each side of the median line of the mother zoid, one lying proximally in that median line.

This species is a very peculiar one regarding its substratum as well as its structure. The ancestrula, and the way in which the zoarium arises from it, is unusual. The aperture is closed by two lips as in certain *Ctenostomata*, but I have not been able to observe a collare; in connection with this it is interesting to note that it has an aperture field. There are no appendages which can be of any assistance when settling the systematical position of the species. Frankly I am at a loss where to place it, and to place it in *Brettia*, to which it has a superficial similarity, is an entirely provisory measure.

Divisio 3. ***Malacostega.***

Fam. **Membraniporidae** Busk.

Harmer (1926, p. 198) uses the word »Superfam.» about this family and expresses in that way the fact that this family is an agglomeration of many groups of species so different from one another that they ought to be referred to different families. And the *Membraniporidae* have been divided into more families by some authors, especially Canu & Bassler. But these families have often been proposed on very vague and insignificant grounds. No general and careful revision of the different types of the family has yet been made and thus it seems best to retain the family *Membraniporidae* for the present until a minute investigation of its different groups has been carried out.

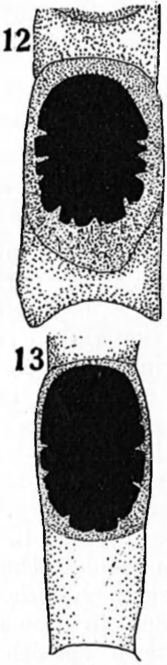
1. **Membranipora** de Blainville.

The most important data are:
Membranipora, de Blainville 1830, p. 411; *Nichtina*, Canu 1900, p. 380; *Membranipora*, Levinsen 1909, p. 144; *Membranipora* Canu & Bassler 1920, p. 77; *Nichtina*, Harmer 1926, p. 208; *Nitscheina*, Canu & Bassler 1929, p. 80; *Membranipora*, Borg 1931, pp. 5—6.

In the genus *Membranipora* most *Membraniporidae* were ranged at first. By and by most species were placed in new genera, whilst in *Membranipora* only *M. membranacea* (L.) and related species as well as »Membraniporae insertae sedis» were retained. Canu (l. c.) proposed the name *Nichtina* (according to Canu & Bassler 1929, p. 80, misprint for *Nitscheina*) for the *M. membranacea*-group and kept the name *Membranipora* for »Membraniporae insertae sedis». In this Harmer followed him. But Borg (l. c.) shows that this course was wrong. If the *M. membranacea*-group and »Membraniporae insertae sedis» are to be divided into different genera the genus *Membranipora*, which was proposed with *M. membranacea* as the type, has to be kept for the *M. membranacea*-group and for the »Membraniporae insertae sedis» a new genus must be proposed. In fact exactly this method was already used by Levinsen (1909, p. 145), when he proposed the name *Membrani-*

porina for »Membraniporae insertae sedis». Thus the name *Nichtina* (*Nitscheina*), nowadays unfortunately becoming more and more used, seems to me to be superfluous as well as wrong.

Type: *Flustra membranacea* LINNÉ 1767, p. 1301 (*Membranipora membranacea* auctt.; synonym: *Flustra telacea* LAMARCK 1816, p. 158; cf. HARMER l. c., CANU & BASSLER 1929, l. c., BORG op. cit., p. 4).



Figs. 12—13. *Membranipora tuberculata* (BOSC) (loc. 13). 93 ×.
Fig. 12: Zoid with two proximal tubercles. — Fig. 13: Zoid with the proximal tubercles fused together.

Fig. 14. *Electra tenella* (HINCKS) (loc. 22). 93 ×.
Zoid in frontal view.

M. tuberculata (Bosc) (figs. 12—13; Pl. 1 fig. 1).

Flustra tuberculata, BOSC 1802, p. 118 (pars); *Membranipora tuberculata*, BUSK 1858, p. 126, Pl. 18 fig. 4; *Amphiblestrum bituberculatum*, ORTMANN 1890, p. 29, Pl. 1 fig. 25 (Japan); *Nichtina tuberculata*, HARMER 1926, p. 208, Pl. 13 fig. 10 (references); HASTINGS 1930, p. 706, Pl. 3 figs. 9—10; OKADA 1934, p. 3, Pl. 1 fig. 1 (Japan); SAKAKURA 1935 b, p. 107 (Japan); OKADA & MAWATARI 1938, p. 449 (Japan); *Nitscheina tuberculata*, CALVET 1931, p. 50 (references).

Localities: South China Sea (47), Japan (13); no depth known; encrusting a shell and an alga.

Spines, all simple, project from the cryptocyst under the frontal membrane (cf. HARMER op. cit., p. 209). The proximal tubercles are very strong in the zoarium from loc. 13. Their distal sides are concave, their proximal sides convex. In old and strongly calcified zoids the two tubercles fuse and form one solid body.

2. Electra LEVINSEN.

E. tenella (HINCKS) (fig. 14).

Membranipora tenella, HINCKS 1880 d, p. 376, Pl. 16 fig. 7; *Electra angulata*, LEVINSEN 1909, p. 149, Pl. 22 fig. 4 a; HARMER 1926, p. 207, Pl. 13 fig. 11; OKADA & MAWATARI 1938, p. 449 (Japan).

Localities: Japan (22, 52); above the low water mark; encrusting a log and zoaria of *Bugula neritina* (L.).

The present specimens are no doubt to be indentified with the specimens of LEVINSEN and HARMER with which they correspond on every point. But this *E. angulata* agrees very well with *Membranipora tenella* HINCKS, and in my opinion they are identical. Only one separating character may possibly be seen, and this only from HINCKS's fig.: the absence of spines in *M. tenella*. But according to LEVINSEN the occurrence of spines varies a great deal in *E. angulata*, and in the present Japanese specimens the spines are absent in large parts of the zoaria, especially in their periphery. In HINCKS's fig. it looks as if the zoids figured were placed in the periphery of a zoarium. Besides we must consider the well known, strong variation regarding the spines in *E. pilosa* (L.); consequently such a variation may occur in one and the same species. On all other points the two species described as different agree entirely with each other. — WATERS (1898. p. 665) places *M. tenella* in his »*Membranipora pilosa*-group», and in this CANU & BASSLER (1920, p. 77) follow him. But in HARMER's (l. c.) list of the known *Electra*-species it is omitted, and this oversight of the species possibly explains HARMER's failure to observe that *E. angulata* is identical with it.

3. Conopeum GRAY.

C. reticulum (L.).

Millepora reticulum, LINNÉ 1767, p. 1284; *Conopeum reticulum*, GRAY 1848, p. 108; HARMER 1926, p. 211, Pl. 13 fig. 12 (references); MARCUS 1938 a, p. 13, Pl. 2 figs 5 a and b (references); *Membranipora reticulum*, MARCUS 1922 a, p. 426 (Japan); HENTSCHEL 1922, p. 4; BORG 1931, p. 29.

Occurrence: China (49), Japan (2); 0—7 m.; encrusting a shell and a stone.

4. Acanthodesia Canu & Bassler.

1. A. savartii (Aud.).

Flustra savartii, Audouin 1826, p. 240, Savigny Pl. 10 figs. 10^1—10^2; *Acanthodesia savartii,* Canu & Bassler 1919, p. 79; Harmer 1926, p. 213, Pl. 13 figs. 8, 13—14, 16 (references); Hastings 1932, p. 411 (references); Okada & Mawatari 1938, p. 448 (Japan); *Membranipora crenulata,* Okada 1923, p. 224, fig. 24 (Straits of Corea).

Localities: China (49), Japan (20, 46), Bonin Islands (33); 0—135 m.

The zoaria from loc. 49 are Escharan, from loc. 20 encrusting, from loc. 46 encrusting and Escharan, from loc. 33 encrusting and Vincularian. — The proximal denticle is prominent in all specimens; in those from loc. 33 it is broad and is distally split into more teeth.

2. A. limosa (Waters) (Pl. 1 fig. 3, Pl. 2 fig. 4).

Membranipora limosa, Waters 1909, p. 140, Pl. 12 figs. 1—5; Levinsen 1909, p. 145, Pl. 22 figs. 5 a—5 c (Formosa Str., Nagasaki); *Acanthadesia limosa,* Canu & Bassler 1919, p. 79; Harmer 1926, p. 217, Pl. 13 fig. 17 (references).

Locality: Formosa Str. (9); 80 m.

One large bushy zoarium. The branches anastomose with each other as described by Harmer (op. cit., p. 219) in *A. nelliiformis* with the exception that the joint, which is formed by the distal end of a branch, when it fuses with another, is naturally of the imperfect type characteristic to *A. limosa* (Harmer op. cit., p. 217).

The bifurcation of the zoarium has not been described before in its details. It takes place as follows. If we regard a bifurcation from one side (Pl. 2 fig. 4) we get this picture. The zoarium is quadrangular and the zoids are ranged in four rows around the main axis, and we now see two of these rows. The one row of the main branch runs undivided into the one daughter branch. The other row divides into two; the outer one runs undivided into the other daughter branch; the inner one divides into two, each of which runs into one of the daughter branches and forms their inner rows. Following Harmer (1923, pp. 322 ff.) we may express it thus: D is derived from B, E and C are derived from E; the zoidrows emanating from D, C, F and G extend undivided to the next bifurcation. If we now turn the zoarium, we perceive the same picture but as seen in a mirror. Thus: two zoid rows placed diagonally to each other in the main branch are the A-rows of the two sides, and these rows bifurcate; the two other rows are the B-rows of the two sides, and these rows extend undivided to the next bifurcation of the zoarium, where they appear as A-rows. — As seen from the fig. F and G are not separated proximally but have a common lumen; this phenomenon is also found in other Anasca, for instance *Levinsenella magna* (Busk) (cf. Kluge 1914, Pl. 28 fig. 8).

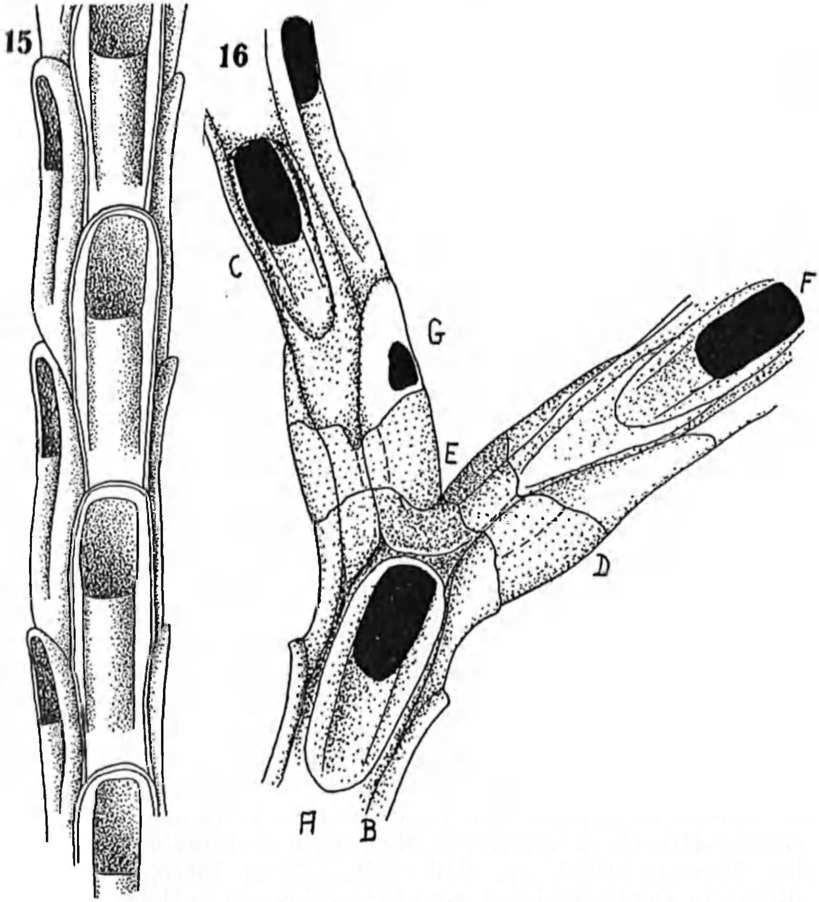
But the bifurcations do not always take place as described above. On one side the A-row may already be divided below the bifurcation of the zoarium into two rows, which extend undivided to the point of the bifurcation where the E-row divides. On the other side the A-row may divide exactly at the point of the bifurcation; in this case F and G are not at all separated from E but represented only by two protuberances on E. Thus the structure of the bifurcations in *A. limosa* is not identical in all cases but varies a great deal. This points to the erect zoarium of this species being at a »young» stage, a supposition which is confirmed by an examination of the related *A. savartii*, which is developing from the encrusting towards the erect stage and exhibits many transitional forms (cf. above, p. 19, and Harmer 1926, p. 215).

A. virgata Canu & Bassler seems to have a similar structure of the zoarium (Canu & Bassler 1929, Pl. 2 figs. 2 and 5).

3. A. bocki n. sp. (figs. 15—16; Pl. 1 fig. 2).

Localities: Japan (17 [type], 29); 135—300 m; many detached zoaria.

The zoarium is erect and composed of long, slender, straight, quadrangular branches. The zoids are ranged in four rows, one along each side of the zoarium. At intervals the zoarium bifurcates as follows. Regard the zoarium in fig. 16 and call the proximal zoid, turned towards us, A, and the zoid to the right of it, B. From the distal right corner of A the zoid C derives. Distally to A and derived from that zoid proximally to the joint, the proximal part of a zoid is to be seen, which directly from this proximal part is divided into two zoids, named G and F, each of which enters into one of the two daughter branches. In *A. limosa* we saw that in certain cases the zoid E was represented by a room, corresponding to the proximal part of a zoid, and this room divided directly into F and G. Thus we may say that in *A. bocki* the proximal part of a zoid, which is derived from the distal end of A, is E, which is directly divided into F and G.



Figs. 15—16. *Acanthodesia bocki* n. sp. (loc. 29). 60 ×.
Fig. 15: Part of a branch of a zoarium. — Fig. 16: The bifurcation of the zoarium.

The B-row enters undivided into the same branch as F. If we turn the zoarium, we get the same picture but seen as if in a mirror; the zoids C and G of this side thus enter the same branch as the zoids B and F of the first side.

The daughter branches are jointed at their bases. In D and G the central part of each zoid is transformed into a chitinous tube and the aperture field is only represented by a small, irregular opening, distally to the tube. . F and C have their proximal parts transformed into chitinous tubes.

If we compare the present zoarium with that of *A. limosa*, it is evident that the bifurcation method of the first one is, so to speak, a specialisation of one of the three different cases in *A. limosa* (p. 20), namely the last. In *A. bocki* the method of bifurcation never varies, and the branches are jointed at their bases. These facts seem to show that *A. bocki* stands in the same developmental series regarding the structure of the zoarium as *A. limosa* but at a greater distance from the starting point, the encrusting zoarium.

The zoids are drawn out, slender, rectangular, and on all sides of the zoarium they are of the same form and size. The aperture field is rectangular, proximally $^2/_3$ of it is covered by a cryptocyst. It is bordered by a narrow, elevated margin. The cryptocyst is of a glistening white and is granulated.

In spite of the great number of zoaria I have not been able to find any avicularia.

Ooecia are absent.

CANU & BASSLER (1928, p. 17, Pl. 2 figs. 1—3) describe as new the species *Quadricellaria caraibica* from the Gulf of Mexico, which resembles *A. bocki* very much. Indeed there seems to be only one point in which the two species differ. CANU & BASSLER say, that in their specimens the zoids of two opposite rows of the zoarium are more narrow than the zoids of the two other rows, and owing to this they refer their species to the genus *Quadricellaria* of D'ORBIGNY (1850, pp. 32, 184; 1860, Pls. 652, 679). It must, however, be remarked that this statement is not confirmed by their figs. Nevertheless I hesitate to identify the two species.

The species described above is to be referred to the group of species in *Acanthodesia* provided with chitinous joints: *A. simplex* (BUSK), *A. nelliformis* HARMER and *A. arctata* HARMER (cf. HARMER 1926, pp. 218—220). From these species it differs in the general features of the zoids and in the seemingly constant absence of avicularia.

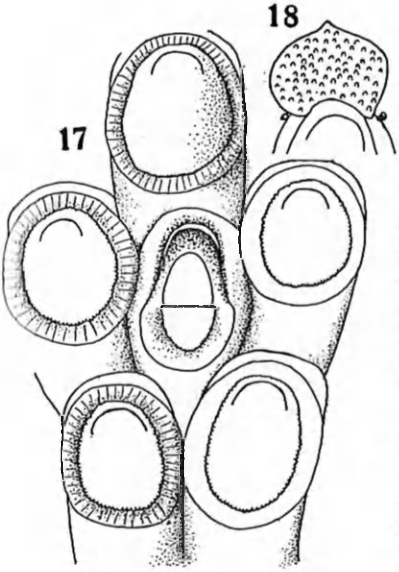
5. **Caleschara** MACGILLIVRAY.

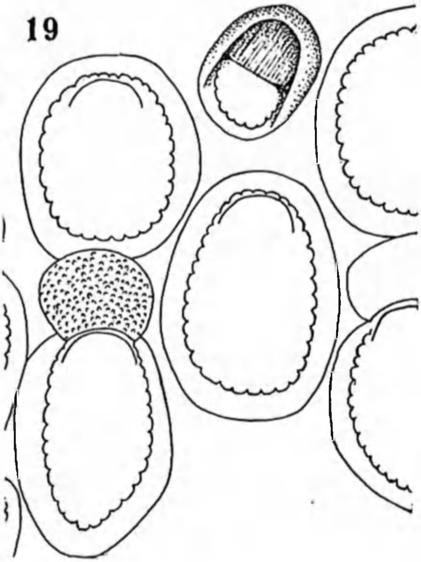
Onychocella (?) *inarmata* CANU & BASSLER (1929, p. 125, Pl. 12 figs. 9—10) is certainly to be added to the species, which HARMER (1926, p. 222) refers to this genus. The structure of the zoid in general and particularly the structure of the ooecium are significant features.

C. levinseni HARMER.

Caleschara levinseni, HARMER 1926, p. 221, Pl. 14 fig. 1 (Japan).

Locality: Japan (29); 600 m.; encrusting.





Figs. 17—18. *Crassimarginatella crassimarginata* var. *japonica* Ortm. (loc. 29). 60 ×.
Fig. 17: Zoids and an avicularium. — Fig. 18: Ooecium.

Fig. 19. *Crassimarginatella kumatae* (Okada). (loc. 33). 60 ×.
Zoids, one of them provided with an ooecium, and avicularium.

The structure of the zoids agrees entirely with Harmer's description. The present specimen especially agrees closely with the specimens obtained by Harmer from Japan and from the Seychelle Is.: frontally the proximal ends of the zoids are often furnished with one and sometimes two strong tubercles. Ooecia are absent.

6. Crassimarginatella Canu.

In the definition of this genus (cf. Harmer 1926, p. 222) the character: »Spines wanting or vestigial» is to be modified thus: »Spines wanting, vestigial, or well developed» (cf. below p. 26).

1. C. crassimarginata (Hincks) var. japonica Ortm. (figs. 17—18).

Membranipora crassimarginata var. *japonica*, Ortmann 1890, p. 28, Pl. 2 fig. 3 (Japan); Marcus 1921 b, p. 97, figs. 2 a—2 d; cf. Silén 1938, p. 271, text-figs. 37—38.

Localities: Japan (20, 29); 40—600 m.; encrusting sponges and hydroids.

The present specimens agree closely with those of ORTMANN. The length of zoid is not so great, compared with the specimens of *C. kumatae* described below; it is only about $^3/_4$ of the latter. The aperture field is nearly circular. Proximally a gymnocyst is rather well developed. In the median axis of the zoid, proximally to the aperture field, a short, slender, pointed spine, or at least the mark of it is found (cf. HINCKS 1880 b, p. 71, in the original description of the main species).

The avicularia are common; they are rather large and, as a rule, placed at the bifurcations of zoid rows as the lateral one of the daughter zoids (SILÉN l. c.), and thus they are to be ranged in group 1 of the vicarious avicularia, proposed in an earlier work of mine (SILÉN 1938, pp. 288, 308). The rostrum is, as already mentioned by ORTMANN, narrower than the proximal part of the avicularium and much longer than it. It is elevated and its margin is divided into small teeth. The mandible moves around two strong, pointed condyles.

Ooecia were found only in the specimens from loc. 29. They are of medium size, broader than their length and frontally-distally they are drawn out into a conspicuous point in the median axis. They are of a glistening white and granulated. In zoids with ooecia there is, proximally to the ooecium, a short, straight, blunt spine on each side; it has not been found in any other zoids.

MARCUS's figs. show avicularia with an evenly rounded rostrum, almost as broad as the proximal part of the avicularium. Thus it is not certain whether his specimens may really be referred to the present variety. On the other hand they have a great resemblance to *C. kumatae* (cf. below). The position in the zoarium of the avicularia is not to be found from his figs., otherwise it would be easier to decide on this point.

The structure of the avicularium and of the ooecium distinguishes this variety from the main species.

2. C. kumatae (OKADA) (fig. 19).

Membraaipora (misprint for *Membranipora*) *kumatae*, OKADA 1923, p. 223, figs. 19, 20 (Straits of Corea); *Crassimarginatella kumatae*, HARMER 1926, p. 224; cf. SILÉN 1938, p. 271, text-figs. 34—36.

Localities: Japan (16), Bonin Islands (33, 35); diver — 300 m.; encrusting shells and lumps of lime-stone.

The present specimens agree in every point with OKADA's short description. The zoids are of the usual *Crassimarginatella*-type. They are oval and rather large. A gymnocyst is just seen. Two distal and one proximal spine are often present; they are short and straight.

The avicularia are common. They are usually placed at the bifurcations of the zoid rows as the terminal one of the daughter zoids and are thus to be referred to group 2 of the vicarious avicularia (SILÉN 1938, pp. 288, 308). In this respect they differ from other avicularia described in *Crassimarginatella*. Their length is about $^1/_2$ of a zoid length. The rostrum is short and broad. The mandible moves around two straight, pointed condyles.

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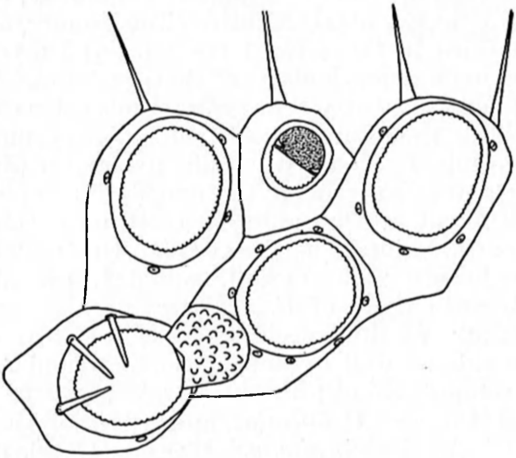


Fig. 20. *Crassimarginatella spinifera* n. sp.
Zoids, one of them provided with an ooecium, and an avicularium. 44×.

The ooecia are of the form and size described by OKADA. They are glistening white and granulated and are frontally-distally drawn out a little, though not so much as the ooecia in *C. crassimarginata* var. *japonica*.

The characteristic features of this species are, besides the general structure of the autozoids, the structure, the size and the position of the avicularia.

3. **C. spinifera** n. sp. (fig. 20).

Locality: Japan (14 [type]); 200 m.; encrusting a shell.

In their morphology the zoids agree closely with those of other *Crassimarginatella*-species. They are of medium size and of a somewhat irregular, drawn out form, and they are clearly distinguished from one another. The oval aperture field occupies the greater part of the frontal side. A narrow, granulated cryptocyst extends under the frontal membrane. In this species the gymnocyst is more extensive than is usual in the genus. Proximally it is especially broad, and then it becomes narrower along the lateral sides of the zoid. A few, usually 4—6, spines are situated around the aperture field. They are rather long and pointed, and bending in over the aperture field reach to its centre. In most zoids they are detached, their positions are then marked by tubercles.

Vicarious avicularia are present. At first glance they seem to resemble those of *C. kumatae* closely. Their sizes and the morphology of the aperture field with the mandible, the rostrum and the cryptocyst, are nearly identical. The gymnocyst, however, is more extensive in the present species. And a very marked difference between the avicularia of this species and those of *C. kumatae* is that the former are always placed as the lateral daughter zoid at the bifurcations of the zoid rows, and thus they belong to group 1 of the vicarious avicularia (SILÉN 1938, pp. 288, 308); the position of the avicularium of *C. kumatae* was quite different. — One autozoid (with an ooecium), regenerated as an avicularium, was observed (cf. SILÉN 1938, p. 271).

The ooecia are rather small, rounded, granulated, and agree closely with those of *C. kumatae*.

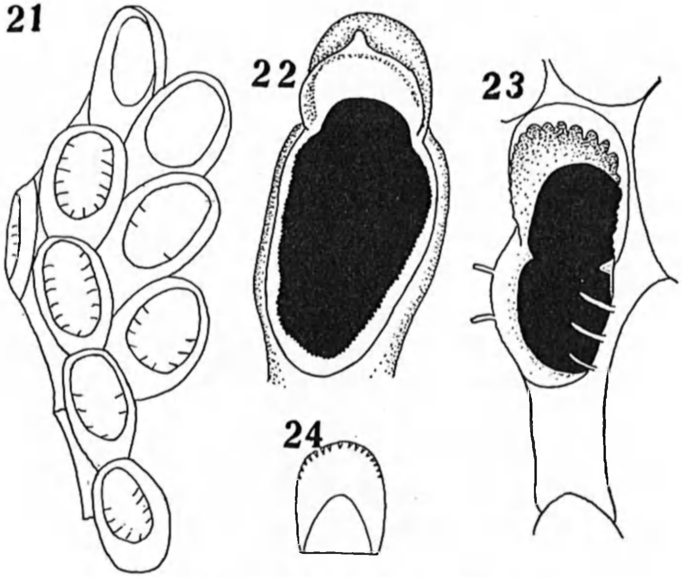
Characteristic of this species are the extensive gymnocyst (in the autozoids as well as in the avicularia) and the presence of well developed spines; the avicularia agree in their morphology with those of *C. kumatae*, and regarding their position with those of *C. crassimarginata*. HARMER (1926, p. 222) says in the definition of the genus *Crassimarginatella:* »Spines wanting or vestigial». Thus the present species could hardly be referred to *Crassimarginatella*. But on the one hand it agrees closely on all other points with other species of this genus, whilst on the other hand it has been noted above, that spines, though few and rather small, are also found in *C. crassimarginata* and *C. kumatae*. Thus it seems to be the right course, not to remove the species discussed from the genus, but to modify the definition of the genus as was done above (p. 23).

7. **Pyrulella** HARMER.

1. **P. boninensis** n. sp. (figs. 21—24).

Locality: Bonin Islands (33 [type]); 100—120 m.; encrusting hydroids.

The zoids are rather small, of an oval shape. The aperture field occupies the greater part of the front. A narrow,



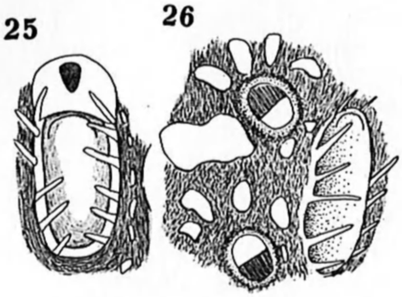
Figs. 21—24. *Pyrulella boninensis* n. sp.

Fig. 21: Zoids with partly remaining spines. 44 ×. — Fig. 22: Zoid with ooecium. 72 ×. — Fig. 23: Avicularium. 72 ×. — Fig. 24: Mandible. 72 ×.

granulated cryptocyst, provided with small teeth along its inner margin, extends below the frontal membrane. The gymnocyst is proximally well developed, and becomes narrower as it extends along the lateral sides of the zoid. It is translucent and granulated. Up to seven pairs of thin, rather short, inward bent spines surround the aperture field. They are often broken. There are one distal and one pair of lateral pore plates.

A few large vicarious avicularia are present. They are almost as long as the autozoids. The zoarium is very irregular and it is not easy to discern the position of the avicularia. Of the seven avicularia found, five are placed at bifurcations of zoid rows as lateral daughter zoids, and two seem to be placed without any connection with the bifurcations. Thus these avicularia are *perhaps* to be ranged in group 1 of the vicarious avicularia (SILÉN 1938, pp. 288, 308). Two condyles are situated at the middle of the aperture field of the avicularia, and thus the distal and the proximal part of the aperture field are of about the same size. Along the margin of the proximal part up to four pairs of spines are situated; this seems to be very unusual in avicularia. They are rather long and thin; often they are broken. The rostrum is elevated and looks like a large, ladle-shaped, translucent, and strongly toothed screen. On their exterior sides the teeth are provided with a median groove, and they seem to have been formed through a plication of the rostral margin. The mandible is broad and rounded and is furnished with fine teeth along the distal margin. It has a bluntly V-shaped sclerite with its point distally directed.

The ooecium is of medium size, its front is flattened and bordered by a curved rim, distally prolonged into a blunt point. The ooecium is closed by the operculum.



Figs. 25—26. *Pyrulella tubulata* var. *triangulata* nov. 45 ×.

Fig. 25: Zoid with ooecium; the interspaces between the connecting tubes are seen. — Fig. 26: One zoid, two avicularia, and connecting tubes.

In general features this species resembles *P. corbula* (HINCKS) (cf. HARMER'S [1926, p. 225] description of that species). The autozoids are rather uninteresting, the structure of the avicularia presents its most important characteristics.

2. **P. tubulata** HASTINGS **var. triangulata nov.** (figs. 25—26).

(For the description of the main species cf. HASTINGS 1930, p. 709, Pl. 6 figs. 20—26).

Locality: Bonin Islands (35 [type]); encrusting lumps of limestone.

Miss HASTINGS (l. c.) gives a careful description of *P. tubulata*, and the present specimens agree on the whole closely with that. But some differences were found.

The avicularia are never of the size seen in Miss HASTING'S fig. 20. In her specimens they are of a length of more than 1/2 autozoid length, in the present specimens they are never of more than 1/3 of an autozoid length. Openings between the autozoids appear at intervals in the zoarium, these openings are usually filled up with a few avicularia and their connecting tubes, which cover the substratum with a coarse network. — It is not possible to say anything for certain about the original cause of these avicularia. Their position in the zoarium does not throw much light upon that question, and they have to be put on one side for the present.

The frontal foramen of the ooecium is never of the size described by Miss Hastings, but much smaller. And it is not circular but has the form of a triangle with its base directed distally.

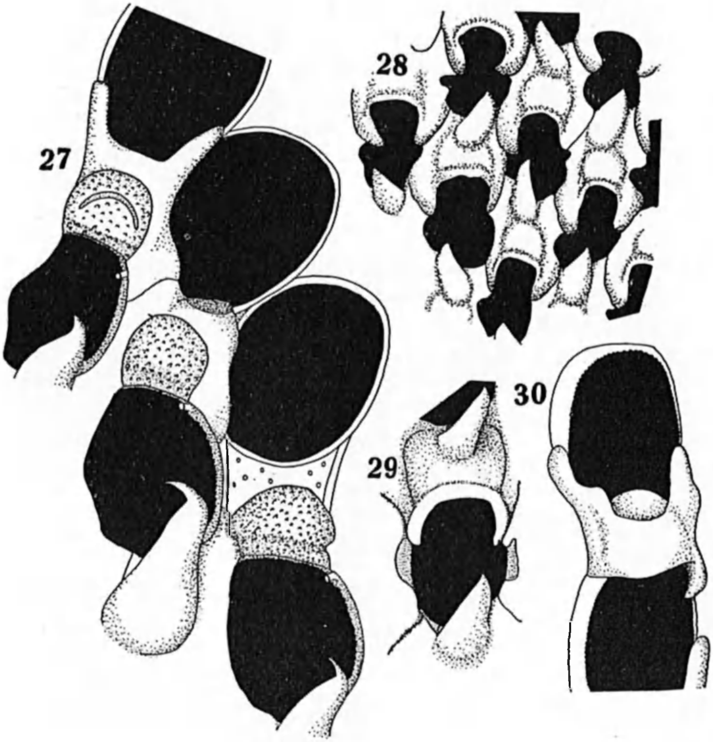
These special features, the size of the avicularium and the size and form of the ooecial foramen, are so unwavering and characteristic that it seems appropriate to refer the present species at least to a new variety. — In referring this species to *Pyrulella* I am following Miss Hastings, but it seems to me that this position of the species must be looked upon as a provisional one; the structure of the avicularia differs too much from that found in other species of the genus.

8. **Tegella** Levinsen.

T. incrustata n. sp. (figs. 27—30; Pl. 2 fig. 5).

Localities: (Japan 18 [type]), Bonin Islands (33); 110—120 m.; encrusting a sponge and a dead sea-urchin.

There is a great difference between the young zoids in the periphery of the zoarium and the old ones in the centre of the zoarium. — The young zoids are of an oval form, and the aperture field occupies the greater part of the front. A narrow, granulated cryptocyst is to be seen. Proximally a gymnocyst is well developed. It is translucent and provided with numerous small tubercles and a few round pores. The distal wall has a row of simple pores, the lateral walls have two pore-plates each, one very large distally and one smaller more proximally. — Towards the centre the appearance of the zoarium is changed by the zoids being covered by a thick lamina of lime concealing their original structure. Already in the second row of zoids from the zoarial margin the following changes have taken place. In one of the distal corners a short, straight, blunt spine is to be seen. Most zoids are provided with ooecia; they are rounded, proximally a little contracted, and over the front there runs a narrow list of varying form; the front is entirely covered by small tubercles. The operculum does not close the ooecium. The polypide is already developed. Close to the ooecium a lime lamina has begun to develop from the margin of the zoid; proximally it



Figs. 27—30. *Tegella incrustata* n. sp.

Fig. 27: Zoids from the periphery of the zoarium; in one zoid (to the right) the gymnocyst is to be seen (loc. 18). 45 ×. — Fig. 28: Part of the strongly calcified centre of the zoarium (loc. 33). 28 ×. — Fig. 29: Zoid from the centre of the zoarium with ooecium and avicularia; the primary margin of the aperture field is dimly visible (loc. 33). 45 ×. — Fig. 30: Zoids from the periphery of the zoarium with an ooecium which begins to be overgrown by a calcareous lamina (loc. 33). 45 ×.

extends along the sides of the distal half of the zoid, laterally along the proximal parts of the lateral sides of the neighbouring zoids, distally along the proximal margin of the distal zoid. The zoid becomes immersed in the development of this lamina. — In the zoids then following, the lamina has increased in thickness to such a degree that the zoarium looks like a undulated lime plate with large, irregular openings; through these openings we may catch a glimpse of the now deeply immersed aperture fields. At one of the distal corners of such an opening the point of the spine mentioned above is seen. The ooecia also are wholly covered by the lamina. They are furnished with a big avicularium, which emanates from the lamina above the distal part of the ooecium and, lying on its side, extends obliquely in a distal direction above the aperture field of the distal zoid. The point of the rostrum is drawn out in a hook. The mandible has a corresponding hook.

The zoarium from loc. 33 differs in that the zoids are not so large, there is a higher degree of calcination, and in the absence of the spine.

Characteristic of this species is the formation of the lamina, which gives the zoarium an appearence different from the common *Tegella*-type. But disregarding this secondarily developed lamina the zoids have the characteristic structure of *Tegella*, and the species must certainly be placed in that genus.

