XIV. Revision of the North American Poriferæ; with Remarks upon Foreign Species. Part I.

By Alpheus Hyatt.

Read November 18, 1874.

The series of Memoirs, which the following introduces, was undertaken in order to prepare a catalogue of the Poriferæ in the Museum of the Boston Society of Natural History. It was found, however, that nothing less than an accurate study of all the forms which could be obtained from all the neighboring Museums would serve to throw light upon the subject. The principal merit of these Memoirs will consist in the completeness of the list of species from Florida which were gathered by Dr. Palmer.

This collection enabled the author to revise the only work which has yet been issued upon the sponges of Florida, "Spongiaires de la Mere Caraïbe," and to identify with approximate exactitude the majority of the numerous species therein described. The discovery of the rich and varied poriferous fauna of Florida compensates for the hopeless confusion which has been momentarily caused in the minds of spongologists by the careless descriptions and imperfect figures which fill its pages. These deficiencies will irritate the mind of every reader, but it should not be forgotten that we owe to the authors some acknowledgment for their patience in collecting and describing so many new forms, whatever we may think of the ability displayed in their subsequent attempts at systematic work.

The collections of the Museum of Comparative Zoology, containing the types of Schmidt's work upon "Spongien Fauna d. Atlantischen Gebietes" have been placed at my disposal by Mr. Alexander Agassiz. The fine collection at New Haven of New England and Florida sponges has been sent to me without reservation by Prof. A. E. Verrill. Many smaller collections, containing many valuable forms, have also been generously loaned. Among these are especially worthy of mention, the collections of the Peabody Academy in Salem, of Prof. Rice of Middletown, of Mr. R. F. Schor of Evansville, Ind., and of C. J. Maynard of Newton, Mass.

Order KERATOSA.

The characteristics of this order are more clearly defined than those of any other among the class Porifera, so far as the skeleton is concerned. It is therefore very curious to observe that the smaller divisions are here more difficult to define, the families and genera being especially close in their affinities. The order is strictly limited by most authors to those forms which have only keratose fibres and do not possess spicules, properly so called; *i. e.*, spicules developed within the integument or internal sarcode. Foreign matter and spicules of other sponges are frequently found in the different parts of the sponge mass, but they have been always introduced from without. The variation of form is very great.

The Janthellidæ are so very similar in form and in the size and aspect of the fibres, to both Antipathes and Gorgonia among the Corals, that when no animal matter is left upon the branches it is very difficult to separate them from the last named. On the other hand, we have the finest and most attenuated fibres and typical sponge structure in the fistular forms of the genus Spongia. So little is known of the purely anatomical characteristics of the internal parts of most singular forms, such as Janthella, that it would hardly be safe to attempt any generalization in this direction.

Sub-order APLYSINÆ Hyatt.

Sub-order IV Bowerbank.

Though Schmidt is disposed to discourage the use of a distinct name for this group, I find myself obliged to admit the hollow-fibred species to the rank of a distinct subdivision of the order Keratosa. The Aplysinæ appear to me a perfectly natural and very easily distinguished group. The skeleton is composed of anastomosing horny fibres, which are typically hollow, though not infrequently filled up by a granular deposit. This filling is generally of a light yellow color, except in *Aplysina aurea*, (in which it is absent, its place being apparently supplied by a thin membrane), and the fibres are therefore either transparent, or black and opaque. The enormous compound fibres of Janthella have neither membrane or yellow matter in the interior, and are also not continuously hollow. The horny matter is laid on in concentric layers, and these are quite loosely connected. Thus the walls of the inner tubes seem sometimes to have shrunk in the dried specimens until they touched and entirely filled the centre with a solid core; whether this also occurs in the living animal I cannot say. The horny material is deposited in concentric layers from without, and in some species, as in *A. cellulosa*, this deposition appears to continue indefinitely, the fibres becoming in course of time exceedingly broad. Usually also the terminations of the fibres near the exterior have much thinner walls than is found in the interior, the concentric deposits being thicker in the older portions of the sponge. This, in dried specimens, causes the collapse of the terminations of the branches and their peculiar irregular twisted aspect and almost black color in some species.[1] The fibres of Verongia are exceptions to this rule; they remain of about the same rotund form in all parts. The variations appear to be in the extreme thickness of the walls of the older fibres, though this increase is never so excessive as in *Aplysina cellulosa*.[2]

DENDROSPONGIADÆ.

