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Art. I.—*Notes on New Zealand Hydroida.*

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(With Plates I.-VII.)

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During a visit to New Zealand in April and May, 1923, I spent a few days collecting Hydroids at Auckland, Island Bay (Wellington), New Brighton (Christchurch), St. Clair (Dunedin), and Bluff. The collecting was done solely in rock pools at low tide, and among algae washed ashore, but it resulted in several new species, a number of species not hitherto recorded from New Zealand, and numerous other and interesting forms.

The present paper deals with this collection, and also includes references to a few specimens collected by my late colleague, Mr. J. F. Mulder, from Stewart Island "oyster" shells many years ago, and to some specimens kindly sent to me by Mr. W. M. Bale, F.R.M.S., for examination and comparison.

I have to thank Mr. W. M. Bale for the very great assistance he has rendered me by identifying species in respect of which I had doubts, by sending me literature and specimens from his own extensive collection for examination, and by valuable advice throughout the preparation of this paper.

Fam. CLAVIDAE.

Endocrypta huntsmani (Fraser).

Crypta huntsmani Fraser, 1911, p. 19.

Endocrypta huntsmani Fraser, 1912, p. 216; 1913, p. 149; 1914, p. 109.

Ascidioclava parasitica Kirk, 1915, p. 146.

I have compared a specimen of *Ascidioclava parasitica* from New Zealand (kindly sent to me for examination by Mr. Bale) with specimens of *Endocrypta huntsmani* from Departure Bay, west coast of Canada (received from Dr. C. McLean Fraser), and there is not the slightest doubt that not only do they belong to the same genus, but also that they are not specifically distinct.

Mr. Bale's specimen is from the peripharyngeal groove of a *Polycarpa,* and was collected at Wellington, N.Z.

Fam. PENNARIIDAE.

Pennaria australis Bale.

Numerous specimens, growing in a shallow rock-pool at the entrance to Auckland Harbour.

This species has not hitherto been recorded from New Zealand.

INCERTAE SEDIS.

Saaba (?) scandens, n. sp.

(Plate I., Figs. 1, 1*a*.)

Specimens from Island Bay no doubt belong to the same genus as *Saaba arenosa* (Bale).

The hydrocaulus is fascicled in its proximal part, unjointed, and consists of string-like stems, with a few ascending branches. The perisarc has a tough and cartilaginous appearance. The polyp-tubes are few, and spring irregularly from all sides. Near the end of the polyp-tubes there is an annular thickening, and often another just below it, probably due to regeneration. Beyond the distal thickening the edge of the polyp-tube is sometimes quite sharp, sometimes rather ragged. Inside the annular thickening is often a narrow septum. Unfortunately no hydranths are present.

Unlike Bale's species, the present form is climbing in habit, the hydrocaulus adhering loosely to other hydroids.

The height of the largest specimen, which is incomplete, is about 35 mm.

Springing from several of the polyp-tubes are large sac-like bodies, which are possibly gonangia. As in *Saaba arenosa* they are formed of very thin colourless perisarc which does not stain readily, and have the whole exterior surface coated with closely adhering grains of sand, calcareous particles and Foraminifera.

In the absence of hydranths the position of this genus is very uncertain, and it can only provisionally be referred to the Hydroida.

Fam. CAMPANULARIIDAE.

Obelia geniculata (Linn.).

Loc.—Island Bay, and New Brighton (Christchurch).

Obelia australis v. Lendenfeld.

I found this species, with numerous gonothecae, growing in tide-pools below the swimming pool at St. Clair (Dunedin).

Orthopyxis formosa, n. sp.

(Plate I., Figs. 2-2*e*.)

Hydrorhiza broad, flattened, with flanged margin, forming an irregular network.

Hydrosoma varying from 1·2 mm. to 2·3 mm. in height.

Peduncles somewhat flattened, usually strongly and spirally undulated; a single spherule below each hydrotheca.

Hydrothecae large, compressed; in broad aspect with wide base and only slightly expanding upwards, and with thickening of

walls mostly extending from the base up to just below the rim, where there is an additional thickening on the outside forming a stout band which completely surrounds the upper part of the hydrotheca; in narrow aspect narrower at the base and with little thickening except at the base and near the rim.

Margin rising slightly above the thickened rim, very thin, furnished with about 12 rounded teeth.

Gonothecae not present.

Hab.—At entrance to Auckland Harbour, on floating seaweed.

Occasionally hydrothecae are found without any thickening, but such have the walls more or less wrinkled, and are obviously abnormal. The hydrothecae vary considerably in size, as may be seen by reference to my figures which are all drawn to the same scale.

Orthopyxis delicata, n. sp.

(Plate II., Figs. 1-1*f*.)

Hydrorhiza broad, only slightly flattened, with a slightly flanged margin.

Hydrosoma varying from 0·75 mm. to 1·5 mm. in height; peduncles somewhat flattened, strongly and spirally undulated throughout their entire length; a single spherule below each hydrotheca.

Hydrothecae large, slightly compressed; in broad aspect with a wide base, but expanding considerably upwards; in narrow aspect narrow at the base and expanding still more upwards so as to make the aperture more nearly circular; walls in broad aspect thickened near the base and becoming only slightly thinner towards the rim, in narrow aspect much thinner throughout; no annular thickening around the rim.

Margin of hydrothecae rather thin, furnished with from about 10 to 15 rounded teeth.

Gonothecae about 1·2 mm. in length, springing from short expanding peduncles, somewhat pear-shaped, more rotund on one side than the other, thus making them curved, with a large, circular, terminal opening.

Loc.—St. Clair (Dunedin), growing over the surface of delicate algae and polyzoa. In the latter case the hydrorhiza forms an anastomosing network roughly corresponding with the cells of the polyzoa.

The hydrothecae vary considerably in size, as will be seen by reference to my figures, which are all drawn to the same scale.

Orthopyxis crenata (Hartlaub).

Numerous specimens with gonothecae, from Island Bay.

Silicularia bilabiata (Coughtrey).

I found this species growing profusely over *Laminaria* washed ashore at Island Bay.

SILICULARIA CAMPANULARIA (v. Lend.).

I found this species in large numbers at St. Clair (Dunedin) and Bluff.

Fam. LAFOEIDAE.

HEBELLA CALCARATA (L. Agassiz).

I found numerous examples of this widely spread species growing over *Sertularella subarticulata* from Stewart Island.

HEBELLA CORRUGATA (Thornely).

I found specimens of this widely spread species growing on *Thecocarpus formosus* var. *inarmatus*, n. var., at Island Bay.

In my specimens the aperture of the hydrothecae is not as oblique as figured by most authors.

Measurements.—Length of pedicel 0·20—0·45 mm.; length of hydrotheca 0·72—0·90 mm.; diameter of hydrotheca 0·37—0·55 mm.

Not previously recorded from New Zealand.

FILELLUM SERRATUM (Clarke).

Specimens of this species occur on several other hydroids from Bluff, Stewart Island, and Island Bay. Not previously recorded from New Zealand.

PERISIPHONIA QUADRISERIATA, n. sp.

(Plate II., Figs. 2-2*d*.)

Hydrorhiza consisting of a dense mass of tubes forming a parchment-like disc.

Hydrocaulus stout, straight, attaining a height of 14 cm., fascicled, consisting of a single axial tube, bearing hydrothecae, surrounded by a large number of peripheral tubes bearing sarcothecae only.

Hydrocladia sub-opposite, forming an angle of about 60° with the hydrocaulus, attaining a length of about 22 mm., stout, flattened, oval in section, about 0·5 mm. in broader (vertical) diameter, and about 0·4 mm. in narrower; fascicled, consisting of a single axial tube bearing hydrothecae, surrounded by a large number of peripheral tubes, none of which spring from the axial tubes of the hydrocladia; hydrocladia not of smaller diameter at base than elsewhere.

Hydrothecae borne on axial tubes of hydrocaulus and hydrocladia, close-set, each usually overlapping the proximal portion of its successor in the same series, cylindrical, with a slightly bulging profile, lying closely adpressed to the axial tube for a considerable part of their length, the terminal portion curving away from the axial tube and projecting for a short distance (about 0·1 mm. in the longest example) through the fascicle of peripheral tubes. Aperture of hydrothecae circular, margin smooth.

Base of hydrothecae passing into a projection of the axial tube corresponding to a hydrothecal peduncle, and containing a strong diaphragm which slants from the outside inwards and slightly downwards.

Hydrothecae on hydrocaulus in two series on opposite sides of the peripheral tube, both series lying in the same plane, alternate though not always regularly spaced, varying in length with the thickness of the mass of peripheral tubes through which they project.

Hydrothecae on the hydrocladia in four series, two series close together on the abcauline side, and two series close together on the adcauline side, the two abcauline series being widely separated from the two adcauline. Hydrothecae, in each series, regularly alternating with those of adjacent series on both sides of it, but opposite to those of the series diagonally opposite.

Sarcothecae numerous, scattered on hydrorhiza, hydrocaulus and hydrocladia, short, cylindrical, diameter wide compared with their length, borne on slight projections from the peripheral tubes, and separated from the projections by a constriction.

Gonosome, not present.

Locality.—Island Bay, washed ashore.

The hydrocladia would appear from casual examination to be opposite, but, on dissecting away the mass of the peripheral tubes, it is found that the axial tubes of the hydrocladia spring from the axial tube of the hydrocaulus at points that would otherwise be occupied by alternate hydrothecae. The hydrocladia are thus sub-opposite.

The peripheral tubes communicate freely with each other, and with the axial tube of the hydrocaulus by numerous circular or oval apertures. They do not however directly communicate with the axial tubes of the hydrocladia except by one or two apertures near the base of each hydrocladium and within the bundle of peripheral tubes of the hydrocaulus.

The axial tubes of the hydrocladia are not thickened to any great extent, but that of the hydrocaulus has a massive wall, built up of numerous layers.

In the axil of each hydrocladium is a hydrotheca which differs from the others. It springs from the hydrocladium immediately above the point of origin of the latter, but lies within the peripheral tubes of the hydrocaulus through which it projects. It curves in the same direction as the hydrothecae of the hydrocaulus, and in the opposite direction to the other hydrothecae on the adcauline side of the hydrocladium. Perhaps it would be more correct to say that the axial tube of the hydrocladium springs from the base of this hydrotheca, for the latter certainly belongs more to the hydrocaulus than to the hydrocladium. The wall of the lower part of this axial hydrotheca is much thickened, and from an aperture just below the diaphragm springs a peripheral tube. This tube immediately divides, one branch running up the hydrocaulus and the other along the hydrocladium.

Other peripheral tubes running up the hydrocaulus from below also divide near the point of origin of the hydrocladium, one branch continuing upwards and the other going along the hydrocladium.

The proximal hydrotheca on each hydrocladium on the abcauline side is separated from the others by a short distance, the first hydrotheca of the adjoining series being missing.

The present species is represented in my collection by a single specimen.

Fam. HALECIIDAE.

Halecium flexile Allman.

I found a few small colonies of this species growing in a rock pool at St. Clair (Dunedin), also at Bluff.

Halecium lenticulare, n. sp.

(Plate III., Figs. 3-3*d*; Plate IV., Figs. 1-1*b*.)

Colonies small, attaining a height of a little more than 1 cm., not fascicled, regularly and markedly sympodial (an example of cincinnal monopodia), the stems usually having a marked zig-zag appearance, sparingly bipinnate.