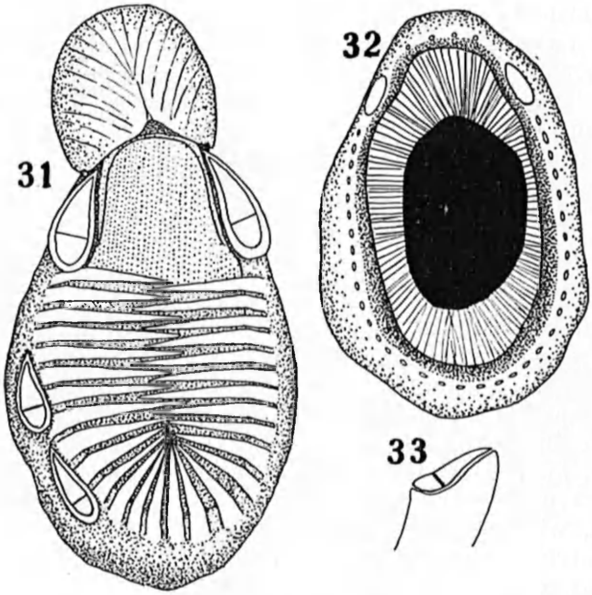
The species resembles *T. robertsoni* CH. & E. O'DONOGHUE (1926, p. 36; synonym: *Membranipora occultata* ROBERTSON [1908, p. 262, Pl. 14 figs. 6—9], nec *M. occultata* WATERS). But in that species the secondary lamina only covers the ooecium, which is small and membranous or very little calcified; moreover it has vicarious avicularia. Miss ROBERTSON'S specimens encrusted Ascidia, and usually Bryozoan zoaria growing upon Ascidia are not strongly calcified, but nevertheless I think that the present specimens belong to a different species. This is confirmed by the fact that Miss ROBERTSON originally (1900, p. 324) identified specimens of the species, which she later on named *Membranipora occultata*, with *T. unicornis;* a confusion of the present species and *T. unicornis* is entirely impossible. — SAKAKURA (1935 a, p. 8, Pl. 1 fig. 5) found specimens from the pleistocene of Japan and he referred them to *T. robertsoni*. The description is short, but it may be seen from that and from the fig. that the secondary lamina is strongly developed. Possibly it is identical with the present species.

9. **Cauloramphus** NORMAN.

1. C. costatus n. sp. (figs. 31—33).

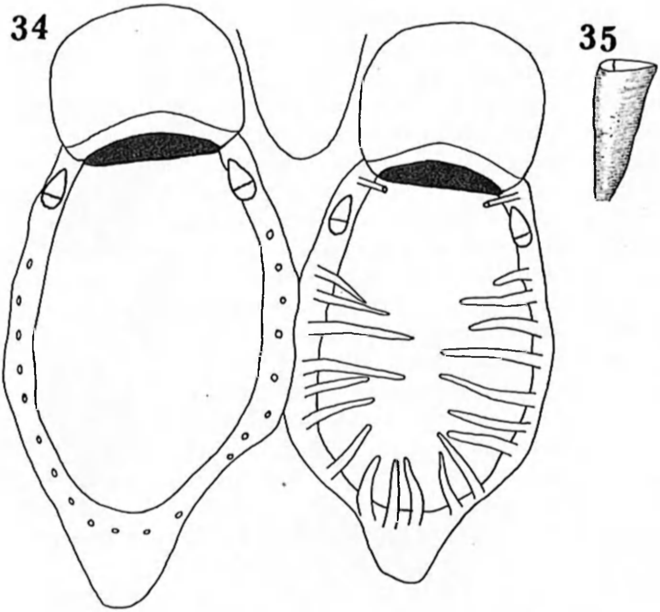
Locality: Japan (29 [type]); 600 m.; encrusting.

The zoids are very large, broad and of an oval form, and they are clearly distinguished from one another. The aperture field occupies the whole of the front. On a level with the proximal border of the aperture it is contracted (the margin of the zoid seems to be pressed in by the large distal avicularia, cf. below), and thus it is much broader proximally than distally. Outside the elevated margin surrounding the aperture



Figs. 31—33. *Cauloramphus costatus* n. sp. 67 ×.
Fig. 31: Zoid with ooecium. — Fig. 32: Zoid which has lost spines and avicularia; the shape of the aperture field and the secondarily developed, centrally perforated, calcareous lamina are shown. — Fig. 33: Distal marginal avicularium in lateral view.

field about 12 pairs of long, flattened, pointed spines are situated. Exactly at the margin of the aperture field they are abruptly bent inwards. They are placed very close to each other, and they are so long that the ends of the spines of one side reach in between the ends of the spines of the other side. Thus the spines form a flat and dense layer above the entire aperture field with the exception of its most distal part, and the zoids assume a very close resemblance to *Membraniporella.* On the distal margin of the zoid four straight and short spines are situated; when an ooecium is present there are only two spines situated proximally and close to it. The zoids have one distal and two pairs of lateral porechambers. — In certain zoids, deprived of spines, avicularia and polypides, a translucent lamina is formed along the original margin of the aperture field. This lamina consists of lime and extends towards the centre, where a round opening remains. The margin of this opening thickens and forms an elevated rim. Along this rim a ring of rather short, thin, slightly curved spines is situated. Here we have to do with a phenomenon of regeneration.



Figs. 34—35. *Cauloramphus japonicus* n. sp. 67 ×.
Fig. 34: Zoids with ooecia and avicularia. — Fig. 35: Distal marginal avicularium in lateral view.

Outside the margin of the aperture field, on a level with the aperture, a rather large, pointed, distally directed avicularium is situated on each side. It has a peduncle of about the same length as the front of the avicularium and of about the same form in cross section as the front of the avicularium. The rostrum is a little curved along the margin of the aperture field. Often there are one or two further avicularia, situated more proximally along the margin of the aperture field. They are smaller but of the same form as the distal ones. Sometimes there is an avicularium of the same structure proximally to the aperture field; it is laterally directed.

The ooecium is large. It is delicately striated and transparent; the white embryo inside is clearly to be seen. The ooecium is rounded, its front is flattened. It is closed by the operculum.

The characteristic features of the species are: the unusual size of the zoid, the dense layer of flattened spines above the aperture field, and the structure and position of the avicularia.

2. C. japonicus n. sp. (figs. 34—35).

Locality: Japan (29 [type]); 600 m.; encrusting a zoarium of *Steganoporella magnilabris* (Busk).

The zoids are of medium size, they are oval and clearly distinguished from one another. The aperture field occupies nearly the whole of the front, its elevated margin is thin and translucent. Along this margin about 10 pairs of spines are situated; they are often detached. They are evenly curved in over the aperture field. They are of a varying length, but often they meet above the aperture field. They are thin, a little flattened, and become thinner towards their ends, which are blunt. Near the distal end of the aperture field there is a small, pedunculated avicularium on each side, its point directed distally. The peduncle is very long and straight, and it becomes very narrow towards its base. Distally to the avicularia there is a short, straight, blunt spine on each side. In the zoids without ooecia the marks of four (here always detached) spines are to be seen along the distal margin. There are one distal and two lateral porechambers.

The ooecia are of medium size, they are rounded, transparent and delicately striated. Along the proximal margin of the ooecium there runs a white, and in the centre, rather broad rim. It is closed by the operculum.

The species is of the usual *Cauloramphus*-type and is not very characteristic. The special features are the structure of the avicularia and of the ooecium.

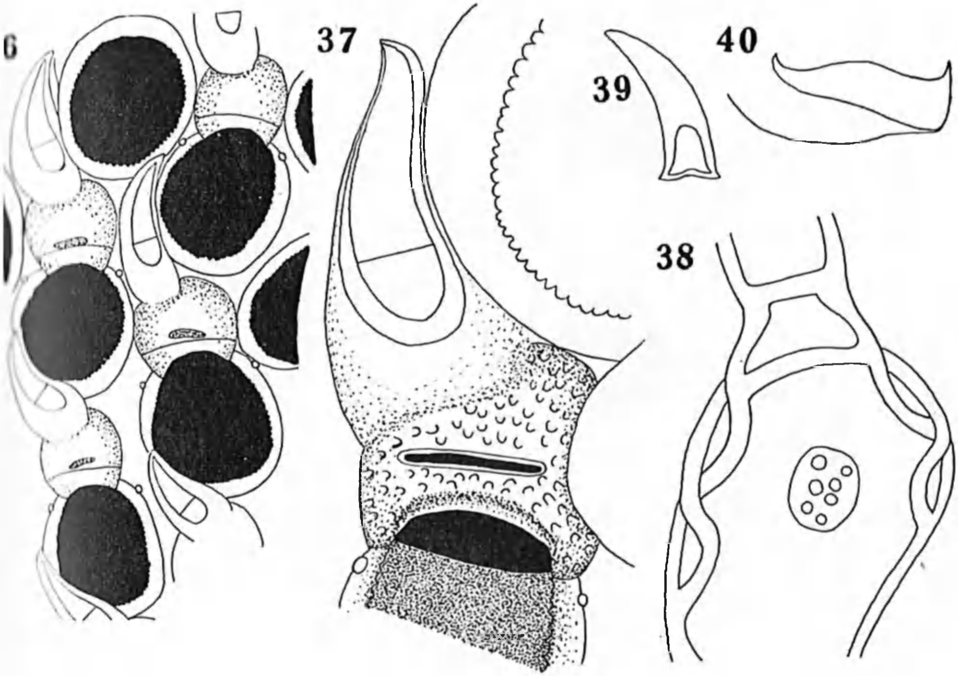
10. **Callopora** Gray.

C. canui n. sp. (figs. 36—40; Pl. 3 fig. 8).

Callopora horrida, Canu & Bassler (nec Hincks) 1929, p. 103, pl. 7 fig. 7, text-fig. 24 B—24 C (Japan).

Localities: Japan (13, 29 [type], 44, 45); 100—600 m.; encrusting algae, stones or dead sea-urchins.

The zoids are of medium size and densely clustered. The aperture field is of a broadly oval form. There is a narrow cryptocyst. It is glistening white, granulated; its inner margin is drawn out in small teeth. Proximally a narrow gymnocyst is developed. In the zoids without ooecia a short, straight, blunt spine is situated in each distal corner; in the zoids with ooecia these spines are placed more proximally, close to the proximal margin of an ooecium. There are no other spines. If we examine the zoarium from its basal side, we find that each zoid has two pairs of crescent-shaped lateral porechambers and one distal, larger one. In the centre of the distal part of the basal wall of the zoid there is a circular area, in which some small, white spots of a mealy appearance are situated. In this area the zoarium is certainly fixed at the substratum.



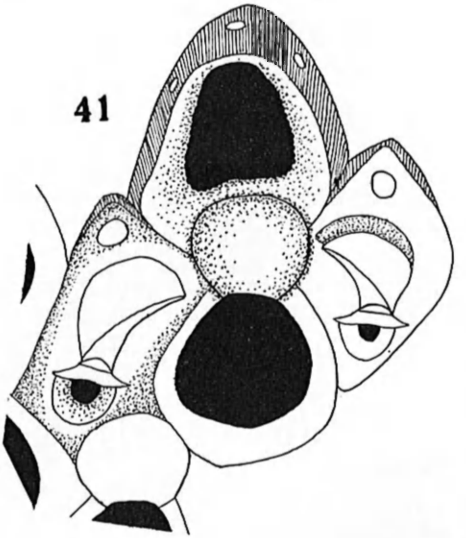
Figs. 36—40. *Callopora canui* n. sp. (loc. 29).
Fig. 36: Part of zoarium. 42 ×. — Fig. 37: Ooecium and avicularium. 105 ×. — Fig. 38: Zoid in basal view; the shape and position of the porechambers and the central fixation area are seen. 57 ×. — Fig. 39. Mandible. 67 ×. — Fig. 40: Rostrum in lateral view. 67 ×.

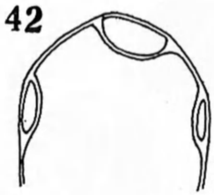
The ooecium is of medium size, it is broad, rounded and provided with numerous small tubercles. Its front is transparent and has a narrow transverse fenestra with an elevated margin. The ooecium is closed by the operculum.

The ooecium is crowned by an avicularium, which is very large, its length varying between $^{1}/_{2}$ and $^{4}/_{5}$ of the length of the aperture field. Its front with the mandible is turned upwards. The rostrum is curved along the proximal-distal margin of the distal zoid; it is pointed and its end is hooked.

The present specimens are certainly identical with those described by Canu & Bassler (l. c.). It was with hesitation that the authors mentioned referred their specimens to *Callopora horrida* (Hincks). They differred from that species in having the avicularium clearly distinguished from the ooecium and in the presence of an ooecial fenestra. The zoaria were dead and the spines detached; thus the number of the latter is not known.

The species is allied to *C. horrida* but is distinguished by





Figs. 41—42. *Ellisina latirostris* n. sp.

Fig. 41: Zoids (with two ooecia) and avicularia from the periphery of the zoarium; the openings of the porechambers are seen in the distal zoid. 67 ×. — Fig. 42: The distal part of the basal wall of a crushed zoid, showing the shape and position of the porechambers. 105 ×.

the following characters. The avicularium differs in its general structure, the rostrum being hooked is, for instance, characteristic. The ooecium has a narrow fenestra. There always are only two, distal, short, straight spines. The circular area of the basal wall of the zoid is not mentioned in *C. horrida*, though it is conspicuous. Porechambers are not described in *C. horrida*, and thus there can not be any comparison on that point. — Taking this into consideration it seems to me that the present specimens can not be identified with *C. horrida*.

11. **Ellisina** NORMAN.

1. **E.** latirostris n. sp. (figs. 41—42).

Locality: Japan (1 [type]); 115 m.; encrusting a stone.

The zoids are of medium size and are clearly distinguished from one another. They have the form of a rounded triangle: proximally they are very broad, half way to the distal end they are contracted and then they become narrower towards the latter, which is curved. The aperture field occupies the greater part of the front. There is a strongly developed cryptocyst. Proximally it is very broad and then becomes narrower along the lateral sides. It is granulated and transversely grooved; its inner margin is provided with small denticles. A gymnocyst is just seen. The distal wall and the lateral walls are each provided with a porechamber. The lateral porechambers are placed at some distance from the distal one. When an avicularium is present it derives from this interval between a distal and a lateral porechamber.

The avicularia are of the type described by Miss HASTINGS (1930, p. 711, Pl. 7 figs. 28—31) in *E. curvirostris* (HINCKS). They are vicarious and placed as lateral daughter zoids at the bifurcations of the zoid rows; thus they are to be referred to group 1 of the vicarious avicularia, proposed in an earlier work of mine (SILÉN 1938, pp. 288, 308). They are large but do not reach the length of an autozoid and are much narrower. Their distal ends are pointed. Owing to the material being very sparse I have not been able to observe the porechambers. But in the obliquely drawn out distal wall there is a large, round opening, indicating the presence of a distal porechamber. Proximally the mandible is drawn out into two lateral, narrow wings. It is composed of two parts; there is a long, slightly curved, strongly chitinized part, which gradually becomes narrower and ends in a point; on one side of this part the mandible is drawn out to a broad, strongly curved, very thin and translucent lamina. Thus the mandible is of about same type as in *E. curvirostris* and in *Onychocella*. The rostrum is of the same form and occupies the greater part of the front.

The ooecium is of medium size, it is round and granulated. It is not closed by the operculum.

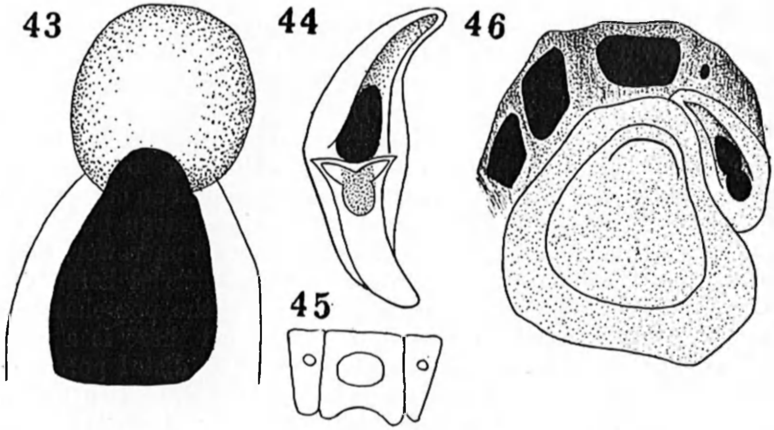
The present species is a typical *Ellisina*, the structure of the avicularium offers the most characteristic features.

Under the name of *Onychocella luciae* JULLIEN (1881, p. 280, text-fig.) described a new species from the west coast of France, by him and by CANU & BASSLER (1920, p. 203) placed in the family *Onychocellidae*. The cryptocyst of this species is very well developed but it is very different from the characteristic extensive structure in *Onychocellidae* (cf. for instance. HARMER's [1926, p. 256] definition of that family). On the contrary it agrees closely with the cryptocyst found in certain *Membraniporidae* especially *Ellisina*. The ooecium is well developed, hyperstomial; in *Onychocellidae* it is very small and endozoidal. The structure of the avicularium agrees closely with that of *E. latirostris*. Thus there is no doubt that *Onychocella luciae* is to be referred to *Ellisina*, and it is especially related to *E. curvirostris* and *E. latirostris*.

2. E. canui (SAKAKURA) (figs. 43—46; Pl. 2 fig. 7).

Membranipora sp. BUCHNER 1918, p. 459, text-fig. 1 (Japan); *Amphiblestrum canui*, SAKAKURA 1935 a, p. 9, Pl. 1 fig. 9, text-fig. 1 (Japan, pleistocene); *Ellisina canui*, SILÉN 1938, p. 273, text-figs. 39—40.

Localities: Japan (1, 24); 1—115 m.; encrusting a stone and a sponge.



Figs. 43—46. *Ellisina canui* (Sakakura).

Fig. 43: Zoid with ooecium (loc. 1). 67 ×. — Fig. 44: Avicularium (loc. 24). 105 ×. — Fig. 45: Zoid with two avicularia seen from its distal end (loc. 24). 67 ×. — Fig. 46: Zoid from the periphery of the zoarium with one avicularium and three not yet closed porechambers (loc. 24). 67 ×.

The zoids are larger than those of *E. latirostris* but generally of the same structure. Thus the zoid as well as its aperture field have the form of rounded triangles; proximally they are broad, at the middle contracted and distally narrower. The cryptocyst is broad proximally and becomes narrower more distally; it is granulated and grooved. A proximal, narrow gymnocyst is often to be seen. There are one distal and one pair of lateral porechambers. As in *E. latirostris* the lateral porechambers are placed a little distance from the distal one. They are large, especially the distal one. On the outer side a porechamber is closed by a wall, and perforated by a round pore (Miss HASTINGS [1930, p. 712, fig. 29 u] describes the distal porechamber of *E. curvirostris* as being open). The basal wall of the zoid is not translucent, and it is covered by secondarily formed, small, concentric lamina of lime. In its centre there is a greyish, oval area by which the zoid is fixed at the substratum.

Close to the lateral corners of the distal end of the zoid an avicularium is situated on each side; sometimes one of them or both are absent. They have a length of about $^2/_5$ of an autozoid length; at the middle their breadth is about $^1/_3$ of an autozoid breadth, and from here they become narrower towards their ends. The rostrum occupies the distal $^3/_5$ of the front of the avicularium. It is curved around the distal corner of the zoid, it is narrow, and towards its distal end it becomes more and more elevated. The mandible is of the same form as the rostrum and moves around two condyles. — The avicularia derive from between the distal and one of the lateral porechambers. Their position in the zoarium has been discussed in an earlier work of mine (SILÉN 1938, pp. 273 ff.), and there it was proved that they are reduced vicarious, avicularia, taking the places of lateral daughter zoids at the bifurcations of the zoid rows. Thus they belong to group 1 of the vicarious avicularia (op. cit., pp. 288, 308).

The ooecia are of medium size, rounded and granulated. They are not closed by the operculum.

The present specimens agree on all points with SAKAKURA's species. SAKAKURA refers the species to the genus *Amphiblestrum*, but he mentions himself that the avicularia are vicarious, and this and other facts stand in opposition to such a classification. The autozoidal characters of the species point directly to *Ellisina*, and it is evident that its avicularia have developed from the type found in other species of this genus.

BUCHNER mentions that he has observed total regeneration in a *Membranipora* from Japan, and the figure he gives of the species is so characteristic that there can be no doubt that he was dealing with the present species.

12. **Pseudolepralia** gen. nov.

Young zoids in the peripherical parts of the zoarium have this form and structure: the zoid is almost oval, has its greatest breadth proximally, becoming narrower towards its distal end; the aperture field occupies the whole front of the zoid; along its inner margin a narrow granulated cryptocyst appears; proximally and laterally a narrow gymnocyst is developed.

In fully developed zoids the entire frontal side up to the operculum is covered by a slightly convex gymnocyst.

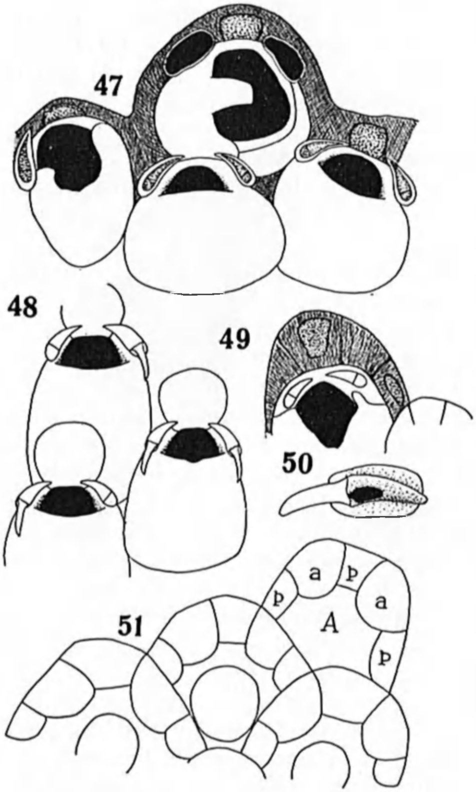
One distal and two lateral porechambers, some distance from it, are present. The interval between the distal and one lateral porechamber on each side of the zoid is occupied by a small vicarious avicularium.

Type: *P. ellisinae* n. sp.

Regarding the structure of the autozoid and the avicularium it is evident that this genus is closely related to *Ellisina*. The great difference is the structure of the gymnocyst in *Pseudolepralia*.

P. ellisinae n. sp. (figs. 47—51).

Locality: Bonin Islands (35 [type]); 45 m.; encrusting a lump of lime-stone.



Figs. 47—51. *Pseudolepralia ellisinae* n. gen. n. sp.

Fig. 47: Zoids from the periphery of the zoarium; in two of them the gymnocyst is not yet fully developed. The fronts of the two distal avicularia are not yet closed. The distal porechamber not closed in the three distal zoids. 45 ×. — Fig. 48: Fully developed zoids with ooecia and avicularia. 45 ×. — Fig. 49: Zoid from the periphery of the zoarium showing the positions of the porechambers and avicularia; the zoid is the same as that called A in fig. 51. 45 ×. — Fig. 50: Avicularium in frontal view. 70 ×. — Fig. 51: Zoids in basal view; the positions of the porechambers (p) and avicularia (a) as well as the central fixation area are seen. 45 ×.

The zoids are placed closely to each other. They are of an oval form. Almost the entire front is covered by a convex, slightly uneven, glistening, yellow-white gymnocyst. It ends on a level with the proximal margin of the operculum in a somewhat concave line traversing the whole zoid. The aperture field is thus restricted to include only the operculum. The operculum is semicircular and is well distinguished from the gymnocyst with the result that the zoid becomes strikingly Lepralioid. — In the young zoids of the peripherical parts of the zoarium the aperture field occupies almost the entire front. It is roundedly triangular, broadest towards the proximal end. It is surrounded by a rather narrow gymnocyst which has its greatest extension proximally. Along the inner margin of the aperture field a narrow, granulated cryptocyst furnished with small denticles along its inner margin is developed. The zoid has one distal and, at some distance from it, one pair of lateral porechambers. The basal side of the zoid is smooth and translucent but has a central, rounded, greyish area where it is fixed at the substratum.

At each side of the zoid, on a level with the free part of the aperture field, one avicularium is placed. It is rather narrow, pointed, curved along and close to the sides of the zoid. The rostrum, towards its distal end, is curved a little upwards from the horizontal plane. The avicularium is of the same appearance and position as that of *Ellisina japonica*. At first glance it appears to be adventitious, but a closer examination reveals that the avicularian chamber, which in transverse section has about the same form as the front, reaches the basal side of the zoarium. The avicularium is placed between the distal and a lateral porechamber. Thus the avicularium is vicarious. The facts described are to be seen clearly when looking at an autozoid from its basal side.

The ooecium is small, rounded, and entirely smooth. It is partly embedded in the distal zoid, in the proximal part of which it appears as a flat, convex protuberance. It is closed by the operculum.

13. Copidozoum Harmer.

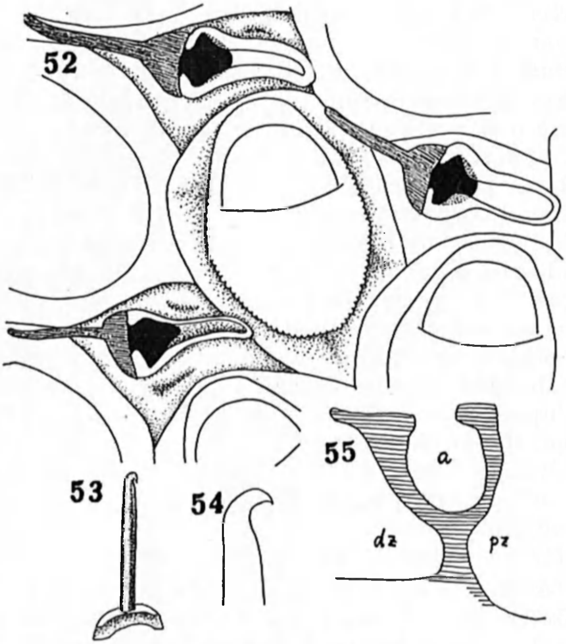
Copidozoum, Harmer 1926, p. 226, list of species p. 227.

Canu & Bassler (1929, p. 101) do not accept this genus but think that its species are to be referred to *Callopora;* according to them the particular and characteristic structure of the avicularia of the species referred to *Copidozoum* is only a »secondary» and unimportant character. I can not agree with that. Undoubtedly the avicularia of the *Copidozoum* species must be said to form a special type very different from that of *Callopora*. But, as pointed out by Miss Hastings (1930, p. 713), who accepts the genus *Copidozoum*, Harmer has given it too wide limits: *Membranipora falcata* Mac Gill., referred to *Copidozoum* by Harmer, certainly is closer to *Ellisina*.

C. transversum n. sp. (figs. 52—55; Pl. 2 fig. 6).

Locality: Japan (29); 600 m; one small, detached crust.

The zoids are very large. They are broad and separated by sharply defined limits. The aperture field occupies the entire front of the zoid. It is of a broadly oval shape and becomes narrower towards its distal end where its border describes an even curve. It is often particularly broad proximally, and then it has an almost straight proximal border; then it assumes in its entirety a roundedly triangular appearance. A cryptocyst is present. Proximally it is extensively developed but becomes narrower towards the distal end of the zoid where it can scarcely be detected. It is shining white and is provided with



Figs. 52—55. *Copidozoum transversum* n. sp.

Fig. 52: Zoids and avicularia. 45 ×. — Fig. 53: Mandible. 45 ×. — Fig. 54: Distal end of mandible in lateral view. 100 ×. — Fig. 55: Longitudinal section showing the position of the avicularium (a) between the proximal zoid (pz) and the distal one (dz). 45 ×.

minute transverse grooves. Its inner margin, excepting the part of it which is situated distally to the operculum, is furnished with small denticles. The operculum is large and moves around a straight chitinous sclerit.

An avicularium is placed distally to each autozoid. It has a rectangular front, the breadth of which is about twice its length and a little less than the breadth of the mother zoid. The rostrum traverses the front of the avicularium diagonally and points to one of the proximal corners of the rectangle. It forms a long, narrow groove widening towards its distal end, where it is rounded. The proximal part of the mandible is semicircular. Its distal part is straight and narrow and contrasts sharply with the proximal part. Its length is three times that of the latter but its breadth is only 1/5 of that of the latter. It is turned so that its margin is directed frontally. It ends distally in a small but sharp hook. — At first glance the avicularium appears to be vicarious, but a length section through the zoarium shows that it does not reach the basal side of the zoarium but that the proximal and distal autozoids are in immediate connection with each other beneath the avicularium.

Ooecia were not found in this zoarium.

This species is easily recognized from the avicularium being placed transversely in relation to the autozoid. The details of its structure are also characteristic.

14. **Antropora** Norman.

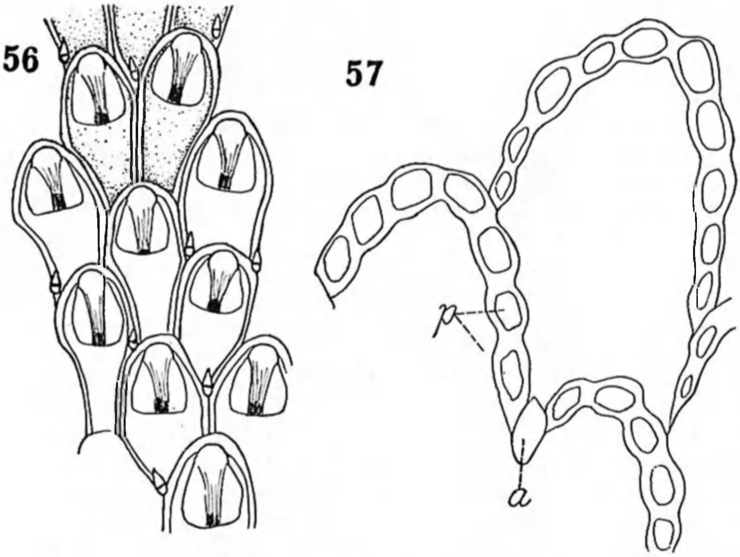
For references see Harmer 1926, p. 232.

In my opinion the genus *Membrendoecium* Canu & Bassler (1917, p. 17), which has been accepted by some authors, can not be kept apart from *Antropora*. The diagnoses, which for instance Canu & Bassler (1920, p. 119 and p. 175) give of these two genera, are in both cases applicable also to the species of the other genus. It is true that they say in the diagnosis of *Antropora:* »A pair of avicularia with their pointed mandible directed inward, and transversely situated above the oral opening». But this direction of the avicularia is only true in the genotype *A. granulifera* (Hincks) and not in other species which have been referred to this genus (cf. for instance Harmer op. cit.), and naturally a division of genera can not be based solely on such a fact. Harmer (op. cit.) expresses himself more cautiously: »Adventitious avicularia paired, — —». Such a diagnosis applies very well to, for instance, »*Membrendoecium*» *lagunculum* Canu & Bassler (1929, Pl. 6 figs. 6—11).

But this diagnosis also seems to me to be too limited. Certain species, which undoubtedly are to be referred to this genus, for instance the one described below, have not always two but very often only one avicularium in this position at the distal margin of the autozoid.

Moreover it must be observed that the nature of these avicularia, which Harmer describes as adventitious and Canu & Bassler (1917), as »interopesial» (a term unknown and not defined!), is not known with certainty. In the species examined (cf. Silén 1938, pp. 274—276) they are, with greater or lesser certainty, vicarious; that is the case also in the species described below. Possibly this holds true to all species belonging here. — The large »vicarious avicularia» described in certain species are zoids of a nature not yet settled with certainty (cf. Silén l. c.).

Thus, firstly, *Membrendoecium* must be united with *An-*



Figs. 56—57. *Antropora erecta* n. sp.

Fig. 56: Part of zoarium in frontal view. 32 ×. — Fig. 57: Zoids in basal view showing the positions of porechambers (p) and of an avicularium (a). 85 ×.

tropora. It is, for instance, significant that *Membrendoecium lagunculum* Canu & Bassler (1929, p. 95, Pl. 6 figs. 6—11) agrees so closely with *Antropora marginella* (Hincks) (Harmer 1926, p. 234, Pl. 14 fig. 15) that it does not seem at all impossible that we are dealing with one and the same species. Secondly, the diagnosis of the united genus *Antropora* must, with regard to the small (true) avicularia, be modified in the following way: Distally to all or most autozoids one single or a pair of laterally arranged, small, pointed avicularia, which in some (or all?) species are vicarious. Should it be proved, that the avicularia are vicarious in all species, it would be a new and important character of the genus.

A. erecta n. sp. (figs. 56—57).

Locality: Bonin Islands (35 [type]); 135 m.; one detached zoarium.

The zoarium is erect, branching, and has the structure of a cylinder surrounding a cavity, which is open at the ends of the branches. It probably grew originally around the narrow branches of an alga, on a hydroid or another similar substratum, which later on has been destroyed; there are parts of organic materia left inside the cylinderwalls.

The zoids are of medium size, a little prolonged, often narrower proximally and then becoming broader towards the middle, from where they become narrower towards their rounded distal ends. No gymnocyst is to be seen, but the entire front is membranous. Below this frontal membrane and close to it a horizontal cryptocyst is extensively developed. It covers more than half the front, and only a roundedly triangular opening is left in the distal part of the zoid. The cryptocyst is evenly granulated and translucent. — The zoid is connected with its neighbouring zoids by thickwalled porechambers, numbering 6—10, which are placed along the basal parts of the vertical walls. It is not possible to divide them into a certain number per each of the distal and lateral walls; these usually join evenly on to one another basally.

Ooecia were not found.

At the distal ends of most autozoids one avicularium is usually placed in a somewhat lateral position. Sometimes, and usually in the mother zoids at the bifurcations of the zoid rows, there are two avicularia at each autozoid. The avicularia are small and vicarious; their basal walls can easily be distinguished on the basal side of the zoarium. The rostrum is pointed, a little elevated and directed straight forward. — Any other specially built, avicularia-like zoids have not been observed.

This species has no particularly characteristic or interesting features. But the general structure of the autozoid, its cryptocyst, etc., does not agree with that of any species known. »*Membrendoecium*» *pyriforme* CANU & BASSLER (1917, p. 17) shows some similitudes but also dissimilitudes.

15. **Hiantopora** MAC GILLIVRAY.

H. intermedia (KIRKP.).

Membranipora radicifera var. *intermedia*, KIRKPATRICK 1890, pp. 612, 615, Pl. 16 fig. 2; *Tremopora dendracantha*, ORTMANN 1890, p. 29, Pl. 2 fig. 6 (Japan); *Membranipora intermedia*, WATERS 1898, p. 681; *Hiantopora intermedia*, HARMER 1926, p. 237, Pl. 34 figs. 1—3, textfig. 2 (Japan; references); *Tremopora intermedia*, BANU & BASSLER 1929, p. 114, Pl. 11 fig. 1.

Localities: Japan (1, 13, 29), Bonin Islands (33); 100—600 m.; detached crusts.

These specimens agree in every detail with those described by HARMER under (f) (1926, p. 239) from Japan. CANU &

BASSLER (l. c.) are of the opinion that HARMER's Japanese specimens together with ORTMANN's *Tremopora dendracantha* should form a separate species. But they do not give any reasons for their statement, and since I have found none myself, I follow HARMER's synonymics.

16. Chaperia JULLIEN.

1. C. acanthina (LAMX.).

Flustra acanthina, LAMOUROUX 1825, p. 605, Pl. 89 figs. 1, 2; *Chaperia acanthina,* WATERS 1898, pp. 656, 659, 664, Pl. 47 fig. 10; HARMER 1926, p. 229, Pl. 14 figs. 9, 10 (Japan; references); HASTINGS 1932, p. 412 (references).

Localities: Japan (23), Bonin Islands (34); 0—150 m; encrusting shells.

2. C. transversalis CANU & BASSLER. (figs. 58—64).

Chaperia transversalis, CANU & BASSLER 1929, p. 473, Pl. 64 figs. 5—9, textfig. 202 a (Japan).

Localities: Japan (16, 17); 135—300 m.; encrusting shells.

The non-calcareous parts of the zoarium have a light red colour.