This family is characterized by the irregular anastomosis of the fibres of the skeleton, their rotund form, and the thickness of the horny walls.

Dendrospongia Hyatt.

Aplysina (pars) Schmidt.

One specimen from the Museum of Comparative Zoology is named by Schmidt as *Aplysina ærophoba ?*. It is fistulose and not very different outwardly from the true *A. ærophoba*, though the surface is much rougher and shows coarse spiniform projections in place of the

[1] Pl. 13, fig. 7.

[2] Pl. 13, fig. 19.

continuous fine ridges of that species. The skeleton, however, at once settles the question of identity. It is composed of excessively coarse fibres, hollow, or more or less filled, as in most parts, with layers of granular matter. These may be either concentric, and fill it up more or less solidly, or only line the tube,[1] or, as in some instances, stretch as flat partitions across a series of constrictions which cut up the tube into bead-like cavities. The reticulations of the skeleton are of the simplest known form, being coarse, irregular and tree-like to the last degree. The figure[2] represents the fibres which support a fistulose projection from a colony, and it may be seen that the skeleton is but just sufficient to support the sarcode and that no regular web or mesh is formed as in Aplysina. The ends of the fibres are free and project considerably, causing the spiniform elevations of the surface described above, but do not pierce the outer skin in carefully dried specimens. This is owing to the thick, tough character of the cuticular layer which is not easily pierced. The sarcode itself in the interior is very abundant and solid, as seen in alcoholic specimens. Very minute spines were occasionally seen attached to the surface of the cuticular layer, but they may have been accidental.

Dendrospongia crassa Hyatt.

Aplysina æroploba Schmidt (pars). Spong. d. Atlant. Gebiet., p. 30.

A curious resemblance is produced between the exterior of dried specimens and *Aplysina æroploba* by the toughness of the external membrane. This forms ridges extending from the apices of the branches and thus cuts up the surface into more or less angular pits resembling, though not so deep as, those due to the honeycomb-like cells of Aplysina. The forms which I have seen may be either fistular or irregularly shaped solid masses, with occasional large excurrent openings. The color, according to Dr. Palmer, in nature is very dark, almost black, and in alcohol it is dark purple. The fibres are of very large size and may be followed in continuous lines for long distances.[3]

Nassau, 12 feet, coral reef. Soc. Coll.

Verongia Bow.

Luffaria Duch. et Mich.
Luffaria Schmidt.

This genus was described by Bowerbank first in 1841 in the Annals and Magazine of Natural History, and subsequently in his British Spongiadæ. He distinctly states that his type is *Spongia fistularis* Lam., an unmistakable species which is placed by Duch. et Mich. in their genus Luffaria. This genus Schmidt adopts in his Spong. d. Atlant. Gebietes, thus suppressing the name Verongia which he had previously published as a synonym of *Aplysina Nardo* in the Spongien d. Adriatischen Meeres, III Suppl., 1866. The channels of the interior of the fibres are very much smaller than in Aplysina and the anastomosis of the fibres occurs at irregular intervals. The direction of the whole is determinable as a radiatory arrangement but still the effect is that of a solid but excessively irregular net work. This is owing to the fact that the growth of the fibres takes place over the whole exterior surface at once. The frame work is formed by the simultaneous growth of projecting fibres over the

[1] Pl. 13, fig. 1.
[2] Pl. 13, fig. 7.
[3] Pl. 13, fig. 7.