Primary hydrothecae low. Secondary hydrothecae with a large basal cavity, somewhat symmetrically developed. Hydrothecae usually with very thin walls, open margin curved outwards and usually everted, particularly on the adcauline side. Diaphragm well developed, but extremely thin; aperture narrow, often terminating in a very delicate membranous tube, which stretches a considerable distance into the basal cavity. Below the diaphragm a well developed adcauline thickening of the wall ("pseudo-diaphragm") often extending completely round the hydrotheca but always thicker on the adcauline side. Sometimes another thickening, similar, but not so pronounced, near the base of the basal cavity.

Regenerations of hydrothecae markedly active, unregenerated examples being an exception to the general rule.

Gonothecae borne on the apophyse immediately below the primary hydrothecae. Male gonothecae borne mainly on the distal parts of the colony, small, ovate, much flattened. Female gonothecae usually confined to the proximal parts of the colony, large, lenticular, with a circular opening in the distal part of the abcauline side; margin of opening thickened.

Localities.—St. Clair (Dunedin), Bluff, Island Bay (Wellington).

The type specimen is from Bluff Harbour.

The specimens from St. Clair differ from the type in that most of the perisarc is enormously strengthened by internal annular thickenings, arranged more or less diagonally around stem and branches.

The specimens from Island Bay resemble those from St. Clair in the above respect, but differ from those from the other two localities. In the latter the hydrothecae, primary and secondary, are usually almost, if not quite, in a straight line with the internode from the apophyse of which they spring, thus giving the colony a distinct zig-zag appearance. In the Island Bay specimens, however, the apophyse and hydrothecae curve away from the line of the internode, and the succeeding internode is in a straight line with its predecessor, the whole stem thus being straight. (Pl. IV., Fig. 1.) Specimens from all three localities bear gonothecae.

Halecium corrugatissimum, n. sp.

(Plate III., Figs. 1-1*f*.)

Colonies small, attaining a height of about 5 cm. Stem not fascicled, strongly annulated, and divided into very short internodes. Growth irregularly sympodial, the main axis not being produced beyond the primary hydrotheca, immediately below the diaphragm of which spring one, two or three branches, the branching thus being sometimes falsely dichotomous or falsely trichotomous.

The branches do not lie in one plane, but are quite irregular in this respect.

Pedicels expanding upwards, much and deeply corrugated. Hydrothecae large, margins broadly expanded and slightly everted, with a well marked row of dots. Margins or the whole hydrotheca sometimes reduplicated.

Diaphragm fairly well developed, but thin; aperture wide.

Gonothecae borne on short pedicels below the hydrothecae, mainly on the upper part of the colony, ovoid, with from 5 to 7 deep and even annulations; upper part usually devoid of annulations, and more or less hemispherical.

Locality.—St. Clair (Dunedin).

The young hydranth is enclosed by an almost spherical, thin, chitinous ball, which eventually splits away from the hydrophore. Fig. 1*d* shows an example with the splitting process just commenced.

This species is closely allied to *H. speciosum* Nutting (1901, p. 181, pl. xxii., figs. 1, 2).

Halecium expansum, n. sp.

(Plate III., Figs. 2-2*c*; Plate IV., Figs 2-2*b*.)

Colonies small, attaining a height of about 6 mm., main stem either not fascicled or sometimes strengthened by one or two irregular peripheral tubes, irregularly sympodial, the prolongation of the axis often developing quite as strongly as the branch, false dichotomy occasionally met with.

Primary hydrothecae sessile. Secondary hydrothecae with a large basal cavity. Hydrothecae wide, shallow and expanding,

with very thick walls, margin never curved outwards. Diaphragm well developed and massive, aperture large. Walls of basal cavity without any marked thickening. Between each hydrotheca and the basal cavity of the hydrotheca above it, a more or less spherical internode, the base of which springs from the inner edge of the diaphragm.

Regenerations of hydrothecae fairly active.

Gonothecae not present.

Locality.—Growing on roots of algae in rock-pools at St. Clair (Dunedin).

The branches are not confined to any particular plane, but are quite irregular in this respect. In the distal parts of some of the colonies the branching is very active, resulting in a bushy mass.

The ring of chitinous "dots" around the hydrothecae are not conspicuous; in fact, I could find them only in a few young hydrothecae that happened to be empty.

Campanulina humilis Bale.

(Plate IV., Figs. 3-3*d*.)

I found numerous specimens of the creeping form of this species growing on other hydroids, polyzoa, and the roots of algae, at St. Clair (Dunedin). After a long search among the material with a view to finding a gonosome, I discovered several branched specimens. These in their mode of branching agree with *Campanulina turrita* Hincks, except that the branching is more active and the hydrothecae consequently more crowded. My specimens are all small, the largest being only 1·35 mm. in height. The stems and branches are all closely annulated, or, sometimes, spirally constricted, throughout.

The specimens are in excellent state of preservation, with many of the polyps fully expanded. There is a web between the tentacles (see Fig. 3*c*), but it extends only a very short distance up.

Unfortunately, no gonothecae were present, so the assignment of the species to the genus *Campanulina* is provisional. Hitherto the species has been known by its creeping form only.

Thyroscyphus simplex (Lamouroux).

Specimens, with gonothecae, from Island Bay. The gonothecae are as described by Bale (1915), except that they are somewhat shorter and broader, their length being from 1·1 mm. to 1·2 mm., and their diameter at the widest part 0·7 mm.

Fam. LINEOLARIIDAE.

Lineolaria flexuosa Bale.

There is a specimen of this small and little known species in the collection of the late Mr. Mulder. It has not hitherto been recorded from New Zealand.

Locality.—Stewart Island.

Fam. SYNTHECIIDAE.

Synthecium patulum (Busk.)

Billard (1925) has united *S. patulum* Busk and *S. orthogonium* Busk under the name *S. patulum*, concluding from his examination of specimens collected by the "Siboga" Expedition that the distinctions pointed out by Bale (1914), namely, the arrangement of hydrothecae, pinnae, and nodes on the hydrocaulus, cannot be relied on to separate the two specifically.

In the absence of gonothecae, I am assigning to this species specimens collected by me at Auckland Harbour and from Stewart Island.

They both differ from Billard's figures in that the orifice of the hydrothecae is very little, if at all, everted. Reduplication of the margin is not common. The measurements of the hydrothecae, however, generally agree with those given by Billard.

	Auckland Specimens.	Stewart Is. Specimens.
Length adnate	0·46—0·60 mm.	0·50—0·69 mm.
Length free	0·16—0·35 mm.	0·20—0·43 mm.
Diameter at mouth	0·19—0·21 mm.	0·25—0·32 mm.
Interval between pairs of hydrothecae (measured from adnate part of one to the base of the next above it)	0·18—0·50 mm.	0·11—0·34 mm.

Fam. SERTULARIIDAE.

Selaginopsis monilifera (Hutton).

(Plate IV., Figs. 4, 4*a*.)

Bale (1915, p. 266) in his description of this species, under the name of *Selaginopsis dichotoma*, states that the hydrophyton is monosiphonic. All my New Zealand specimens are fascicled.

There is considerable variation in the distance between hydrothecae even in a single specimen; the space occupied by four hydrothecae in the four series (measured from the base of the first to the base of the fifth) varies in my specimens from 0·6 mm. to 1·45 mm. Occasionally, when widely separated, the hydrothecae lose their quadriserial arrangement and all lie in the same plane.

Localities.—St. Clair (Dunedin), Bluff, and Stewart Island.

This species has not hitherto been correctly figured.

Genus Sertularella.

Characters.—Hydrothecae with operculum of three or four valves; hydranths with abcaulinary caecum; hydrothecae alternate, opposite, verticillate, or spirally arranged.

The addition of the last three words to the above is rendered necessary by the discovery of *Sertularella irregularis*, n. sp.

One of the characteristics of the genus *Sertularella* is the presence of a more or less developed abcaulinary caecum, or blindsac. From the circumference of this, most markedly at the abcauline side, spring a number of threads a split external ectodermal lamella, according to Kühn which stretch to the wall of the hydrotheca, and hold the caecum in position. In many species, especially, curiously enough, in those in which the caecum is well developed, these threads have no definite points of attachment to the chitin, but appear to be attached only to the layer of ectoderm cells which is left adhering to the inside of the hydrotheca when the young hydranth shrinks away from it. This layer often breaks away, and lies loosely within the hydrotheca, but attached by the threads to the caecum.

In other species these threads have definite points of attachment to the chitin itself, the points of attachment being marked by a number of scars, or, sometimes, chitinous denticles which are usually minute. Occasionally, however, there is a comparatively large denticle at the abcauline side, and sometimes this is the only one that can be detected.

This line of denticles stretches obliquely backwards and downwards around the lower part of the hydrotheca. This line of attachment is the "apparent oblique septum" referred to by Bale (1914, p. 21) in his description of *S. divaricata*.

I have found that the angle at which this ring encircles the hydrotheca is fairly constant in each of the species I have examined, but often differs in closely allied species, and thus gives considerable assistance when in doubt as to which of two species a specimen belongs. For example, in *S. johnstoni* the highest point reached by the ring is about half way up the abcauline side of the hydrotheca; in *S. pygmaea*, which is so closely allied as to be considered by some authorities to belong to the same species, without doubt erroneously, the ring reaches to about one-third of the way up; while in *S. rentoni* it is quite close to the base, and only slightly diagonal.

Sertularella pygmaea Bale.

Specimens, growing on other hydroids, from Bluff.

Sertularella rentoni Bartlett.

(Plate I., Fig. 3.)

I found this species growing in a rock-pool at St. Clair (Dunedin). No gonothecae were present. It has not hitherto been recorded from any other locality than Victoria.

In *S. pygmaea* the line of points of attachment of the caecum is less conspicuous than in *S. rentoni*, and at the front of the hydrotheca is usually much higher up, and runs around it in a more

diagonal position. This enables the two species to be separated with ease, even when no gonothecae are present.

Usually the walls of the hydrothecae are thin, but the margin is sometimes slightly thickened, but never to the extent found in the species next described.

Sertularella macrogona, n. sp.

(Plate I., Figs. 4-4*d*.)

Hydrocaulus attaining a height of about 1 cm., simple or irregularly branched, branches usually springing from inside a hydrotheca. Hydrocaulus and branches divided by slightly oblique joints into short internodes, each (with an occasional exception) bearing a hydrotheca.

Hydrothecae adnate for about one-third of their height, both series springing from the front, the two planes in which they lie being at about right angles to each other; hydrothecae tubular, smooth, slightly concave in outline on the abcauline side, the adcauline side being ventricose; the margin slightly thickened, especially at the adcauline side; aperture with three broad rounded marginal teeth, one superior, short and comparatively inconspicuous, and two lateral, much longer; no internal submarginal denticles. Operculum of three triangular pieces.

The hydrothecae lie at, approximately, an angle of 45° with the stem, and the aperture is, approximately, at an angle of 45° with the length of the hydrotheca, thus making the aperture at about right angles with the stem.

Gonothecae large, about 4 times as long and 2½ times as broad as the length of a hydrotheca, usually springing from inside hydrothecae, but sometimes borne on the front of the stem just below a hydrotheca, obovate, flattened and slightly depressed just above its widest part, and from the centre of the depression rises a narrow, converging tube with a circular orifice.

Locality.—St. Clair (Dunedin).