The zoids are very large. They are not much longer than their breadth. The proximal part of the zoid is covered by a flat, even gymnocyst. At its centre there is an avicularium, which, however, is fallen away in most zoids leaving only a mark behind. It is rather small, sessile, and has a triangular front. It points towards the proximal end of the mother zoid. The distal part of the zoid is occupied by the very wide, circular aperture. In zoids provided with ooecia its distal margin is straight. The distal margin of the zoid forms a raised screen, which descends abruptly down into the aperture. At a good distance from the frontal opening of the aperture the occlusorlaminae (cf. HARMER 1926, p. 229) are to be seen. They unite distally, and thus they form a horseshoe along the distal wall of the aperture. The operculum is dark red and translucent. It is provided with a chitinous sclerite in the form of a horseshoe, which is parallel with the arched distal margin of the operculum. On the raised distal margin of the zoid four strong, basally jointed spines are placed. Usually they are broken but are, when fully developed, very long and distally divided into branches of a varying number and length. The raised distal margin of the zoid projects beyond the true distal wall, and thus it hides, when seen

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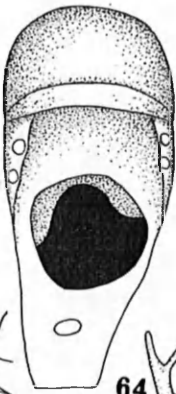

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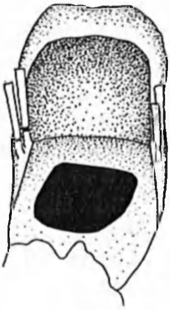

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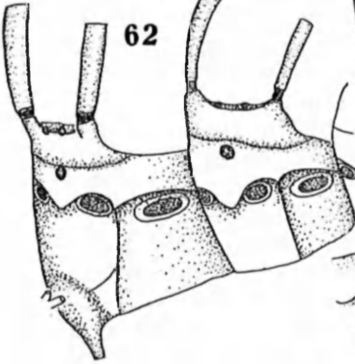

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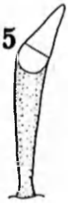


Figs. 58—64. *Chaperia transversalis* CANU & BASSLER. 45 ×.

Fig. 58: Zoid showing occlusor lamina and distal spines (loc. 17). — Fig. 59: Operculum (loc. 17). — Fig. 60: Zoid with ooecium in frontal view; the proximal avicularium is detached (loc. 17). — Fig. 61: Zoid with ooecium in frontal-proximal view showing the ladleshape of the ooecium (loc. 17). — Fig. 62: Zoids in distal-lateral view; frontal and lateral poreplates, the lateral spines and the distal-basal fixation-tube are seen; median spines and distal avicularia detached (loc. 16). — Fig. 63: Distal end of zoid with distal avicularium (loc. 16). — Fig. 64: Spine (loc. 16).

Fig. 65. *Chaperia transversalis* var. *boninensis* nov. 45 ×. Stalked proximal avicularium.

from the front, an avicularium, which is placed there. It is of the same form and size as the proximal avicularium; it is sessile, and its rostrum points in a distal direction. The lateral and (true) distal walls of the zoid are very high, the height being almost the same as the breadth of the frontal side. The distal wall has two very large, round poreplates, the lateral walls one still larger, oval poreplate each. Distally the basal wall is drawn out in a tube, which is fixed at the substratum. Thus the zoarium does not rest immediately upon the substratum but stands, so to speak, on stilts.

The ooecium is very large and ladleshaped. It stands erect, almost at right angles with the front of the zoid. Its distal side is convex, its proximal side excavated and covered by a very thin membrane; here it is separated from the front of the zoid by the raised distal margin of the latter. The ooecium consists of two calcareous laminae the inner one of which is bent over the outer one along its free margin and joined to the latter to form a ribbon. In zoids provided with ooecia the spines are placed two on each side proximally to the lateral margins of the ooecium.

Canu & Bassler give a very short description of this species, and they figure only cleaned specimens deprived of all appendages. The specimens here described agree, however, closely with their description. Two, apparently very characteristic features that they have not described can also be seen in their figures: the occlusorlaminae are distally united to form a horseshoe; the spines of the zoids with ooecia are placed two on each side proximally to the lateral margins of the ooecium, and they are all similar.

The species reminds one very much of *C. cervicornis* (Busk) but shows, if compared with Harmer's (1926, p. 231, Pl. 14 fig. 8) description of the latter species, the following differences: the union of the occlusorlaminae in a horseshoe; the spines are stouter and not so richly branched, and they are all alike; the spines of the distal wall described by Harmer are not present here; the positions of the spines in zoids with ooecia are different; avicularia are not known in *C. cervicornis;* the frontal ribbon of the ooecium is not found in *C. cervicornis.* The two species agree, however, closely in their general structure, and they are certainly closely related.

3. **C. transversalis** Canu & Bassler var. **boninensis** nov. (fig. 65).

Locality: Bonin Islands (33 [type]); 100 m.; encrusting a lump of lime-stone.

These zoaria agree very closely with *C. transversalis.* But there are some features which make it very difficult to refer them to that species without further notice. The most striking feature is that the zoids of the Bonin-specimens are all much smaller, being only about $^2/_3$ of the size of the Japanese specimens. And the proximal avicularia are not sessile but elevated upon very long peduncles, which are narrow at the bases but widen a little towards their extremities. These features give a rather different appearance to the Bonin specimens. But they are certainly closely allied to the Japanese specimens.

17. Nellia Busk.

N. oculata Busk (Pl. 3 fig. 9).

Nellia oculata, Busk 1852 b, p. 18, Pl. 64 fig. 6, Pl. 65 fig. 4; Harmer 1926, p. 240, Pl. 14 fig. 18, textfigs. 3 B, D and 4 A, B (references); Hastings 1932, p. 410 (references).

Localities: Malacca Str. (5), Formosa Str. (9); 35—80 m.; from loc. 5 small zoaria on a hydroid, from loc. 9 a large agglomeration of zoaria.

All the specimens belong to the typical form. For the structure of the zoarium cf. Harmer (l. c.).

Fam. Flustridae Smitt.

In this family the following genera have been proposed:

1). *Flustra*, Linné 1758, proposed for the species *Eschara foliacea* L. When the number of known Bryozoa increased all *Flustridae* in the modern sense (together with numerous other species now removed to other families) were enclosed in this genus. Since then species have been removed from the genus now and then, and new genera have been proposed for them.

2). *Carbasea*, Gray 1848, was proposed for *Flustra carbasea* Ell. & Sol. It is distinguished by the absence of avicularia and ooecia and by the unilaminar zoarium. This genus has been disregarded by some later authors (for instance by Levinsen 1909), or it has been made a subgenus of *Flustra*. Other authors, however, have referred several new species to it. When these new species have not had all the three characters mentioned their entering into the genus has depended upon which of them bas been looked upon as the most important by the various authors. We mention, for instance, that Bidenkap (1900, p. 508) referred his species *Flustra spitzbergensis* (possibly a synonym of *Flustra serrulata* Busk), which is bilaminar but is devoid of ooecia and avicularia, to *Carbasea*. Okada (1921, p. 23) proposed as new *Carbasea sagamiensis*, which is unilaminar but has ooecia and avicularia. Harmer (1926, p. 249) proposes as new *Carbasea linguiformis*, which is unilaminar, has ooecia but is devoid of avicularia; which feature he looks upon as a special character of the genus does not appear from his discussion. Thus the genus *Carbasea* has become very vague, and a new raison d'être must be given to it if it is to be maintained.

3). *Chartella*, Gray 1848, proposed for *Flustra papyracea*

ELL. & SOL. No special characters have ever been given to this genus, and it has never been accepted without argument, except as a subgenus (CANU & BASSLER 1925, p. 14, and 1929, p. 83).

4). *Spiralaria*, BUSK 1861, proposed for *Spiralaria florea* BUSK. LEVINSEN (1909, pp. 124—126) was the first to give a detailed diagnosis to this genus: »The lateral walls with as a rule a row of spine-like processes (or denticles) a short distance within the covering membrane; the edges of the aperture as a rule furnished with spines, sometimes over their whole length; the avicularia generally with beak-shaped, pointed mandible; the ooecia most often immersed in avicularia; the side-walls have numerous uniporous rosette-plates.» After that he points out that these characters, as is seen also by the diagnosis, are not constant. It may be added that some of them are also to be seen in species belonging to other genera. LEVINSEN refers several species with greater or less certainty to the genus.

5). *Sarsiflustra*, JULLIEN & CALVET 1903, proposed for *Flustra abyssicola* M. SARS. The diagnosis of this genus is discussed by SILÉN (1938, p. 350), who at the same time referred a new species, *S. japonica* to the genus. The revised diagnosis proposed there runs thus: »Zoarium vom primitiven *Flustra*-Typus, locker gebaut, zweischichtig; Avicularien vikariierend, lateral bei Verzweigungspunkten der Zoidreihen gelegen, nähern sich in der Grösse den Autozoiden, mit spatenförmiger Mandibel und wohl ausgebildeter Cryptocyste; Ooecien reduziert (oder fehlen?)».

Until the year 1909 the genus *Flustra* remains enclosing most *Flustridae*. But this year brings a great change with LEVINSEN'S (1909, pp. 122—130) revision of the family. *Sarsiflustra* is preserved. *Flustra* is limited to enclose *F. foliacea* and *F. carbasea* with the following diagnosis: the lateral poreplates multiporous, the ooecium, if present, eggshaped (these characters in contrast with the following species, which have uniporous lateral poreplates and »cup-shaped» ooecia); the structure of the avicularium above all separates the genus from *Sarsiflustra*. The species excluded are distributed among *Spiralaria* (see above) and three new genera, *Kenella*, *Retiflustra* and *Heteroflustra*.

6). *Kenella*, proposed for *Flustra biseriata* BUSK. The ooecia are embedded in kenozoids, the zoarium is biserial, avicularia are wanting. HARMER (1926, p. 249) seems to have his doubts as to the correctness of the genus. CANU & BASSLER (1929, p. 83) maintain it. I have not had the opportunity of examining the genus myself.

7.) *Retiflustra*, proposed for *Retepora cornea* BUSK (lectotype, HARMER 1923, p. 315; synonym: *Carbasea cribriformis* BUSK), *Flustra reticulum* HINCKS and *Retiflustra schönaui* LEVINSEN. This genus is above all characterized by the structure of the zoarium; the zoaria are richly branched, and in most species the branches anastomose and form a fenestrated disc. The avicularia are very large, they reach almost the size of an autozoid. The lateral poreplates are uniporous.

8). *Heteroflustra* is an artificial group enclosing those *Flustridae* which can not be placed in the above genera; thus most members of the old genus *Flustra* should be referred to this genus.

But this system proposed by LEVINSEN, which is still prevalent, is uncertain in many respects. The importance of such characters as the shape of the ooecia and the multi- or uniporousness of the lateral poreplates is not clear. The extent and the definition of the genera *Flustra* and *Spiralaria* is vague, as well as the position of the genus *Carbasea*. It is above all unsatisfactory that a very large part of the *Flustridae* are referred to *Heteroflustra*, a genus of an artificial and altogether negative nature. In short, there is no main principle in the arrangement of the *Flustridae*.

SILÉN (1938, pp. 276—279, 288—310) has shown, that the vicarious avicularia present in most *Flustridae* can be arranged in different types as to their position in the zoarium. In each species one type prevails. In some species the avicularia are placed at the bifurcations of the zoid rows, in other species they have no connection with these. In the former case they are placed distally-terminally to their mother zoids in certain species, in other species they are placed distally-laterally to their mother zoids. If the latter is the case the avicularia are very large, often they almost reach the size of the autozoids; proximally they are pointed. All other avicularia are rather small, square, and the proximal wall is straight. It was proved that this regularity as to the position in the zoarium and the shape of the avicularia depends upon the method of budding by which the zoaria are built up. And the connection between these phenomena makes it certain that the different position of the avicularia in different species, since they are significant of the structure of the zoarium in those species, has a great importance when settling the relationship between these species and thus also when drawing up a natural system. With regard to this and to the characteristics used by earlier authors, such as the ooecia being embedded in autozoids, avicularia or kenozoids, the lateral porereplates being uni- or multiporous, etc., it seems to be correct to propose a system such as the following one.

1) Ooecia (if present) embedded in autozoids.
   2) Avicularia present.
      3) Avicularia at the bifurcations of the zoid rows, derive distally-laterally from their mother zoids, large, proximally pointed.
         4) Lateral poreplates multiporous; zoarium of a simple *Flustra*-shape.
            5) Avicularia almost of the size of the autozoids; mandibles large, spade-shaped, occupy more than 1/2 of the fronts of the avicularia; ooecia reduced (or wanting?) . . . . *Sarsiflustra.*
            5) Avicularia considerably smaller than the autozoids; mandibles rather small, occupy less than 1/2 of the fronts of the avicularia; ooecia well developed. *Flustra.*
         4) Lateral poreplates uniporous; zoarium richly bifurcating, the branches anastomosing . . . . *Retiflustra.*
      3) Avicularia rather small, square, proximal wall straight; if placed at the bifurcations of the zoid rows they derive distally-terminally from their mother zoids.
         6) Avicularia as a rule placed at the bifurcations of the zoid rows; zoarial structure not fixed (cf. SILÉN 1938, pp. 277—278, etc.). . . *Terminoflustra* n. gen.
         6) Avicularia as a rule not placed at the bifurcations of the zoid rows; zoarial structure fixed (cf. SILÉN, l. c.) *Securiflustra* n. gen.
   2) Avicularia wanting . . . . *Carbasea.*
1) Ooecia embedded in avicularia . . . . *Spiralaria*
1) Ooecia embedded in kenozoids . . . . *Kenella.*

There is one advantage with this system: most species can be arranged according to one main principle, namely the position in the zoarium and the shape of the avicularia. It has been possible to separate a great many species from LEVINSEN's *Heteroflustra* (which is not introduced here, as it seems unnecessary to establish a new genus for the sake of species, the relationships of which have not yet been examined), to distribute them among the new genera *Terminoflustra* and *Securiflustra* and to place them in one system together with other species. The undoubted and close relationships between *Sarsiflustra*, *Flustra* and *Retiflustra* in contrast to the group *Terminoflustra-Securiflustra* also finds expression. But some difficulties remain.

Carbasea has been reestablished for species without avicularia, whose absence has made it impossible to arrange them in accordance with the above system. It is not possible without a close examination of each species, to say for sure if this genus is heterogenous. It may be that some species never have had avicularia but that other species have lost theirs' secondarily (cf. Silén 1938, p. 292, textfigs. 49—54, etc.). Thus it is interesting to note that in »*Flustra*» *securifrons* some zoaria have, others are deprived of, avicularia.

If we try to determine the species of *Retiflustra* with the aid of the above table we will see that it is impossible to put the qualification presence or absence of avicularia into rigorous practice. Two of the three species, *R. schönaui* and *R. reticulum*, have avicularia of the type, which according to the table is characteristic of the genus. But *R. cornea* has no avicularia! Thus, according to the table, it should be placed in *Carbasea*. But the structure of the zoarium and other features show that it without a doubt is close to the other two species of *Retiflustra*. Thus we see that the above table characterizes the different genera especially with regard to their relationships to one another. But it is not in all cases possible to use it for the determination of all the species of *Flustridae*, owing to the absence of avicularia in numerous species, i. e. the structures on which the table is based. In such circumstances it is necessary to take refuge in characters of less importance and to settle the relationship between such a species and a species the systematical position of which is clear, by means of a detailed examination. Regarding *Retiflustra* it is, however, very unfortunate that *R. cornea* has been picked out as the type of the genus as it is not typical of it.

We have another deficiency in the genus *Spiralaria*. It does not seem to be certain that the phenomenon that the ooecia are embedded in avicularia (and they are not so in all species referred to this genus by Levinsen!) is of such an importance as to be the motive of establishing a special group in contrast to all other *Flustridae*. Perhaps the genus ought to be split up and its species distributed among other genera.

In order to give an example of my opinions regarding the distribution of the *Flustridae* among the different genera and the limits of the latter, I have made the following list of species, which can be placed with some certainty.

Sarsiflustra:

Type: *S. abyssicola* (M. Sars).
S. japonica Silén.

Flustra:

Type: *F. foliacea* (L.)
F. drygalskii Kluge.
F. vanhöffeni Kluge.

(The two latter species are close to each other [for instance in the shape of the ooecium]; perhaps a new genus could be established for them).

Retiflustra:

Type: *R. cornea* (Busk) (cf. above).
R. schönaui Lev.
R. reticulum (Hincks).

Terminoflustra:

Type: *T. barleei* (Busk).
T. membranaceo-truncata (Smitt).
T. albida (Hasenbank).
T. gracilenta (Hasenbank).
T. oblonga (Waters).
T. sagamiensis (Okada).
T. spoliata (Ortm.).

Securiflustra:

Type: *S. securifrons* (Pall.).

Carbasea;

Type: *C. carbasea* (Ell. & Sol.).
C. papyracea (Ell. & Sol.).
C. linguiformis Harmer.
C. curva (Kluge).
C. macropora Hasenbank.

Spiralaria:

Type: *S. florea* (Busk).
S. denticulata (Busk).
S. denticulata var. *brevimandibulata* Hasenbank.
S. serrata (Mac Gill.).
S. vegae n. sp. (p. 59).
S. incrustans n. sp. (p. 59).
? *S. dentigera* (Waters).
? *S. spinuligera* (Waters).
? *S. alice* (Jull.).
? *S. neptuni* (Jull.).
? *S. flustroides* (Hincks).
? *S. octodon* (Busk).
? *S. rhizophora* (Ortm.) (= *S. serrata* or *S. spinuligera*?).

Kenella:

Type: *K. biseriata* (Busk).

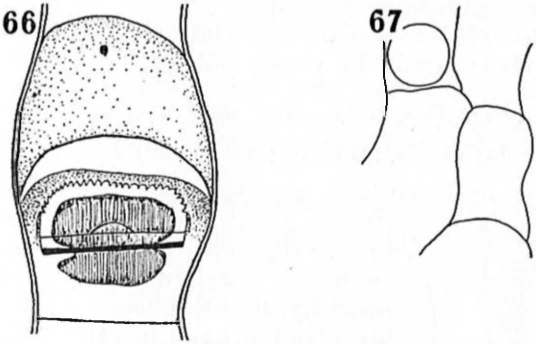
1. Sarsiflustra Jullien & Calvet.

S. japonica Silén.

Sarsiflustra japonica, Silén 1938, p. 351, Pl. 18 fig. 122, textfigs. 56 A and 56 B, 72—75.

Locality: Japan (29 [type]); 450—600 m.; one large and several small, detached zoaria.

This species belongs to the collection here treated but as it was of importance for the discussion of some general problems it has already been described in the work cited.



Figs. 66—67. *Terminoflustra sagamiensis.* (Okada).

Fig. 66: Avicularium. 95 ×. — Fig. 67: Part of zoarium in basal view showing an ooecium (to the left) and an avicularium. 37 ×.

2. Terminoflustra n. gen.

T. sagamiensis (Okada) (figs. 66—67; Pl. 3 fig. 10).

Carbasea sagamiesis (misprint for *sagamiensis*), Okada 1921, p. 23, textfig. 3 (Japan); *Flustra sagamiensis,* Silén 1938, p. 277, Pl. 18 fig. 123, textfigs. 57 A and 57 B.

Locality: Japan (17); 135 m.; two detached zoaria.

Okada (l. c.) gives a detailed description of the species. Silén (op. cit.) treats the structure of the zoarium and the position of the avicularia. Some minor observations may be added.

The avicularian rostrum is raised a little and forms an angle of about 20° with the front side. Its inner margin is provided with small teeth. The distal wall of the avicularium descends obliquely below the proximal part of the distal zoid, and thus it is clearly to be seen from the front. It has one poreplate. The lateral walls have 4 poreplates each. — In the autozoids the number of the poreplates varies considerably as suggested already by OKADA. There are 8—12 poreplates in the lateral walls, 2—4 in the distal one. They are all uniporous.

The margins of the zoarial branches are strengthened by kenozoids. They are long and narrow, pointed at their ends, their walls are very thick and strongly calcified. At the basal bifurcations of the zoarium they form a layer of up to 6 rows, which extends upwards along the margins of the branches and becomes narrower until it consists of one row only and then disappears. The kenozoids of the 1—2 inner rows are more like the autozoids in shape.

»*Flustra*» *albida* HASENBANK (1932, p. 348) from the Nicobar Islands seems to be closely allied.

»Flustra» sp. (fig. 68).

Locality: Japan (15); 175 m.; two small fragments.

The zoarium is unilaminar. No ooecia and avicularia were present on the fragments. The autozoids are of the usual *Flustra*-shape, long and roundedly hexangular. Their lateral walls are very thin, high and straight. There are about 5 pairs of lateral and 2 distal uniporous poreplates. The zoarial margin is strengthened by a row of kenozoids. They are very narrow (about 1/4 of the breadth of an autozoid) and long (twice the length of an autozoid). Their walls are translucent and not thickened.

Owing to the fragmentary state of the specimens it is not possible to decide upon the systematic position of the species.

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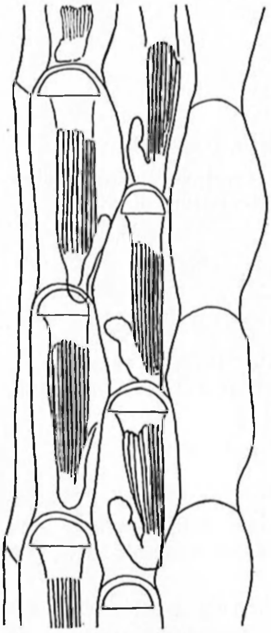

Fig. 68. »*Flustra*» sp. 60 ×. Margin of zoarium with auto- and (to the left) kenozoids.

3. Spiralaria BUSK.

I have referred three species to this genus. They are all encrusting, and thus they have a general appearance which is not like the usual Flustrid one. But all other features show that they are very close to the *Flustridae* and especially the *Spiralariae*. In one of them, *S. serrata*, the ooecia are often embedded in autozoids, but nevertheless I think it must be referred to *Spiralaria*. In *S. incrustans* and *S. vegae* the ooecia are embedded in avicularia, but in spite of that I am sure that *S. incrustans* is more close to *S. serrata* than to *S. vegae* as shown by the structure of the autozoids and the avicularia. The following determination table will show this. — The avicularia, when placed at the bifurcations of zoid rows, always derive distally-terminally from their mother zoids.

1) Avicularia scattered in the zoarium; rostrum and mandible pointed, placed obliquely; in an avicularium at the bifurcation of a zoid row the rostrum is directed from the sister zoid.
    2) Ooecia embedded in autozoids, (sometimes in avicularia) *S. serrata*.
    2) Ooecia embedded in avicularia . . . . *S. incrustans*.
1) Distally to almost each zoid an avicularium; rostrum and mandible rounded, point straightly in the distal direction *S. vegae*.

As will be seen many encrusting species referred by earlier authors to *Membraniporidae*, probably ought in fact to be ranged in *Spiralaria*.

1. S. serrata (MAC GILL.) (fig. 69).

Membranipora serrata, MAC GILLIVRAY 1869, p. 131, 1882, p. 3, 1886, p. 105, Pl. 127 fig. 5; *Membranipora acifera*, MAC GILLIVRAY 1882, p. 2; *Spiralaria serrata*, LEVINSEN 1909, p. 126; *Spiralaria spinuligera*, OKADA & MAWATARI 1936, p. 53, Pl. 9 fig. 7, textfig. 1 (Japan).

Localities: Japan (1, 29); 115—600 m.; encrusting stones and sponges.

The zoids are rather large and of the usual *Spiralaria* shape. I have not been able to observe the spinelike projections below the frontal membrane (cf. LEVINSEN l. c.). There are 6—7 pairs of spines. They are placed horizontally above the frontal membrane. They become narrower towards their extremities. Three types of spines are discernable: the praeoral pair, the postoral pair and the more proximal spines. The two praeoral spines are short; from the proximal side of each spine a branch derives in the horizontal plane, which is a little shorter than that one which runs in the main direction of the spine. The two postoral spines are considerably longer and meet, as the proximal spines, at their extremities. They are strong and curved towards the distal side. From the distal side of each spine two small branches derive in the horizontal plane. The other spines are of about the same shape as the postoral ones, but they are curved upwards from the frontal membrane, and from their frontally directed sides two small branches derive in each spine.

The avicularia are square; they are scattered in the zoarium. Sometimes they are placed at the bifurcations of the zoid rows, and then they derive distally-terminally from their mother zoids. The rostrum is very long and drawn out along the margin of the distal zoid in the way described by Mac Gillivray.

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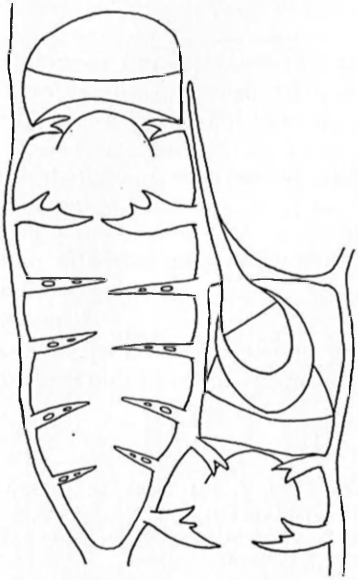

Fig. 69. *Spiralaria serrata* (Mac Gill.) (loc. 29). 95 ×.

Zoids with ooecia, and avicularium.

The ooecium is embedded in the distal autozoid or in an avicularium. Its proximal part is crossed by a transverse ribbon, which is formed by the zoidal wall in the way described by Mac Gillivray. In this respect the species differs from *S. spinuligera*, where the frontal ribbon of the ooecium is formed by fused spines (cf. Marcus 1922 b, p. 9).

The spines do not fully agree with any of the types described by Mac Gillivray, but nevertheless these specimens doubtless are to be ranged in his species; as shown by Mac Gillivray the species varies much as to the shape of the spines, as is the case also in other species of this genus. — Marcus (l. c.) refers Ortmann's (1890, p. 27, Pl. 1 fig. 24) *Carbasea rhizophora* to *Spiralaria* and expresses as his opinion that it is allied to *S. spinuligera* (cf. also Hincks 1891, p. 287). But it seems to me as if it, with at least the same plausibility, could be referred to *S. serrata*. Mac Gillivray describes specimens of the latter species which are deprived of spines as is the case in Ortmann's species. And Ortmann draws the frontal ribbon of the ooecium as formed by the zoid wall, but owing to his figure being very undetailed that is no definitive proof. This discussion shows, however, that *S. serrata* and *S. spinuligera* are closely allied, allthough I have not convinced myself that they are identical. *S. spinuligera* of Okada & Mawatari certainly is identical with *S. serrata*, but its identity with the true *S. spinuligera* seems to me to be very doubtful. — Jullien & Calvet (1903, pp. 37—38, Pl. 5 figs. 1—2) describe two new species, *Membraniporella alice* and *M. neptuni*, which seem to be close to *S. serrata* and possibly ought to be ranged in *Spiralaria*.

2. S. incrustans n. sp. (fig. 70).

Locality: Japan (43 [type]); 100—135 m.; encrusting wormtubes.

The zoids are of about the same shape and structure as those of *S. serrata*. They are, however, considerably smaller and more rounded. They have their greatest breadth towards their proximal ends, which are rounded; in *S. serrata* the zoids are pointed at their proximal ends and become broader towards their distal ends. There are about 5 pairs of spines. They are bent in over the frontal membrane, and thus they are not placed in the horizontal plane as in *S. serrata*. They are rather short, flattened and become a little broader towards their blunt extremities. Some of them, usually the third and the fifth pair from the distal end of the zoid, are sometimes forked. The distal pair of spines is more upright and rounded in cross section. I have not been able to observe any spinelike projection below the frontal membrane (cf. LEVINSEN 1909, p. 126).

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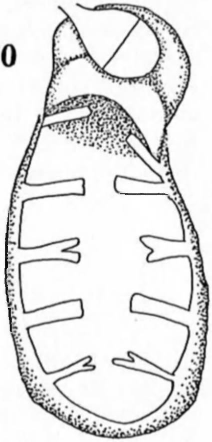


Fig. 70. *Spiralaria incrustans* n. sp. 37 ×. Zoid with ooecium, and avicularium.

The avicularia are square, and are scattered in the zoarium. Sometimes they are placed at the bifurcations of the zoid rows, and then they derive distally-terminally from their mother zoids. The rostrum and the mandible are pointed but rather short; they are placed obliquely.

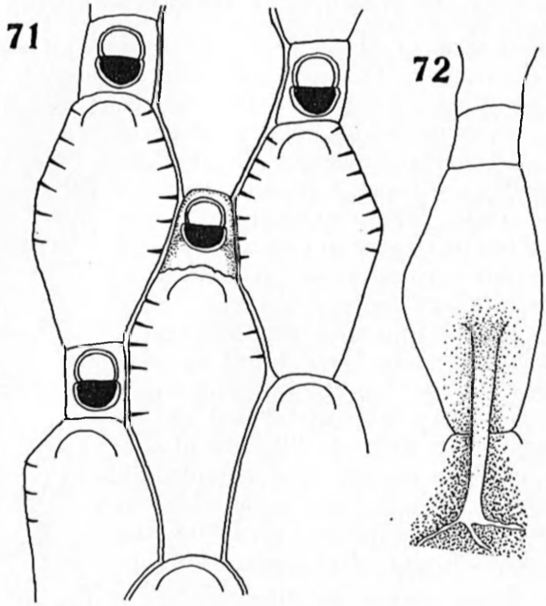
The ooecium is rather small and rounded. It is always embedded in an avicularium and occupies about its proximal half.

This species is rather close to *S. serrata* but is easily distinguished from it. If we disregard its encrusting habit however, it resembles *S. denticulata* most closely; in fact at first I referred these specimens to that species, but when I got the opportunity of comparing them with specimens of *S. denticulata* it was evident that they could not belong to that species.

3. S. vegae n. sp. (figs. 71—72; Pl. 3 fig. 11).

Locality: Japan (1 [type]); 115 m.; one zoarium encrusting a stone.

The zoids are of the usual *Flustra*-type. The proximal wall is short and straight. Then the zoid broadens out to about $^3/_5$ of the length of the zoid, where it again becomes narrower. Its distal end is rounded. Along the margins of the distal half of the aperture field 4—7 pairs of very short and pointed spines are placed; they are bent inwards. Very often they are detached. From the centre of the proximal part of the basal wall of the zoid a rather long, narrow tube derives, which divides at its extremity and is fixed at the substratum. There are 2 distal and 8—10 pairs of lateral poreplates. They are all uniporous.



Figs. 71—72. *Spiralaria vegae* n. sp. 42 ×.

Fig. 71: Zoids and avicularia; an ooecium is embedded in the central avicularium. — Fig. 72: Zoid and avicularium in basal view; a fixation-tube emanates from the zoid.

The avicularia are vicarious and placed at the distal end of almost every autozoid. They are square, the length being about the same as the breadth and $^1/_4$ of the length of an autozoid. The mandible is semicircular and points in the distal direction. There are 1 distal and 2 pairs of lateral poreplates; they are uniporous.

The ooecia are rather small, rounded, they are always embedded in avicularia.

Levinsen (1909, pp. 125—126) has made his diagnosis of the genus *Spiralaria* wide enough to enclose *Flustra octodon*

Busk (1852 b, p. 49, Pl. 56 fig. 4 and Pl. 58 fig. 5) and *Membranipora* (*Hincksina*) *flustroides* Hincks (1877, p. 213, 1880 a, p. 151, Pl. 19 fig. 2). These species differ from the other species of *Spiralaria* in their rounded, distally directed avicularian mandibles, and Levinsen was not sure if they were to be ranged in this genus. *S. vegae* is allied to these species. In its appearance it resembles *Flustra octodon* (the development and position of the spines is, for instance, the same in both species) but differs from it in many details of the structure of the autozoids and avicularia; ooecia are not known in the latter species. It has no particular resemblance to *Membranipora flustroides*, but the ooecium being embedded in an avicularium is characteristic of both species. The latter feature and the structure of the autozoid are in my opinion characters which make it convenient to range at least *S. vegae* in *Spiralaria*. It is clear that it belongs to *Flustridae*, and there is no other genus at present in which it can be placed.

Fam. **Onychocellidae** Jullien.

Onychocella Jullien..

O. angulosa (Reuss).

Cellepora angulosa, Reuss 1848, p. 93, Pl. 11 fig. 10; *Onychocella angulosa*, Waters 1891, p. 9; Harmer 1926, p. 256, Pl. 16 figs. 8—9 (Japan; references); Calvet 1927 a, p. 4; Calvet 1927 b, p. 12; Canu & Bassler 1930 b, p. 22 (synonyms); Calvet 1931, p. 71.

Localities: Japan (1, 25, 26, 27, 29, 43), Bonin Islands (32, 33); 3—600 m.; on stones, shells, and the like.

Fam. **Lunulariidae** Levinsen.

Cupuladria Canu & Bassler.

C. guineensis (Busk).

Cupularia guineensis, Busk 1854, p. 98, Pl. 114 figs. 1—5; *Cupuladria guineensis*, Harmer 1926, p. 266, Pl. 16 figs. 5—7, text-fig. 9 (references); Hastings 1932, p. 412 (references); ? *Cupuladria elongata*, Sakakura 1935 a, p. 6, Pl. 1, figs. 1—3 (Japan, pleistocene).

Locality: East China Sea (4); 90 m. One large zoarium, figured by Silén 1938, Pl. 17 fig. 119.

Divisio 4. *Coelostega.*

Fam. **Steganoporellidae** Hincks.

Steganoporella Smitt.

For details see Harmer 1900, Harmer 1926, Silén 1938 pp. 342—347.

S. magnilabris (Busk).

Membranipora magnilabris, Busk 1854, pp. 62, 113 (pars); *Steganoporella magnilabris,* Ortmann 1890, p. 30, Pl. 2 fig. 7 (Japan); Okada 1923, p. 224 (Straits of Corea); Harmer 1926, p. 277, Pl. 17 figs. 1—3, 7, 9, 12, text-fig. 10 (Japan; references); Canu & Bassler 1929, p. 144, Pl. 15 figs. 1—2 (Japan; references); O'Donoghue & Watteville 1935, p. 205; Okada & Mawatari 1935, p. 130 (Japan); Okada & Mawatari 1938, p. 450 (Japan).

Localities: East China Sea (4), Japan (1, 2, 22, 25, 26, 28, 29, 44, 50); 0—600 m.; Escharan or encrusting stones, shells, algae, and the like.

Fam. **Labioporellidae** Harmer.

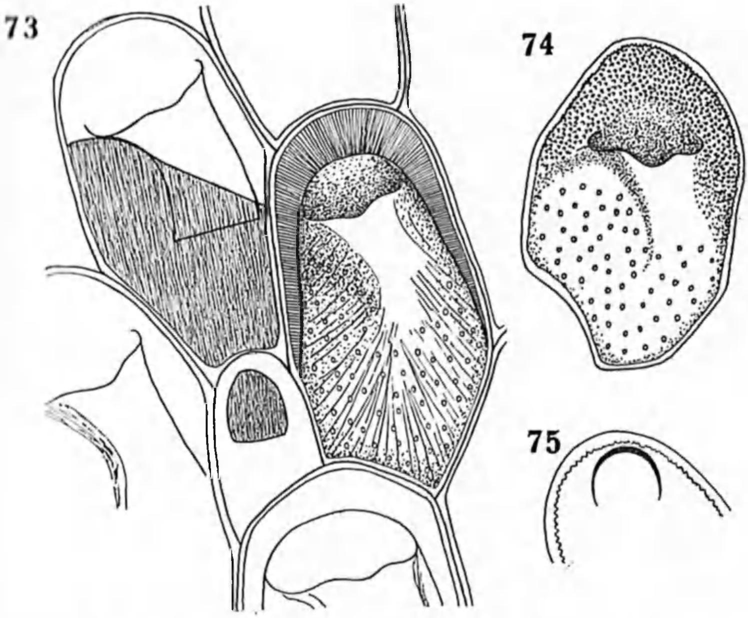
Harmer (1926, p. 280) considers that only the genus *Labioporella* can be enclosed in this family. The genus *Siphonoporella,* he says, ought possibly to be placed in a separate family as the known members of this genus differ from *Labioporella* in having a proximal gymnocyst, in the lateral position of the tube and in the absence of avicularia. In the following, however, will be described a new species, which in many important features such as the position of the tube and the Membraniporine operculum corresponds to *Siphonoporella* so closely that it seems proper to include it in that genus. But this species does not have a proximal gymnocyst and it has vicarious avicularia. Canu & Bassler (1928, p. 68, Pl. 7 figs. 4—7, text-fig. 9) also describe a *Siphonoporella, S. dumontii,* with vicarious avicularia. At present at least there seems to be no reason to propose a new family for the sake of *Siphonoporella,* and in the following it is placed in *Labioporellidae.*

Siphonoporella Hincks.

S. aviculifera n. sp. (figs. 73—75).

Locality: Japan (1 [type]); 115 m.; a large zoarium, most of it dead, encrusting a stone.