whole external surface,[1] which at certain intervals throw out two lateral branches. These anastomose in all directions with the tips of the branches from the neighboring fibres. The growth of new branches takes place by a bud from the point of junction of these new ones, and the resulting branch therefore seems to spring from the upper side of the next lower mesh. This is the general mode of growth, but, as may be seen by the figure,[2] more than one bud may result from the union of the branches of the fibres, and sometimes these may remain undeveloped. The cavities, as may be seen by reference to the same figure, are larger in proportion to the diameter of the fibres among the new growth on the right of the figure, and the walls are thinner; but so far as I saw, this is attended by no change of form even in the dried specimens.

Verongia fistularis Bow.

Spongia fistularis Esper, Pflanzenthiere, vol. 2, pl. 21, A.
Spongia rigida Esper, Pflanzenthiere, vol. 2, pl. 27.
Spongia rigida Lam., Anim. sans Vert., vol. 2, p. 367.
Luffaria rigida Duch. et Mich., Spong. Mer. Car., p. 60.

The variety of forms under which this species appears has entirely misled Duchaissing and Michelotti, who have described them as distinct. Schmidt is evidently inclined to unite them, though his means of information were not complete. I have, however, had the good fortune to see a specimen from Bermuda belonging to the collection of Prof. Rice of Middletown, Conn., which completes the circuit of the extreme forms in itself.[3] It is a pair of fistular tubes equivalent to *Luffaria fistularis* D. et M., united only at the base. The long one is almost surrounded by various small solid stems equal to *Luffaria fulva* and *L. applicata* D. et M., which spring from its sides and top and are themselves branching. The large tube is also quite deeply indented and the sides are unusually thick, thus approximating to the forms described by Duch. et Mich., as *Luffaria rupicola* and *L. uneiformis*. The reason of the extreme variation of form in this species seems to me to lie in the adaptability of the skeleton to any form which may be best suited to the location taken possession of by the floating germ. Accident determines the form, and the range is not limited or determined, as in some other species, by the peculiar structure of the skeleton.[4] The fibres themselves are subject to considerable variation. They are thicker and more brittle in some forms than in others, and even differ in the same specimen. Usually the difference occurs between the older and younger fibres,[5] the fibres externally being somewhat smaller than the internal ones, or these than those nearer the base. But sometimes contiguous spots on the same specimen may exhibit the greatest difference in the size and thickness of the fibres.

The variation in color must also be very great, since the form described as *Luffaria fulva* by Duch. et Michel. as of a yellow color, is said by Dr. Palmer to be dark purple, while the *Luffaria applicata* he collected was of the usual bright yellow. It may be that the smaller forms, such as *Luffaria applicata* D. et M., grow only in the shallows, *Luffaria fulva*

[1] And in the fistular forms, this springing out of new branches takes place over the internal surface also. The result of this method of growth greatly increases the thickness of the walls at the expense of the diameter of the tube. It must be remembered, however, that this method of growth is combined with a steady addition to the height of the tube, which is much less in those which have very thick sides than in those with thin sides; the variety *rupicola* represents the former mode of growth, and the variety *Sebæ* the latter.

[2] Pl. 13, fig. 19. [3] Pl. 13, fig. 20.
[4] Pl. 13, fig. 11. [5] Pl. 13, fig 19.

D. et M. in somewhat deeper, say from eight to ten feet, and the fistular forms in the deepest waters. This view is suggested by Dr. Palmer's notes, he having collected the first-named varieties in the shallower water associated with Echinoderms and Star-fishes, and the branching forms, equivalent to *Luffaria fulva* D. et M., only in the deeper water associated with Gorgonia or Corals; and the skeletons of the last, equivalent to *Luffaria rupicola*, only when cast up by storms on the reef. Usually the tubular interior of the fibres remains smaller than in any species of Aplysina, but I have one specimen of variety *applicata* which shows in one portion fibres with thin walls while in other parts the usual proportions are maintained.