Though the branches usually spring from inside a hydrotheca, generally broken, they sometimes arise from the front of the hydrocaulus, just beneath a hydrotheca. One specimen shows a branch springing from inside a broken gonotheca.

The lower part of the hydrocaulus, below the proximal hydrotheca, is deeply and closely annulated or spirally thickened.

This species is allied to *S. rentoni* Bartlett, but differs in many important respects, as will be seen by a comparison of the description of the two species.

The points of attachment of the caecum of the hydranth are in the same position as in *S. rentoni*, and marked in the same way by a faint ridge with minute chitinous processes.

Sertularella procera, n. sp.

(Plate I., Figs. 5-5*d*.)

Colony tall and slender, attaining a height of 22 cm., tapering very gradually towards the apex. Main stem giving rise to a few

principal branches of the same structure as itself. Main stem and principal branches fascicled, except in distal parts. Main stem and branches giving rise on all sides to irregularly placed pinnae (the longest of which attain a length of about 1·3 cm.), except at the distal part where the pinnae all lie in the same plane and are more or less regularly alternate.

Pinnae sometimes strengthened in their proximal part by a tube running out from the fascicled stem or branch, but otherwise not fascicled, themselves pinnate or bipinnate, or with somewhat irregular sub-dichotomous ramification; the more regular forms with the sub-pinnae alternate; usually three hydrothecae (including one in the axil) between every two sub-pinnae or sub-dichotomous branches.

Internodes of stem and main branches usually bearing three hydrothecae; those of the pinnae and sub-pinnae bearing only one each. Pinnae not terminating in stolons.

Hydrothecae tubular or sub-conical, both series directed strongly to the front, curved outwards, sometimes somewhat abruptly; margin with three conspicuous teeth, one superior and two lateral, and an operculum of three pieces; no internal submarginal denticles. Points of attachment of caecum of hydranths extending very obliquely across the hydrothecae, reaching to nearly half way up in the front.

Gonothecae borne on the pinnae, large, obovate, surrounded by a number of prominent annular ridges, except on the proximal part of back which is smooth and adpressed to the pinna; distal portion of gonotheca not projecting forward; rising from the centre of the flattened end surrounded by the distal ridge a narrow, long, expanding tube; aperture usually central, rarely slightly eccentric.

The annular ridges on the gonothecae are similar to those of *S. johnstoni* and *S. pygmaea* except that they are somewhat more pronounced and the flange rather wider.

A fenestra is sometimes present at the base of the hydrothecae but more often absent. Similar fenestrae are numerous on the axillary tubes of the stem and branches, often on the abcauline side. Inter-communication between the tubes is frequent. Occasionally bridges like the letter H are met with between tubes not in contact with one another, though how they originate is not clear.

This species is closely allied to *S. divaricata* var. *subdichotoma*. A single pinna or two could not be distinguished from that species, but the manner of growth is altogether different.

Localities.—Bluff, several fine specimens; Stewart Island (J. F. Mulder), fragments.

Sertularella subarticulata (Coughtrey).

(Plate VII., Figs. 7-7*b*.)

Locality.—Bluff, numerous specimens; Stewart Island, growing on "oyster" shells. This species has not hitherto been correctly figured.

Sertularella irregularis, n. sp.

(Plate V., Figs. 1-1*b*.)

Hydrorhiza somewhat flattened, giving rise to shoots at close intervals.

Hydrocaulus unbranched or sparingly branched, attaining a height of about 5 mm., divided into short internodes each of which bears a hydrotheca.

Hydrothecae not arranged in two series, but in an irregular spiral, every fourth one approximately completing one turn, so that there are three irregular, longitudinal series. Hydrothecae adnate for about one-third of their height, tubular, slightly converging towards the mouth, slightly curved, the adcauline side being convex and the abcauline concave; aperture with three pointed, prominent teeth, one superior and two lateral, and an operculum of three triangular flaps. No internal sub-marginal denticles. Hydranth with about 16 to 20 tentacles, abcaulinary caecum weakly developed.

Gonothecae usually springing from the interior of a hydrotheca, but sometimes from the stem, ovate, marked with about 8 to 10 conspicuous transverse annulations which are not provided with a flange, terminating at the summit in a short tube which is sometimes slightly expanded at the orifice.

Locality.—St. Clair (Dunedin), growing on roots and stems of algae in rock-pools below the swimming pool.

Sertularella crassiuscula Bale.

I collected specimens of this species, with gonothecae, at Bluff and New Brighton. In most of the hydrothecae in my specimens the marginal teeth are very shallow indeed, and the margin practically entire. Only in a comparatively few cases can I make out the four teeth, which are little more than undulations of the margin.

Sertularella fusca, n. sp.

(Plate V., Figs. 2-2*b*.)

Hydrocaulus pinnate, or, occasionally, slightly bipinnate, attaining a height of about 15 mm., divided by oblique joints into internodes each bearing a hydrotheca.

Pinnae alternate, often crowded, one springing immediately below almost every hydrotheca of the hydrocaulus, both series directed in a marked degree to the front, the angle between them usually being 45° or less.

Hydrothecae alternate, both series directed in a marked degree to the distal side, the angle between the two series being usually a little less than 90°, adnate for a third, or less, of their height, constricted and somewhat thickened immediately below the mouth, especially on the adcauline side, where the margin is slightly

everted; abcauline side almost straight, adcauline side ventricose; margin with three prominent, rounded teeth, and an operculum of three pieces; three small and often inconspicuous internal submarginal denticles.

Gonothecae not present.

Locality.—St. Clair (Dunedin), in rock-pools below the swimming pool.

In several of the specimens there spring, from immediately below the base of one or more of the proximal hydrothecae,

	S. simplex St. Clair Dunedin	*S. simplex* Auckland Harbour	*S. robusta* var. *quasiplana*
Hydrotheca			
length	0·40 - 0·52	0·42 - 0·54	0·50 - 0·55
greatest diameter	0·20 - 0·25	0·25 - 0·32	0·29 - 0·33
diameter at mouth (*c*)	0·14 - 0·20	0·17 - 0·20	0·15 - 0·20
proportion adnate	$\frac{1}{3}$ - $\frac{1}{2}$	about $\frac{1}{2}$	about $\frac{1}{2}$
Internode			
length	0·36 - 0·62	0·45 - 0·94	0·55 - 0·82
diameter (*d*)	0·15 - 0·20	0·13 - 0·16	0·15 - 0·16
Gonotheca			
length	1·24 - 1·70	?	1·36 - 1·72
diameter	0·60 - 0·83	?	0·77 - 0·90

	S. robusta forma typica (*a*)	*S. angulosa* Bale (*b*)	*S. robusta* var. *fluctuculata*
Hydrotheca			
length	0·45 - 0·60	0·57 - 0·60	0·65 - 0·75
greatest diameter	0·23 - 0·37	0·29	0·34 - 0·37
diameter at mouth (*c*)	0·16 - 0·22	0·16 - 0·19	0·22 - 0·25
proportion adnate	$\frac{1}{3}$	$\frac{1}{3}$ - $\frac{1}{2}$	about $\frac{1}{3}$
Internode			
length	0·45 - 1·00	0·50 - 0·60	0·45 - 0·65 (*e*)
diameter (*d*)	0·15 - 0·21	0·17	0·18 - 0·30
Gonotheca			
length	1·95	?	1·60 - 1·92 (*f*)
diameter	1·00	?	1·20 - 1·35 (*f*)

(*a*) Measurements taken from specimens from Bluff and Stewart Island.
(*b*) Measurements taken from Bale's figure.
(*c*) Measured across the narrowest part.
(*d*) Half way between base of hydrotheca and proximal end of internode.
(*e*) Proximal internode of branch often attains 1·10 mm.
(*f*) From robust specimen from Bluff. Other specimens vary from 1·30 mm. × 0·85 mm. to 1·80 mm. × 1·0 mm.

stolons which turn downwards, but not in contact with the stem. In one example one of these reaches the hydrorhiza, and anastomoses with it.

Sertularella simplex-robusta Group.

The New Zealand forms belonging to this group are very difficult to separate from one another. Though *S. simplex* (Hutton), at the one end of the group, and *S. robusta* var. *flucticulata*, n. var., at the other, are so different even to the naked eye that no one could have any difficulty in separating them, there are numerous intermediate forms connecting them, which merge gradually into one another.

One great difference between the two above named is in the size of the hydrothecae, but the table of measurements on the opposite page shows how completely the gaps between them are filled up by other forms. The measurements are in millimetres.

Sertularella simplex (Hutton).

(Plate VI., Figs. 1-1*d*, 2-2*e*.)

Hutton's description (1872) of this species under the name of *Sertularia simplex* is not very full, and could easily include several forms which undoubtedly belong to a distinct species, though where to draw the line between them is not easy to decide. Coughtrey (1874) adds to Hutton's description sufficient further details to fix the typical form more satisfactorily. He, however, includes under this name two other forms, which he figures (1874, pl. xx., figs. 9 and 10), the latter of which he afterwards (1875) describes as a distinct species under the name of *Sertularella robusta*. The second form he describes as having faint, shallow grooves, generally three in number, that cross the hydrotheca.

It is very difficult indeed to decide to which species some of the forms in my collection belong, as there are so many intermediate forms, differing from one another in small details, but all of them having the general characteristics of the typical form.

The figure and description given by Bale (1924) may be taken as illustrating the typical form of the species. The hydrothecae of the specimens collected by me at the entrance to Auckland Harbour agree with his figure and description, but, though it was the most common species on the beach, I failed to find a gonotheca.

Hutton (1872) says "Hydrothecae distant," and many of my specimens agree with this. There is, however, considerable variation in this respect even in a single colony. Figs 1 and 1*a* are drawn from two shoots springing from the same hydrorhiza, and illustrate how considerable the variation may be.

The hydrorhiza anastomoses very freely; and my Auckland specimens show a considerable number of single hydrothecae growing from the hydrorhiza. No doubt they are the beginnings of new shoots which would ultimately develop, but in their present form they remind one forcibly of Allman's untenable genus

Calamphora. The hydrorhiza in these specimens is not flattened to any appreciable extent.

Specimens growing in tide pools at St. Clair (Dunedin) differ somewhat from the former, the hydrothecae being smaller, and usually directed more to the front, and slightly less of it being adnate. The gonothecae are also different from the typical form as figured by Bale, inasmuch as the tubular neck is absent. They have four conical projections at the summit, but these are not well developed. (See Fig. 2*e*.) The difference between the two forms is not sufficient to warrant the constitution of a new species in the case of such a variable hydroid as the present.

Stechow (1923) has figured quite a number of species belonging to this group, all of which have four external teeth and three internal submarginal denticles, as having one superior, one inferior, and one lateral internal denticle. I feel sure, however, that he has done this inadvertently. Bale describes the denticles as being "two within the two upper emarginations of border, and the third below inferior marginal tooth," and, in all probability, this is the arrangement of the internal denticles in all species having four teeth and three internal denticles. Plate VI., Fig. 1*d*, shows the appearance, when looking straight into the aperture, of the hydrotheca. The external teeth are not apparent in this figure, as they face directly towards the observer, but their position is indicated by the angles at the bases of the triangular flaps of the operculum, *a* and *b* representing the positions of the superior and inferior marginal teeth respectively, and *c* and *d* those of the lateral.