The zoids are large and of a considerable length, their form is hexagonal. There is no gymnocyst. The cryptocyst



Figs. 73—75. *Siphonoporella aviculifera* n. sp. 60 ×.
Fig. 73: Zoids and avicularium; in the zoid in the upper left corner the extension of the polypide tube is schematically lined out. — Fig. 74: Zoid. — Fig. 75: Operculum.

covers the proximal part of the zoid. It extends farther on one side than on the other and owing to this the line at which it meets the basal wall runs obliquely to the main axis of the zoid. It is translucent, sharply striated from the margins and to the median line and is provided with numerous pores and granules. On the side where the cryptocyst ends more proximally the polypid tube comes forth. It begins a little in under the cryptocyst, runs along one of the lateral walls and then it curves and runs over to the other side, where it perforates the distal part of the cryptocyst. In the median axis of the zoid it ends as a wide funnel, the basal wall of which is formed by the basal wall of the zoid. The walls of the tube are finely granulated like the cryptocyst but they have no pores. The frontal side of the zoid is covered by the frontal membrane, in the foremost part of which we find the simple Membraniporine operculum. Its edge is marked by a chitinous sclerit, but there is no proximal sclerit.

Vicarious avicularia are rather frequent. They are to be seen only at the bifurcations of the zoid rows, where they have the position as one (the lateral) of the two daughterzoids. Consequently they are to be placed in group 1 of the vicarious avicularia proposed in an earlier work of mine (SILÉN 1938, pp. 288, 308 and elsewhere). Their length is about $^1/_3$ of the length of the autozoid, and their breadth about $^1/_2$ of its breadth. They have a transparent, finely granulated frontal wall without pores, in the distal part of which a large, almost triangular opening is to be seen. The avicularia were all dead and, owing to this, were devoid of mandibles.

The most characteristic feature of the species are the avicularia.

Fam. **Thalamoporellidae** LEVINSEN.

Thalamoporella HINCKS.

T. lioticha (ORTM).

Micropora lioticha, ORTMANN 1890, p. 30, Pl. 2 fig. 11 (Japan); OKADA 1923, p. 225 (Straits of Corea); *Thalamoporella lioticha*, LEVINSEN 1909, p. 179, Pl. 6 figs. 7 a—7 p, Pl. 6 b fig. 4 a (Japan); CANU & BASSLER 1929, p. 150, Pl. 17 figs. 1—2 (Japan); SAKAKURA 1935 a, p. 14 (Japan, pleistocene).

Localities: East China Sea (4), Japan (11, 20, 26, 28, 29, 43), Bonin Islands (33, 34); 40—150 m.; on stones and hydroids.

Most zoaria are encrusting, sometimes with erect Vincularian branches. From locality no. 20 there is a very large zoarium with Escharan, anastomosing branches and not fully developed ooecia. One zoarium from locality no. 11 has fullgrown ooecia. — The avicularia are abundant in all the zoaria and are as as a rule situated at the bifurcations of the zoid rows, replacing the more lateral of the two daughterzoids; thus these avicularia can be ranged in group 1 of the vicarious avicularia (SILÉN 1938, pp. 288, 308). — In an earlier paper of mine (SILÉN 1938, pp. 223—236) a detailed description of the morphology and anatomy of this species is to be found.

Fam. **Microporidae** HINCKS.

1. **Monoporella** HINCKS.

M. nodulifera (HINCKS).

Haploporella nodulifera, HINCKS 1880 c, p. 11; *Monoporella nodulifera*, HINCKS 1880 d, p. 135, Pl. 1 fig. 4; HARMER 1926, p. 310, Pl. 20 figs. 21—23 (Japan; references).

Occurrence: Japan (27); 45—60 m.; one small zoarium encrusting a worm tube.

HARMER (op. cit., p. 311) describes specimens from Japan, which, as he says, are perhaps to be considered as a distinct species. They differ from the typical specimens in the absence of spines, in that the operculum is not pitted and is »rather more than a semicircle», and in certain features of the ooecium. The present specimens show the same differences, except that the ooecia are absent and therefore their structure can not be observed. The operculum is of a chocolate colour instead of black as noted by HARMER; perhaps this depends on the preservation fluid. — No new facts have thus come forward which can throw light upon the problem when we are dealing with a new species, and for the precent I think it advisable to retain the specimens in question in the old species.

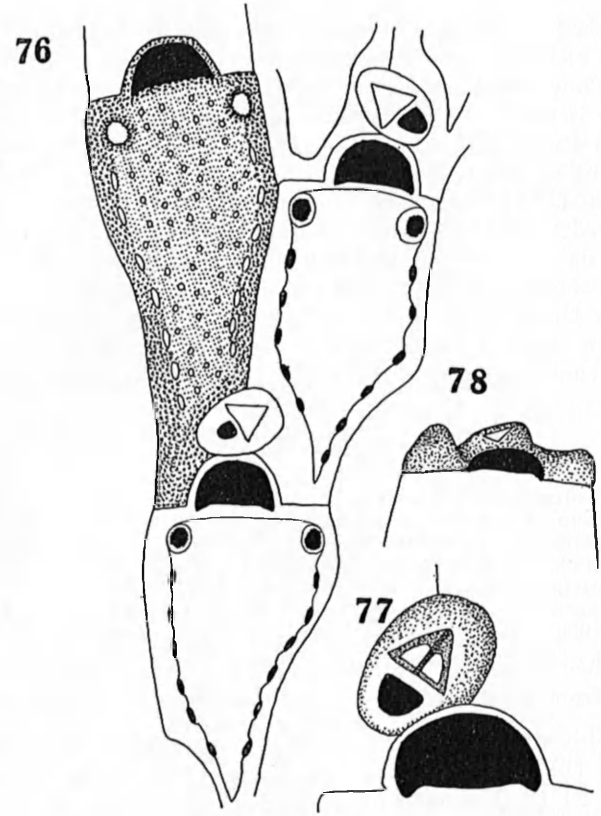
2. Microporina LEVINSEN.

1. M. elongata (HINCKS) (figs. 76—78; Pl. 3 fig. 12).

Steganoporella elongata, HINCKS 1880 d, p. 380, Pl. 16 fig. 4; *Micropora elongata*, HINCKS 1882 a, p. 123; WATERS 1889, p. 8, Pl. 1 figs. 21—22; *Micropora variperforata*, WATERS 1887, p. 51, Pl. 8 fig. 27 (cf. WATERS 1889); *Microporina elongata*, LEVINSEN 1909, p. 162; *Verminaria areolae*, SAKAKURA 1935 a, p. 12, Pl. 2 fig. 5, text-fig. 3 (Japan, pleistocene).

Localities: Japan (1, 43); 100—135 m.; from locality 1 several large, from locality 43 one small zoarium; encrusting stones.

The zoids of considerable length, rectangular. The breadth varies; in the zoarium from loc. 43 it agrees with WATERS's (1889) fig. 21 (= HINCKS's specimens), in those from loc. 1 with fig. 22 of the author named. They are distinctly separated from one another by thin brown lines in the way that Miss HASTINGS (1930, p. 720) describes in *Micropora coriacea* (JOHNST.). Along the lateral and proximal sides the zoids have a rather broad elevated margin, which abruptly descends to the cryptocyst. It is coarsely granulated. The cryptocyst covers entirely the area inside this margin. It is delicately granulated and provided with a large number of small pores. The opesiulae are situated along the lateral margins. Their number varies but there can be 8 on each side. The two distal opesiulae are much larger than the proximal ones. All have a circular form. The aperture is situated in the foremost part of the frontal side and is surrounded by a low narrow wall. Distally this wall is semicircular, proximally it is straight but for two incisions at the lateral ends. The operculum is of a light brown colour and has a sclerit along its margins. Proximally the zoid is prolonged at each side and thus it distally and laterally surrounds the prominent median part of the proximal



Figs. 76—78. *Microporina elongata* (Hincks).

Fig. 76: Zoids and avicularia (loc. 1). 67 ×. — Fig. 77: Avicularium (loc. 1). 105 ×. — Fig. 78: Zoid seen almost horisontally to its front to show its elevated distal avicularium and the proximal tubercles of the distal zoid (loc. 43). 67 ×.

zoid. These proximal projections are often each furnished with a more or less conspicuous knob.

Distally to the aperture and close to itself an avicularium is mostly to be found. It is circumscribed by a thin brown line. It is raised as an even knob and of an oval shape. The mandible is almost equilaterally triangular and in addition to a marginal sclerit it has a median one. Through this a rounded transparent area is formed on each side of the median sclerit. The avicularium is not situated on the proximal part of a zoid (cf. Harmer 1926, p. 307, concerning the corresponding circumstances in *Micropora*) but derives from the distal end of a zoid. This may be easily seen at the bifurcations of the zoid rows, where the last zoid in the simple zoid row has only one avicularium at the distal end; on each side of this the two daughterzoids emanate.

Ooecia were not found.

These specimens have been identified with *M. elongata*, as they agree with that species in all important points. HINCKS (l. c.) only percieved one pair of opesiulae in his specimens, but WATERS (1889) in the same zoarium saw zoids with two and such with more opesiulae. Thus the number of the opesiulae can not be said to be a reliable character in this and perhaps also in related species (WATERS l. c. mentions that the number of the opesiulae also varies in »*Haploporella*» *lepida* [HINCKS]). The proximal knobs have not been observed before, but in the same zoarium they vary much as to size and may be absent in some zoids and thus are not reliable as characters.

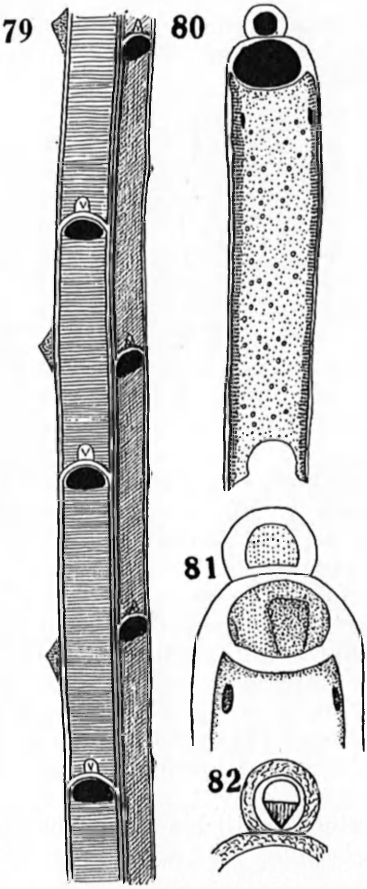
SAKAKURA (l. c.) says that the specimens he describes as *Verminaria areolae* are closely related to *M. elongata* but differs from that species in having a great number of opesiulae. He follows the system of JULLIEN (1888) and consequently he is able not only to propose a new species but also a new genus for these specimens. The significance of the number of the opesiulae is, as said above, negligible and JULLIEN's system has been severely criticized by WATERS. And since SAKAKURA's description and figs. agree in every detail with WATERS's description and with the specimens here described (in the text-fig. 3 the above mentioned proximal knobs are to be seen, though they have been figured as belonging to the distal part of the proximal zoid!) his specimens can certainly be identified with *M. elongata*.

2. M. articulata (FABR.)

Cellularia articulata, FABRICIUS 1821, p. 27; *Salicornaria borealis*, BUSK 1855, p. 254, Pl. 1 figs. 1—3; *Microporina borealis*, LEVINSEN 1909, p. 162; *Microporina articulata*, BORG 1933 a, p. 526; SAKAKURA 1936 (Japan). *Microporina japonica*, CANU & BASSLER 1929, p. 139, Pl. 14 figs. 9—11 (Japan).

Locality: Japan, Yezo, Hakodate (53); two segments of a zoarium.

Without a doubt these fragments are to be identified with *M. articulata*. The specimens described by CANU & BASSLER as belonging to the new species *M. japonica* are from the same part of Japan and are to be referred to *M. articulata*, as already shown by SAKAKURA (1936, p. 5).



Figs. 79—82. *Microporina okadai* n. sp.

Fig. 79: Part of the zoarium 36 ×. — Fig. 80: Zoid treated with Eau de Javelle. 60 ×. — Fig. 81: The distal part of a zoid treated with Eau de Javelle. 93 ×. — Fig. 82: Avicularium. 93 ×.

3. M. okadai n. sp. (figs. 79—82; Pl. 4 figs. 13—14).

Cyclostomella articulata, Okada (nec Ortmann) 1921, p. 29, text-fig. 6 (Japan).

Locality: Japan (29 [type]); 450—600 m.; several detached zoaria.

The zoarium is erect, and hexangular. It bifurcates at large intervals. This bifurcation takes place in a very simple way and is only a cleaving of the main branch; the zoid rows of the one half of the main branch compose the one daughter branch, the zoid rows of the other half of the main branch the other daughter branch. The branches are straight and narrow and are jointed at their proximal ends, the zoid walls of these parts of the zoarium being decalcified and strongly chitinized. — The same type of bifurcation is also found in *M. articulata* (Fabr.) (specimens from Greenland).

The zoids are situated on all sides of the zoarium and alternate. They are very prolonged, rectangular, their distal ends are rounded. The zoid margins are raised and descend abruptly to the cryptocyst. They are coarsely granulated. The cryptocyst covers the entire area inside the margins. It is densely granulated and has numerous pores. In the foremost part of the frontal side the aperture is situated. It is rounded, transversely drawn out and surrounded by a raised wall. Proximally to the aperture and close the elevated margin of the zoid there is a small, drawn out opesiula in each side. They may be clearly distinguished only when the zoarium has been treated with Eau de Javelle.

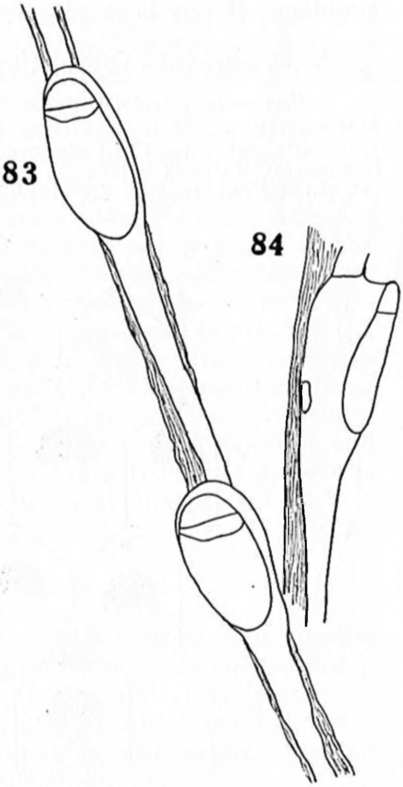
Distally to the aperture and close to it a small, rounded and slightly raised avicularium is always to be seen. The point of the triangular mandible is directed proximally.

There is here, as in *M. elongata* (p. 66), only one avicularium at a bifurcation of a zoid row, situated between the proximal ends of the daughter zoids, and it is evident that the avicularium is derived from the proximal zoid. — This type of avicularia is the same as that which we found in *M. elongata*. A special and unusual feature in the avicularia of *M. okadai*, as well as in those of *M. articulata*, is the proximal direction of their mandibles (cf. SILÉN 1938, pp. 310, 318).

Ooecia not found.

The specimens described are with certainty identical with those described by OKADA under the name of *Cyclostomella articulata* ORTM. OKADA did not observe the opesiulae but these are, as has been mentioned, distinguishable only when the zoarium has been cleaned. And that is the only point in which his and the above description differ. *Cyclostomella articulata* ORTM. does not seem to have anything to do with the species discussed. The characters: »Zooecien rings um die zylindrischen Zweige, langröhrig», »Internodien mit einer Anzahl unregelmässig gestallter, nach allen Seiten gerichteter Zooecien» and, above everything, the fig. shows that. And thus a new name must be proposed for the species discussed.

The species is allied to *M. articulata* (FABR.) but is easily distinguished.



Figs. 83—84. *Crepis longipes* JULLIEN. 60 ×.
Fig. 83: Zoids in frontal view. — Fig. 84: Zoid in lateral view.

Fam. Chlidoniidae BUSK.

Crepis JULLIEN.

C. longipes JULLIEN (figs. 83—84).

Crepis longipes, JULLIEN 1882, p. 522, Pl. 17 figs. 60—61; HARMER 1926, p. 318, Pl. 15 fig. 19.

Locality: Malacca Str. (5); 35 m.; on a hydroid.

Divisio 5. *Pseudostega.*

Fam. **Cellariidae** Hincks.

Cellaria Ell. & Sol.

1. **C. boninensis** Silén.

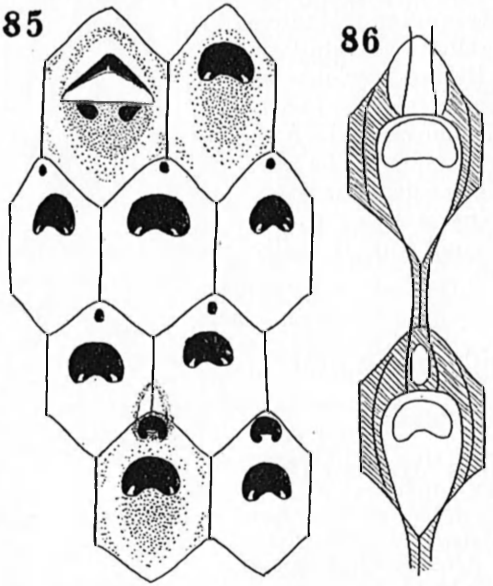
Cellaria boninensis, Silén 1938, p. 353, Pl. 17 fig. 121, text-figs. 45—46, 76—80.

Locality: Bonin Islands (35 [type]); 100—120 m.; numerous detached zoaria.

This species belongs to the collection here treated, but since it was of importance for the discussion of some general problems, it has been already described in the work cited.

2. **C. punctata** (Busk) (figs. 85—86).

Salicornaria punctata, Busk 1852 a, p. 366 (pars); *Cellaria punctata,* Harmer 1926, p. 337, Pl. 21 figs. 14—16, text-fig. 13 a (Japan; references); Hastings 1932, p. 413 (references); Marcus 1938 b, p. 206, text-fig. 13 (references). *Cellaria triangularis,* Ortmann 1890, p. 32, Pl. 2 figs. 13 (Japan); Okada 1921, p. 30, text-fig. 7 (Japan); Okada 1935, p. 225 (Straits



Figs. 85—86. *Cellaria punctata* (Busk). 67 ×.

Fig. 85: Zoids, two of them with ooecia, and avicularium. — Fig. 86: Two young zoids showing the extension of the body cavity.

of Corea); OKADA 1934, p. 11, Pl. 1 fig. 8 (Japan); OKADA & MAWATARI 1935, p. 132 (Japan); SAKAKURA 1935 a, p. 15 (Japan, pleistocene); SAKAKURA 1935 b, p. 108 (Japan); OKADA & MAWATARI 1938, p. 450 (Japan); ?*Cellaria japonica*, CANU & BASSLER 1929, p. 11, Pl. 20 fig. 9 (Japan).

Localities: East China Sea (4), China (8), Japan (1, 2, 16, 17, 18, 19, 25, 26, 27, 29, 43, 44), Bonin Islands (33, 34, 37); (3—)90—600 m.; numerous zoaria, detached or seated on zoaria of *Caberea*.

The present specimens certainly are to be identified with *C. punctata*. No doubt they are also identical with ORTMANN's *C. triangularis*. ORTMANN mentions that his species is closely related to *C. gracilis* BUSK (synonymous with *C. punctata*) and the differences that he gives between these two species are insignificant and grounded on features which vary much in one and the same zoarium. *C. triangularis* is, for instance, said to differ from *C. punctata* in having »längere und stärkere Internodien». In this respect the present specimens vary a great deal, and HARMER shows the same.

C. japonica CANU & BASSLER »resembles *Cellaria triangularis*, ORTMANN, 1892» (misprint for 1890!) »but differs in the absence of avicularian zooecia». The number of the avicularia in the zoaria here described varies widely, some zoaria are almost devoid of them. It is accordingly not possible, on the absence of avicularia alone, to keep *C. japonica* separated from *C. punctata*. The fig. of *C. japonica* agrees very well with the last named species. The proximal border of the aperture in *C. japonica* is described as being straight but, as the fig. shows, it is provided with the same median lip as *C. punctata* and other members of the genus. Only one thing is left: the zoids are described as smooth in *C. japonica* and then it is not able to say for certain that that species is identical with *C. punctata*, however likely that may be.

Divisio 6. ***Cellularina*** SMITT.

In this divisio HARMER (1926, p. 190) ranges the families *Scrupocellariidae*, *Euoplozoidae*, *Epistomiidae*, *Farciminariidae*, and *Bicellariellidae*, and later authors follow him in that respect. According to him »the Scrupocellariidae are the central group of the Cellularina»; thus he seems to consider the other families as derived from *Scrupocellariidae*.

There is no distinct definition of the Cellularina. SMITT (1868) proposed that group for most of the erect Anasca, and the shape and appearance of the zoarium is still looked upon as the main characteristicum of the divisio. The species referred to it are usually erect, richly and regularly bifurcating, rather or very slender, multi—biserial. Further, the zoarium is often jointed, the autozoids are more or less slender, numerous adventitious avicularia are usually present as well as hyperstomial ooecia.

If we make a close investigation of the structure of the zoaria of *Scrupocellariidae* and *Bicellariellidae*, the large families which contain most of the Cellularina, we will see, however, that it, in spite of the superficial similarity, is entirely different in the two families. HARMER (1923, pp. 322—323, and 1926) was the first to make such an investigation. According to him the zoarial structure seen at the bifurcations is mainly the same in all Cellularina: »The bifurcation of a biserial branch takes place by the doubling of the number of zooecia, and generally in such a way that two successive, alternating zooecia of opposite side of the parent-internode are each followed by two distal successors, instead of by a single successor as in parts where the internode is merely elongating without dividing.» The zoids at a bifurcation are always placed in the same way and HARMER denominates them by means of letters. With these letters inset the bifurcation takes place as follows: »E» (the axillary zoid) »(is) derived from A and (lies) on the inner side of C, and F (is) derived from B and (lies) on the inner side of D.» This description holds good for the *Bicellariellidae*, but it is wrong regarding the *Scrupocellariidae* as shown by SILÉN (1938, p. 321): »Bei einer Verzweigung» (of a Scrupocellariid) »ist nämlich nur das distale Zoid in der einen einfachen Reihe, nämlich A, Anlass zweier Tochterzoide, dagegen nicht B; diese Reihe setzt vielmehr einfach fort. A ist an der Aussenseite Anlass von C, welches das Proximalzoid in einer einfachen Reihe wird; an der Innenseite wird E, das axilläre Zoid, abgegeben, das seinerseits F und G abgibt. Aus A entsteht somit der ganze Zweig, der bei der Verzweigung des Zoariums an derselben Seite wie A liegt, sowie die innere Reihe des anderen Zweiges. Aus B kommt nur die äussere Reihe im Zweig der B-seite. Bei den nächsten Verzweigungen ist es die Reihen, die hier als B- bzw. C-Reihe bezeichnet wurden, die sich verzweigen, und somit bei den zuletzt genannten Verzweigungen als A bezeichnet werden. Die G- und F-Reihen treten bei diesen Verzweigungen als B-Reihen auf.» Thus, regarding the structure of the zoarium, there is a certain superficial similarity but no true relationship between *Scrupocellariidae* and *Bicellariellidae*. *Euoplozoidae* (HARMER 1923, p. 326, fig. 6, and 1926, p. 393, Pl. 30 fig. 3) is close to *Scrupocellariidae* in that respect. *Epistomiidae* has not been investigated. In *Farciminariidae Farciminellopsis gracilis* n. sp. (cf. below, p. 91) has the same mode of bifurcation as the *Scrupocellariidae*, but in other species of that family it seems doubtful.

In several respects, however, the Scrupocellariid type of zoarium and the Bicellariellid one show a great resemblance. Thus the branches of the zoaria are often jointed basally in both families. But this feature we see also in many species which are not related to these families at all, such as *Catenicellidae* and *Crisiidae*, species which, as *Scrupocellariidae* and *Bicellariellidae*, have an erect branching mode of growth. Thus it is evident that the jointing of the branches does not depend upon a relationship between the families in question but is necessary to give the fragile zoaria enough elasticity to resist the movements of the water. In the same way we are able to explain the occurrence in both families of chitinous tubes which support the zoaria or keep their branches together; such tubes we find also in *Flustridae*, *Cellariidae, Catenicellidae*, etc.

When we scrutinize the shape and structure of the different zooid types to see if any connections between *Scrupocellariidae* and *Bicellariellidae* may be found there we straight away meet a feature of the autozoids often pointed to as significant, namely their slender, proximally narrowing shape. It must be remarked, however, that this shape of the autozoids is not well developed in all species. In *Caberea*, for instance, the autozoids are almost square in some species; and these are to be found especially in the species, the zoaria of which are strongly and broadly built. The more slender the zoaria of a species are, the more slender are its autozoids. Then it is clear that the slenderness of the autozoids of some species is not necessarily significant of a close relationship between those species but depends on the slender mode of growth of their zoaria. Here it may be noted that we see the same slender autozoidal shape in *Catenicellidae* and other only distantly related families with slenderly built zoaria.

In other respects the autozoids of the families in question do not show any features distinctly pointing to a close relationship between them. They are of the common Anascan type. On the contrary the one unusual feature in the Scrupocellariid autozoid, the scutum that is found in many species, does not occur in *Bicellariellidae*.

It is characteristic of *Scrupocellariidae* as well as *Bicellariellidae* that the heterozoids are numerous and well developed. But when we examine the structure of the heterozoids it becomes evident that they do not favour a close relationship.

The avicularia of *Bicellariellidae* are of the well known and characteristic bird's head shape and are provided with a narrow peduncle; thus they are very unlike the more clumsy, sessile avicularia of *Scrupocellariidae*. And, moreover, in the latter family we find the curious basal vibracularia, which, taking into consideration their structure as well as their positions in the zoarium, are entirely different from all that are seen in a Bicellariellid zoarium.

Thus we see that the great resemblance in the appearance between *Scrupocellariidae* and *Bicellariellidae* is an entirely superficial one and does not correspond to a similar resemblance in the structure of their zoaria and zoids. On the contrary, the latter details are in many respects very unlike in these families. In my opinion there are no structural features making it possible to refer these families to a common divisio. *Scrupocellariidae* and possibly *Euoplozoidae* form one systematic group, *Bicellariellidae* and perhaps *Epistomiidae* another. *Farciminariidae* has possibly no connection with the other families. For practical reasons, however, I find it convenient to retain the divisio *Cellularina* for those families for the present; it is evident that they are not closely related, but it is not clear where to place them if separated from each other. In the history of bryozoology groups of species have only too often been separated and placed elsewhere before it has been made clear which is their true position. But when retaining the divisio *Cellularina* it must always be kept in mind that in reality it is an artificial group.

Fam. **Scrupocellariidae** LEVINSEN.

As a very important character of the family the following may be added to its diagnosis (cf. above p. 72): at the bifurcations of the zoarium the inner rows of the two daughter branches derive from the same zoid; or, in other words, the zoid E (the axillary zoid) gives rise to both F and G.

1. **Tricellaria** FLEMING.

1. **T. longispinosa** (YANAGI & OKADA) (fig. 87; Pl. 5 figs. 17—18).

Menipea longispinosa, YANAGI & OKADA 1918, p. 408, Pl. 6 fig. 3, text-fig. 1 (Japan); *Tricellaria longispinosa*, HARMER 1923, p. 356.

Localities: Japan (15, 18); 110—175 m.; 2 entire zoaria and fragments.

The specimens agree fully with the description given by YANAGI & OKADA. The specimens from loc. 18 are however deprived of scuta. The number of the zoids in each internode is 6. It is peculiar that the zoid E has disappeared in this species.

87

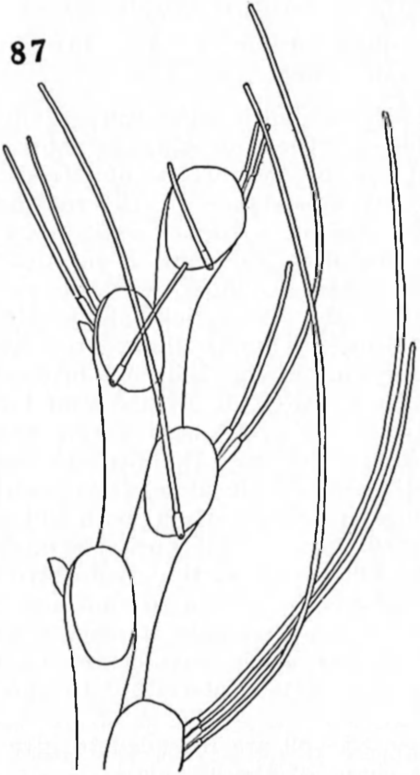


Fig. 87. *Tricellaria longispinosa* (YANAGI & OKADA) (loc. 18). 60 ×.

Young zoids with spines and lateral avicularia; frontal avicularia not yet developed.

88

89

Figs. 88—89. *Tricellaria sympodia* (YANAGI & OKADA) (loc. 18). 60 ×.

Fig. 88: Frontal avicularium in lateral view. — Fig. 89: Lateral avicularium in lateral view.

CANU & BASSLER (1929, pp. 221, 224) propose the new genus *Monartron* and refer *T. longispinosa* to it. In that genus they range species from *Tricellaria* and *Emma* and elect *Emma cyathus* (WYV. THOMS.) as the type. It is characteristic of these species that basally the branches consist of simple tubes and that the biseriality arises afterwards through lateral budding from the basal zoid. This phenomenon has been proposed as the character of the genus. But those species which were removed from *Tricellaria*, and those which were removed from *Emma*, agree closely with these genera in all other respects, and therefore it is the most plausible that the zoarial structure peculiar to them has arisen independently in the two genera. Thus, if these species are to be removed from the original genera, two new genera ought to be proposed, one for the species removed from *Tricellaria*, the other for those removed from *Emma*; in this case the name *Monartron* should be maintained for the *Emma*-species as the genotype was elected from that genus. This procedure, however, seems superfluous.

2. **T. sympodia** (YANAGI & OKADA) (figs. 88—89; Pl. 4 figs. 15—16).

Menipea sympodia, YANAGI & OKADA 1918, p. 410, Pl. 6 fig. 1, text-fig. 2. (Japan); *Tricellaria sympodia*, HARMER 1923, p. 355.

Localities: Japan (16, 18); 110—300 m.; one large zoarium from each locality.

These specimens agree in all details with the original description. The following is, however, an addition to the description of the method of bifurcation and of the peculiar sympodial appearance of the zoarium. At a bifurcation the branch, which is formed entirely by the zoid row A, is not jointed basally. As a rule it remains very short, is composed of 5—6 zoids, and does not bifurcate. The branch formed by the zoid row B is jointed basally in the way usual in *Tricellariae*. It forms the continuation of the main stem of the zoarium. But at the next bifurcation it is the zoid row, which was called B at the first bifurcation, that is the A-row (cf. above p. 72) and forms the branch which is not jointed. In that way the zoarium assumes the appearance of consisting of a main stem, from which short lateral branches derive alternatingly from both sides. But here and there a disjointed branch (»A-branch») extends further and bifurcates in the same way as the »main stem». In this way the few »main branches» of the zoarium are formed. — This structure of the zoarium has been hinted at in a few words by HARMER (l. c.); it has some resemblance to the zoarium of *Menipea spicata* (MAC GILL.), described by the same author (op. cit., p. 343, fig. 19).

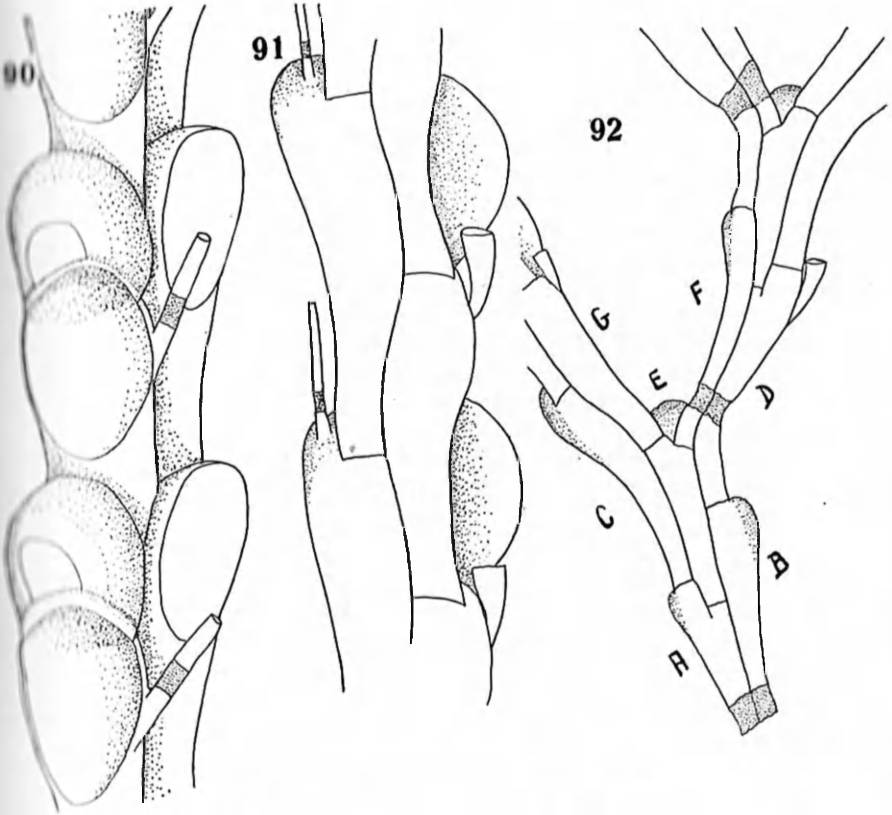
Figs 88—89 are intended to give a more detailed picture of the shape of the avicularia.

3. **T. ziczac** n. sp. (figs. 90—92; Pl. 6 figs. 20—21).

Locality: Japan (14 [type]); 200 m.; 2 detached zoaria deprived of their basal parts.

The zoarium bifurcates »sympodially». The branch at a bifurcation, which continues in the direction of the main axes, is jointed basally, the other branch is not jointed and does not bifurcate. Each internode of the »main stem» is composed of 3 zoids, each unjointed branch of 10—12. The zoids F and G do not meet at their starting-points on the zoid E.

The zoids are drawn out, proximally to the aperture field they become more and more narrow towards their proximal extremities. The aperture field is large (about $^2/_5$ of the length of the zoid), it is oval and becomes broader distally.



Figs. 90—92. *Tricellaria ziczac* n. sp.

Fig. 90: Zoids with ooecia in frontal view. 60 ×. — Fig. 91: Zoids in basal view showing lateral spines, lateral avicularia and parts of two ooecia. 60 ×. — Fig. 92: Zoarium in basal view showing the mode of branching. 37 ×.

On the side turned towards the other zoid row and on a level with the middle of the aperture field, the zoid has a long (usually broken), strong, jointed spine. The distal free corner of its basal side has a thinner, long, jointed spine. This is often replaced by an avicularium, which has the shape of a narrow funnel; the rostrum and the mandible are placed on its plane distal extremity. There are no frontal avicularia and no basal tubes. No scutum.

The ooecia are very large, rounded, and glistening white. Frontally they are flattened. The proximal free margin of the ooecium is curved outwards and forms a narrow screen. Frontally there is a large, rounded fenestra, proximally reaching the distal border of that screen.

This species belongs to the group of the genus, the zoaria of which are »sympodially» branched and which encloses *T. sympodia* (YANAGI & OKADA), *T. aquilina* HARMER and *T. scalariformis* HARMER (cf. above *T. sympodia*, and HARMER 1923 and 1926). Characteristics of the species are: the great size of the aperture field, the spine of the inner side, the spine or avicularium of the distal corner and the shape of the latter, the absence of frontal avicularia. It is easily distinguished from *T. sympodia* by the long lateral branches of the zoarium, by the considerably greater size of the autozoids, and by the fact that the latter are not at all so strongly calcified and, consequently, not so fragile; the chitinous tubes extending along the entire basal side of the zoarium of *T. sympodia* are absent in *T. ziczac*. It is true that the specimens of the latter species are not entire, but the parts remaining are so large that if there had been tubes running along the whole zoarium they would certainly have been present.