Cape Florida, Nassau, Bermuda. Soc. Coll.

Verongia hirsuta Hyatt.

Variety *fulvoides*. One specimen in the collection of the Museum of Comparative Zoology exhibits a very hirsute exterior. This is due to a sudden lengthening of the not yet anastomosed fibres which always project beyond the surface. Both branches also have subsequently to this curious variation given rise to a bud, which resumes in the formation of the skeleton the closer growth observable in the central parts of the parent stem. Another type of this fulva-like variety occurs in two specimens in the Society's Collection. These are equally hirsute, the points of the fibres standing out prominently all over the surface.

Variety *fistularoides*. The fistularian variety is represented in one specimen in the Museum of Comparative Zoology from Havana. This is the fragment of a very large specimen perfectly fistular, with thick walls, dark brown colored and large fibres, which dichotomize near the external surface, dividing into single branches of greater or less extent but forming no proper net-work. These are gathered into tuft-like prominences and appear sometimes to be a quarter of an inch deep. This curious surface renders the sponge entirely distinct from any other, though the forms of the varieties are the same as in *V. fistularis*.

Florida and Havana.

Verongia tenuissima Hyatt.

This species is founded upon a single specimen, but the characteristics are so different from even the most extreme variety of *Verongia fistularis* that I venture to describe it as distinct. The fibres are either round or slightly flattened, very much smaller than those in any variety of *V. fistularis*, but anastomose in the same irregular way. Though this is the case the mesh, nevertheless, in size and form approximates in the older parts of the specimen examined to the mesh of Aplysina, though there is no tendency to build up cells as in that genus. The form is fistulose, the single specimen examined being an irregularly shaped double tube, about an inch and a half high and two inches broad. The surface of the specimen in alcohol is softer and firmer than that of *Aplysina œrophoba*; it is studded as in *Verongia fistularis*, with projecting points, but has not the rough prickly feeling of that species. All of these characteristics are due to the greater elasticity of the fibres, their small diameter and the density of the skeleton. The shrinkage of the body is

not so great as in *Aplysina cærophoba*, the animal matter being sustained more fully by the skeleton.

Key West, in shallow water. Color unknown. Soc. Coll.

APLYSINIDÆ.

This family may be characterized by the regular net-like anastomosis of the fibres, the tendency of this to occur in the same plane, the flatness of the fibres, and the thinness of their walls.

Aplysina Nardo.

Evenor Duch. et Mich.
Aplysina (pars) Schmidt.

This interesting genus was first described in the Isis for 1833 as Aplysia by Nardo, who changed the name to Aplysina in 1834. Schmidt identifies the Florida specimen, described on the following page, as the *Aplysina cærophoba* Nardo, a Mediterranean form. However this may be, there is one expression in Schmidt's description of the true *Aplysina cærophoba* of the Mediterranean which seems to settle, at any rate, the true, generic name of the Florida specimens described below.[1] He describes the peculiar network and says that, in this respect, the genus differs from all others. The peculiar structure is due to the anastomosing of the fibres at regular intervals and in the same plane, thus forming a net work with a mesh, which may be either regular or very variable in size.[2] The net-like walls thus formed anastomose with each other at intervals of greater or less extent according to the species; in some species forming elongated cells, and in others angular cells like those of a honey-comb; or better still, they may be compared closely with Porites, as Ellis and Solander have done in their plates of *Aplysina cellulosa*. The genus Evenor as described by Duchaissing and Michelotti either belongs to this genus or is a new genus intermediate between this and Dendrospongia. It is, of course, impossible to say anything positively because the authors have given so little besides the mere external characteristics of the skeleton and living sponge. These, so far as they go, indicate a species of Aplysina, which differs in form, and perhaps in the skeletal characteristics, from all others yet described.

Aplysina aurea Hyatt.