Hutton says in his original description that this species is "simple or rarely branched." I have a small branched specimen from St. Clair that I consider belongs to this species. It shows considerable variation both in the length of the internodes and in the manner in which the hydrothecae lie. In some shoots both series project to the front in a marked degree; in others the two series lie almost in the same plane. In this specimen the gonothecae differ somewhat from those already described, being, as a rule, narrower. None of them possesses more than three projections at the summit. (See Figs. 2*b*-2*d*.)

All the above described forms have the hydrothecae entirely destitute of any transverse undulations, and I consider that the forms with undulated hydrothecae should not be assigned to this species.

Sertularella robusta Coughtrey.

(Plate VI., Figs. 3-3*c*.)

Of the three forms originally assigned by Coughtrey to *Sertularia simplex* I include under the present species those figured by him (1874, pl. xx., figs. 9, 10). He included only Fig. 10 under the name *Sertularia robusta*, apparently leaving Fig. 9 as *Sertularia simplex*. These are what he refers to as the "several pigmy

varieties in which the hydrothecae are transversely wrinkled." I take it that the word 'pigmy' here refers to the height of the colony, and not to the size of the hydrothecae, because reference to his figures shows that the hydrothecae of Fig. 9 do not differ appreciably in size from those he figures as the typical form (Fig. 8). In his Description of Plate he says, "All objects magnified 50 diameters except where otherwise specified." This, as Mr. Bale has pointed out to me, is obviously incorrect. The length of a hydrotheca of the typical form, in my collection, of *S. simplex*, which varies very little from that figured by Bale, is about 0·5 mm. Assuming that the hydrothecae of the typical form of *S. simplex* as figured by Coughtrey are about the same length, his figures of *S. simplex* and its variety *S. robusta* cannot be magnified more than about 18 diameters.

I have endeavoured to separate the forms with undulated hydrothecae into more than one species, but, although the large and small forms differ very considerably from one another in size and general appearance, I have so many intermediate forms that I am unable to do so satisfactorily, and must be content for the present in describing as varieties certain forms that differ somewhat from the typical form. At first it seemed that there was a decided gap between the largest of the small forms and the smallest of the large, but this is filled by *Sertularella angulosa* Bale (1893, p. 102, pl. iv., fig. 6), which, I think, must be regarded as a variety of *S. robusta* (*Sertularella robusta* var. *angulosa*). In the smaller forms the hydrothecae are about 0·5 mm. in length, and differ from *S. simplex* in having transverse ridges. In *S. angulosa* the hydrothecae are about 0·6 mm. in length. In this form the stem is zig-zag. In many of my New Zealand specimens also the stem is zig-zag (though most of them are almost, if not quite, straight), and one specimen so closely resembles Bale's figure as to leave no doubt whatever in my mind concerning the identity of the species.

As it is quite impossible to say definitely which form Coughtrey had before him and used as his type of *S. robusta*, I am assuming that it was the more common form, and not either of the varieties I am describing under the names of var. *quasiplana* and var. *flucticulata*. Both of these are comparatively rare, while the common form is so plentiful that Coughtrey could not possibly have missed it.

The full description of a typical specimen of *Sertularella robusta* is as follows:—Shoots simple, attaining a height of 10 mm., divided by slightly oblique joints into internodes which vary considerably in length, each bearing a hydrotheca on its upper part. Hydrothecae adnate for about one-third of their height, large, divergent, barrel-shaped, but smaller towards the summit, usually more ventricose on the adcauline than the abcauline side, with about six distinct sharp, transverse ridges, completely surrounding them, but usually becoming less distinct on the abcauline side; aperture expanding, with four well-defined teeth, aperture some-

times at about right angles to the length of the hydrotheca but often with the inferior tooth projecting further than the others; three internal, compressed, vertical, submarginal denticles, two of which are within the two upper emarginations of the border, and the third opposite the inferior marginal tooth.

Gonothecae large, borne sometimes on the hydrocaulus and sometimes on the hydrorhiza, ovate, with several distinct cross undulations, upper part sometimes in the form of a tubular neck, which, however, is not always distinctly present; summit usually with about four conical projections.

Locality.—Bluff, and on "oyster" shells from Stewart Island. I have already referred to the single hydrothecae that are found on the hydrorhiza of *S. simplex*. In the present species single hydrothecae are also met with quite commonly, and remind one even more forcibly of Allman's genus *Calamphora*.

Sertularella robusta var. quasiplana, n. var.

(Plate VI., Figs. 4, 4*a*.)

I have separated *S. robusta* from *S. simplex* on account of the presence in the latter and the absence in the former of transverse undulations on the hydrothecae. The present form seems to be on the border line. At first sight it looks like a rather robust form of *S. simplex*, but closer examination reveals the presence of three or four transverse rugae completely surrounding the hydrotheca. It is true they are often rather faint; in fact, in some hydrothecae, such as the one figured, they would be likely to be overlooked but for the presence of minute diatoms which grow thickly along the shallow depressions between the ridges. This variety differs from the others not only in the above respect, but also in having the hydrothecae usually broader at the base, in proportion to their height, than the others. They are often adnate for as much as one-half of their height. In some specimens I have found the superior tooth projecting slightly more than the others, but usually the mouth is at right angles to the length of the hydrotheca. The teeth are, as in the typical form, well defined. My specimens attain a height of 13 mm.

The gonothecae do not differ from the typical form in any important particular. They are, however, somewhat larger.

Locality.—Island Bay.

Sertularella robusta var. fluctuculata, n. var.

(Plate VI., Figs. 5, 5*a*.)

This variety differs from the others mainly in its much greater size in all its parts, and only for the existence of *S. angulosa* Bale (1893, p. 102, pl. iv., fig. 6), I would have no hesitation in ranking it as a distinct species. The rugae appear like little waves on the adcauline side (hence the proposed name of the variety), but rarely

extend more than half way round the hydrotheca, the abcauline side being almost, if not altogether, free from undulations. The internal submarginal denticles are very large and well developed, but form very thin vertical plates. Usually the mouth of the hydrotheca is not at right angles to its length, the inferior tooth projecting considerably more than the others. The teeth are rarely well developed, and are often no more than a slight wave in the otherwise entire but oblique peristome.

The gonothecae are broader than those found on the other varities, and are borne on stem and branches.

Unlike the other forms belonging to this species the hydrophyton branches rather freely, but the branching is quite irregular. There is considerable variation in the length of the internodes, even in the same colony. In one specimen they vary from 0·45 mm. to 0·85 mm.

Locality.—Bluff.

Thuiaria farquhari Bale.

(Plate VII., Fig. 4.)

A fine specimen of this species collected at Bluff densely clothes the stem of an ascidian for several inches.

Thuiaria buski Allman.

(Plate VII., Figs 1-1*c*.)

Hydrocaulus not fascicled, attaining a height of about 3 inches (*fide* Allman), straight or almost so, unbranched, pinnate. Stem usually thick, divided by slightly oblique nodes into internodes of variable length, each bearing from 1 to 5 pairs of hydrothecae. Pinnae irregular, usually with a tendency to alternate disposition, rarely opposite, stout, divergent at nearly right angles, borne on slender apophyses from which they are separated by a rather oblique, conspicuous node; usually divided into 2 or 3 long internodes each bearing from 4 to 8 (sometimes up to 11) pairs of hydrothecae; nodes oblique, very rarely transverse.

Hydrothecae in pairs, strictly opposite both on hydrocaulus and pinnae, adnate in front, widely separated behind, most of their length vertical, upper portion turned outward and narrowed, aperture vertical, widened laterally, with two lateral lobes, facing outward and forward; edge of peristome thin, especially on the adcauline side, where the sinus between the lateral lobes is filled up by a very thin prolongation of the wall of the hydrotheca; sometimes a slight broad internal thickening of the perisarc just inside the peristome on the abcauline side, but no well developed internal denticle.

Pairs of hydrothecae usually closely approximated, sometimes actually touching, on the pinnae; more separated on the hydrocaulus.

Gonothecae borne on the front of the pinnae, near the base of same, ovoid, about 2·5 mm. in length, aperture round, entire, on a very short neck.

Colour of perisarc, dark brown.

Locality.—Island Bay and Bluff.

Allman's (1876) description and figures of this species are faulty. He describes and figures the pinnae as being divided into short internodes, each of which bears a single pair of hydrothecae only, and his figure shows the joints as being transverse. At Mr. Bale's request Captain A. K. Totton, M.C., of the British Museum (Natural History), has examined Allman's type, and in a letter, which the former has kindly placed at my disposal, writes as follows:—"The successive pairs of hydrothecae on the type of *D. buskii* are closely approximated though not quite touching, but there is *not* a node between each pair. It would be unwise to say more about the nodes than this, because the type specimen is a poor one, very imperfect and much overgrown."

In my experience nodes in the pinnae of Sertulariidae are never found in the position shown in Allman's figure, immediately above the base of the hydrothecae. The explanation of his mistake is doubtless that he examined a pinna lying approximately in the position shown in my Fig. 1*c*, and mistook for a node the base of the hydrotheca on the further side of the pinna. In his Fig. 4 an oblique view of the pinna is shown. His Fig. 7 is a lateral view, not "oblique," as he calls it. This is borne out by the relative distances between the hydrothecae and the back of the pinnae. The importance of this is that if his Fig. 4 showed a true lateral view of the pinna, the distance by which the hydrothecae are separated at the back would be greater than it really is. I have searched my material for a transverse node such as he shows, but find that transverse nodes in this species are very rare, and when present occur, as one would expect, above the adnate part of the hydrothecae. Allman's figure would make them occur behind the adnate part.

In all my specimens the colour of the perisarc is very pale horn.

This species is allied to *T. bicalycula*, but differs from it in several respects, the most striking of which are that in the latter the hydrocaulus is much stouter and consequently the hydrothecae on it are far more widely separated at the back, these hydrothecae are not spaced regularly and not always in pairs, the apophyses are much stouter and are not separated from the pinnae by a conspicuous node, and on the pinnae of the latter species the pairs of hydrothecae are not placed so closely together.

Thuiaria buski var. tenuissima, n. var.

(Plate VII., Fig. 2.)

Specimens from Island Bay and Bluff, attaining a height of 35 mm., differ sufficiently from the typical form to be ranked as a distinct variety. The whole hydrophyton is more slender, the hydrocaulus being little, if at all, thicker than the pinnae and scarcely distinguishable from it in arrangement of the hydrothecae. The hydrothecae are somewhat smaller and the pairs are not so closely approximated. The hydrocaulus and pinnae being narrower, the hydrothecae are not so widely separated at the back. The pinnae are much shorter than those of the average specimen of the typical form, and the node between pinna and apophyse is more oblique. The apophyses are much longer and more slender. To the eye this variety closely resembles Allman's natural size figure of *T. buski* (Allman, 1876, pl. xiv., fig. 3).

Gonothecae not present.

Thuiaria spiralis, n. sp.

(Plate VII., Figs. 3-3*e*.)

Hydrocaulus attaining a height of 16 cm., arranged in a loose but fairly regular spiral, sparingly branched, pinnate. Stem thick, fistulous, divided by slightly oblique joints into internodes, each bearing from 1 to 5 pairs of hydrothecae. Pinnae quite irregular, occasionally opposite, stout, divergent usually at an angle of 60° or more, borne on short stout apophyses from which they are separated by a conspicuous oblique node; pinnae themselves giving rise to secondary pinnae borne on similar but somewhat more slender apophyses; pinnae and secondary pinnae stout, usually divided by slightly oblique nodes into internodes, each bearing from 1 to 7 (sometimes up to 11) pairs of hydrothecae, but sometimes undivided.