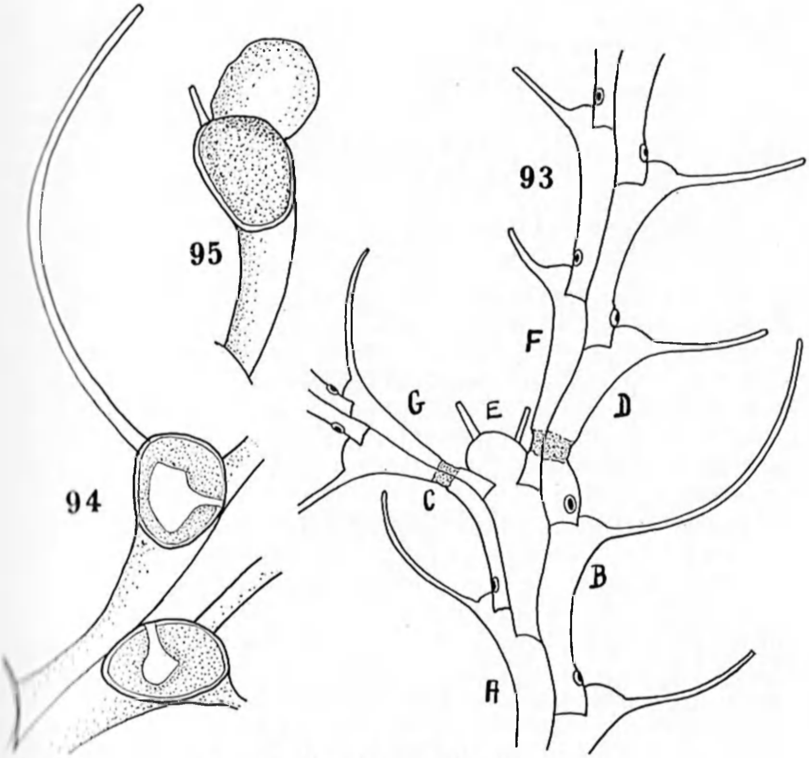
4. **T. dubia** n. sp. (figs. 93—95).

Localities: Japan (29, 44 [type]), Bonin Islands (33, 34); 90—600 m.; some entire zoaria and numerous fragments.

The zoarium is of the usual *Tricellaria*-type. The joints are composed of two chitinous tubes. F and G do not meet at their starting-points on E.

The zoids are long, proximally narrow and tube-shaped, widening towards their distal ends. The walls are whitish and translucent. The aperture field is placed towards the distal end of the front; it is small (about $^1/_3$ of the length of the zoid), oval, and a little broader distally. Almost always there is a scutum; its shape varies, but usually it is roundedly triangular, straight at ist distal side and with a proximal lobe. It covers only a small part of the aperture field. In the free distal corner of the zoid there is a very long spine, twice the length of the zoid, and curved towards the front of the zoarium in about the same way as the setae in *Caberea lata*. Sometimes there is another, short spine inside the firstnamed one on the distal margin of the zoid. The zoid E has 2—3 short spines on its distal margin. Avicularia or marks of them are totally absent. On the proximal parts of their free basal-lateral sides the zoids have each one round mark of a tube. Only the zoids E, F and G are always deprived of these.

There are no ooecia on the type specimen. But some very small fragments from loc. 34 have ooecia. They are large, a



Figs. 93—95. *Tricellaria dubia* n. sp.

Fig. 93: Zoarium in basal view showing its mode of branching (loc. 44). 37 ×. — Fig. 94: Zoids in frontal view (loc. 44). 60 ×. — Fig. 95: Zoid with ooecium (loc. 34). 60 ×.

little prolonged and have each a shallow depression traversing the distal parts of their fronts. They are greyish and evenly calcified. There is no fenestra.

This species is a very common *Tricellaria* type and is deprived of all interesting features. The structure and position of the spines is the one somewhat characteristic feature. This feature, as well as the small size of the aperture field, the numerous tube marks, the absence of avicularia and of ooecial fenestrae, and the structure of the scutum, give, however, a type, which it does not seem possible to range in any species known before.

5. T. occidentalis (Trask).

Menipea occidentalis, Trask 1873, p. 113, Pl. 4 fig. 4; Robertson 1905, p. 254, Pl. 6 figs. 22—25; Yanagi & Okada 1918, p. 409 (Japan);

CH. & E. O'DONOGHUE 1923, p. 17, and 1925, p. 99; OKADA & MAWATARI 1936, p. 57 (Japan), and 1937, p. 437 (Japan); *Menipea occidentalis* var. *catalinensis*, ROBERTSON 1905, p. 255, Pl. 7 figs. 26—27; YANAGI & OKADA 1918, p. 409 (Japan); OKADA 1929, p. 15, Pl. 1 fig. 3 (Japan); OKADA & MAWATARI 1937, p. 438 (Japan); *Tricellaria occidentalis*, HARMER 1923, p. 354 (fig. 10 of *T. occidentalis* var. *dilatata*); *Menipea compacta*, HINCKS 1882 b, p. 461, and 1884, p. 208, Pl. 9 fig. 8; *Menipea compacta* var. *dilatata*, ORTMANN 1890, p. 21, Pl. 1 fig. 2.

Locality: Japan (41); 3 m.; on *Bugula neritina* and algae; numerous zoaria.

In the numerous very young zoaria the internodes are usually composed of 3 zoids. The scutum is narrow and simple, or divided into 2—5 lobes. The spines are all undivided. In the somewhat older and larger zoaria the internodes of their distal parts are usually composed of 5, sometimes 7, zoids. The scuta in these internodes are kidney-shaped and undivided. The spines at the distal part of the aperture are often forked.

The variety *catalinensis* differs, according to Miss ROBERTSON, from the main species on the following points: internode with 5 or 7 zoids; scutum divided into 5 or more lobes; the spines at the distal part of the aperture may be forked. The variety *dilatata* differs, according to ORTMANN, from the main species in the scutum being stronger and kidney-shaped.

CH. & E. O'DONOGHUE (1923) found that *T. occidentalis* varied towards var. *catalinensis*. OKADA (1929) says that the specimens described by him as var. *catalinensis* vary a great deal; for instance, the scutum may be divided or entire.

Since the characters, in which the main species, var. *catalinensis* and var. *dilatata* are said to differ, appear in all sorts of combinations, as seen above, in my opinion these varieties are not to be accepted.

2. **Amastigia** BUSK.

A. rudis (BUSK).

Caberea rudis, BUSK 1852 a, p. 377, and 1852 b, p. 38, Pl. 46 figs. 1—3; ORTMANN 1890, p. 23, Pl. 1 figs. 8 (Japan); YANAGI & OKADA 1918, p. 419 (Japan); *Amastigia rudis*, HARMER 1923, p. 332, figs. 26—27, 49, 52, and 1926, p. 349, Pl. 23 figs. 9—13 (Japan; references); HASENBANK 1932, p. 361 (references); OKADA 1934, p. 9, Pl. 1 fig. 6 (Japan); SAKAKURA 1935 b, p. 109 (Japan); OKADA & MAWATARI 1935, p. 137, Pl. 10 fig. 4 (Japan), and 1938, p. 453 (Japan).

Localities: Japan (1, 3, 13, 16, 17, 26, 43, 44, 45); 100—300 m.; numerous zoaria.

3. Caberea LAMOUROUX.

HARMER (1926, p. 359) has an exhaustive discussion concerning the genus.

HASENBANK (1932, p. 360) proposes a new genus, *Cabereopsis*, for the new species *Cabereopsis elongata*. It is characterized as agreeing in its main features with *Caberea* but differing in «längliche, schlanke Form der Zooecien, die weniger als die Hälfte der Vorderseite einnehmende Area, die kleinen Vibracularien, die den grössten Teil der Dorsalfläche freilassen und die längliche Form der Ooecien». The same features recur in *Caberea bursifera* and *Caberea megaceras* (cf. below). The latter species has, however, rather large vibracularia. It seems to me, however, to be entirely superfluous to propose a new genus for these species on such futile motives. They are nevertheless typical *Cabereae* in all fundamental points. In such a case one seems to be at a loss where to refer *C. megaceras*, which shows the transition from one group to the other.

1. C. boryi (AUD.).

Crisia boryi, AUDOUIN 1826, p. 242, and SAVIGNY, Pl. 12 figs. 4^1—4^6; *Caberea boryi*, BUSK 1852 b, p. 38, Pl. 16 figs. 4—5 (pars, fide HARMER 1926); HARMER 1926, p. 362, Pl. 24 figs. 13—15 (Japan; references); CANU & BASSLER 1930 b, p. 19, Pl. 2 figs. 9—12 (references); HASENBANK 1932, p. 359, textfig. 28 (references); PRENANT & TEISSIER 1924, p. 13; HASTINGS 1932, p. 411; SAKAKURA 1935 b, p. 109 (Japan); *Carberea minima*, ORTMANN (nec BUSK 1884, fide HARMER 1926) 1890, p. 23, Pl. 1 figs. 9 (Japan).

Localities: Japan (21, 26, 28, 29), Bonin Islands (32, 36); diver — 300 m.; fragments.

Caberea tenella OKADA (1929, p. 14, textfig. 3; Japan) at least seems to be very close to this species. Lateral avicularia are said to be absent, but all other features point to *C. boryi*. Possibly the absence of lateral avicularia represents a variation within the limits of the species.

2. C. lata BUSK.

Caberea lata, BUSK 1852 a, p. 378, and 1852 b, p. 39, Pl. 47 figs. 1—3; YANAGI & OKADA 1918, p. 418 (Japan); HARMER 1926, p. 360, Pl. 24 figs. 7—9 (Japan; references); HASTINGS 1932, p. 411 (references); OKADA 1934, p. 7 (Japan); SAKAKURA 1935 a, p. 16, Pl. 3 fig. 7 (Japan, pleistocene), and 1935 b, p. 108 (Japan); OKADA & MAWATARI 1935, p. 136, Pl. 10 fig. 3 (Japan), and 1938, p. 452 (Japan); *Carberea* (errorim!) *lata*, ORTMANN 1890, p. 22, Pl. 1 figs. 5 (Japan).

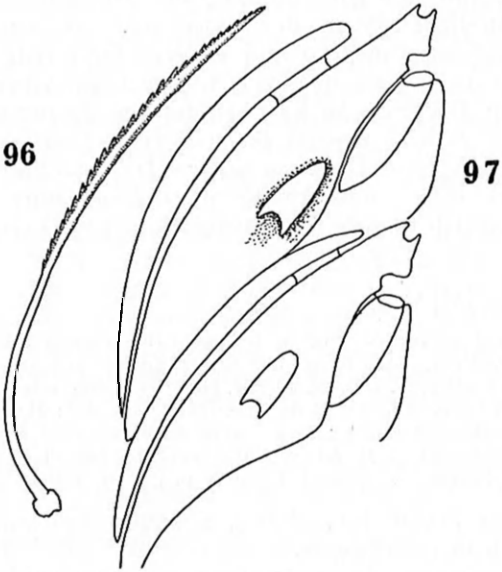
Localities: South China Sea (6, 48), East China Sea (4), Japan (1, 2, 10, 13, 14, 15, 16, 17, 20, 21, 26, 27, 29, 43, 44), Bonin Islands (33, 34); 3—450 m.; numerous zoaria.

3. C. hataii Okada (figs. 96—97; Pl. 5 fig. 19, Pl. 6 fig. 22).

Caberea hataii, Okada 1929, p. 13, Pl. 1 fig. 2, Pl. 4 fig. 2, textfig. 2 (Japan); Sakakura 1935 b, p. 109 (Japan); Okada & Mawatari 1937, p. 437 (Japan); Silén 1938, p. 319, textfig. 64.

Localities: Japan (16, 17, 21, 29); 85—600 m.; 4 zoaria and some fragments.

The zoarium is robust, and fan-shaped. It has a compact appearance, the zoids being strongly calcified and intimately connected with each other. Its front is distinctly convex. At the bifurcations the same phenomenon can be observed as noted by Harmer (1926, p. 362) in *C. lata*: one branch is basally biserial, the other triserial. After that two and one row respectively are intercalated, and thus the other parts of the zoarium become quadriserial. It was not possible to discern a joint at the bifurcations, but the biserial branch often appears as broken at its base; possibly that represents an articulation.



Figs. 96—97. *Caberea hataii* Okada (loc. 17). 60 ×.

Fig. 96: Seta. — Fig. 97: Two zoids in basal view showing vibracularia with the chambers from which the tubes emanate, and lateral avicularia.

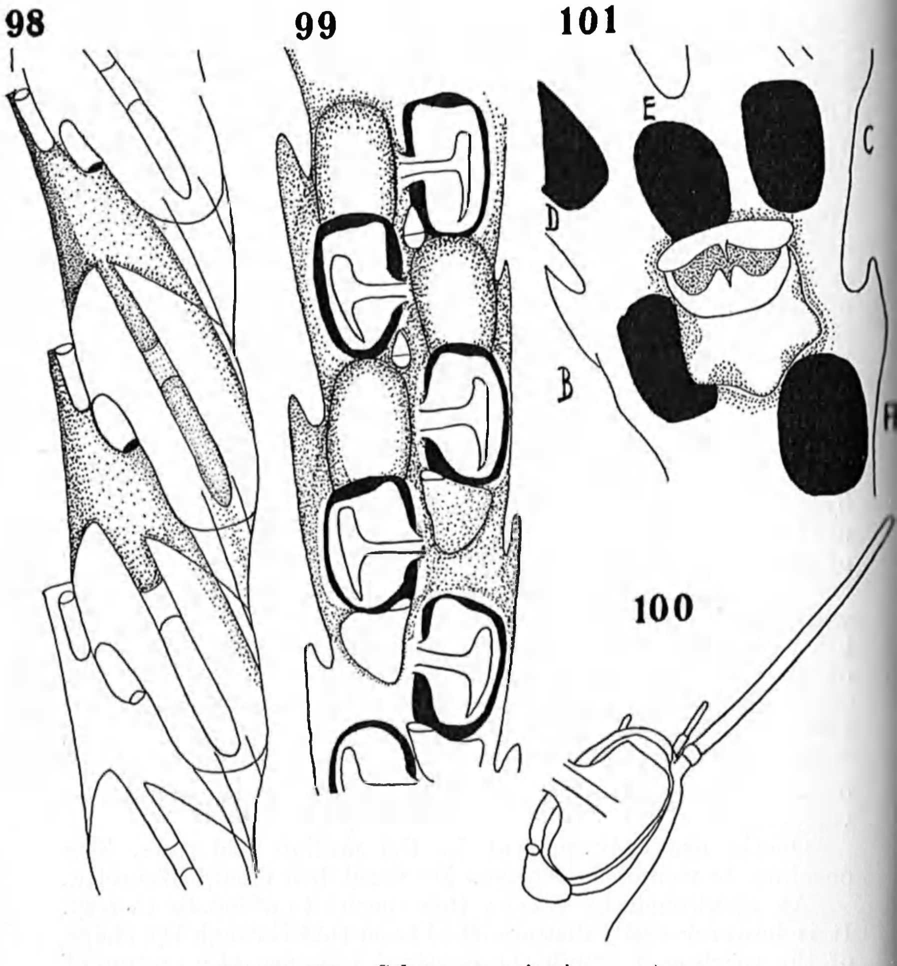
The zoids are square. The aperture field occupies almost the entire front. A cryptocyst is well developed as a narrow area of uniform breadth proximal and lateral to the square open area; it descends rather abruptly. At the scutum it is more narrow. Proximally to the aperture field there is a narrow gymnocyst. In young zoids there are 2 very short spines on the distal margin. A strong, linear, often pointed scutum is usually present; it often traverses the entire aperture field.

A rather small, raised, pointed avicularium is placed laterally on each half of the proximal gymnocyst. In zoids placed distally to zoids without ooecia the avicularia are placed rather close to the median line; their points are then directed obliquely proximally-inwards. In zoids placed distally to zoids with ooecia the avicularia are placed considerably more laterally; their points are directed obliquely and proximally-outwards. These differences in the positions of the proximal avicularia were discussed in an earlier work (Silén l. c.). — The lateral avicularia are of the same type as those of *C. lata.*

The basal side of the zoarium is almost entirely covered by the very large vibracularia, which only leave small parts of the marginal zoids free. In their main features they are of the same type as those in *C. lata.* The outward lobe of the proximal end is, however, almost straight and provided with two impressions. The small chamber, from which the basal tube derives, is displaced from its position at the margin of the vibracularium and lies on the vibracularium itself. The setae are unusually strong and denticulated. When directed forward they are pressed to the frontal side of the zoarium. This position is very different from that of the setae of *C. lata.* The basal, median bundle of tubes is as usual well developed.

Ooecia are only present in the median zoid rows. The ooecium is roundedly square. Its front has a large fenestra.

As mentioned by Okada this species is allied to *C. lata.* It is however easily distinguished from that through the shape of the zoarium, through the constant presence of a scutum of characteristic shape, through the positions of the avicularia and through the shape of the proximal ends of the vibracularium, without mentioning some less important distinguishing features. It seems to be still more close to the species *C. climacina* very briefly described by Ortmann (1890, p. 22, Pl. 1 fig. 6). Ortmann says that the latter species is deprived of avicularia and has scuta only in the median zoid rows. In all other features they agree closely. Even the characteristic convexity of the frontal side of the zoarium may be discerned in Ortmann's fig. It is possible that *C. hataii* is in fact identical with *C. climacina*, but this problem will perhaps never be solved.



Figs. 98—101. *Caberea sagamiensis* n. sp. 72 ×.

Fig. 98: Basal view of zoarium with vibracularia, lateral avicularia and chambers from which tubes emanate. — Fig. 99: Zoids, three of them with ooecia, seen from their fronts. — Fig. 100: Young zoid with spines. — Fig. 101: Enlarged frontal avicularium at a bifurcation of the zoarium.

4. **C. sagamiensis** n. sp. (figs. 98—101; Pl. 7 figs. 25—26).

Locality: Japan (44 [type]); 90 m.; two zoaria.

The zoarium is of the usual *Caberea*-type, biserial.

The zoids are of medium size and of uniform breadth. The aperture field occupies more than 1/2 of the front, and is oval. It is almost totally covered by a very large, oval scutum.

Its distal lobe is broader than the proximal one, its distal margin is oblique and straight. Its proximal lobe is rounded and becomes narrower towards its extremity. A cavity penetrates through the peduncle of the scutum, and then divides into a distal shorter and slightly broader blunt lobe, and a proximal longer pointed lobe. A short spine is placed at the distal inner corner of the zoid; its distal free corner has a long (= the length of the zoid), rather strong, jointed spine and, inside that, a short, thin, jointed spine. All these spines are present and entire only in the young zoids of the extremities of the zoarium.

Proximally to the aperture field there is an avicularium. It extends along the proximal margin of the aperture field, is expands proximally. The rostrum is placed at the inward proximal corner of the aperture field. It is narrow and roundedly triangular. It points obliquely proximally-outwards, but in zoids placed distally to zoids with ooecia it points distally (cf. *C. hataii* and *C. bursifera*). The avicularium of the zoid E is enlarged. Its rostrum is broadly triangular and lies in the horizontal plane with its point directed outwards from the front of the zoid. The mandible is thickened, and at its extremity it has a long hook, which, when the mandible is closed, lies in a groove of the rostrum. The lateral avicularium is very small, it appears as a narrow tube at the outer margin of the vibracularium. Its mandible is rounded.

The vibracularia are broad with rounded extremities and cover $^2/_3$ of the basal side of the zoid. Proximally they are drawn out in walls on each side of the setal groove, which prolong the setal furrow and reach the median line of the zoid.

The ooecium is drawn out, narrow, rounded, translucent and has no fenestra.

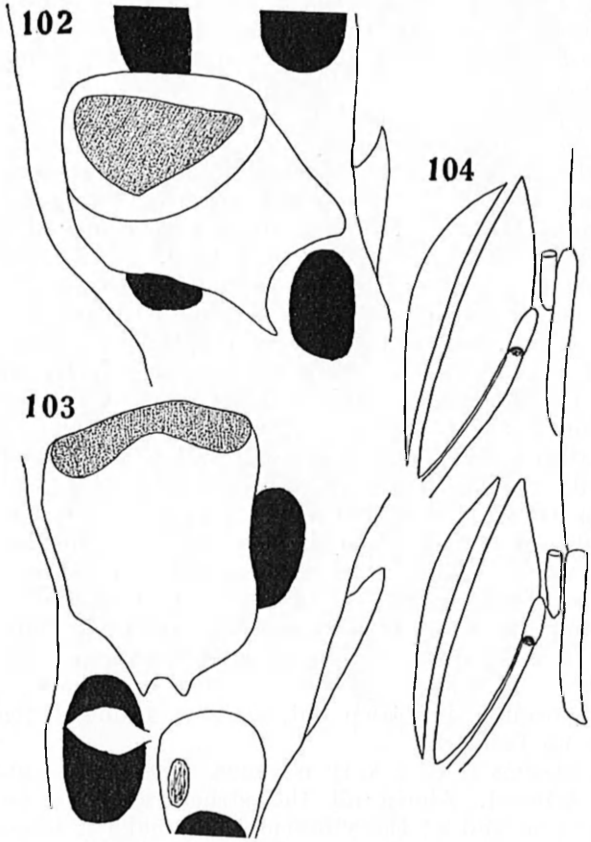
This species is of a very common *Caberea*-type and has no further interest. Above all the structure of the scutum, of the ooecium and of the vibracularium make it impossible to identify it with any other species.

5. C. megaceras Yanagi & Okada (figs. 102—104; Pl. 7 figs. 23—24).

Caberea megaceras, Yanagi & Okada 1918, p. 417, Pl. 6 fig. 5, textfig. 6 (Japan).

Localities: Japan (25, 45); 400—450 m.; 3 zoaria.

These specimens show the characteristic features described by Yanagi & Okada. The shape of the scutum as shown by their textfig. 5 seems to be characteristic as it is to be seen in the present specimens too. In zoids which lie distally to zoids with ooecia the frontal avicularia point distally, in the other zoids proximally (cf. *C. hataii* and *C. bursifera*). In the present zoaria the frontal avicularium of the zoid E is enlarged and occupies an area twice that of an autozoid; it



Figs. 102—104. *Caberea megaceras* YANAGI & OKADA (loc. 42). 60 ×. Fig. 102: Enlarged frontal avicularium seen from its front. — Fig. 103: Enlarged frontal avicularium seen from its distal side. — Fig. 104: Basal view of zoarium with vibracularia, lateral avicularia and chambers from which tubes emanate.

has however the usual shape of a frontal avicularium. They are strongly calcified, glistening white and have projections resting upon the neighbouring autozoids. Lateral avicularia are present, but they are very small and tube-shaped; their mandibles are rounded.

In the present zoaria the vibracularia are rather narrow and oval, they cover more than $^1/_2$ of the basal sides of the zoids. The setal groove is linear. The basal tube emanates from a small chamber a little above the middle of the outward side of the vibracularium.

The ooecium possesses a characteristic, oval fenestra in the inner part of its front.

6. C. bursifera ORTM. (figs. 105—110).

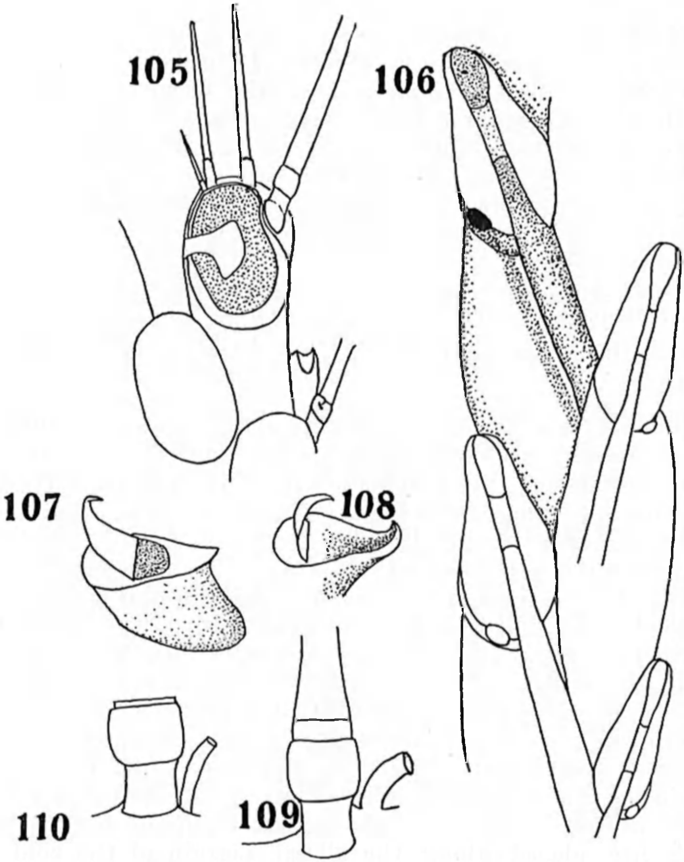
Carberea (errorim!) *bursifera*, ORTMANN 1890, p. 22, Pl. 1 figs. 7 (Japan); SILÉN 1938, p. 319, textfig. 63.

Localities: Japan (13, 20, 29, 43, 44, 45); 40—600 m; numerous zoaria.

The zoaria are biserial. The appearance of the young zoaria and that of the older ones are rather different. The young zoaria are thin and translucent, the old ones very robust and apparently not so richly bifurcated, the bifurcations usually taking place basally.

The zoids are prolonged and become broader distally. The aperture field is oval, placed distally in the front and occupies a little less than $^1/_2$ of the front. There is a cryptocyst, which is rather narrow, and very narrow along the distal margin and at the scutum. The latter is always present, it is mostly linear and only very little expanded towards its extremity. Sometimes, however, it is expanded into an irregular triangle. The zoid has 2—5 spines. One spine is placed on the free margin of the zoid a little proximally to its distal end; it points outwards. It is distinguished from the other spines, which are placed along the distal margin of the zoid and point distally, by its position and its very strong development. Its base is rounded and chitinized, followed by a short, swollen, calcified part. The distal part of the spine is very long (up to 5 times the length of the zoid), translucent. and flattened; it is bent over the front of the zoarium. It is often broken distally to the basal swelling. The other spines, usually 2 in number, do not reach more than $^1/_2$ of the length of the zoid; they are round in cross section, narrow and pointed. They are almost always broken in the older zoids.

Proximally and close to the aperture field there is an avicularium. It is expanded proximally, its front is small and placed at the inward margin of the aperture field. The rostrum and the mandible are triangular and they are both hooked at their extremities. They usually point in the proximal direction, but in zoids placed distally to zoids with ooecia they are directed distally; this phenomenon was discussed by



Figs. 105—110. *Caberea bursifera* ORTM.
Fig. 105: Young zoid with all spines remaining (loc. 29). 72 ×. — Fig. 106: Basal view of zoarium with vibracularia and the pores from which the tubes emanate (loc. 29). 72 ×. — Fig. 107: Frontal avicularium (loc. 13). 112 ×. — Fig. 108: The shape of the rostrum of frontal avicularium (loc. 13). 112 ×. — Fig. 109: Big lateral spine, entire (loc. 13). 112 ×. — Fig. 110: Big lateral spine, broken (loc. 13). 112 ×.

SILÉN (l. c.). In a zoarium from loc. 29 the frontal avicularium of the zoid E is often enlarged but not to the same degree as in some other *Cabereae*. Lateral avicularia are absent.

The vibracularia cover the distal $^1/_3$ of the basal sides of the zoids. A rather broad, calcareous ribbon crosses the setal groove. Proximally the vibracularia are drawn out in walls on each side of the setal groove, which is thus prolonged to the median line of the zoid (cf. *C. sagamiensis*); this prolongation of the setal groove is considerably broader than the groove itself. The basal tube emanates from a small round chamber placed at the outer margin of the vibracularium. The setae are long, narrow, and denticulated.

The ooecia are rather narrow, drawn out, rounded, and translucent. There is a large fenestra.

Ortmann's description of the only specimen of this species he obtained is very short, and his figs. are schematic. But the present specimens can be ranged with certainty in Ortmann's species, since they agree fully with his description; particularly characteristic are: the number and the structure of the spines, especially the shape of the proximal one, and the structure of the avicularia and the scutum as well as the prolongation of the setal groove.

4. **Scrupocellaria** van Beneden.

1. S. diadema Busk.

Scrupocellaria diadema; Busk 1852 a, p. 370, and 1852 b, p. 24, Pl. 28 figs. 1—3; Ortmann 1890, p. 22, Pl. 1 figs. 4 (Japan); Yanagi & Okada 1918, p. 414 (Japan); Okada 1923, p. 221 (Straits of Corea), and 1934, p. 6, Pl. 1 fig. 7 (Japan); Harmer 1926, p. 375, Pl. 25 figs. 20—25 (Japan; references); Hastings 1932, p. 410 (references); Okada & Mawatari 1936, p. 55 (Japan), and 1938, p. 452 (Japan).

Localities: East China Sea (4), South China Sea (6, 7), China (8), Japan (16, 17, 18, 44), Bonin Islands (34); 40—300 m.; numerous zoaria.

The frontal avicularium of the zoid E is enlarged in zoaria from loc. 6, 18, 44 (cf. Harmer l. c.).

2. S. maderensis Busk.

Scrupocellaria maderensis, Busk 1860, p. 280, and 1861, p. 77, Pl. 32 fig. 1; Harmer 1926, p. 372, Pl. 25 figs. 16—19 (Japan; references); Hasenbank 1932, p. 356, textfig. 26 (references); Hastings 1932, p. 410.

Locality: Japan (44); 90 m.; 2 fragments.

3. S. spatulata (d'Orb.).

Cellularia spatulata, d'Orbigny 1850—1852, p. 50; Harmer 1926, p. 382, Pl. 26 figs. 1—10 (Japan; references); Hastings 1932, p. 411 (references).

Locality: Japan (29); 150—300 m.; 1 small fragment.

A lateral avicularium of the peculiar enlarged type is present.

5. Canda Lamouroux.

Okada & Mawatari (1936, p. 56) found a small fragment (from Japan), which they referred to *C. retiformis* Pourtales.

1. **C. foliifera** Harmer.

Canda foliifera, Harmer 1926, p. 386, Pl. 26 figs. 21—23.

Locality: Bonin Islands (33); 100 m.; numerous fragments.

2. **C. pecten** Thornely.

Canda pecten, Thornely 1907, p. 182, textfig. 2; Harmer 1926, p. 389, Pl. 26 figs. 25—28 (Japan).

Localities: Japan (21, 29, 44), Bonin Islands (38); 85—600 m.; fragments.

3. **C. pecten** Thornely **var. scutata** Harmer.

Canda pecten var. *scutata*, Harmer 1926, p. 389, Pl. 26 fig. 24.

Localities: Japan (21, 44), Bonin Islands (34, 37); 75—150 m.; fragments.

I am not wholly convinced that this variety is to be accepted. The absence or presence of a scutum is possibly to be looked upon as an individual variation, proportionately to which the size of the zoarium varies. It may be observed that, in loc. 21 and 44, fragments with the characters of the main species as well as those with the characters of the variety were obtained; that however proves nothing.

Fam. Epistomiidae Gregory.

Synnotum Hincks.

S. aegyptiacum (Aud.).

Loricaria aegyptiaca, Audouin 1826, p. 243, and Savigny, Pl. 13 figs. 4^1—4^5; *Synnotum aegyptiacum*, Harmer 1926, p. 398, Pl. 27 figs. 3, 4 (Japan; references); Marcus 1938 a, p. 26, Pl. 5 fig. 12 (references). *Gemellaria macrostoma*, Ortmann 1890, p. 23, Pl. 1 fig. 15 (Japan).

Locality: Japan (29); 150 m.; 1 zoarium.

The zoarium is prostrate and attached by short rootlets to a zoarium of a Smittinid not yet determined. The zoarium and the heterozoids agree with Harmer's description. But the fronts of all the autozoids are entirely calcified, and thus they assume the general appearance described by Ortmann, which differs sharply from what is characteristic of the species. Harmer, however, shows that this stronger calcification and the modified shape of the autozoids are a matter of age.

Fam. **Farciminariidae** Busk.

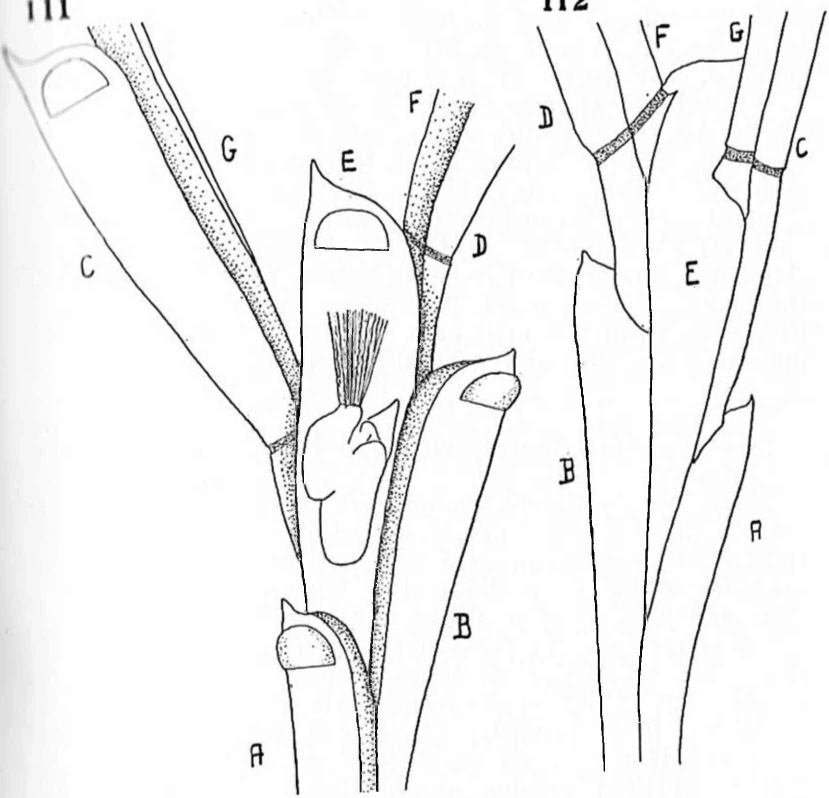
Farciminellopsis n. gen.

Zoarium erect, biserial, richly bifurcating in the same way as *Scrupocellariidae*; thus F and G derive from E. Branches basally jointed. The zoids of the two zoid rows turn their fronts away from each other. Zoid long, narrow, very little calcified; the aperture field occupies its entire front. Operculum present. Avicularia and ooecia not found.

Type: *F. gracilis* n. sp.

This genus is allied to *Farciminellum* Harmer (1926, p. 404).

111 **112**



Figs. 111—112. *Farciminellopsis gracilis* n. sp. 60 ×.

Fig. 111: Zoarium in frontal view; the zoids are placed almost back to back; the mode of bifurcation is shown. — Fig. 112: Zoarium in basal view; the mode of bifurcation is shown.

F. gracilis n. sp. (fig. 111—112).

Locality: Japan (15 [type]); 175 m.; 3 detached zoaria.

The zoarium is very delicate, richly bifurcating, biserial and has a height of about 1 ½ cm. The method of bifurcation is that of *Scrupocellariidae*, E giving rise to F as well as G. E is turned straight forward, its distal part is free. The branches are jointed basally, the two basal zoids being chitinized on the same level. Each internode is composed of (3—) 5 (—7) zoids. The zoids of the two rows are directed obliquely from each other but are not placed exactly back to back; thus the zoarium has a frontal and a basal side.

The zoids are very long and narrow, gradually widening towards their distal ends. Their proximal ends are a little expanded but not forked. The free distal corner of the zoid is drawn out into a projection, the other distal corner is rounded. The entire front is occupied by the aperture field. The basal side is convex and translucent. In the distal part of the aperture field an operculum can be clearly discerned; when open it projects as a lip. The zoid E has exactly the same shape as the other zoids.

Avicularia and ooecia were not found.