This remarkable species is described by Dr. Palmer as having a brilliant gamboge yellow color when living; but when dried it is of the same purplish black, though of a somewhat lighter shade, as in the preceding species. In drying it shrinks excessively and will, according to Palmer, unless frequently turned, melt into a solid mass, losing entirely its natural aspect. The dried specimens show quite a complete series from the young, which are single, short, fistulose tubes, to those six or seven inches long, composed of more or less irregularly shaped masses of similar conical tubes. The aspect of the dried specimen is quite similar to the figure of the dried *Spongia fenestrata* Duch. et Mich., but this is described as black when living. The meshes of the net-work of the fibres are exceedingly

[1] "Die Fasern sind stark, ziemlich elastisch und bilden ein unregelmässiges, ziemlich weitläufiges Maschenwerk. Schon ihrem Bau nach sind sie total von denen der anderen Gattungen verschieden."

[2] Pl. 13, figs. 12–14.

small and the whole resembles a honeycomb with small cells and walls of the finest lace.[1] The fibres are deficient in yellow filling.

Nassau. Soc. Coll.

Aplysina prætexta Hyatt.

The difference between this and the preceding species lies principally in the larger size of the areas or honeycomb-like tubes inclosed by the net-like walls. These are so large and elongated that the honeycomb-like aspect of the surface of the skeleton is destroyed. There is a similar but very slight elongation of these openings near the outer edge in *Aplysina gigantea*, but in this species the honeycomb-like structure is only irregularly maintained near the point of attachment on the inner side. The fibres themselves are thinner, more delicate, and more elastic.[2] The filling of yellowish matter occupies less of the whole extent of the tubular interior of the fibres, which are black and empty to a much greater depth than in *Aplysina gigantea*. The honeycomb-like openings have the same structual character as in the preceding species, but both sides are much rougher and more deeply indented in the dried specimen, owing to the greater openness of the supporting skeleton. The form is similar to *Aplysina, gigantea,* which in all probability varies from flabellate to cup-shaped, according to the surface upon which it grows.

Nassau, 12 ft. on reef. Soc. Coll.

Aplysina gigantea Hyatt.

In this species the net work of the fibres in passing outwards, changes from an extremely coarse and elongated mesh to a finer texture of attenuated and dark horny fibres destitute of the yellow granular filling which gives a yellow tinge to the internal fibres.[3] The honeycomb-like tubes radiate from the centre outwardly, being shorter on the lower than on the upper side of the specimens. The specimens examined were parts of a large cup-shaped sponge with sides about eighteen inches broad, about ten inches deep in the centre, and diameter unknown. It is described by Dr. Palmer as a deep cup growing on the reefs, attached in such a manner to the irregular surface of the rock that the diver was only able to detach the specimen in fragments. One of these shows the centre of the cup which is hollowed out on the upper side. From this centre and from the other points of attachment on the lower convex side large folds or irregular thickenings of the surface radiate toward the circumference, the upper side being more plainly concave with fewer and more depressed foldings. The lower side in the dried specimen is very cellular, owing to the falling in of the external membrane, every cell being marked by a blind sac reaching nearly or quite to the centre. The excurrent openings are, however, rare on the convex side, though very numerous on the concave side. Portions of the convex side of this specimen exhibit the condition described by Dr. Palmer in the living animal, when the dividing walls of the honeycomb-like cells project slightly above the external membrane, cutting up the surface into polygonal figures in place of the deep cells described above. On the concave side those portions of the surface which intervene between the numerous excurrent orifices maintain nearly the aspect of the surface in the living sponge, while the orifices themselves have, in most cases, been very much enlarged. The color, according to Dr. Palmer, is purplish black.

Nassau, 12 feet on reef. Soc. Coll.

[1] Pl. 13, figs. 3, 4, 5, 6.

[2] Pl. 13, figs. 12–15.

[3] Pl. 13, figs. 8–14.

Aplysina ærophoba Nardo? Isis. 1833-34.