Hydrothecae in pairs, strictly opposite, in contact in front, widely separated at the back, especially those on the hydrocaulus, most of their length vertical, upper portion turned outward and forward, and narrowed; aperture vertical, widened laterally, with two lateral lobes; edge of peristome thin, especially on the adcauline side in the sinus between the lateral lobes, slightly thickened just inside the abcauline side, but with no well developed internal denticle.

Pairs of hydrothecae fairly closely approximated on the pinnae, but widely separated on the hydrocaulus.

Colour of perisarc, dark brown.

Gonothecae borne on the front of the pinnae, near the base of same, large, ovoid, about 2·5 to 2·7 mm. in length, and 1·1 to 1·3 mm. in diameter; aperture round, entire, on a very short neck, scattered, vertically flattened, irregular denticles sometimes projecting into the interior round the neck, but not always present.

The spiral habit and dark colour of this species at once makes it easily distinguished from *T. buski* and *T. bicalycula*, to which it is allied. It also differs from the latter in the regular arrangement of the hydrothecae on the hydrocaulus, and the oblique joints between the pinnae and the apophyses. The hydrothecae on the pinnae are not so closely approximated as in *T. buski*.

The pinnae, following the twisting of the hydrocaulus, are given off in all directions, and do not lie in a single plane. The cauline hydrothecae also spirally follow the twisting of the hydrocaulus.

Sertularia episcopus (Allman).

I found specimens of this species growing profusely over algae washed ashore at Island Bay.

Sertularia fasciculata (Kirchenpauer).

I collected a specimen of this species at Island Bay, and another at Bluff.

Sertularia bispinosa (Gray).

A specimen of this species is in the collection of the late Mr. J. F. Mulder, but the locality is not stated. The gonothecae contain a ring of tiny internal denticles. One of the gonothecae is totally destitute of " shoulders."

Sertularia trispinosa Coughtrey.

(Plate V., Fig. 3.)

I found numerous specimens, with gonothecae, at St. Clair (Dunedin), and Bluff.

Attention has been drawn (Mulder and Trebilcock, 1914, p. 38) to the presence of a tiny aperture, from which sometimes protrudes a short and delicate tube, in the perisarc of the infrathecal chamber of *S. minima, S. minuta,* and allied species. This aperture is also found in a similar position in *S. trispinosa,* but in no case can I find any trace of a tube. In this species I have noticed protruding from the aperture a small mass of (?) protoplasm, but whether it is a sarcostyle or not I am unable to determine, as the soft parts of my specimens of this species are not in sufficiently good state of preservation.

In most cases in *S. trispinosa* these apertures are missing, and, when present, I have not found them paired.

Stechow treats these structures as nematophores, and creates a new genus *Nemella* for the reception of the species possessing them.

Sertularia trispinosa var. inarmata, nov.

(Plate V., Fig. 4.)

A specimen, collected by me at Island Bay, having a large number of shoots, differs from the typical form in its gonothecae which are totally destitute of " horns " or even " shoulders." At first I felt disposed to treat it as merely an accidental variation, especially as in some instances there is a slight irregularity in outline of the gonothecae at the spot usually occupied by the " horns."

However, after examining the whole of the gonothecae, of which there are a considerable number, and among which I find no exception, I have come to the conclusion that the difference is sufficient to warrant this form being named as a distinct variety.

In the trophosome the variety does not differ in any respect from the typical form.

Sertularia minima Bale.

(Plate VII., Figs. 5, 5*a*.)

I have specimens of this species from Island Bay (Wellington), St. Clair (Dunedin), and Bluff. In specimens from all three localities the tiny apertures and tubes are found springing from the infrathecal chambers. In many of the specimens from St. Clair two apertures and tubes are found instead of one, and similar structures are also found on the hydrorhiza, but in the latter case the tubes are much longer.

Two apertures, with tubes, are also found in some of the Bluff specimens. In the latter the gonothecae sometimes have and sometimes are without the internal submarginal denticles.

The Island Bay specimens belong to the variety *pumiloides*.

Sertularia divergens Busk.

A few specimens of this species were growing on an " oyster " shell from Stewart Island. " *Tridentata xantha* " Stechow (1923*a*, p. 64; 1925, p. 236, fig.) does not belong to this species, but is probably a young form of *Sertularia unguiculata* Busk.

Sertularia unguiculata Busk.

I collected specimens of this species at St. Clair and Bluff, those from the latter locality having gonothecae. They do not differ in any respect from the average Victoria specimen.

Dynamena quadridentata (Ellis and Solander).

A few fragmentary specimens of this species from " oyster " shells from Stewart Island are in the collection of the late Mr. J. F. Mulder. Not hitherto recorded from New Zealand.

Stereotheca elongata (Lamouroux).

Bale (1924) states that " specimens from Lyttelton, in Professor Chilton's collection, do not differ in any respect from the small form abundant on the southern Australian coast." My New Zealand specimens, on the contrary, which I collected at Island Bay, St. Clair (Dunedin) and Bluff, belong to the larger variety, and most of them are more robust than the average large southern Australian specimens, and usually branch more freely.

Fam. PLUMULARIIDAE.

Plumularia pulchella Bale.

I collected a single specimen of this small species, with gonothecae, growing on *Stereotheca elongata,* at Bluff. It differs in no respect from the form usually found on the Victorian coast. As in the Victorian specimens, the gonothecae are of two sizes, one about twice the length of the other. Possibly they are of different sexes, but in the absence of gonangial contents I am unable definitely to decide that point. This species has not hitherto been recorded from New Zealand.

Plumularia setacea (Linn.).

I collected numerous specimens of this species at St. Clair and Island Bay.

Plumularia setaceoides Bale.

I collected numerous specimens of this species, with gonothecae, at Island Bay, St. Clair (Dunedin), and Bluff. It has not hitherto been recorded from New Zealand. The specimens do not differ materially from the average specimen from Victoria.

I have considerable doubt whether *Plumularia wilsoni* Bale (1926), (=*P. delicatula* Bale, not Busk, not Quelch) is specifically distinct from *P. setaceoides,* but must examine further specimens of *P. wilsoni* in a well preserved condition before coming to a definite conclusion. Some of my specimens from Island Bay, which had been washed ashore and dried, cannot be distinguished from the last named species, though others were undoubtedly *P. setaceoides.*

Plumularia hyalina Bale.

(Plate VI., Fig. 6.)

I collected specimens of this species at St. Clair, Island Bay, and Bluff. It has not hitherto been recorded from New Zealand.

This species has always been looked upon as possessing pinnae each bearing essentially a single hydrotheca only, and would thus be placed in Nutting's genus *Monotheca.* The better opinion seems to be that the retention of this genus is not warranted. In specimens collected at St. Clair and Island Bay I find an additional argument in favour of this view. Several of the pinnae bear two hydrothecae each, and are divided, like a typical *Plumularia,* into alternate long and short internodes, the former each bearing a hydrotheca, one median inferior and two lateral superior sarcothecae, and the latter each bearing a single median sarcotheca only.

The retention of the genus *Monotheca* would doubtless be very convenient, but the existence of forms such as the above is a strong argument against it.

Thecocaulus minutus, n. sp.

(Plate VII., Figs. 6, 6*a*.)

Hydrocaulus attaining a height of about 5 mm., not fascicled, unbranched, lower part usually destitute of appendages, remainder divided into alternate hydrothecate and non-hydrothecate internodes, the latter usually short. Pinnae, the proximal two usually opposite, the remainder alternate, bearing from one to three hydrothecae, divided into alternately long and short internodes of which only the former bear hydrothecae.

Hydrothecae free for two-thirds of their length, campanulate, longer than broad, broad at base, slightly constricted at the rear near the margin; margin smooth, circular slightly everted at the rear.

Sarcothecae bithalmic, canaliculate, narrow at base, one median below each hydrotheca, and a pair of laterals above it, one median on each intermediate internode of stem and pinnae, and sometimes one median above the caulinary hydrothecae, on the upper part of the hydrothecate internodes.

The pinnae are each borne on a prominent apophyse, which springs from beside each caulinary hydrotheca.

The first internode, and sometimes the second, are short, and bear no appendages. The intermediate internodes, both on the stem and pinnae, vary in length, but are usually short. Sometimes on the stem two intermediate internodes are found in succession.

The joint above each intermediate internode, both on stem and pinnae, is oblique.

The lateral sarcothecae rise to about the level of the margin of the hydrotheca. Gonosome, not present.

Locality.—St. Clair (Dunedin).

Thecocaulus heterogona Bale.

Mr. Bale has kindly sent me a specimen of this interesting species. In the axil at the back of each hydrotheca there is a sarcostyle protected by an extremely delicate, monothalmic, rudimentary, bract-like sarcotheca, shaped something like the terminal half of the bowl of a spoon. These sarcothecae are difficult to detect anywhere, but particularly so on the pinnae; in fact, I could distinguish them there in only a few instances.

Aglaophenia acanthostoma Allman.

I collected several specimens of this species at Bluff and St. Clair (Dunedin).

Aglaophenia laxa Allman.

(Plate V., Figs. 5-5*b*.)

I collected numerous specimens of this species with corbulae at Island Bay. The largest specimen attains a height of nearly 60

mm. In my specimens the teeth of the hydrothecae are more rounded than shown by Bale (1924, p. 260, fig. 15).

There are two forms of this species represented in my collection, one with the hydrocladia lax, there being about 26 to the cm., the other with close-set hydrocladia, as many as 46 to the cm. In general appearance these two forms are so different as to lead one at first to the conclusion that they belong to different species, but, apart from the distance between hydrocladia I can detect no difference between them, and, as the length of the hydrocladial internodes varies in some specimens, there is little doubt that examination of a large number of specimens would reveal intermediate forms connecting these two extremes.

Bale's conjecture that the gonosome, when found, would prove to be of the same character as in *A. acanthocarpa* and *A. divaricata* I find to be correct.

Thecocarpus formosus (Busk) var. inarmatus, nov.

(Plate V., Figs. 6, 6*a*.)

I was fortunate in collecting a number of specimens of this apparently rare species at Island Bay. M. Billard, to whom I submitted specimens, has kindly compared them with his specimens from Madagascar, and writes me as follows:—

> "Malgré des différences, je crois qu'il s'agit de la même espèce. Dans vos échantillons, seule la dent latérale adcaulinaire est bifurquée à tel point même qu'elle apparaît comme en formant deux; les deux autres situées du côté de la médiane ne le sont pas du tout. Je dois dire que mon dessin représente un cas extrême et que dans toutes les hydrothèques les dents latérales voisines de la médiane ne sont pas toujours aussi franchement bifurquées; le dessin de Marktanner donne un cas intermédiaire entre ce qui existe chez mes exemplaires africains et vos exemplaires néo-zélandais. Dans ceux-ci j'ai noté le plus faible développment du repli intrathécal et du processus spiniforme médian. Dans les échantillons que vous possédez, les hydroclades sont-ils terminés par une épine ayant à sa base une dactylothèque? Je n'ai pas observé ce détail dans les spécimens que j'ai reçus. Il-y-aurait lieu je crois de faire de la forme néo-zélandaise une variété distincte."

Billard's letter leaves little for me to add in the description of this variety. In none of my New Zealand specimens are the hydrocladia terminated in a spine.