It is characteristic of this species that it is so »clean»; there are no spines, ooecia, avicularia or other projections, the autozoids are smooth. This made it at first very difficult to decide upon its systematic position. It is to be looked upon as a modified and reduced type of *Farciminariidae.*

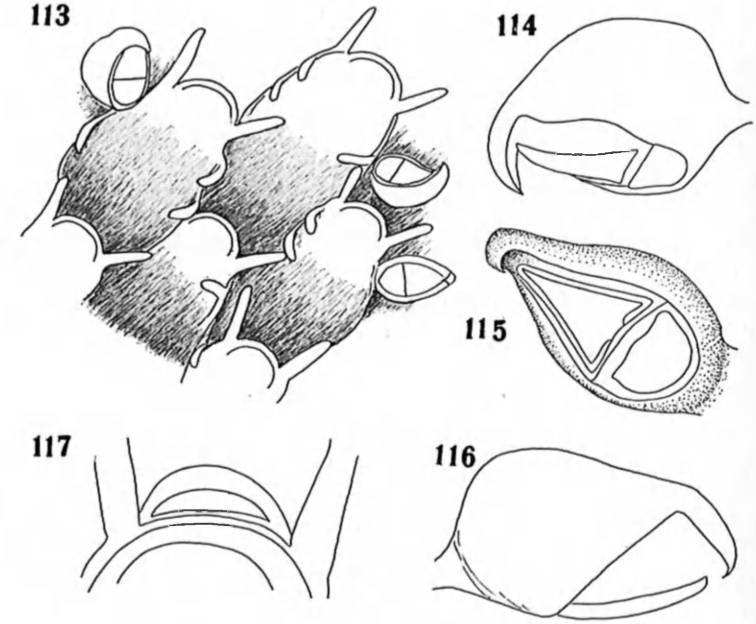
Fam. **Bicellariellidae** Levinsen.

As a very important character of the family the following may be added to its diagnosis (cf. above p. 72): at the bifurcations of the zoarium the inner rows of the two daughter branches derive from different zoids; or, in other words, F derives from B, G from E (the axillary zoid).

In most species of the genus *Bugula* at least and in numerous other *Bicellariellidae* there is no operculum. Then the question is if this phenomenon which is unusual in the *Cheilostomata*, is primitive or if it has arisen secondarily. Levinsen (1909, p. 95) seems to be the one author who has stated a distinct opinion as to this matter: »This family» (i. e. *Bicellariellidae*) »— — — presents a series of points of contact with the Ctenostomata, and forms, so to speak, a connecting link between these and the Cheilostomata.» Further, when enumerating these connections, he says: »We should also remember that an operculum is absent in species of the genus Bugula, ———». Thus, according to him, the absence of the operculum is a primitive feature. But from the first the fact that numerous *Bicellariellidae* have an operculum makes it difficult to hold such an opinion, which is destroyed as soon as we consider that those species, the autozoids of which are deprived of opercula, have avicularia. The mandibles of these are homologous with opercula, and therefore opercula in fact are present in these species, though only in the zoids which are developed as avicularia. Thus it once must have been present also in the autozoids, from which the avicularia are to be deduced.

1. **Beania** JOHNSTON.

CANU & BASSLER (1927 a, p. 14) propose the new family *Beaniidae* for the genera *Beania* and *Stolonella*. In a later work (1929, p. 232) they give the diagnosis of this family: »No ovicell; the larva develops in the interior of the female zooecia in which the polypid is small. The zooecia are little calcified and are joined together by stoloniform prolongations containing a multiporous septule. Often there are pedunculate avicularia. The dorsal frequently bears radicells with multified base. The colonies are unilamellar, uni- or multiserial». The authors seem to have got their opinion that ooecia are absent in *Beania* from LEVINSEN (1909, pp. 97, 110). But already WATERS (1889, p. 4) observed ooecia in *B. hirtissima* var. *conferta*, and now ooecia are known to exist in several species though they are usually small (cf. *B. discodermiae* and *B. hexaceras* below). *B. asymmetrica* HARMER (1926, p. 414) has large ooecia. The authors do not mention if they have observed for themselves, or, if not, from which author they have got the phenomenon that the larva would develop »in the interior of the female zooecia in which the polypid is small». It is true that HARMER (1926, p. 413) mentions that in *B. magellanica* the ooecia are so small that the eggs can not be wholly contained by them but also occupy parts of the body-cavities in some zoaria; he does not mention that the polypids of such zoids would be dwarfed. Thus CANU & BASSLER'S description of the circumstances at the development of the embryo is wrong. As to the other characters there are no important differences between the genera mentioned and other *Bicellariellidae*. The mode of growth of the zoarium and the connecting tubes of the zoids are however peculiar features. HARMER (1926, pp. 410—411) investigated those peculiarities, which can be derived from the common Bicellariellid type.



Figs. 113—117. *Beania hexaceras* (Ortm.).

Fig. 113: Part of zoarium. 45 ×. — Fig. 114: Avicularium in lateral-frontal view. 100 ×. — Fig. 115: Avicularium in frontal view. 100 ×. — Fig. 116: Avicularium in lateral view. 100 ×. — Fig. 117: Ooecium. 100 ×.

These characters are only of generic value, and thus it does not seem appropriate to propose a new family for the sake of *Beania* and *Stolonella*.

1. B. magellanica (Busk).

Diachoris magellanica, Busk 1852 b, p. 54, Pl. 67 figs. 1—3; Jullien 1888, p. 72, Pl. 11 figs. 1—3, Pl. 12 fig. 3 (Japan); *Diachoseris* (errorim!) *magellanica*, Ortmann 1890, p. 25, Pl. 1 fig. 22 (Japan); *Beania magellanica*, Mac Gillivray 1890, prefatory note, after Index; Yanagi & Okada 1918, p. 427 (Japan); Harmer 1926, p. 412, Pl. 28 figs. 1—4, textfig. 21 (Japan; references); Hasenbank 1932, p. 340, textfig. 14 (references).

Locality: Japan (26); 150 m.; several large zoaria extending over zoaria of *Steganoporella magnilabris*.

2. B. hexaceras (Ortm.) (figs. 113—117).

Diachoseris (errorim!) *hexaceras*, Ortmann 1890, p. 26, Pl. 1 fig. 30 (Japan). *Beania hexaceras*, Yanagi & Okada 1918, p. 427 (Japan); Okada & Mawatari 1938, p. 453 (Japan).

Locality: Japan (22); 1—3 m.; 1 large, detached zoarium.

The zoids are densely crowded. The distal end of the zoid is elevated, and then it descends proximally and extends below the proximal zoid, the distal end of which covers the proximal part of the distal zoid. The zoid is broad, oval, connected to its neighbouring zoids by 6 short tubes. At its distal corners there is a rather long (about $^1/_3$ of the length of the zoid), thick, blunt spine on each side, which points distally. At the margin of the distal part of the aperture field there are two spines on each side; they have about the same appearance as the distal ones but point upwards and are bent over the aperture field. Sometimes there is a slender spine on each side proximally to those.

Proximally to one of the distal lateral spines there is an avicularium in many zoids. It is large, its length is about $^1/_2$ of the length of the autozoid, and has the shape of a bird's head. Its basal side is very convex. Distally it is drawn out to a very long and strong rostral point, which forms an angle of about 180° with the front. The mandible is triangular and has a small hook at its extremity. The avicularium is fixed by means of a short narrow peduncle, through which the main axis of the avicularium runs. The avicularia form an angle of about 120° with the front of the zoarium; their fronts are directed upwards.

There are very small, shallow, rounded ooecia at the distal ends of many zoids.

3. B. discodermiae (Ortm.) (figs. 118—119.)

Diachoseris (errorim!) *discodermiae*, Ortmann 1890, p. 26, Pl. 1 fig. 23 (Japan); *Beania discodermiae*, Harmer 1926, p. 415, Pl. 28 figs. 9—10; Okada & Mawatari 1936, p. 57 (Japan).

Localities: Japan (16 [large zoaria], 17 [2 zoids], 26 [6 zoids], 44 [large zoaria]); 90—300 m.

These specimens agree exactly with those carefully described by Harmer.

4. B. discodermiae (Ortm.) var. boninensis nov. (figs. 120—123).

Localities: Bonin Islands (33 [type], 34); 120—150 m.; numerous large zoaria, fixed as fishing nets to hydroids.

The sizes of the autozoids and of the avicularia are always considerably less, averaging $^4/_5$ of those of the main species. The lateral spines are very short; in the main species they are rather long and slender. The avicularia are not basally convex to the same degree. — As can be seen these

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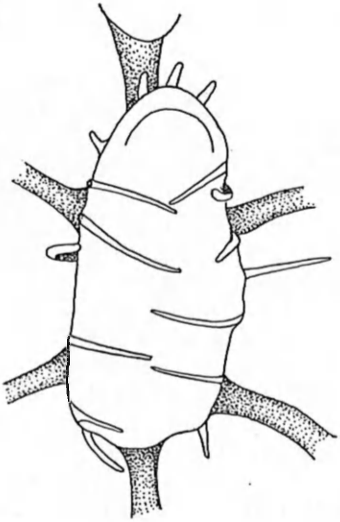

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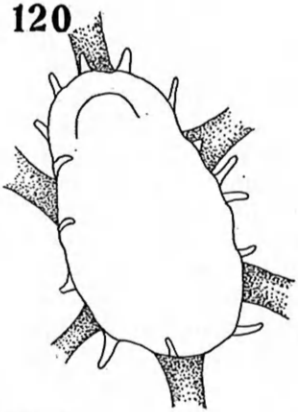

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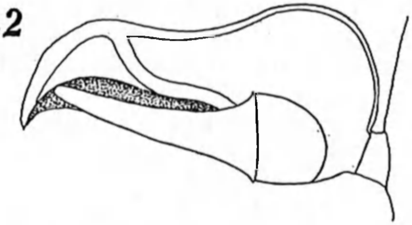

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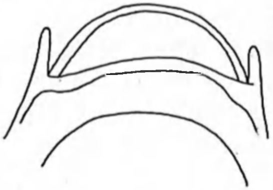

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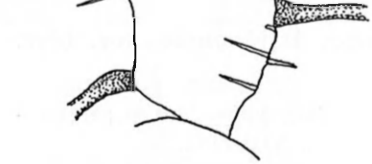


Figs. 118—119. *Beania discodermiae* (ORTM.) (loc. 41). 72 ×.

Fig. 118: Zoid. — Fig. 119: Avicularium.

Figs. 120—123. *Beania discodermiae* var. *boninensis* nov. (loc. 32).

Fig. 120: Zoid. 72 ×. — Fig. 121: Avicularium. 72 ×. — Fig. 122: Avicularium. 160 ×. — Fig. 123: Ooecium. 160 ×.

Fig. 124. *Beania petiolata* HARMER. 72 ×. Zoid with two avicularia.

specimens do not differ much from the main species. But the differences are constant, and as these specimens are recorded from an area rather distant from that of the main species I feel inclined to look upon them as representing a true variety.

5. B. petiolata Harmer (fig. 124).

Beania petiolata, Harmer 1926, p. 416, Pl. 28 figs. 18—19.

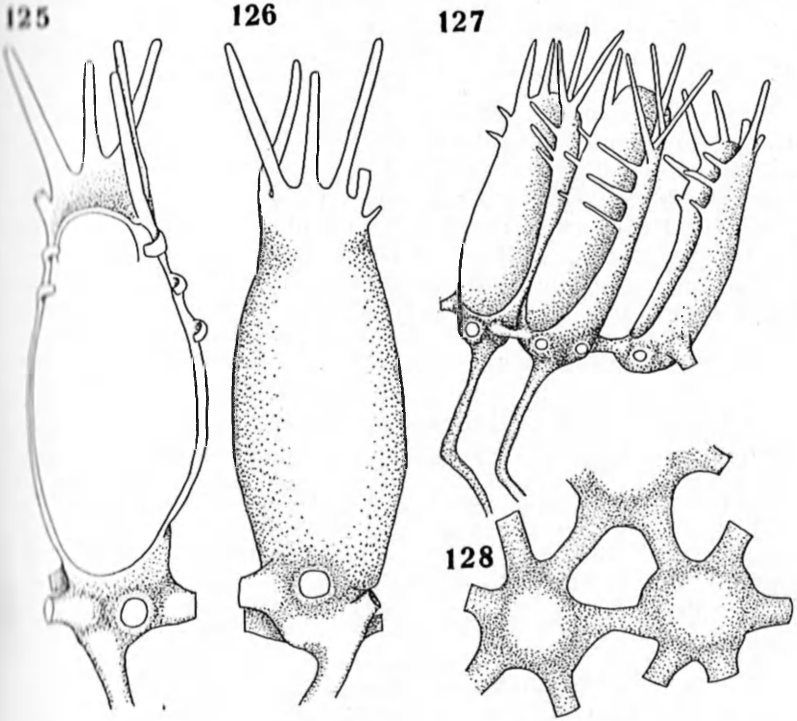
Locality: Bonin Islands (34); 150 m.; a small zoarium consisting of 10 zoids on *Caberea lata*.

This zoarium seems to be very close to Harmer's species. The peduncles of the avicularia and the connecting tubes are considerably longer than those shown in Harmer's figs.

6. B. vegae n. sp. (figs. 125—128).

Locality: Japan (1 [type]); 115 m.; 1 zoarium in a cavity of a stone.

The zoarium has the appearance of a tuft consisting of densely placed zoids. The zoids are very large, prolonged,



Figs. 125—128. *Beania vegae* n. sp.

Fig. 125: Zoid in frontal view. 45 ×. — Fig. 126: The same zoid in basal-lateral view 45 ×. — Fig. 127: Three zoids with connection- and fixation-tubes. 28 ×. — Fig. 128: Proximal ends of zoids showing the connecting tubes. 45 ×.

oval. They are erect, only resting on the substratum with their rounded proximal ends. The diameter of the proximal end is about $^{1}/_{4}$ of the length of the zoid. The basal side is convex, the front is flat and, as usual in this genus, entirely occupied by the aperture field. The distal end is drawn out as a screen and has 5—8 thick, straight, blunt, erect spines. On each side of the distal part of the aperture field there are 3 shorter and more slender spines; they are curved inwards. The spines are always undivided. 6 short tubes emanate from the periphery of the proximal end and connect the zoid with the neighbour zoids. A rather long tube with a multified base and fixing the zoid at the substratum emanates from the centre of the proximal end in many zoids.

Avicularia and ooecia were not found.

This species belongs to the group of species the zoids of which are erect and the connecting tubes of which emanate from a small area at the proximal end of the zoid. This group encloses *B. crotali* (Busk), *B. hirtissima* var. *conferta* Mac Gill., *B. fragilis* (Ridley) and *B. erecta* Waters (cf. Waters 1904, p. 30). It differs from *B. crotali* and *B. fragilis* by the absence of avicularia, from *B. fragilis* by the number of the connecting tubes being 6. It is certainly most close to *B. hirtissima* with its subspecies (cf. Harmer 1926, p. 417). Its special characters are: the zoid is absolutely perpendicular, it is very large, the lateral spines are few and simple, the distal ones are very strong, the connecting tubes emanate from a very small proximal area.

7. B. cupulariensis Osburn (figs. 129—131).

Beania cupulariensis, Osburn 1914, p. 190, textfigs. 6—7; Harmer 1926, p. 419, Pl. 28 figs. 13—14; Okada & Mawatari 1938, p. 454 (Japan).

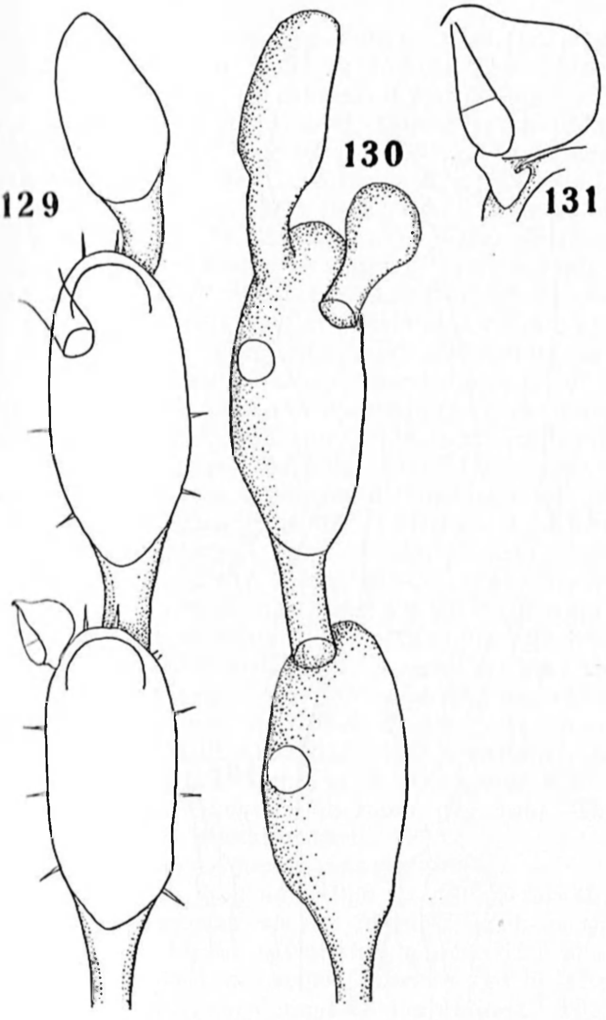
Locality: Japan (22); from seaweed; a few zoids on a hydroid.

The present zoids agree closely with Harmer's specimen 371. F. Thus the tube-shaped proximal part of the zoid is rather long; there are three pairs of short and straight lateral spines. The basal fixation tube, however, emanates considerably more distally from the zoid than is the case in Harmer's specimens.

8. B. mirabilis Johnst.

Beania mirabilis, Johnston 1840, p. 272, textfigs. 1—2; Harmer 1926, p. 419, Pl. 28 fig. 15 (references); Friedl 1918, p. 231 (references); Prenant & Teissier 1924, p. 12; Okada & Mawatari 1938, p. 453 (Japan); Marcus 1938 b, p. 209 (references).

Localities: Japan (22, 23); 0 m. — diver; a few zoids on a sponge and on a shell.



Figs. 129—131. *Beania cupulariensis* OSBURN.
Fig. 129: Zoarium in frontal view. 67 ×. — Fig. 130: The same zoarium in basal view. 67 ×. — Fig. 131: Avicularium. 150 ×.

2. Dendrobeania LEVINSEN.

Dendrobeania, LEVINSEN 1909, p. 99. *Dendrobeania*, CANU & BASSLER 1929, p. 193. *Bugula* auctt. (pars).

The zoarium is erect. It bifurcates according to HARMER's (1923, p. 326, and 1926, p. 433) »type 3» and is bi- or multiserial. The proximal part of the zoid is tube-shaped, its prox-

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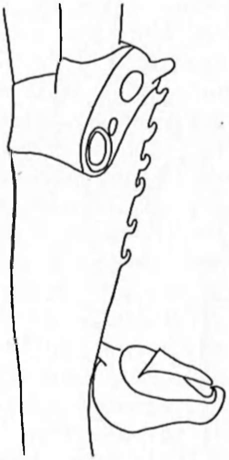

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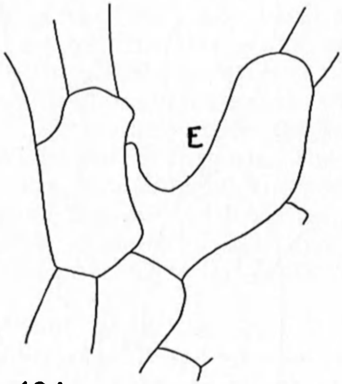

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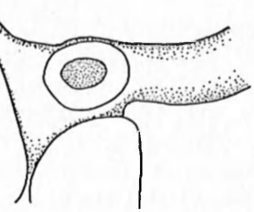

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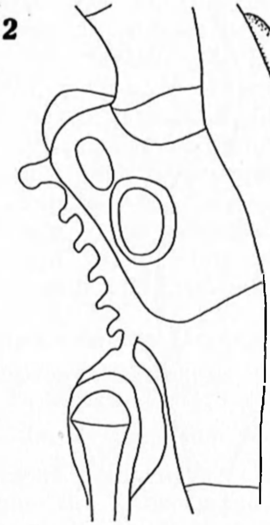

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Fig. 131: *Dendrobeania murrayana* (JOHNST.). From Norway. 45 ×. Marginal zoid in basal view showing the distal-basal calcareous lamina and three pore-plates.

Figs. 132—135. *Dendrobeania birostrata* (YANAGI & OKADA).

Fig. 132: Marginal zoid in basal view showing the distal-basal calcareous lamina and two pore-plates (loc. 42). 45 ×. — Fig. 133: Bifurcation of zoarium in basal view (loc. 40). 28 ×. — Fig. 134: Proximal part of connecting tube with reduced aperture field (loc. 40). 45 ×. — Fig. 135: Lateral avicularium (loc. 40). 45 ×.

imal end is not expanded or forked (figs. 131, 132, 137). The distal part of the front is broad. The distal wall is prolonged obliquely in the distal direction and covers the proximal part of the distal zoid; thus only the distal parts of the zoids with the aperture fields are to be seen when regarding the zoarium from the front (fig. 136). On the basal side of the zoarium only the narrow basal walls of the zoids are to be seen (fig. 137). There is one distal poreplate. The lateral pores are concentrated into 2 or 3 poreplates (figs. 131, 132, 137) (in *D. birostrata*, however, there are some solitary pores proximally to the proximal poreplate of the free lateral walls of the marginal zoids). A strong calcareous lamina covers the distal part of the dorsal side of the zoid (i. e. the distal wall and the distal part of the basal wall); distally it is prolonged in a short tube surrounding the base of the distal zoid (figs. 131, 132, 137). The shape of this calcareous shield varies in different species and seems to represent a good species-character. Chitinous tubes are given off by the marginal zoid rows. — An operculum is always present. — The ooecia are characteristic. They are placed at the distal margins of the zoids, they are short, broad, rounded. The ectocyst of the ooecium is membraneous, the endocyst is calcareous and provided with striae emanating from the centre of its proximal margin and then diverging towards its periphery. The ooecium is closed by the operculum. There are no ooecia in marginal zoids. — Avicularia of the shape characteristic of the family are as a rule placed a little proximally to the aperture field in all zoids (fig. 136). They may however be absent in certain zoaria.

Type: *Flustra murrayana*, Johnston 1847.

Harmer (1923, p. 306, and 1926, p. 432) refers this genus to *Bugula*. Its numerous special features, such as the shape of the zoid, the dorsal calcareous shield, the shape and structure of the ooecium, seem, however, to be of such an importance that the genus must be maintained. The species which are to be ranged in this genus are, besides the type of the genus, *D. birostrata* and *D. japonica* (cf. below). *Bugula curvirostrata* and *B. laxa* (cf. Robertson 1905, p. 272, 275) certainly belong to it. *Bugula flabellata* Gray is referred to *Dendrobeania* by Canu & Bassler (1928, p. 42), in my opinion wrongly so; but *D. lamellosa* Canu Bassler (l. c.) certainly is a *Dendrobeania*. *Bugula sinuosa* Busk (1884, p. 39) which is said to be related to *D. japonica* by Ortmann (1890) and by Yanagi & Okada (1918) belongs to *Himantozoum* (Harmer 1926, p. 453).

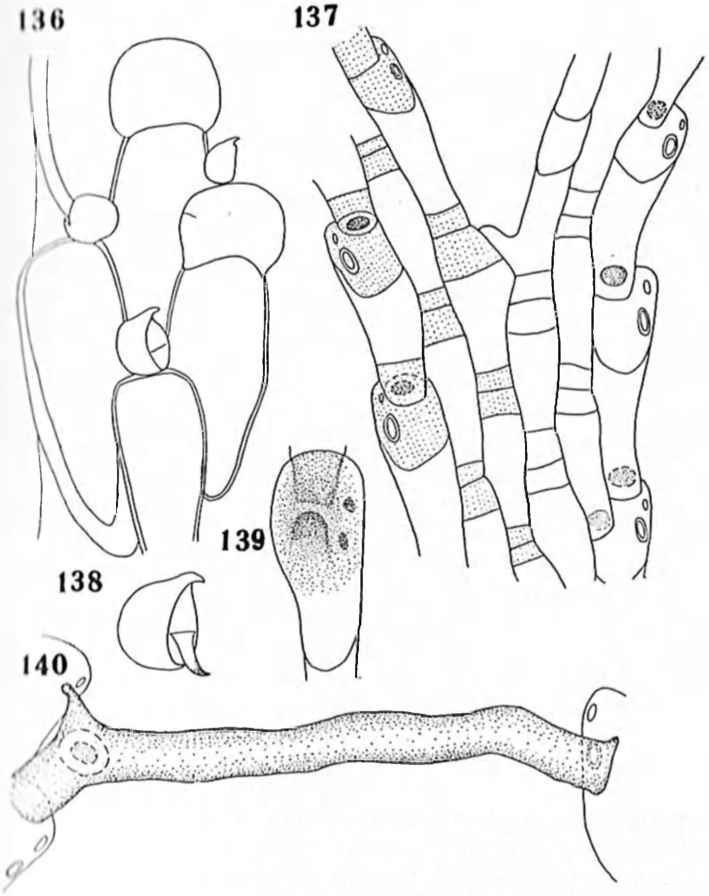
Chitinous tubes are present in the species of this genus.

In *D. murrayana* they are of the common type, which usually is called rootlets, i. e. they emanate from the marginal zoids, run downwards along the margins of the zoarium and are fixed at the substratum; in that way they support the zoarium. In *D. birostrata* and *D. japonica* chitinous tubes were not found before; here they are, however of particular interest. They are formed in the same way in the two species (figs. 134, 140). A marginal zoid row is abruptly stopped in its growth, its distal zoid giving off a tube instead of an autozoid from its distal end. The proximal part of the tube has the same structure as the proximal part of an autozoid and its walls are calcified. After that it is developed as an entirely chitinous, very long, round tube. It continues a short distance in the distal direction, later bending outwards at right angles to its proximal part and running directly to the neighbour branch of the zoarium where it is usually fixed at the proximal poreplate of a marginal zoid. From the inner distal corner of the part of the tube, which runs in the same direction as the mother zoid, a small tube derives which is connected with the proximal poreplate of the zoid of the inner zoid row that is placed distally to the starting-point of that tube. In the distal part of that section of the tube which runs in the same direction as the mother zoid a small, oval area of the frontal wall is membraneous and is surrounded by a broad, calcified ring. The shape and the situation of this peculiar structure make it certain that it is a reduced aperture field. In an autozoid the aperture field always reaches the distal margin of the zoid. Thus we must assume that the part of the tube which runs in the same direction as the mother zoid, including the reduced aperture field, is homologous with one zoid. The distal part of the tube is not separated from that part by a wall but it must certainly be looked upon as a bud, the proximal wall of which is not developed or is reduced. Possibly this part of the tube is homologous with several zoids, the proximal walls of which are reduced. In any case, the tube is homologous not with one but with at least two zoids, and thus it is homologous with a zoid row. — In *Camptoplites tubifera* (cf. below, p. 112) tubes of the same type are present.

1. D. birostrata (YANAGI & OKADA) (figs. 132—135).

Bugula birostrata, YANAGI & OKATA 1918, p. 420, Pl. 6 fig. 10, textfig. 6 (Japan); *Dendrobeania birostrata*, SILÉN 1938, p. 236, Pls. 14—16, textfigs. 24—33.

Localities: Japan (13 [?, small fragments], 26, 29, 43, 45); 100—600 m.; several detached zoaria.



Figs. 136—140. *Dendrobeania japonica* (ORTM.) (loc. 29).

Fig. 136: Zoids in frontal view. 45 ×. — Fig. 137: Zoarium in basal view showing the bifurcation, the distal-basal calcareous laminae of the zoids, and the pore-plates of the marginal zoids. 28 ×. — Fig. 138: Avicularium. 70 ×. — Fig. 139: Zoid in frontal view showing the emanation of the distal zoid. 45 ×. — Fig. 140: Connecting tube in basal view; the reduced aperture field of its front is dimly seen. 45 ×.

YANAGI & OKADA (l. c.) give a good description of the morphology of the species, SILÉN (l. c.) describes its anatomy.

2. D. japonica (ORTM.) (figs. 136—140).

Bugula japonica, ORTMANN 1890, p. 25, Pl. 1 figs. 19 (Japan); YANAGI & OKADA 1918, p. 422 (Japan); *Bugula hexacantha*, ORTMANN 1890, p. 25, Pl. 1 figs. 21 (Japan).

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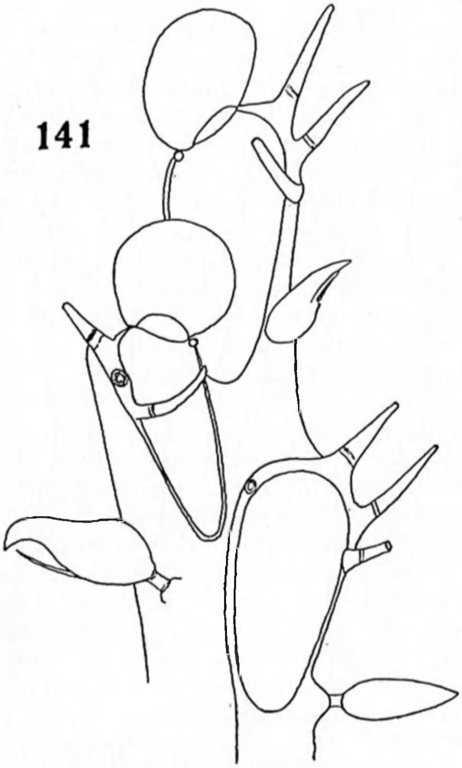

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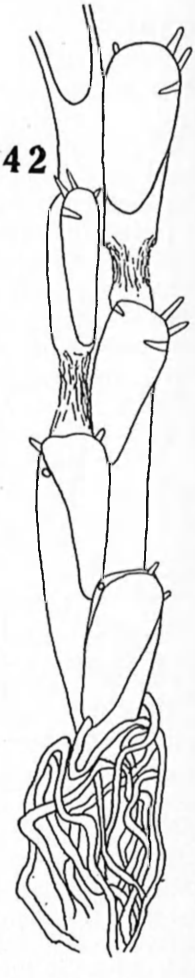

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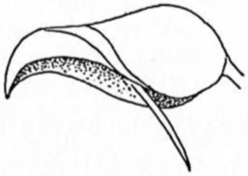


Figs. 141—143. *Bugula dentata* (Lamx.)
Fig. 141: Zoids in frontal view. 72 ×. — Fig. 142: Branch of zoarium with joint; the zoids proximally to that joint are strongly, those distally to it less calcified; basal tuft of rootlets. 44 ×. — Fig. 143: Avicularium. 112 ×.

Locality: Japan (29, at several different occasions); 150—600 m.; numerous zoaria.

As already mentioned by Yanagi & Okada Ortmann's *D. japonica* and *D. hexacantha* are identical; the distinguishing characters mentioned by Ortmann are caused by the individual variation. — Okada (1933, p. 14) proposes the subspecies *kurilensis* for specimens from the Kurile Is.

3. Bugula Oken.

Harmer (1926, p. 432) made a detailed synopsis of this genus.

1. B. dentata (Lamx.) (figs. 141—143; Pl. 8 figs. 27—28).

Acamarchis dentata, Lamouroux 1816, p. 135, Pl. 3 figs. 3; *Bugula dentata*, Busk 1852 b, p. 46, Pl. 35 figs. 1—5; Ortmann 1890, p. 25, Pl. 1 fig. 20 (Japan); Yanagi & Okada 1918, p. 421 (Japan); Harmer 1926, p. 459, Pl. 30 figs. 5—6, Pl. 32 figs. 21—25 (references); Hasenbank 1932, p. 329; Okada 1934, p. 5, Pl. 1, fig. 9 (Japan); Okada & Mawatari 1937, p. 435 (Japan), and 1938, p. 450 (Japan); *Bugula dentata* var. *africana*, Ortmann 1892, p. 669.

Localities: Japan (28 [2 zoaria], 42 [3 zoaria]); 5—135 m.

The basal parts of the branches of the zoarium are surrounded by a web of winding tubes, emanating from the lateral and basal walls of the zoids. At the base of the zoarium the tubes diverge and form a tuft which is fixed at the substratum. Thus the zoarial branches become very thick basally; the zoids of this part are strongly calcified but have the same shape as the other zoids. The distal parts of the branches form a contrast with these proximal ones, they are slender and translucent and have no tubes. They are jointed basally, the proximal parts of their proximal zoids being decalcified and constricted at the transition in the strongly calcified basal parts of the zoarium.

The avicularia differ a little as to their shape from those figured by Harmer. They are more prolonged, their dorsal sides are not so convex, their rostra are more prolonged and distally drawn out in long hooks. The enlarged avicularia observed by Harmer are not present in these specimens.

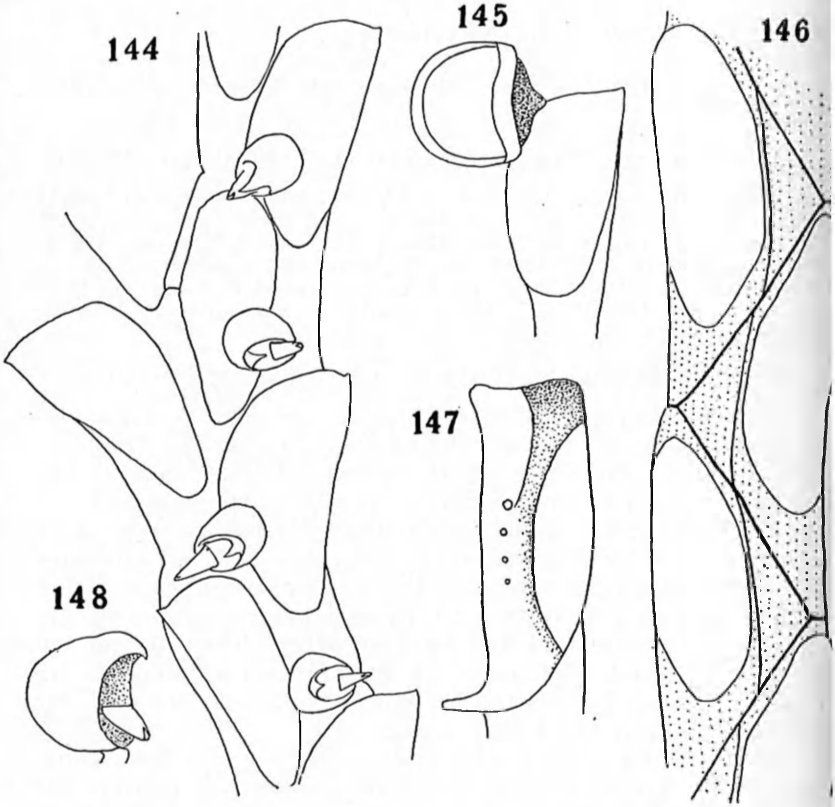
The features which according to Ortmann (1892) are characteristic of var. *africana* are all due to the individual variation (cf. Harmer's description and figs.) and thus it can not be kept apart from the main species.

2. B. subglobosa Harmer (figs. 144—148).

Bugula subglobosa, Harmer 1926, p. 444, Pl. 32 figs. 15—18 (Japan).

Locality: Japan (10); numerous big zoaria.

These specimens agree entirely with Harmer's description. Some observations may be added. The colour of the zoarium is a reddish brown. Its basal side is provided with the light red zigzag line which Harmer (op. cit., pp. 436, 444) observed in *B. robusta* and *B. scaphoides*. The basal side of the zoid has a large oval area where the wall is almost membraneous;



Figs. 144—148. *Bugula subglobosa* Harmer.

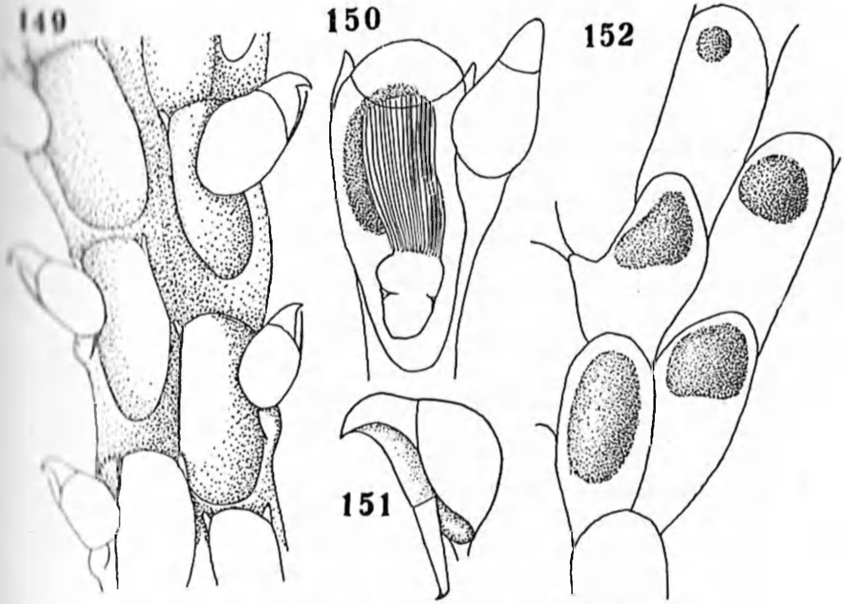
Fig. 144: Zoids in frontal view. 60 ×. — Fig. 145: Zoid with ooecium. 60 ×. — Fig. 146: Zoids in basal view. 60 ×. — Fig. 147: Zoid in lateral view. 60 ×. — Fig. 148: Avicularium. 95 ×.

this area contrasts sharply with the surrounding, calcified parts of the wall. The distal upper part of the free lateral wall is also membraneous. Proximally to this latter area there is a row of 3—4 round pores.