Aplysina ærophoba Schmidt, Spongien d. Adriat., p. 25, pl. 3, fig. 2, 1862, etc.
Aplysina ærophoba Schmidt, Spongien d. Atlant., p 30, 1870.

The types of this species, as determined by Schmidt, are in the Collection of the Museum of Comparative Zoology.[1] These I have examined. They consist of two specimens, which belong to two distinct genera. Schmidt probably identified them with *Aplysina ærophoba* Nardo, a Mediteranean species, without examining the skeleton of more than one specimen, which if not identical with, is doubtless very closely allied to, that species. The difference is shown by a comparison of the two figures given by Schmidt, one of the Mediterranean or undoubted *Aplysina ærophoba* in the "Adriatischen Spongien," and one of the Florida form in "Spongien Fauna d. Atlantischen Gebietes." The former seems to have a thinner wall to the fibre and to be filled up with solid granular matter, whereas the latter seems hollow, or only lined with a layer of granular matter. The former also seems to be rounded while the latter is flattened.

Schmidt nowhere describes the peculiar arrangement of the network or the variation in size of the meshes near the surface as compared with the interior. This net-like web of the fibres and the honeycomb-like arrangement of the walls formed by the web is as plainly shown as in any other species of the genus. The formation of the smaller meshes near the surface is by no means so well marked as in other species, but it is developed on some parts of the specimen. The size of the fibres, the size of the mesh and of the honeycomb-like tubes is smaller than in *Aplysina gigantea*;[2] the form of the specimens described by Schmidt and the form of the single one examined by me was fistulose, the fistular craters arising out of a solid basal mass. There were two fistular projections in a specimen about two inches long in the Collection of the Museum of Comparative Zoology, Cambridge. No figures of the fibres in section have been given, but those given for the form of the fibres in *Aplysina gigantea* are similar though much larger.

Florida. Mus. Comp. Zool.

Aplysina cellulosa.

Spongia cellulosa Esper, Pflanzenthiere, vol. 3, p. 206, pl. 60.

The peculiar formation of this sponge, the coarseness of the fibres and the typical character of the comb-like cells are very well depicted in Esper, and also Ellis and Solander's figures. A single specimen from an unknown locality is in the collection of the Peabody Academy of Science at Salem. This is too closely similar in all respects to the figures to leave any doubt of its identity, but it is somewhat curious that no one has yet been able to cite the locality. The specimen has been much beach-worn and it can only be seen that the fibres differ greatly in size on one side from those on the other.[3] The internal filling of granular matter is abundant, and the fibres therefore opaque and yellowish along the centre, with thick, dark, horny walls.

[1] The specimens were *Aplysina ærophoba* Ndo., and *Dendrospongia crassa* Hyatt.

[2] Pl. 13, figs. 10 and 16.

[3] Pl. 13, figs. 13, 17, 18.

JANTHELLIDÆ.

This group was first described by Dr. J. Edward Gray in 1869 in the Proceedings of the Zoological Society of London. The specimen, of which a description is given below, and Gray's own description, shows that the group has really a family value as he supposed.

The fibres are of enormous size when compared with those of the preceding group, and are destitute of the yellowish filling found in the Dendrospongiadæ and Aplysinidæ. Though typically hollow they are in part often solidly filled by the concentric layers of horny material. The exterior of these fibres is coarsely granular, and they are very opaque. The aspect of the dried specimens, as described by Gray, is very characteristic. Instead of being massive they are frondose. The sarcode, as in the Aplysinidæ, shrinks down closely upon the flattened trellis work of the skeleton and covers the huge fibres with a thin tenacious coating, which spreads across the broad interstices or mesh of the fibres, and is here and there pierced by canals which pass entirely through it. Gray describes the stem, "root," as composed of interlaced filaments from which the fibres of the frond spread out in all directions. All of the species which he describes, viz., *Janthella flabelliformis*, *basta*, and *Homei*, seem to have been either flat, as in Gorgonia, or modified into a funnel shape; the fibres also were smooth apparently. It will be seen below that *Janthella concentrica* differs very much and can only be provisionally referred to the same genus.