The median spiniform processes of the hydrothecae are hollow, and vary considerably in size.

Gonosome, not present.

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EXPLANATION OF PLATES.

Plate I.

Fig. 1.—*Saaba* (?) *scandens*, n. sp. ×15.
1*a*. Gonangium (?) of same. ×15.
Fig. 2.—*Orthopyxis formosa*, n. sp.
2. Showing flanged hydrorhiza, renovation of stem, and broad view of hydrotheca. ×20.
2*a*. Another hydrotheca, broad view. ×20.

2*b*. The same, narrow view. ×20.
2*c*. A large hydrotheca, with renovated margin. ×20.
2*d*. A thin walled specimen, showing hydranth. ×20.
2*e*. Transverse section through perisarc of stem, showing flattening and thickening. ×20.

Fig. 3.—*Sertularella rentoni* Bartlett. ×70.

Fig. 4.—*Sertularella macrogona*, n. sp.
4. Typical specimen. ×20.
4*a*. Front view. ×70.
4*b*. Side view. ×70.
4*c*. Hydrotheca, showing operculum. ×70.
4*d*. Gonotheca. ×15.

Fig. 5.—*Sertularella procera*, n. sp.
5. Part of typical colony. ×½.
5*a*. Part of pinna. ×35.
5*b*. The same showing fenestrae. ×35.
5*c*. A hydrotheca from the hydrocaulus. ×35.
5*d*. Gonotheca. ×15.

Plate II.

Fig. 1.—*Orthopyxis delicata*, n. sp.
1-1*d*. Hydrothecae, showing variation in size. ×50.
1*a*. Showing renovation of margin. ×50.
1*e*. Gonangium. ×15.
1*f*. Hydrotheca, viewed from above. ×50.

Fig. 2.—*Perisiphonia quadriseriata*, n. sp.
2. Complete specimen. ×½.
2*a*. Part of hydrocaulus and of one hydrocladium and the base of another, dissected after maceration in liquor potassi, showing part of three peripheral tubes. ×35.
2*b*. Part of hydrocladium, broad view. ×35.
2*c*. The same, narrow view. ×35.
2*d*. Three sarcothecae. ×110.

Plate III.

Fig. 1.—*Halecium corrugatissimum*, n. sp.
1. Complete colony, showing method of branching. ×15.
1*a*. Two hydrothecae. ×70.
1*b*, *c*. Hydrothecae, showing reduplication of hydrothecae. ×70.
1*d*. Young hydrotheca. ×70.
1*e*. Hydrotheca and gonotheca. ×70.
1*f*. Hydrotheca, ×110, to show thinness of perisarc.

Fig. 2.—*Halecium expansum*, n. sp.
2. Complete colony, showing method of branching, with hydranths, one of them young. ×15.

2*a*. The same species, showing normal method of branching. ×50.
2*b*, *c*. Hydrothecae. ×110.

Fig. 3.—*Halecium lenticulare*, n. sp.
3. Complete colony, showing method of branching and position of gonothecae, the proximal one of which has been twisted on its stalk to show broad aspect. ×15.
3*a*. An example of vigorous reduplication of hydrotheca. ×15.
3*b*, *c*. Examples of irregular branching. ×35.
3*d*. Male gonotheca. ×15.

Plate IV.

Fig. 1.—*Halecium lenticulare*, n. sp.
1. Specimen from Island Bay. ×35.
1*a*. Specimen from St. Clair. ×50.
1*b*. Specimen from Bluff, showing delicate diaphragm, and reduplication of margin of hydrotheca. ×110.

Fig. 2.—*Halecium expansum*, n. sp.
2. Distal part of a colony, with hydranths, showing crowded state of hydrothecae. ×50.
2*a*. Another example of active branching. ×50.
2*b*. An example of unusually active renovation of hydrothecae. ×50.

Fig. 3.—*Campanulina humilis* Bale.
3. Simple form. ×50.
3*a*, *b*. Branched form, showing hydranths. ×50.
3*c*. Base of four tentacles, showing web. ×360.
3*d*. Tip of tentacle, showing nematocysts. ×360.

Fig. 4.—*Selaginopsis monilifera* (Hutton). ×15.
4*a*. A young hydrotheca of same, showing three-toothed margin. ×35.

Plate V.

Fig. 1.—*Sertularella irregularis*, n. sp. ×50.
1*a*, *b*. Gonothecae of same. ×35.

Fig. 2.—*Sertularella fusca*, n. sp. × 35.
2*a*. Another view of same. ×35.
2*b*. Hydrotheca. ×50.

Fig. 3.—*Sertularia trispinosa* Coughtrey, showing pore (*a*) in infrathecal chamber. ×50.

Fig. 4.—*Sertularia trispinosa* var. *inarmata*, n. var. Gonotheca. ×15.

Fig. 5.—*Aglaophenia laxa*. Allman. ×110.
5*a*. Hydrotheca, viewed from the front. ×110.
5*b*. Adcauline part of top of hydrotheca. ×200.

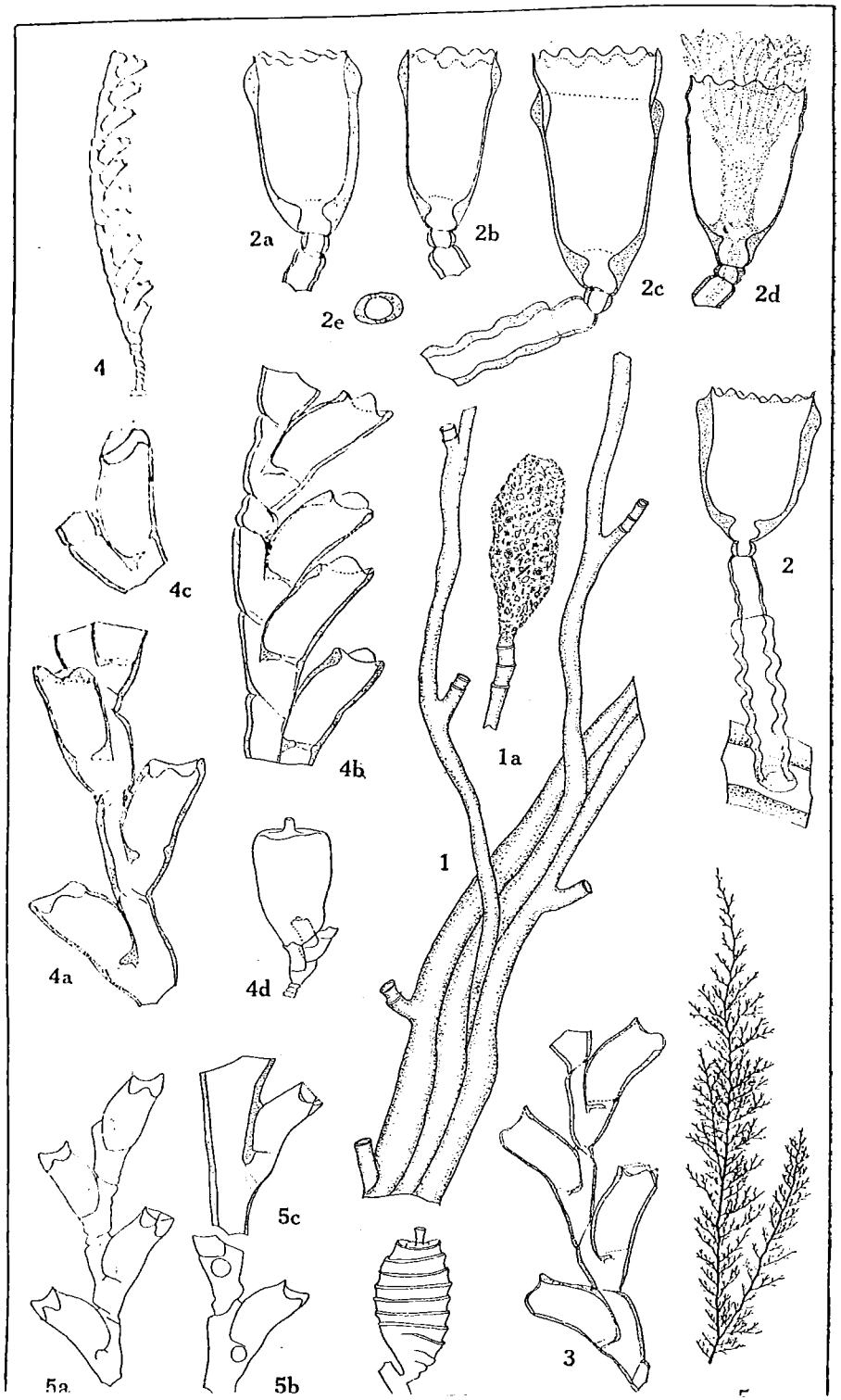
Fig. 6.—*Thecocarpus formosus* (Busk) var. *inarmatus*, nov. ×110.
6*a*. Front view of hydrotheca. ×110.

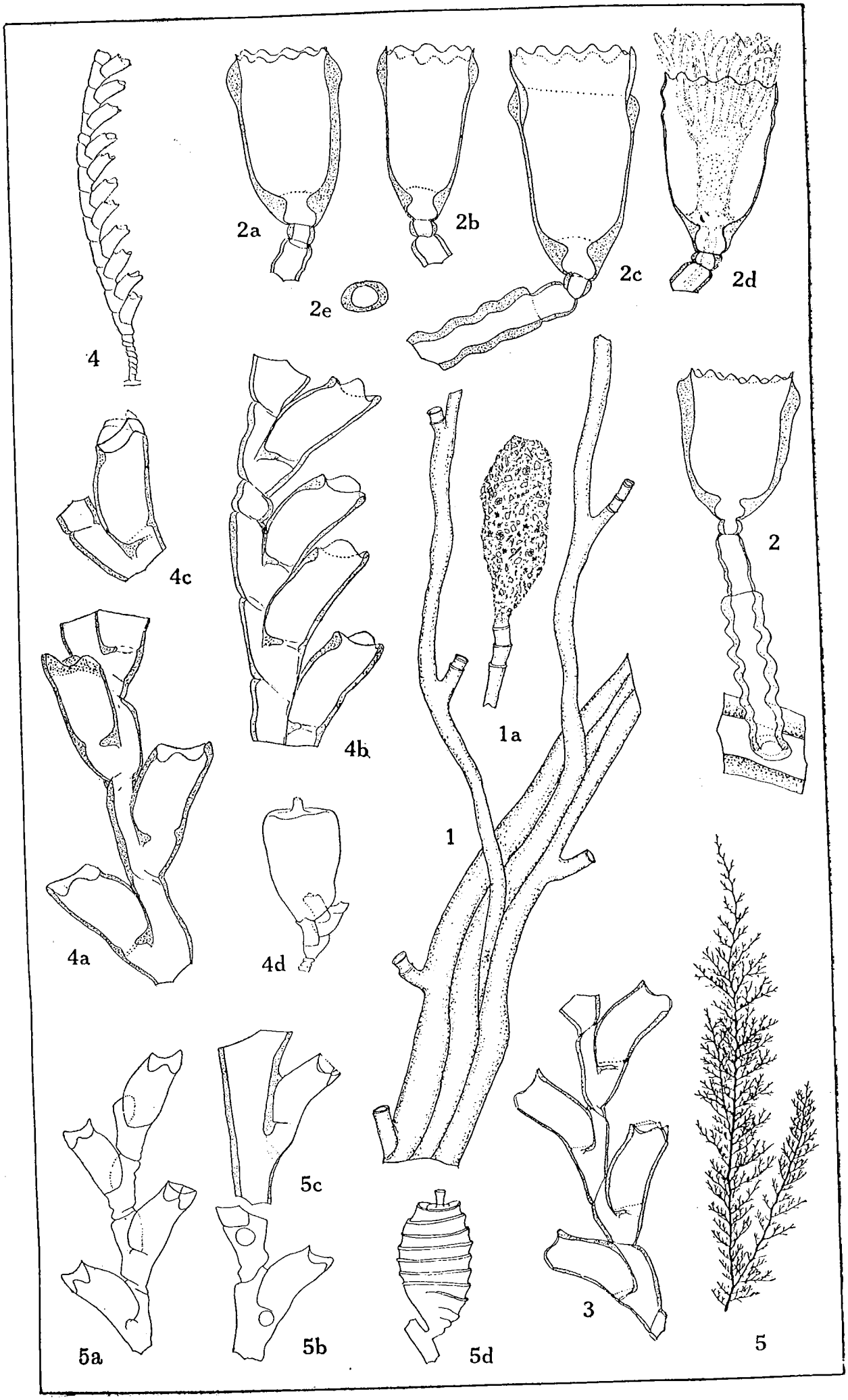
Plate VI.