3. **B. pugeti** Robertson var. **kiuschiuensis** nov. (figs. 149—152; Pl. 8 figs. 29—30).

Locality: Japan (20 [type]); 40 m.; 5 small zoaria on a zoarium of *Thalamoporella lioticha.*

The zoarium is biserial. It is fixed at the substratum by means of a short peduncle, formed by a row of old, strongly calcified zoids which are surrounded by numerous winding



Figs. 149—152. *Bugula pugeti* var. *kiuschiuensis* nov.

Fig. 149: Zoids in frontal view. 60 ×. — Fig. 150: Zoid with polypid and egg. 95 ×. — Fig. 151: Avicularium. 95 ×. — Fig. 152: Zoarium in basal view showing the position and size of the eggs, and (to the left) a bifurcation. 60 ×.

tubes; the tubes are fixed at the substratum by means of their expanded, feet-like extremities. The branches emanating from the peduncle bifurcate repeatedly and form a shallow cup with the distal end of the peduncle in its centre.

The spines of the zoids are usually 1:1, only in one or two zoids of the peduncle they are 2:2.

The avicularia agree with those of the main species.

The largest of the zoaria shows the same type of development of the embryos which is described below in var. *umbelliformis*. The polypids of the zoids with embryos are not reduced.

Owing to the entirely different structure of the zoarium it seems appropriate to propose a new variety for these specimens.

4. B. pugeti ROBERTSON var. umbelliformis YANAGI & OKADA (Pl. 9 figs. 31—32).

Bugula pugeti ROBERTSON var. *umbelliformis*, YANAGI & OKADA 1918, p. 424, Pl. 6 fig. 8 (Japan); OKADA & MAWATARI 1938, p. 451 (Japan).

Localities: Japan (22 [on several occasions], 24, 40); 1—3 m.; several zoaria.

These specimens are certainly identical with those of YANAGI & OKADA. They agree with those and differ from Miss .ROBERTSON's (1905, p. 271, Pl. 10 figs. 53—54, Pl. 11 fig. 55) main species in the structure of the zoaria and in the spines being 1:1 in all zoids. The distal knob observed by these authors seems however to be absent.

Miss ROBERTSON mentions that ooecia are absent and that the embryos develop in the body-cavity. This is also the case here (cf. also above in *B. pugeti* var. *kiuschiuensis*). The young embryo lies in the distal-basal part of the body-cavity; as it grows further it occupies a greater and greater part of the basal side. Miss ROBERTSON observed that the polypids of the zoids with embryos were degenerated. This is not the case here. The polypid is bent up over the embryo; and the frontal membrane becomes convex. The zoids placed proximally to those provided with embryos are, however, empty, containing only a »brown body» each. Thus it is possible that the polypid degenerates when the larva emerges.

It seems appropriate to maintain this variety, the mode of growth being very different from that of the main species but no other important differences being observed.

HARMER's (1926, p. 441, Pl. 32 figs. 12—14) *B. pedata* seems to be very close to this species. Ooecia are not known, and it seems possible that this species too has the type of development of the embryo described above.

5. B. neritina (L.).

Sertularia neritina, LINNÉ 1758, p. 815; *Bugula neritina*, OKEN 1815, p. 89; Jelly 1889, p. 27 (references); ORTMANN 1890, p. 24, Pl. 1 fig. 17 (Japan); WATERS 1909, Pl. 11 figs. 1—3 (references); YANAGI & OKADA 1918, p. 424 (Japan); HASTINGS 1927, p. 334 (references); OKADA 1929, p. 13 (Japan); HASTINGS 1930, p. 704; CALVET 1931, p. 61 (references); OKADA & MAWATARI 1937, p. 435 (Japan), and 1938, p. 451 (Japan).

Localities: Sumatra (12), Japan (22, 23, 24, 41, 51, 52); 1—3 m.; numerous zoaria.

6. B. longicauda HARMER.

Bugula longicauda, HARMER 1926, p. 450, Pl. 30 figs. 8, 15—16 (Japan); *Bugula johnstoniae*, ORTMANN (nec GRAY) 1890, p. 24, Pl. 1 figs. 16 (Japan); ?YANAGI & OKADA 1918, p. 423 (Japan).

Localities: Japan (13, 26, 29 [on several occasions]); 100—600 m.; numerous zoaria.

These specimens agree closely with Harmer's description. Harmer is not certain whether Ortmann's and Yanagi & Okada's *B. johnstoniae* is identical with this species. But I must say that Ortmann's specimens certainly are. Yanagi & Okada give no description of their specimens and thus their position can not be settled with certainty; it is, however, possible that these authors have followed Ortmann when determining their specimens and in such a case they also were naturally to be referred to *B. longicauda*.

4. **Caulibugula** Verrill.

C. bocki n. sp. (figs. 153—157).

Locality: Bonin Islands (32 [type], 37); 100—135 m.; 2 zoaria.

The zoarium from loc. 32 is small. It consists of a stem of old and strongly calcified kenozoids, which is surrounded by chitinous tubes, and of two branches emanating from that stem. One broken branch consists of 2 kenozoids only; the other begins with 3 strongly calcified autozoids, which are followed by 4 kenozoids and then by autozoids again.

The kenozoids are of the common *Caulibugula*-type, they are long (= 2—3 times the length of an autozoid), narrow, and have each a very narrow, long, membraneous aperture field, strongly calcified lateral walls and a translucent, membraneous basal wall. In the old kenozoids of the main stem the lateral walls are so strongly calcified that the lumen is constricted to a narrow slit between them.

Between the distal group of kenozoids and the distal group of autozoids there is one zoid of a peculiar structure. Its length is about 1 ½ of the length of an autozoid. Its proximal part is narrow and round in cross section; thus it has the shape of a kenozoid here. But the zoid expands towards its distal end where it has the shape of an autozoid. Its distal margin is evenly rounded. Its front is occupied by a proximally narrow, distally expanding aperture field. Like the true autozoids, this zoid has a distinct operculum which has not been observed before in *Caulibugula*. It contains a »brown body», which shows that it is an autozoid though one of peculiar structure.

The following, true autozoids are of the shape usual in *Bugula*. They are more narrow proximally and expand a little towards their distal ends. The free lateral side of the zoid is distally drawn out in a corner, its inner side is distally

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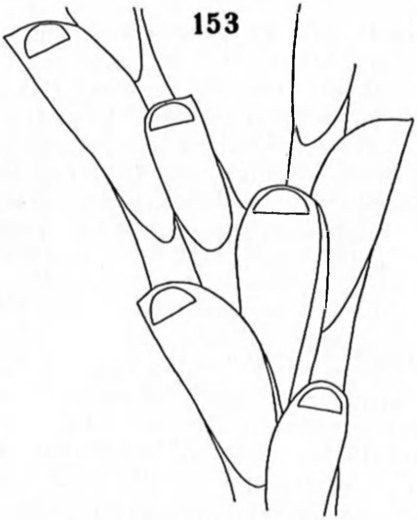

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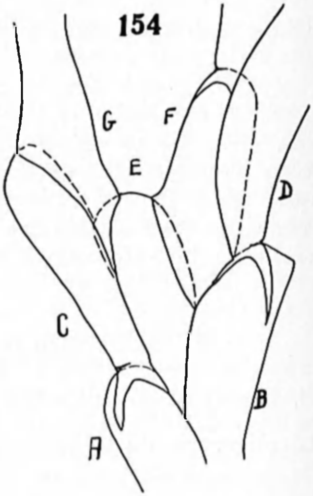

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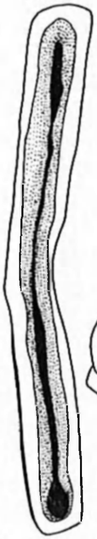

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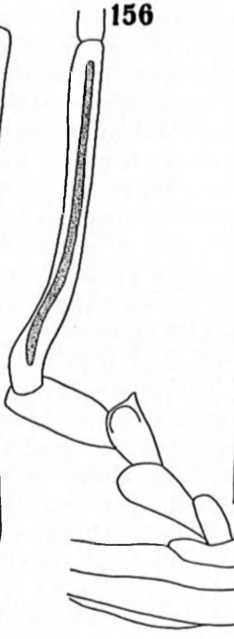

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Figs. 153—157. *Caulibugula bocki* n. sp. (loc. 31).

Fig. 153: Bifurcation of zoarium in frontal view. 45 ×. — Fig. 154: Bifurcation of zoarium in basal view. 45 ×. — Fig. 155: Kenozoid. 45 ×. — Fig. 156: Erect branch emanating from the creeping part of the zoarium, which latter is surrounded by tubes. 28 ×. — Fig. 157: The basal part of the zoarium showing the distal part of a kenozoid, a zoid being a transitional from between kenozoid and autozoid, and true autozoids. 28 ×.

evenly rounded. The aperture field occupies the entire front. The proximal end of the zoid is fixed at the basal side of the proximal zoid, and here it is forked in a longer outer and a shorter inner branch; these branches are pointed and slightly curved. On a level with the distal margin of the proximal zoid the distal zoid is sharply constricted from the outer side. It ought to be mentioned that the proximal end of the special autozoid described above is not forked as in the true autozoids but evenly rounded as in the kenozoids.

Spines and avicularia as well as marks of such structures are absent.

Ooecia were not found.

This species belongs to the »Bugula-group» of *Caulibugula* (cf. HARMER 1926, p. 457). It is close to *C. inermis* HARMER, spines and avicularia being absent, but it differs clearly from that species in the shape of the autozoids including the special one. An interesting feature is the presence of an operculum.

5. **Camptoplites** HARMER.

HARMER (1926, p. 452) says in the diagnosis of this genus: »Proximal ends of zooecia not forked». In the new species proposed below, however, which in other characters is a typical *Camptoplites*, the proximal end of the autozoid is forked, and thus the character mentioned is to be excluded from the diagnosis of the genus.

C. **tubifera** n. sp. (figs. 158—167).

Localities: Japan (13 [1 zoarium], 25 [2 zoaria], 26 [type; numerous zoaria], 29 [2 zoaria]); 225—450 m.

All zoaria are without their basal parts. They are of the usual structure, and biserial.

The zoids are prolonged, proximally they are narrow, tube-shaped, their proximal ends are expanded and a little forked. The distal half of a zoid is expanded, and of equal breadth; it is bent forward at an angle with its proximal half. Its entire front is occupied by the aperture field. The distal corners are a little drawn out but no true spines are present. The aperture is situated at the distal end of the aperture field. An operculum has not been observed. The zoid shows, so to speak, a tendency to be jointed on two points: proximally to the aperture field, and a little distally to its proximal end. Here the zoid wall is a little constricted, uncalcified and translucent.

From certain zoids there emanates distally, in addition to an autozoid, a tube on the outer side of the latter. The tube is thick, round, and calcified. It passes directly to the neighbour branch, where it is fixed at the proximal part of an autozoid. Close to its starting-point on its mother zoid it has a frontal, circular area which is covered by a membrane. In *Dendrobeania birostrata* and *D. japonica* a similar structure was observed (p. 102), which was assumed to be a reduced aperture field. That may be the case also in the present species, and the tubes can be looked upon as modified zoid rows. — Such tubes have been observed in *Camptoplites* in the species »*Bugula*» *reticulata* Busk (1884, p. 40) and possibly in *C. lunatus* Harmer (1926, p. 452). A comparison with *C. bicornis* (Busk) (cf. Waters 1904, p. 21, Pl. 1 figs. 4 a—4 b) is of interest. That species has tubes, but they emanate from the basal sides of the zoids, and from other features also it is clear that they have nothing to do with those of *C. tubifera*. The interesting phenomenon is that the zoarium of *C. bicornis*, besides the usual bifurcations, is provided with small lateral branches (a phenomenon which seems to be unique in *Bicellariellidae*). These lateral branches each consist of up to 7 zoids, which are considerably smaller than those of the main stem; these branches do not bifurcate. These branches are placed in exactly the same way as the tubes of *C. tubifera*. The first zoid of a lateral branch is placed as the marginal one of two distal buds of its mother zoid; the other bud grows as a »normal» zoid in the direction of the main stem. This phenomenon seems to make it still more likely that the tubes of *C. tubifera* are homologous with zoid rows as it suggests that these tubes, at least, are homologous with the lateral branches of *C. bicornis*.

1—2 avicularia are placed in the median line of the autozoid proximally to the aperture field. The distal one has a rather short ($^1/_3$ of the length of the autozoid), narrow peduncle; the avicularium itself is narrow and prolonged. The proximal avicularium has a very long (up to 3 times the length of the autozoid) peduncle. As to the shape of the avicularium itself there are two different types here. One is very narrow and prolonged, but it has not the same shape as the distal avicularium: the convexity of its dorsal side is not so high, its greatest height lies more distally, proximally it is drawn out and not rounded as is the case in the distal avicularium; further, the rostrum is sharply hooked and the mandible has a strong tooth at its distal end, which is not the case in the distal avicularium. The length of the proximal avicularium is about 3 times the length of the distal

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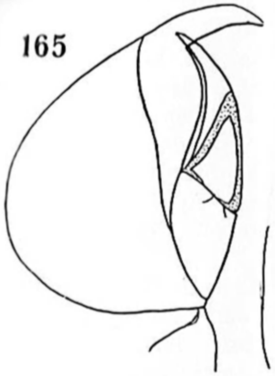
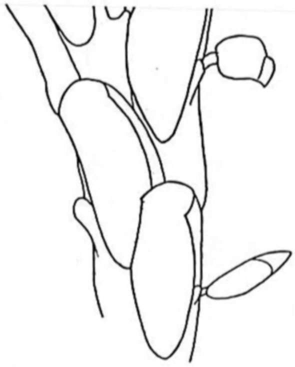
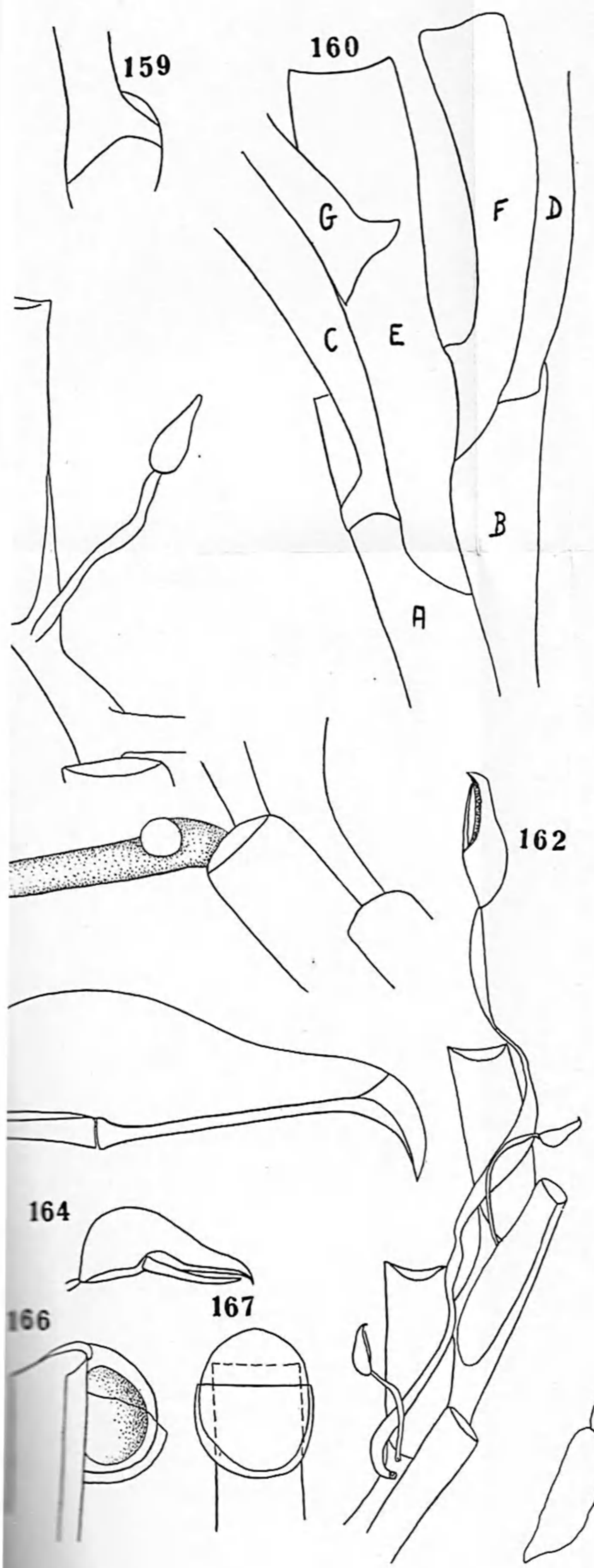




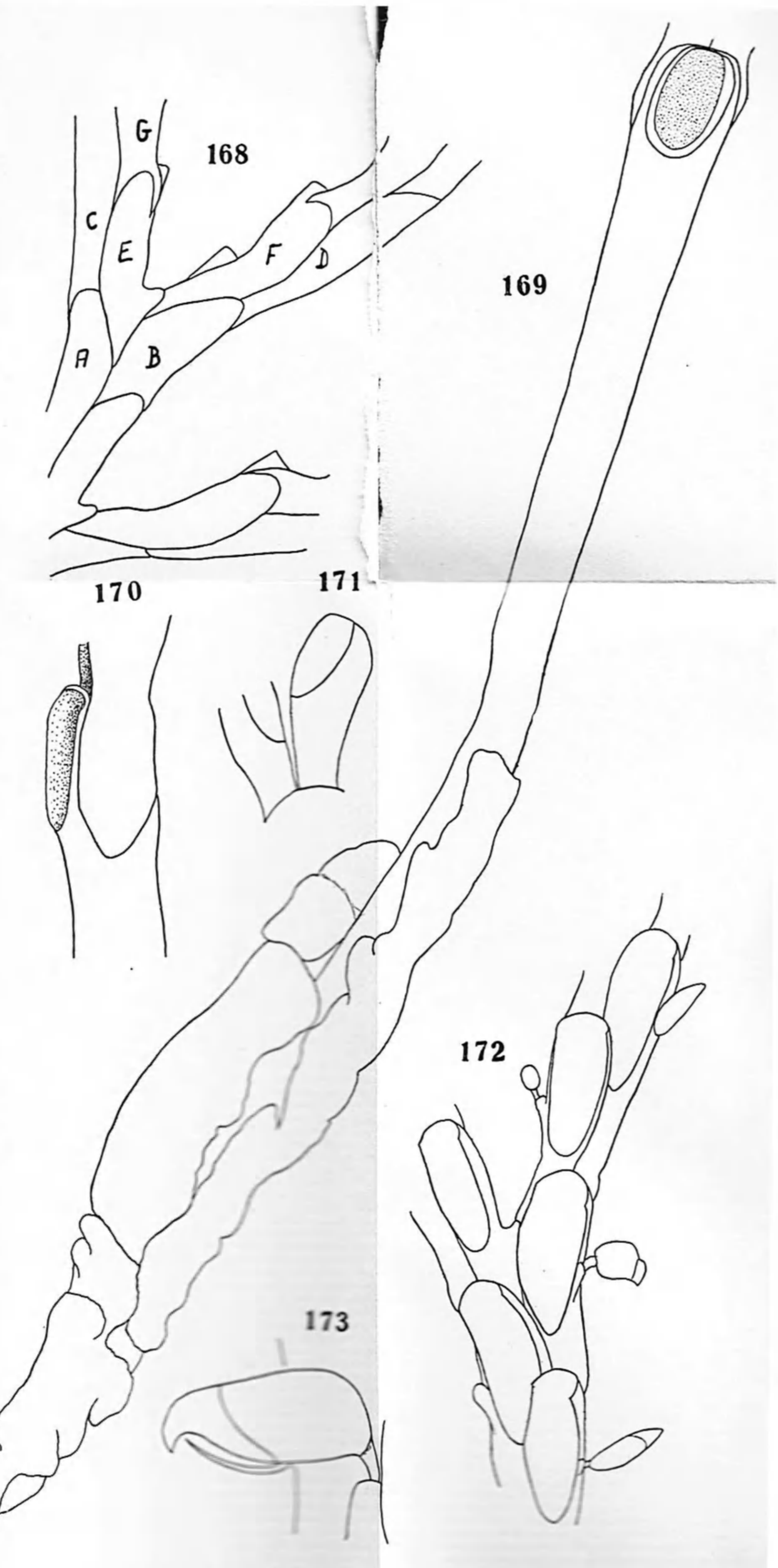
Figs. *kias dubia* n. gen. n. sp.

Fig. 158: Zoids in fro showing mode of bifurcation
— Fig. 159: The forke tem zoid (loc. 29). 37 ×. — Fig.
view showing the mode basal zoids from the stem zoid
aperture field in front Fig. 171: The emanation of the
them long-pedunculated zoid in frontal view (loc. 29).
with long head, of the ntal view (loc. 26). 60 ×. — Fig.
the smaller type. 140 × oc. 26). 95 ×.
Zoid with ooecium in



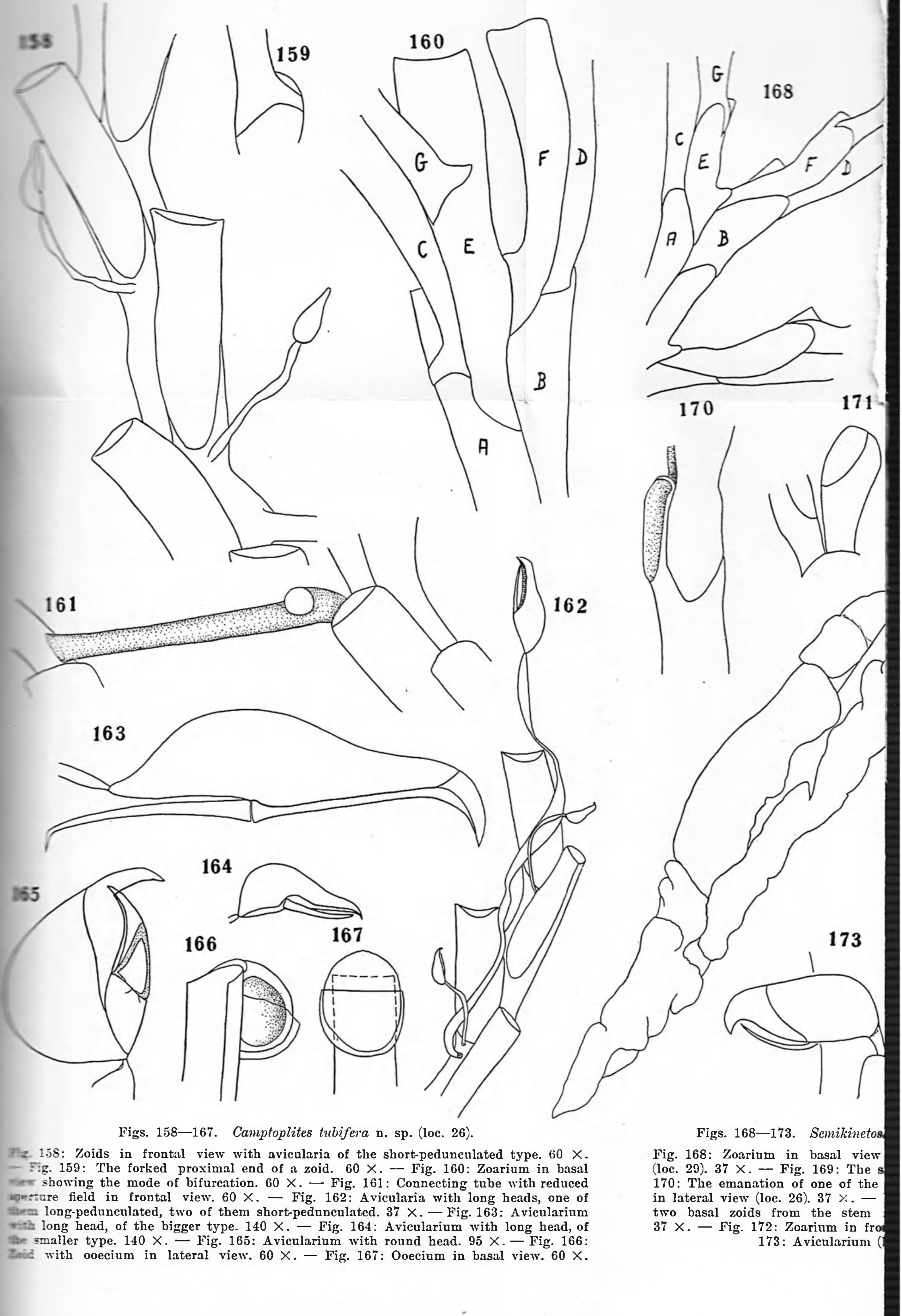
–167. *Camptoplites tubifera* n. sp. (loc. 26).

view with avicularia of the short-pedunculated type. 60 ×. proximal end of a zoid. 60 ×. — Fig. 160: Zoarium in basal bifurcation. 60 ×. — Fig. 161: Connecting tube with reduced 60 ×. — Fig. 162: Avicularia with long heads, one of them short-pedunculated. 37 ×. — Fig. 163: Avicularium type. 140 ×. — Fig. 164: Avicularium with long head, of Fig. 165: Avicularium with round head. 95 ×. — Fig. 166: view. 60 ×. — Fig. 167: Ooecium in basal view. 60 ×.



Figs. 168—173. *Semikinetoskias dubia* n. gen. n. sp.

Fig. 168: Zoarium in basal view showing mode of bifurcation (loc. 29). 37 ×. — Fig. 169: The stem zoid (loc. 29). 37 ×. — Fig. 170: The emanation of one of the basal zoids from the stem zoid in lateral view (loc. 29). 37 ×. — Fig. 171: The emanation of the two basal zoids from the stem zoid in frontal view (loc. 29). 37 ×. — Fig. 172: Zoarium in frontal view (loc. 29). 60 ×. — Fig. 173: Avicularium (loc. 29). 95 ×.



Figs. 158—167. *Camptoplites tubifera* n. sp. (loc. 26).

Fig. 158: Zoids in frontal view with avicularia of the short-pedunculated type. 60 ×. — Fig. 159: The forked proximal end of a zoid. 60 ×. — Fig. 160: Zoarium in basal view showing the mode of bifurcation. 60 ×. — Fig. 161: Connecting tube with reduced aperture field in frontal view. 60 ×. — Fig. 162: Avicularia with long heads, one of them long-pedunculated, two of them short-pedunculated. 37 ×. — Fig. 163: Avicularium with long head, of the bigger type. 140 ×. — Fig. 164: Avicularium with long head, of the smaller type. 140 ×. — Fig. 165: Avicularium with round head. 95 ×. — Fig. 166: Zoid with ooecium in lateral view. 60 ×. — Fig. 167: Ooecium in basal view. 60 ×.

Figs. 168—173. *Semikinetos*

Fig. 168: Zoarium in basal view
(loc. 29). 37 ×. — Fig. 169: The s
170: The emanation of one of the
in lateral view (loc. 26). 37 ×. —
two basal zoids from the stem
37 ×. — Fig. 172: Zoarium in fro
173: Avicularium (

one. The other type of proximal avicularia has a large round, swollen »head» with a sharply bent rostrum; the mandible seems to have no distal tooth, it is furnished with a V-shaped chitinous sclerit.

Ooecia are present in two zoaria. They are of the usual *Caulibugula*-type. They are placed distally on the basal sides of the zoids and have narrow, slit-like openings along the distal margins of the zoids. They are oval in form and transparent. The endocyst is striated longitudinally, the ectocyst, which appears as a cup surrounding the proximal part of the ooecium, is smooth.

This species is a typical *Caulibugula*. It is easily recognized by tubes connecting the branches of the zoarium (other species provided with tubes are entirely different in other features) and the forked proximal ends of the zoids.

6. **Semikinetoskias** n. gen.

The autozoids are of *Bugula*-shape and are intimately connected with each other. The proximal zoids of the branches are jointed. Flexor zooecii muscles are absent. Aventitious, pedunculated avicularia are present; they are placed on projections of the autozoids (»step-like projections», HARMER 1926, p. 468). The peduncle of the avicularium emanates from the front of the latter at right angles. The zoarium is elevated on a long peduncle, formed by one kenozoid. The distal part of the kenozoid has an aperture field, proximally to which it becomes tube-shaped, its proximal end is pointed; its proximal half is surrounded by thick, irregular, chitinous tubes. The entire wall of the kenozoid is calcified. The zoarium is biserial and bifurcates according to HARMER'S »Bugula-type 3».

Type: *S. dubia* n. sp.

This genus has a position between *Bugula* and *Kinetoskias*. The autozoids are Bugula-like as to their structure and in being immovably connected with each other. Consequently the branches of the zoarium are basally jointed. The avicularia are placed on »step-like projections» as in *Kinetoskias*, but their peduncles are at right angles to the »head» of the avicularium as in *Bugula*. The peduncle, on which the zoarium is elevated, is the feature most similar to *Kinetoskias*, but the details of its structure are not the same. Thus its wall is entirely calcified as in an autozoid, whereas in *Kinetoskias* it is chitinized. It has an aperture field; this we find in one species of *Kinetoskias*, *K. mitsukurii* YANAGI & OKADA (1918,

p. 425). In *Kinetoskias* thin chitinous tubes emanate from the proximal end of the peduncle, which are fixed at the substratum. In *Semikinetoskias*, however, the proximal half of the peduncle is surrounded by thick chitinous tubes and in that way a turnip-shaped structure is formed, from which the zoarium is elevated on the narrow distal half of the peduncle. When considering this peculiar shape of the peduncle one is tempted to assume that its turnip-shaped proximal half is buried in a soft bottom and that the zoarium is held up over the bottom by its narrow distal half. Therefore it was a surprise to me to find that actually the zoaria are fixed on hard substratum; 2 zoaria were not detached but fixed upon a shell. — From the distal end of the peduncle there emanate 2 zoids in *Semikinetoskias* but only one in *Kinetoskias*.

Though *Semikinetoskias* morphologically has a position between *Bugula* and *Kinetoskias* it seems uncertain, not to say unlikely, that it holds such a position in the true developmental series *Bugula—Kinetoskias*.

S. dubia n. sp. (figs. 168—173).

Localities: Japan (13, 26, 29 [type]); 100—600 m.; several zoaria.

The zoarium is fixed at the substratum by a peduncle of about 7,5 mm. in length. The peduncle is cylindrical, its distal end is a little expanded but then its distal half becomes narrower proximally; its proximal half is of equal breadth, its proximal end is pointed. Close to the distal end of the peduncle there is an aperture field which is surrounded by a narrow, translucent, calcareous ring. There is no aperture and thus it is clear that the peduncle is a true kenozoid. The proximal half of the peduncle is surrounded by long, thick, irregular tubes, forming a turnip-shaped body.

From the distal end of the peduncle 2 autozoids emanate. These zoids are, proximally and on their free lateral sides, drawn out into a broad lobe, running along the lateral sides of the peduncle and stopping on a level with the proximal margin of its aperture field. Thus the distal end of the peduncle is enclosed by the proximal parts of the distal zoids as by two hands. The distal zoids show a tendency to be jointed; on a level with the distal margin of the peduncle they are a little constricted and decalcified.

From each one of the two first autozoids a branch is derived, which grows further and bifurcates according to HARMER's »*Bugula*-type 3». They are biserial. The autozoids are prolonged, they are narrow proximally and expand towards their distal ends. Their distal-lateral corners are a little drawn out. True spines are absent. Their proximal ends are forked and enclose the distal ends of the proximal zoids. Thus the zoids are immovably fixed to each other. The aperture field occupies the entire distal half of the front; it becomes narrower proximally. There is a translucent operculum with a distal and a proximal chitinous sclerit in the distal part of the aperture field. — At a bifurcation the daughter branches have traces of basal joints. Along a line which traverses the zoid E proximally to its aperture field, C close to its proximal end, F proximally to its aperture field and D close to its proximal end, the zoids mentioned are a little constricted and decalcified.

On the outer side of the aperture field of a zoid and a little proximally to its centre there is a »step-like projection» to which an avicularium is fixed by a short, narrow peduncle. The »head» of the avicularium is prolonged, the rostrum is about $^1/_3$ of its length and has a hook at its extremity. The mandible has a short tooth at its point. The peduncle emanates from the frontal side of the proximal end of the avicularium at right angles to its longitudinal axis.

Ooecia were not found.

Divisio 7. *Cribrimorpha.*

Fam. **Cribrilinidae** Hincks.

1. **Figularia** Jullien.

1. **F. figularis** (Johnst.) **var. japonica** nov. (figs. 174—177).

? *Figularia figularis*, Okada & Mawatari 1935, p. 138, Pl. 10 fig. 6 (Japan).

The main species:

Lepralia figularis, Johnston 1847, p. 314, Pl. 66 fig. 2; *Figularia figularis*, Jullien 1886, p. 608.

Localities: Japan (1 [type], 18, 21); 85—115 m.; encrusting stones or shells.

The zoarium from loc. 1 consists of old, partly dead, strongly calcified zoids. The frontal shield formed by the costae covers the greater part of the frontal side. It is surrounded by a smooth though striated, narrow gymnocyst. The costae are elevated and stand out conspicuously. Usually their number is 11—13. They are basally broad and then

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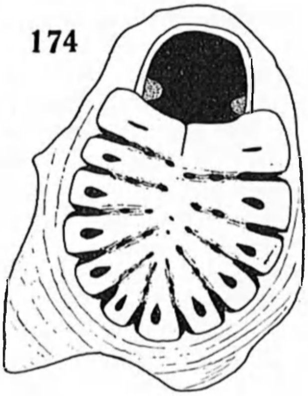

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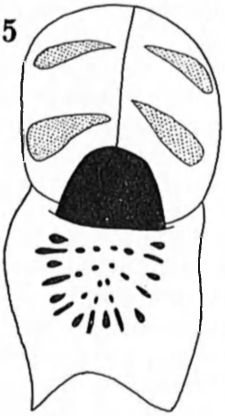

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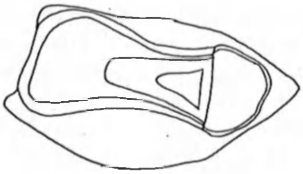

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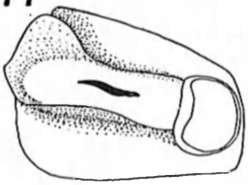


Figs. 174—177. *Figularia figularis* var. *japonica* nov. 60 ×.

Fig. 174: Strongly calcified zoid (loc. 1). — Fig. 175: Young zoid with ooecium (loc. 18). — Fig. 176: Old worn avicularium (loc. 1). — Fig. 177: Avicularium (loc. 18).

gradually become narrower towards their distal ends. Proximally they are each provided with a pelma; this is rounded, in the distal pair of costae however it is narrow and fissurelike. The costae are separated by a narrow incision between their bases and 2—3 pores ranged in the prolongation of this incision. Only in the distal pair of costae is a median suture observed marking the border between the ends of the costae. This pair of costae is particularly elevated and forms a bar along the proximal margin of the aperture. This bar is a little concave; the lateral-distal margin of the aperture describes an even curve. Inside the mouth of the aperture and close to its proximal margin one rounded condyle is found laterally on each side. The operculum is light brown, it is bordered by a thin sclerite. The distal walls of the zoids are usually furnished with 2 multiporous rosette-plates and a varying number of single pores (cf. LEVINSEN 1909, p. 159, and HARMER 1926, p. 478); their lateral walls are usually furnished with 3 multiporous plates.