JANTHELLA.

Janthella concentrica Hyatt.

The description of *Janthella Homei* Gray applies very well to this specimen, but as there is no positive notice of the most prominent characteristics of this species I must consider it a new form. The fibres are of enormous size, being from one to three mm. in diameter. The youngest or the outer portions are single, but the inner branches are compound and ornamented with thick, short spines and more minute wart-like prominences. The compound fibres are made by the frequent tendency of the fibres to divide into branches which run side by side for long distances before they separate. As a result of this, and the freedom with which keratose matter is deposited, we find the fibres almost always double, or when joined by other branches, still more numerous, though contained within common layers of horny material and externally appearing as but one stem. The spines are, also, in reality only the terminations of abortive branches which run parallel with the fibres from which they sprang, and are closely united with them for a short distance but have free tips which protrude out of the common covering like the end of a young thorn. The type specimen is in the Collection of the Museum of Comparative Zoology, and is only a fragment, but it shows that the sponge must have been very irregularly frondose. The mesh is also quite irregular in size and shape, varying from 11.6 mm. to only 5 mm. in length, while the breadth varies from 3 to 6 mm. The specimen appears under the name of *Antipathes flabelliformis*, but whether the same as Dana's type or not I have no means of determining.

Fejee Islands. U. S. Ex. Expedition.

Explanation of Plate xiii.

Figs. 1, 2. 7. *Dendrospongia crassa.*

Fig. 1. Single fibre × 8 showing the interior, with lining deposit, concentric form of this deposit, and what appeared to be a particle of foreign matter imbedded in the interior.. The concentric structure of the horny walls is well shown in this and in figure 2.

Fig. 2. Section of same fibre × 8.

Fig. 7. Skeletal supports of one fistular projection or projecting excurrent orifice of a solid specimen. Natural size.

Figs. 11, 19, 20. *Verongia fistularis.*

Fig. 11. Section of skeleton, natural size of variety *applicata.*

Fig. 19. Portion of the same × 8 showing the growth of new fibres externally and the irregular characteristics of the anastomosis of the fibres, also their round form by the accompanying transverse section "a".

Fig. 20. Reduced to two thirds natural size of specimen, combining characteristics of varieties *fistularis* and *rupicola* "d" and *applicata* "a" and *fulva* "b, c".

Figs. 3, 4, 5, 6. *Aplysina aurea* Hyatt.

Fig. 3. The side of one of the honeycomb-shaped cells, natural size.

Fig. 4. The same × 8 in outline merely, the internal tube is not drawn.

Fig. 5. Transverse sections of dried fibre showing variation in form.

Fig. 6. Broken fibre exhibiting the lining very much contracted, twisted and projecting beyond the end "a".

Figs. 12, 15. *Aplysina prætexta* Hyatt.

Fig. 12. Natural size of the side of one of the cells.

Fig. 15. A portion × 8.

Figs. 8, 9, 14. *Aplysina gigantea* Hyatt.

Fig. 14. Natural size of the side of one of the cells.

Fig. 8. A portion of Fig 14 × 8.

Fig. 9. Sections of fibres showing the variation of form.

Figs. 10, 16. *Aplysina ærophoba* Nardo.

Fig. 10. Natural size.