Fig 1.—*Sertularella simplex* Hutton. (Loc. Auckland.)
1, 1*a*. Specimens taken from same hydrorhiza. ×15.
1*b*. Typical hydrotheca. ×35.
1*c*. Single hydrotheca growing from hydrorhiza. ×35.
1*d*. Mouth of hydrotheca viewed from above, showing operculum, internal denticles, and position of (*a*) superior, (*b*) inferior, and (*c* and *d*) lateral teeth. ×50.
Fig. 2.—*Sertularella simplex* Hutton. (Loc. Dunedin.)
2. Part of hydrocaulus, showing unusual anastomosis. ×35.
2*a*. Hydrotheca from specimen with unusually massive walls. ×35.
2*b-e*. Gonothecae, showing extent of variation. ×35.
Fig. 3.—*Sertularella robusta* Coughtrey.
3. Typical hydrotheca from Island Bay. ×35.
3*a*. Typical hydrotheca from Bluff. ×35.
3*b*. Single hydrotheca growing from hydrorhiza, front view. (Loc. Bluff.) ×35.
3*c*. Gonotheca. (Loc. Island Bay.) ×15.
Fig. 4.—*Sertularella robusta* var. *quasiplana*, n. var. (Loc. Island Bay.) ×15.
4. Typical hydrotheca. ×35.
4*a*. Gonotheca. ×15.
Fig. 5.—*Sertularella robusta* var. *flucticulata*, n. var.
5. Branched form with gonothecae. ×20.
5*a*. Typical hydrothecae. ×42.
Fig. 6.—*Plumularia hyalina* Bale, showing hydrocladium bearing more than one hydrotheca. ×50.

Plate VII.

Fig. 1.—*Thuiaria buski* (Allman). (Loc. Island Bay.)
1. Part of average pinna. ×15.
1*a*. Pinna without joints, side view. ×15.
1*b*. Part of pinna with two kinds of nodes, side view. ×15.
1*c*. Part of pinna showing both series of hydrothecae. ×15.
Fig. 2.—*Thuiaria buski* var. *tenuissima*, n. var. ×15.
Fig. 3.—*Thuiaria spiralis*, n. sp.
3. Distal half of type specimen. Nat. size.
3*a*. Part of hydrocaulus showing spiral arrangement of hydrothecae. (The hydrocaulus has been straightened in the drawing to economize space.) ×15.

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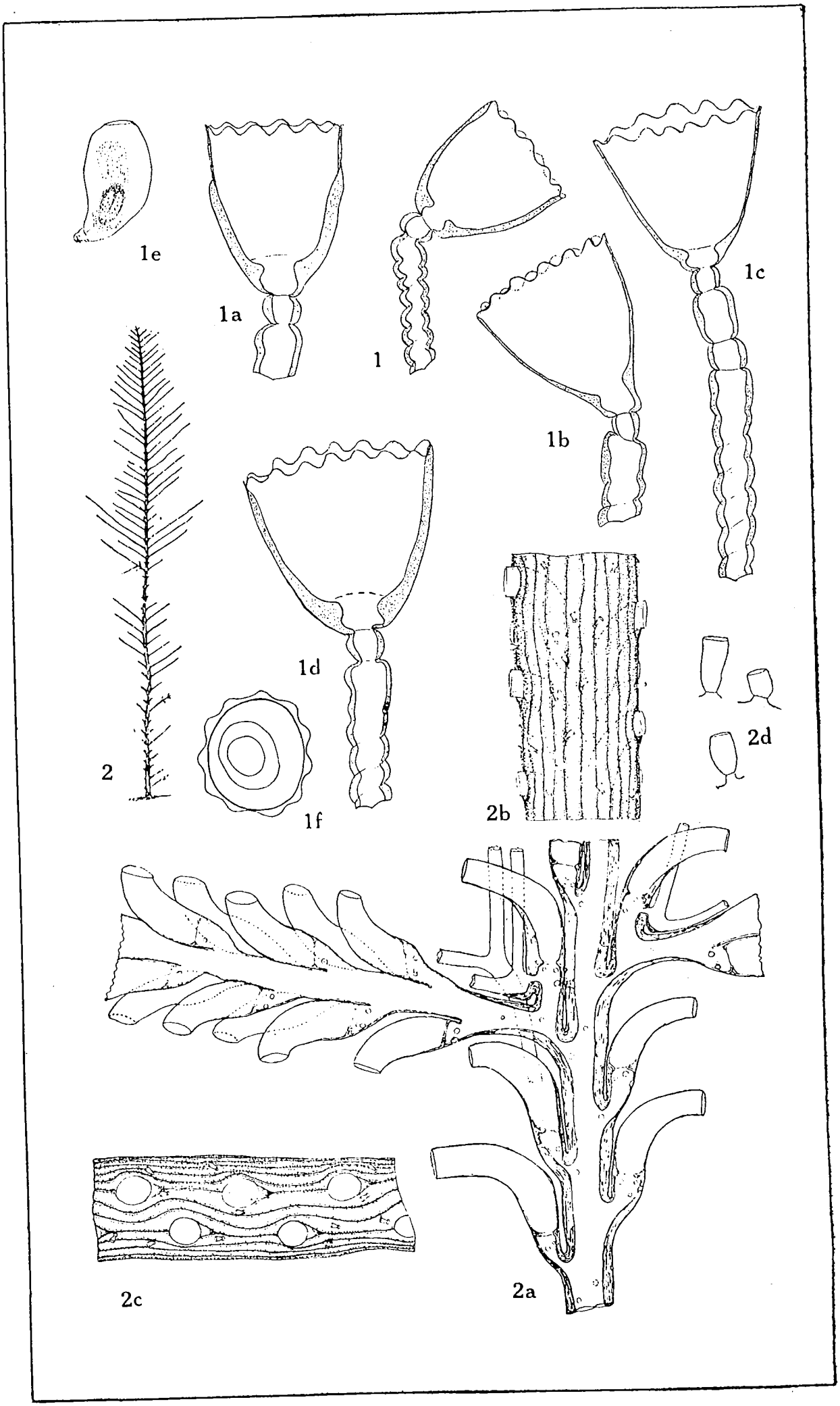

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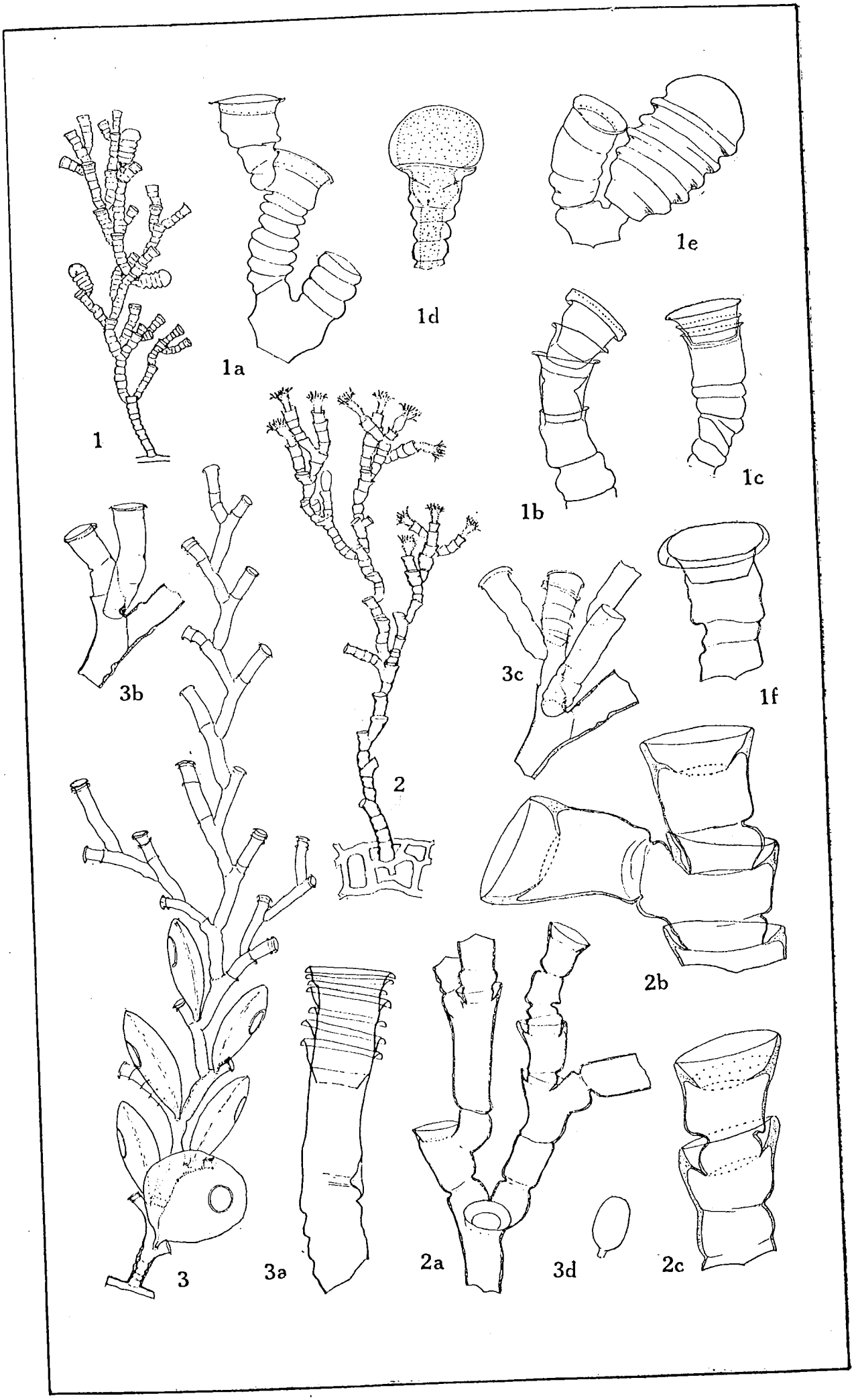