A few vicarious avicularia of the usual *Figularia*-type were found. They are placed at bifurcations of zoid rows as the lateral daughter zoid and thus belong to the group 1 of the vicarious avicularia (SILÉN 1938, pp. 288, 308). A characteristic feature is that the rostrum, distally very broad, is drawn out to a distal-lateral wing on each side. The mandibles had all fallen away.

The ooecia are very large, strongly calcified and smooth. They are provided with a median carina and with two large, stilliform fenestrae in each side.

The zoarium from loc. 18 is composed of young, little calcified, translucent zoids. Only the distal pair of costae is elevated, the other part of the costal shield is even and the situation of the costae is only marked by the pelmae and the intercostal pores. In the poorly calcified ooecia it is here easily seen that the median carina of the ooecia of the zoarium above discussed was originally a suture, the rims of which fused and thickened on a larger degree of calcination. Also these ooecia have the two pairs of fenestrae.

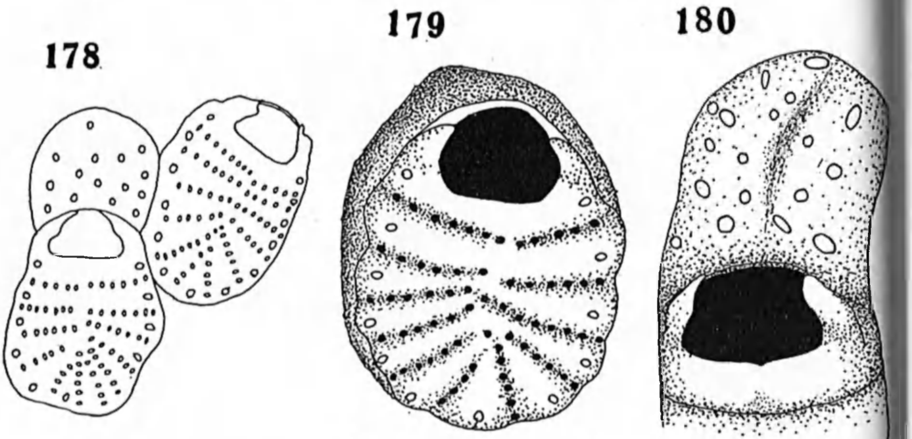
The species present agrees with *F. figularis* in the more important features. The distal-lateral wings of the rostrum of the avicularium and the *two* pairs of fenestrae of the ooecia are its characteristic attributes. But they do not seem to be of such an importance as to merit the proposal of a new species. — The presence of two pairs of ooecial fenestrae does not seem to have been mentioned before. But at least some ooecia of *F. fissurata* CANU & BASSLER (1929, p. 239, Pl. 22 figs. 4—6) have two pairs of fenestrae, as fig. 4 shows, though in the description they are said to have only one pair. It does not seem unlikely that the last named species is also a variety of *F. figularis;* it is even possible that it is identical with the variety here described, but the brief description and the indistinct figs. make it difficult to say anything definite about it. — OKADA & MAWATARI (1935, p. 138, Pl. 10 fig. 6) identify with some hesitation some fragments of zoaria from Japan with *F. figularis.* Possibly it belongs to the variety here described?

2. F. multipora (SAKAKURA) (figs. 178—180).

Lyrula multipora, SAKAKURA 1935 b, p. 109, Pl. 8 fig. 7 (Japan).

Locality: Japan (2); 3—7 m.; encrusting a stone.

The zoids are of medium size, they are oval and well confined. The costal shield covers the entire front. The number of the costae is about 13. They are proximally broad and become narrower towards their ends. The pelma is



Figs. 178—180. *Figularia multipora* (SAKAKURA).
Fig. 178: Two zoids, one of them provided with an ooecium. 50 ×. — Fig. 179: Young zoid. 102 ×. — Fig. 180: Old zoid with ooecium; the distal costae and their projections strongly developed. 102 ×.

represented by a rather small and not very conspicuous pit. The borders between the costae are marked by rows of small round pores, 6—8 in each row. These pores are placed in the bottom of grooves. Even in young zoids the costae are elevated. The distal pair of costae forms a bar proximally to the aperture. From the proximal parts of these costae emanates on each side one, often very strong, projection. These projections encircle the lateral and partly the distal margin of the aperture. The aperture is of broad and roundedly triangular form and is a little contracted at the lateral margins owing to the projections mentioned. In old, highly calcified zoids the distal pair of costae and their projections are very elevated to a solid wall surrounding the aperture. And in this case a strong median mucro is often formed at the union of the two costae proximally to the aperture. The operculum is crescent-like, thin, of a light yellow. It is bordered by a thin sclerite. The distal wall of the zoid has 4—6 single pores, the lateral walls have 2—3 rosette-plates.

Avicularia have not been found.

The ooecia are very large, smooth, white glistening, and have a median carina. They are perforated by many rather large pores. At a higher degree of calcination the ectocyst is elevated around the pores to short tubes. They are spread irregularly over the ooecium, possibly they are a little larger and more frequent towards the periphery. The ooecia are closed by the operculum.

The present specimens differ from the description given by SAKAKURA in the following points. SAKAKURA mentions that the costae are provided with »one large lumen pore near the end and one smaller pore, situated more centrally». I have not been able to find the latter, perhaps it has disappeared owing to the strong calcination of the zoarium. Then SAKAKURA describes his specimens as having 3 lateral porechambers. Those are absent in the present specimens, which, as mentioned above, are provided with 2—3 lateral rosette-plates. And, finally, the pores of the ooecium are described by SAKAKURA as being situated in the periphery of the ooecium, which is, however, contradicted by his own fig., where pores are to be seen in the central part of the ooecium too; thus the difference on this point between SAKAKURA's and the present description is of no importance. — In all other points the present specimens agree with those of SAKAKURA. The characteristic structure of the ooecium, of the aperture and of the costal shield is the same. And this correspondence is so close that there can be no doubt that we are dealing with one and the same species. And this in spite of the fact that SAKAKURA's specimens are said to have porechambers. Perhaps there is some mistake on SAKAKURA's part on this point.

SAKAKURA put the species in the genus *Lyrula* JULLIEN (JULLIEN 1886, p. 606). The structure of the costal shield and the median suture of the ooecium (along which the carina is formed) are features making this impossible. On the contrary these and other features, for instance the definite absence of porechambers, point to the genus *Figularia*, where it seems proper to place the species. True enough the fact that the ooecium is provided with many rather small pores is not known before in any other species placed in this genus. Usually the ooecium in this genus has 1—2 pairs symetrically placed, very large, stilliform pores, fenestrae. But WATERS (1923, p. 571, Pl. 18 fig. 1) describes a new species, *Figulina tahitiensis*, the ooecium of which is deprived of such fenestrae and instead has one rather small pore on each side situated peripherically near the aperture; in one case an ooecium had two or three small pores more medially placed. In connection with this it must be remarked that WATERS in the paper cited uses the name *Figulina* (originally misprint for *Figularia* by NORMAN 1903) as well as the name *Figularia* (cf. HARMER 1926, p. 478). Since he gives the name *Figulina* to *Figularia figularis* auctt. and describes *Figulina tahitiensis* as closely related to that species, it is evident that in his opinion *Figulina tahitiensis* is to be ranged in the group of species usually named *Figularia*. This is confirmed by his description and fig. This failure to coincide with the normal as to size, form and arrangement of the ooecial pores, thus does not seem to Waters to prevent the ranging of the species named in the genus *Figularia*. And though the species here described differs from the normal still more in that respect it does not seem to be of such importance as to prevent the species being ranged in *Figularia*.

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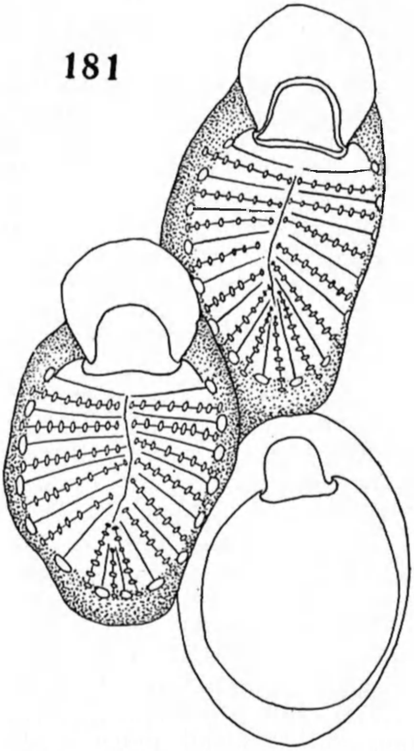


Fig. 181. ?*Figularia ortmanni* n. sp. (loc. 29). 67 ×.

Zoids with ooecia; the operculum is seen in the distal zoid.

3. ?F. ortmanni n. sp. (fig. 181).

Cribrilina philomela, Ortmann (nec Busk) 1890, p. 37, Pl. 1 fig. 26 (Japan).

Localities: Japan (25, 26, 29 [type], 43); 100—600 m.; encrusting worm tubes.

The zoids are oval and well defined. The costal shield covers nearly the entire frontal side; the gymnocyst is to be seen only as a narrow frame along the proximal and lateral sides. The costae are proximally broad and then become narrower towards their ends. They are transparent and provided with a large proximal pelma and a narrow lumen. The borders between them are marked by rows of very small intercostal pores, which are placed very close to each others and are drawn out transversely, a thin line running between these pores. A thin median line marks the border between the costae belonging to the different sides of the zoid. There are 8 pairs of costae. The distal pair forms the proximal border of the aperture; they are connected to each other without a suture. The distal margin of the aperture describes an even curve; proximally there is a little rounded incision, laterally directed, on each side. The proximal margin is evenly convex. The operculum is of the same form as the aperture and moves around its proximal-lateral projections. It is of a light yellow colour and is provided with a simple sclerite along its margin.

Avicularia have not been found in spite of the great number of the zoaria.

Ooecia were found in the type specimen only. The ooecium is low, evenly rounded, smooth and transparent. Fenestrae are absent. It is closed by the operculum.

The present specimens are with certainty identical with ORTMANN's but separate from BUSK's (1884, p. 132, Pl. 17 fig. 6; cf. also HARMER 1902, p. 292, fig. 8) *F. philomela.* A very characteristic feature is the form of the aperture, which is very different from that in the true *F. philomela.* ORTMANN did not see any ooecia; these are also clearly distinguished from those of *F. philomela.* ORTMANN did not find any avicularia either, and thus their absence can very likely be said to be a characteristic of the species. The operculum of *F. philomela* is deprived of the sclerite proximally (HARMER l. c.). — The present species has a strong resemblance to *Cribrilina simplex* O'DONOGHUE & WATTEVILLE (1935, p. 209, Pl. 5 fig. 3, Pl. 6 fig. 13) as especially the lastnamed fig. (a photograph!) shows. But the other fig. (a drawing!) shows such differences, especially in the structure of the intercostal pores, that the two species can hardly be identified. The short and vague description does not say much. We find about the same case regarding *Cribrilina depressa* O'DONOGHUE & WATTEVILLE (1937, p. 14, text-fig. 1).

There are great difficulties as to the genus in which to place the present species. The structure of the costal shield and of the ooecium does not agree very well with that of true *Figularia*-species, and it is with great hesitation that it is ranged in that genus. Perhaps it would be best to propose a new genus for the sake of this species, but then it is difficult to get distinct characters for that purpose.

2. **Colletosia** JULLIEN.

C. radiata (MOLL).

Eschara radiata, MOLL 1803, p. 63, Pl. 4 figs. 17; *Colletosia radiata,* HARMER 1926, p. 475, Pl. 34 figs. 15—18 (Japan; references); MARCUS 1938 b, p. 211 (references); *Puellina radiata,* FRIEDL 1918, p. 236; CANU & BASSLER 1930 a, p. 13 (references); CALVET 1931, p. 75 (references); SAKAKURA 1935 a, p. 16 (Japan, pleistocene); *Cribrilina radiata* SMITT (sic!), FRATTARELLI 1929, pp. 383, 391, 394; *Cribrilaria radiata,* CANU & BASSLER 1930 b, p. 29 (references).

Localities: South China Sea (48), Japan (17, 21, 45), Bonin Islands (31, 32, 33, 34, 38); 85—180 m.; encrusting stones, shells and worm tubes.

Even if *C. innominata* (BUSK) is to be kept separate from *C. radiata* (cf. for instance WATERS 1923, p. 556) nevertheless the present specimens must be referred to the latter species.

3. **Cribralaria** n. gen.

The costal shield covers the entire frontal side of the zoid. The intercostal pores are rather few and large, as in the genus *Cribrilina.* Porechambers are wanting. Vicarious avicularia are present. They are situated in the zoid rows without any connection with the bifurcations. They are square. The mandible and the rostrum are narrow and very prolonged, they are curved along the proximal-lateral side of the distal zoid. The ooecium is immersed in an avicularium.

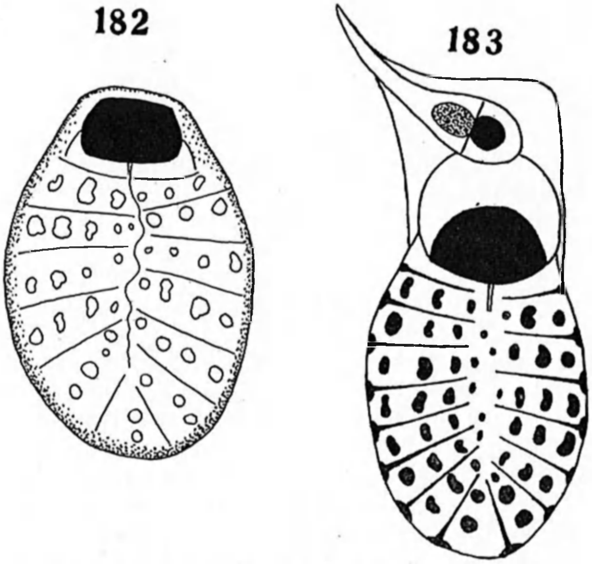
Type: *C. curvirostris* n. sp.

Especially characterisitic are the structure of the avicularium and the fact that the ooecia are immersed in avicularia. These features are not observed in any other known *Cribrilinid.* On these points the genus has a near (but naturally only superficial) resemblance to the Flustrid genus *Spiralaria.*

C. curvirostris n. sp. (figs. 182, 183).

Locality: Bonin Islands (33 [type]); 120 m.; encrusting lumps of lime.

The zoids are oval and transparent and the entire front is covered by the costal shield. There are usually 7 pairs of costae. They are proximally provided with a round pelma and have a narrow lumen. The intercostal pores are 3—4 in each row; the fourth, if present, is round and very small, the others large, oval or, usually, kidney-shaped; the latter ones are sometimes divided in two small pores each. The costae of the distal pair are not fully connected at their ends, a narrow slit is left between them. Mucro wanting. It has not been possible to observe any borderline between the other costae. (Here it must be remarked that the research of the details has been very difficult in this species owing to the fact that the wholly transparent zoids grow upon glistening white lime; the lime reflects the light very much and this reflected light, so to speak, prevails over the zoids; and it



Figs. 182—183. *Cribralaria curvirostris* n. gen. n. sp. 67 ×.
Fig. 182: Zoid. — Fig. 183: Zoid with ooecium and avicularium.

was not possible to separate the zoids undamaged from the lumps). The aperture is square in zoids deprived of ooecia, the breadth is a little greater than the length. Its proximal margin is elevated. Porechambers are wanting. It has not been possible to observe the rosette-plates or pores.

Distally to nearly all zoids there is a vicarious avicularium. The length of the quadratic avicularium is about $^1/_2$—$^1/_3$ of the length of an autozoid. The rostrum and the mandible are placed diagonally over the front of the avicularium. They are, as has been said before, prolonged and narrow and are curved along the proximal-lateral margin of the distal autozoid.

The ooecium is low and rounded and is closed by the operculum. It is immersed in an avicularium. The distal and lateral margin of the aperture describes an even curve in the zoids provided with ooecia.

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Explanation of Plates.

Plate 1.

Fig. 1. *Membranipora tuberculata* (Bosc) (p. 17). Loc. 13. Zoarium encrusting an alga; the proximal tubercles are seen. 20 ×.
Fig. 2. *Acanthodesia bocki* n. sp. (p. 20). Loc. 29. Bifurcation of zoarium. 20 ×.
Fig. 3. *Acanthodesia limosa* (Waters) (p. 19). Loc. 9. Zoarium. Nat. size.

Plate 2.

Fig. 4. The same. Part of zoarium showing the mode of bifurcation. 20 ×.
Fig. 5. *Tegella incrustata* n. sp. (p. 29). Loc. 18. Zoarium; in the upper, not so strongly calcified zoids ooecia are seen; the avicularia are prominent. 20 ×.
Fig. 6. *Copidozoum transversum* n. sp. (p. 41). Loc. 29. Zoids and avicularia; the mandibles are open. 20 ×.
Fig. 7. *Ellisina canui* (Sakakura) (p. 37). Loc. 24. Zoarium; avicularia and ooecia are seen. 20 ×.

Plate 3.

Fig. 8. *Callopora canui* n. sp. (p. 34). Loc. 44. Zoarium; avicularia with open or closed mandibles and ooecia are seen. 20 ×.
Fig. 9. *Nellia oculata* Busk (p. 49). Loc. 9. Zoarium. Nat. size.
Fig. 10. *Terminoflustra sagamiensis* (Okada) (p. 55). Loc. 17. Part of zoarium at a bifurcation; the marginal kenozoids, two ooecia, and an avicularium in typical position are seen. 20 ×.
Fig. 11. *Spiralaria vegae* n. sp. (p. 59). Loc. 1. Zoarium; one avicularium is placed at the bifurcation of a zoid row; a zoarium of *Callopora canui* is hardly seen through the translucent zoarium. 20 ×.
Fig. 12. *Microporina elongata* (Hincks) (p. 65). Loc. 1. Zoarium; avicularia, proximal tubercles, and opesia are seen. 20 ×.

Plate 4.

Fig. 13. *Microporina okadai* n. sp. (p. 68). Loc. 29. Zoaria. 2,5 ×.
Fig. 14. The same. Bifurcation of zoarium. The black line separates the two halves of the stem which form each a daughter branch at the bifurcation. 20 ×.

Fig. 15. *Tricellaria sympodia* (Yanagi & Okada) (p. 76). Loc. 18. Zoarium. 1,5 ×.
Fig. 16. The same. Part of zoarium. The frontal avicularia are seen. 20 ×.

Plate 5.

Fig. 17. *Tricellaria longispinosa* (Yanagi & Okada) (p. 74). Loc. 18. Zoarium. 20 ×.
Fig. 18. The same. Distal end of zoarium, showing the spines and the mode of bifurcation. 20 ×.
Fig. 19. *Caberea hataii* Okada (p. 82). Loc. 21. Part of zoarium. 20 ×.

Plate 6.

Fig. 20. *Tricellaria ziczac* n. sp. (p. 76). Loc. 14. Zoarium in frontal view with ooecia and spines. 20 ×.
Fig. 21. The same. The same zoarium in basal view; the mode of bifurcation, ooecia, spines, and lateral avicularia are seen. 20 ×.
Fig. 22. *Caberea hataii* Okada (p. 82). Loc. 21. Zoarium. 2,5 ×.

Plate 7.

Fig. 23. *Caberea megaceras* Yanagi & Okada (p. 85). Loc. 45. Zoarium; the big avicularia at the bifurcations are seen. 2 ×.
Fig. 24. The same. Part of zoarium. 20 ×.
Fig. 25. *Caberea sagamiensis* n. sp. (p. 84). Loc. 44. Zoarium. 3 ×.
Fig. 26. The same. Part of zoarium. 20 ×.

Plate 8.

Fig. 27. *Bugula dentata* (Lamx.) (p. 105). Loc. 28. Zoarium, showing the proximal web of rootlets. 4 ×.
Fig. 28. The same. Part of zoarium with ooecia and avicularia. 20 ×.
Fig. 29. *Bugula pugeti* var. *kiuschiuensis* nov. (p. 106). Loc. 20. Zoaria. 3,3 ×.
Fig. 30. The same. Part of zoarium with avicularia. 20 ×.

Plate 9.

Fig. 31. *Bugula pugeti* var. *umbelliformis* Yanagi & Okada (p. 107). Loc. 22. Zoarium. 2 ×.
Fig. 32. The same. Part of zoarium with avicularia. 20 ×.

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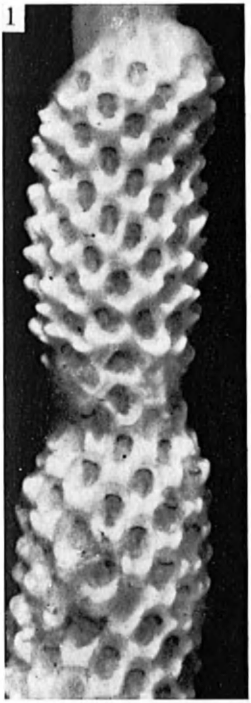
Tryckt den 23 september 1941.

Uppsala 1941. Almqvist & Wiksells Boktryckeri-A.-B.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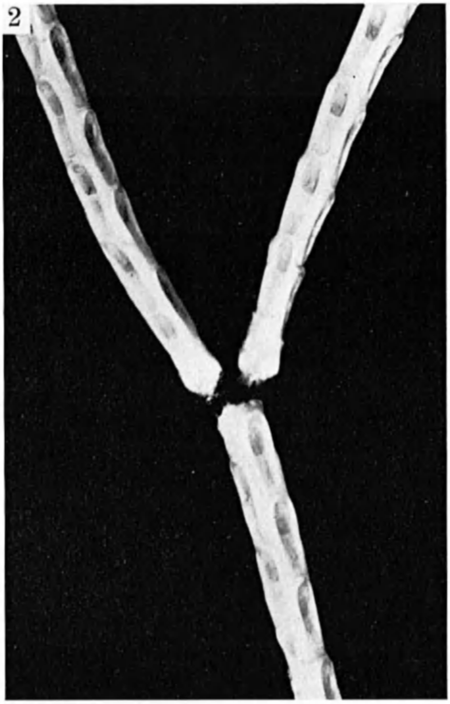
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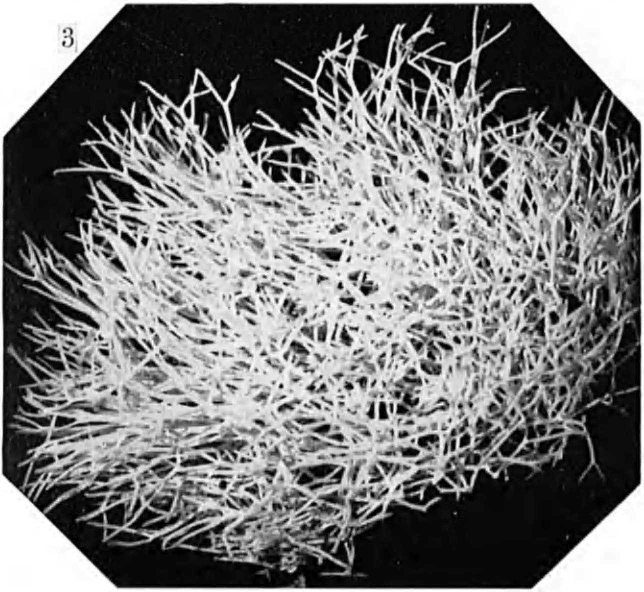


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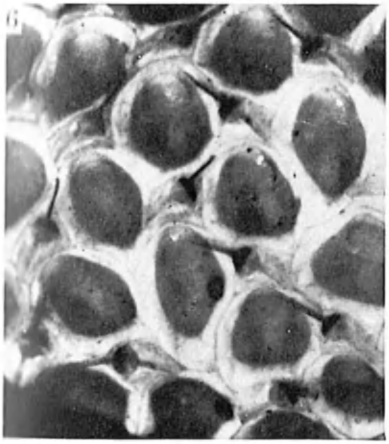
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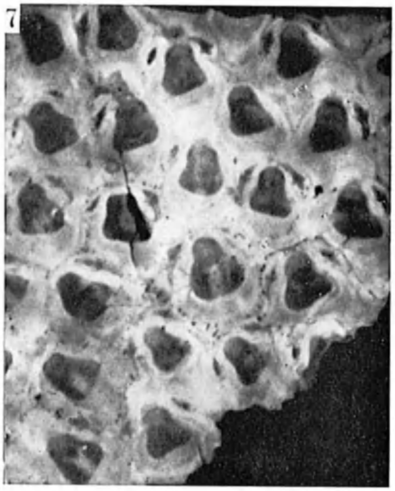
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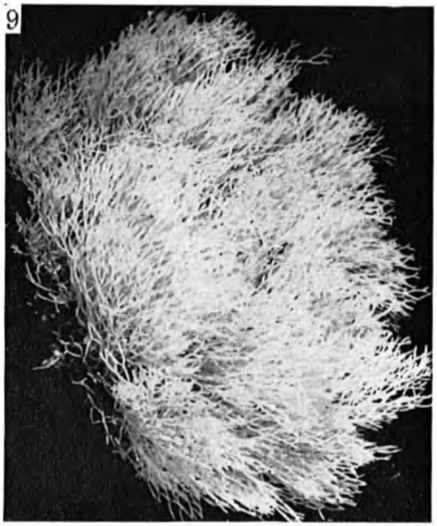
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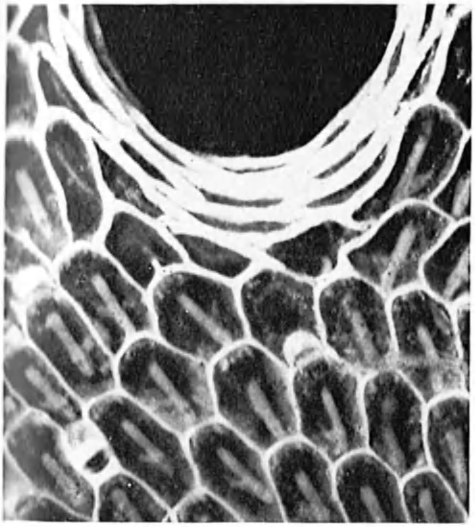

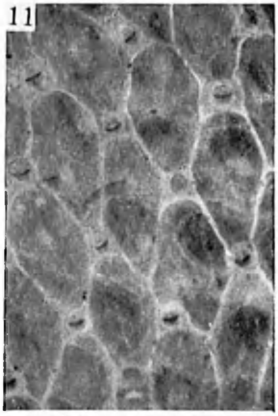
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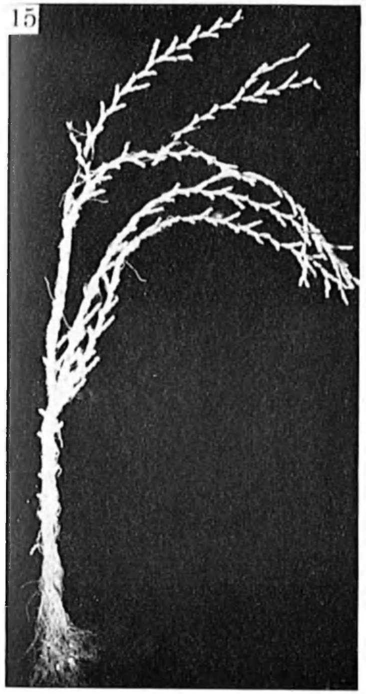
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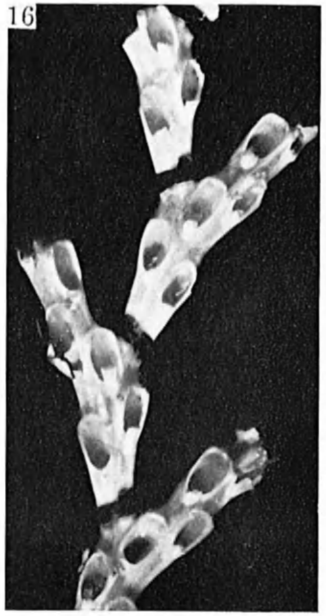
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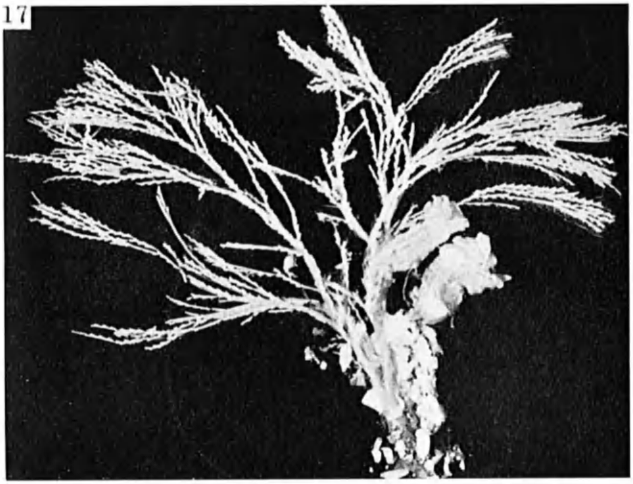

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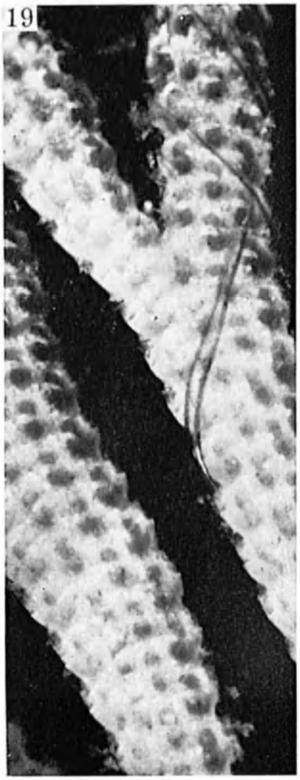

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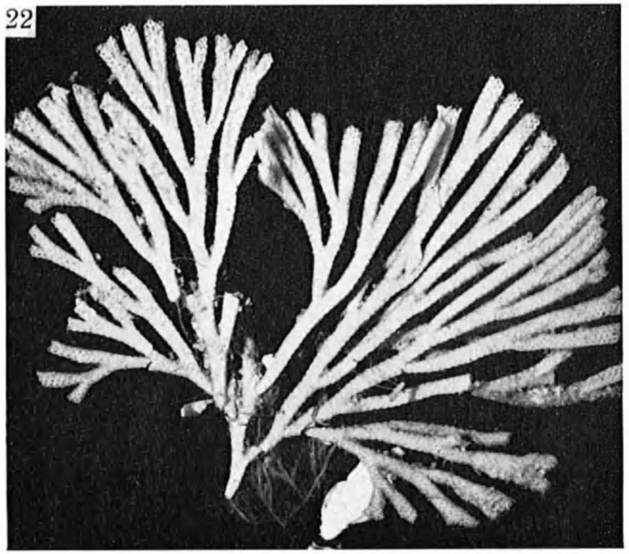

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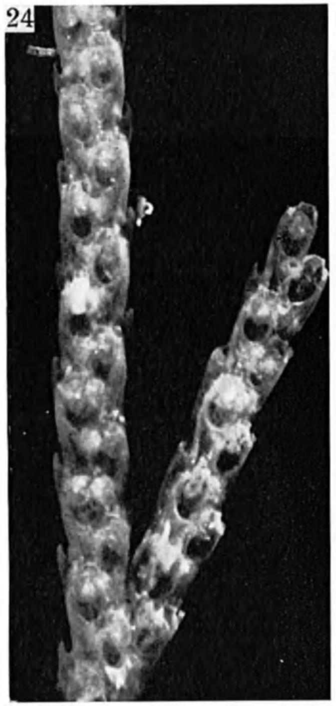

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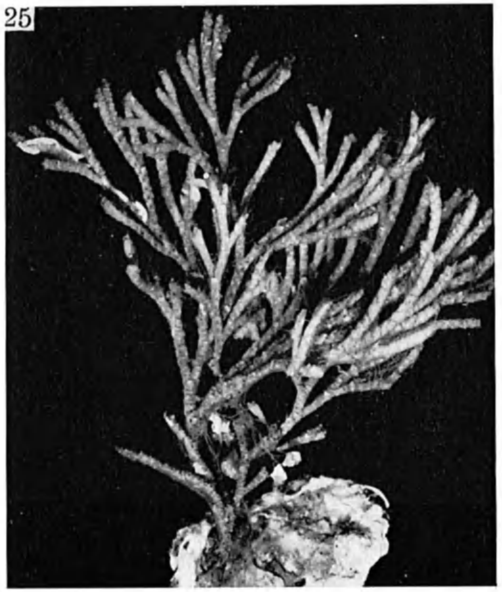

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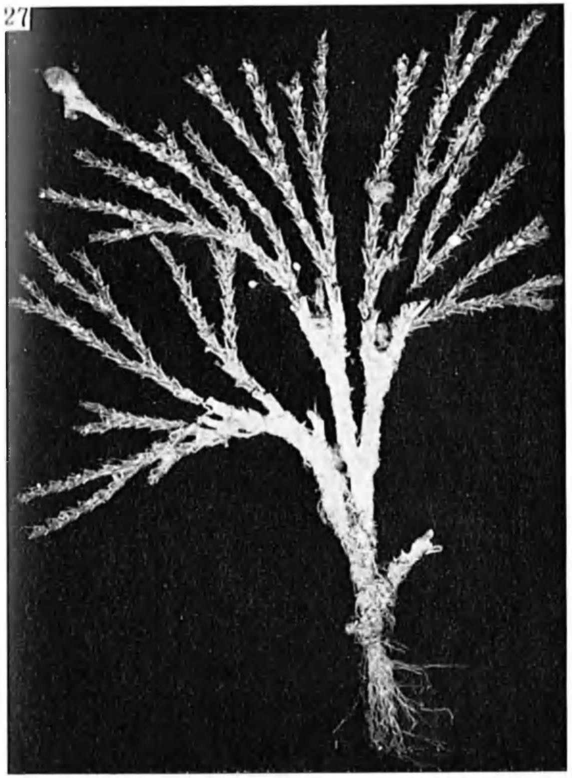
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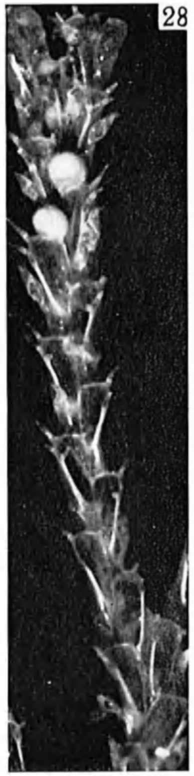
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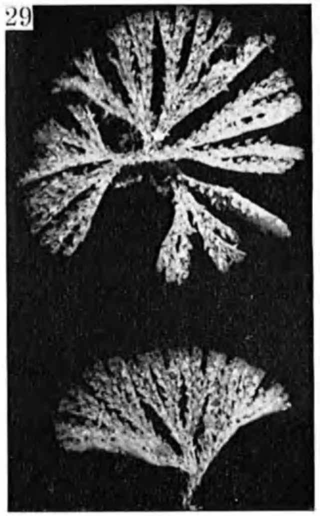
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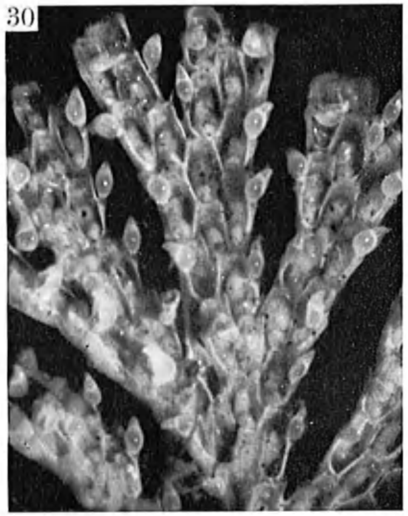
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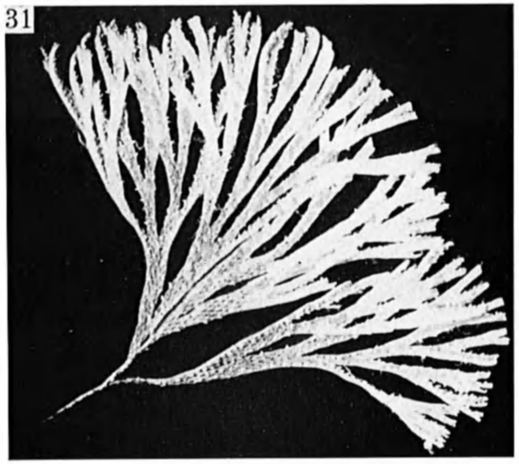

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