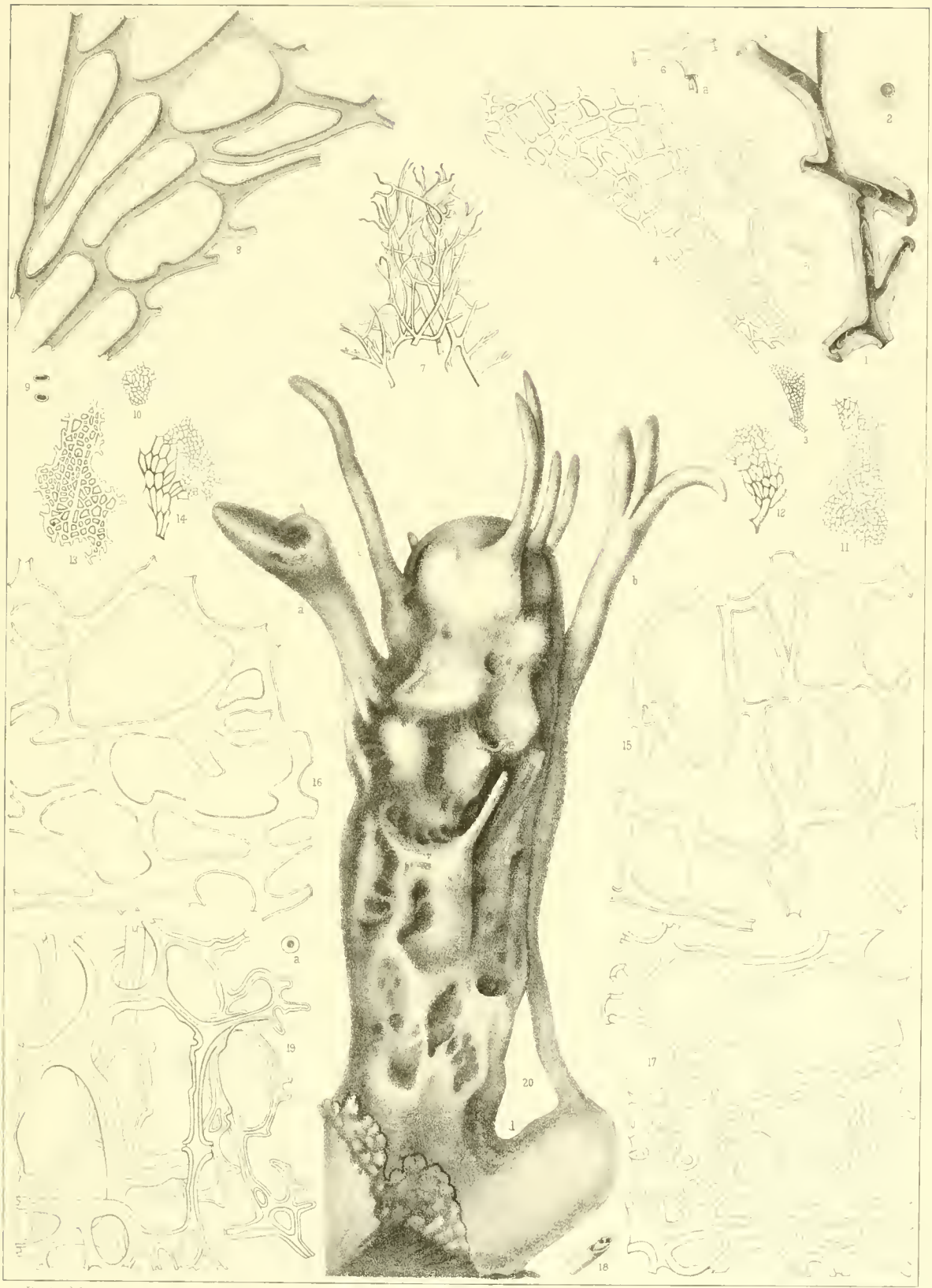
Fig. 16. × 8.

Figs 13, 17, 18. *Aplysina cellulosa* Hyatt.

Fig. 13. Side of one cell, natural size.

Fig. 17. Shows thickness of some of the fibres and the complete filling up of some of the smaller meshes on the left of the figure by the external concentric deposits of keratose "a".

Fig. 18. Exhibits the solid filling of granular yellow matter, which is found in this and many other species of the Aplysinæ, projecting from a broken tube.



A Hyatt del

A HYATT ON THE SUB-ORDER APLYSINAE