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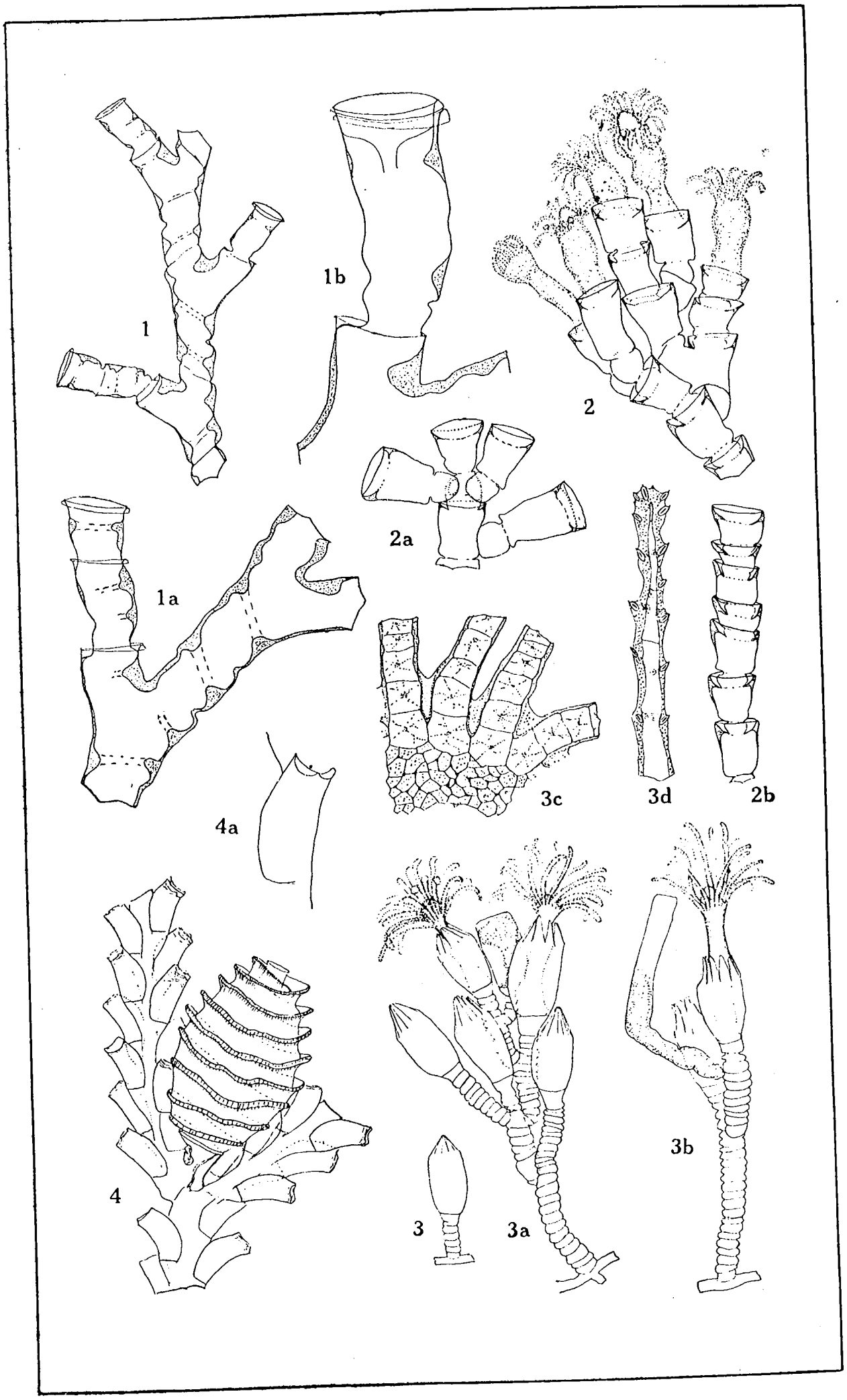

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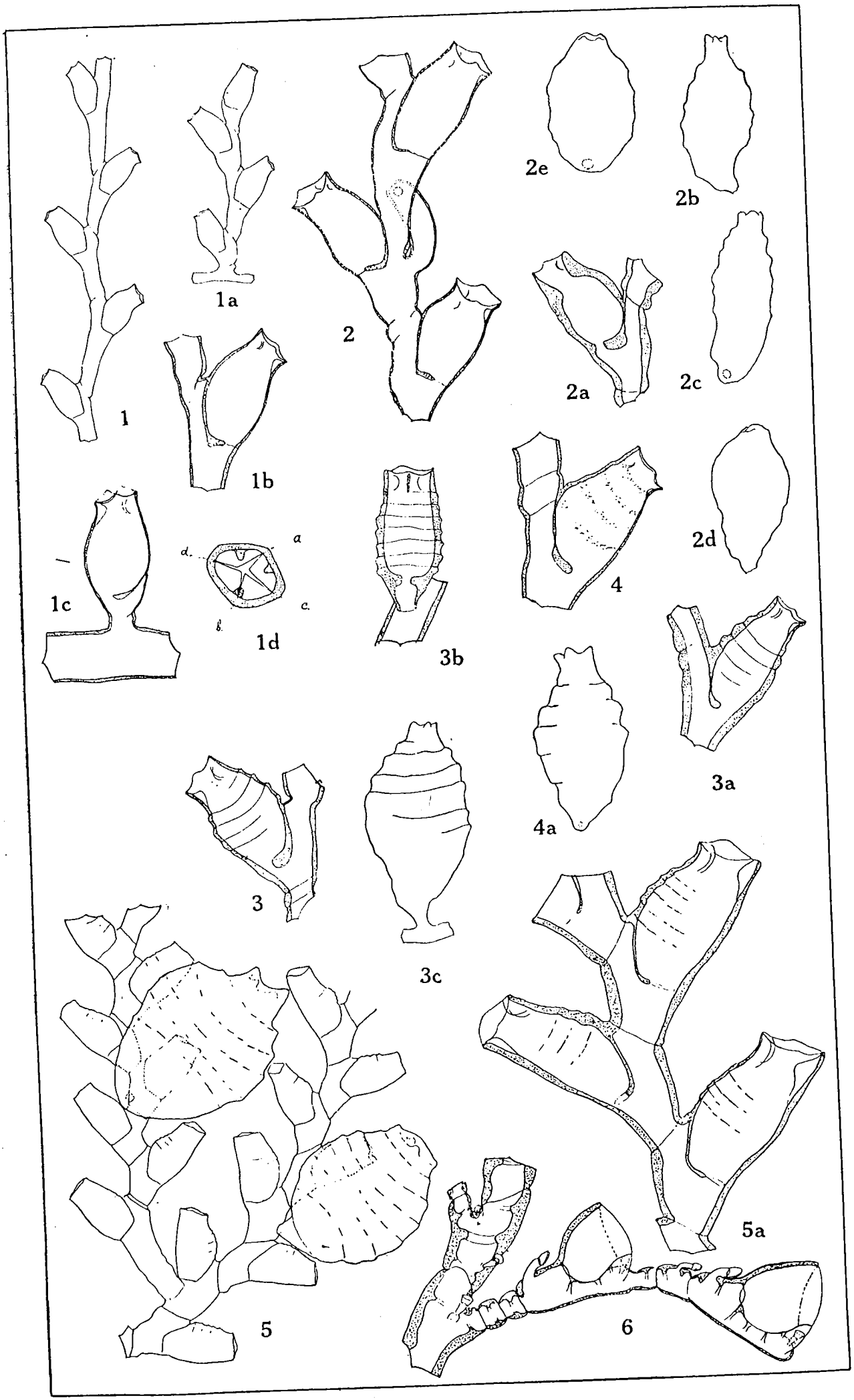

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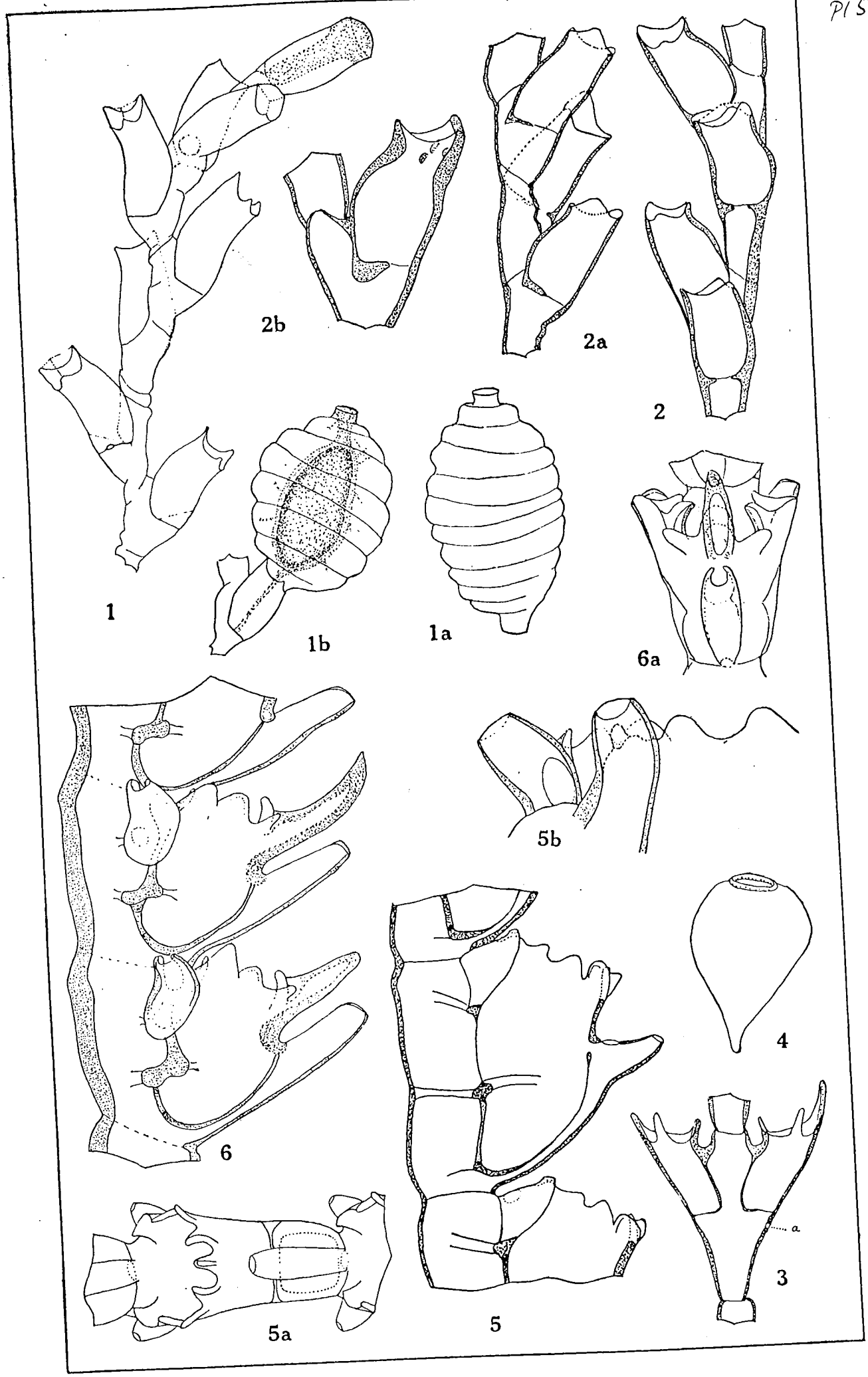
Plate 6



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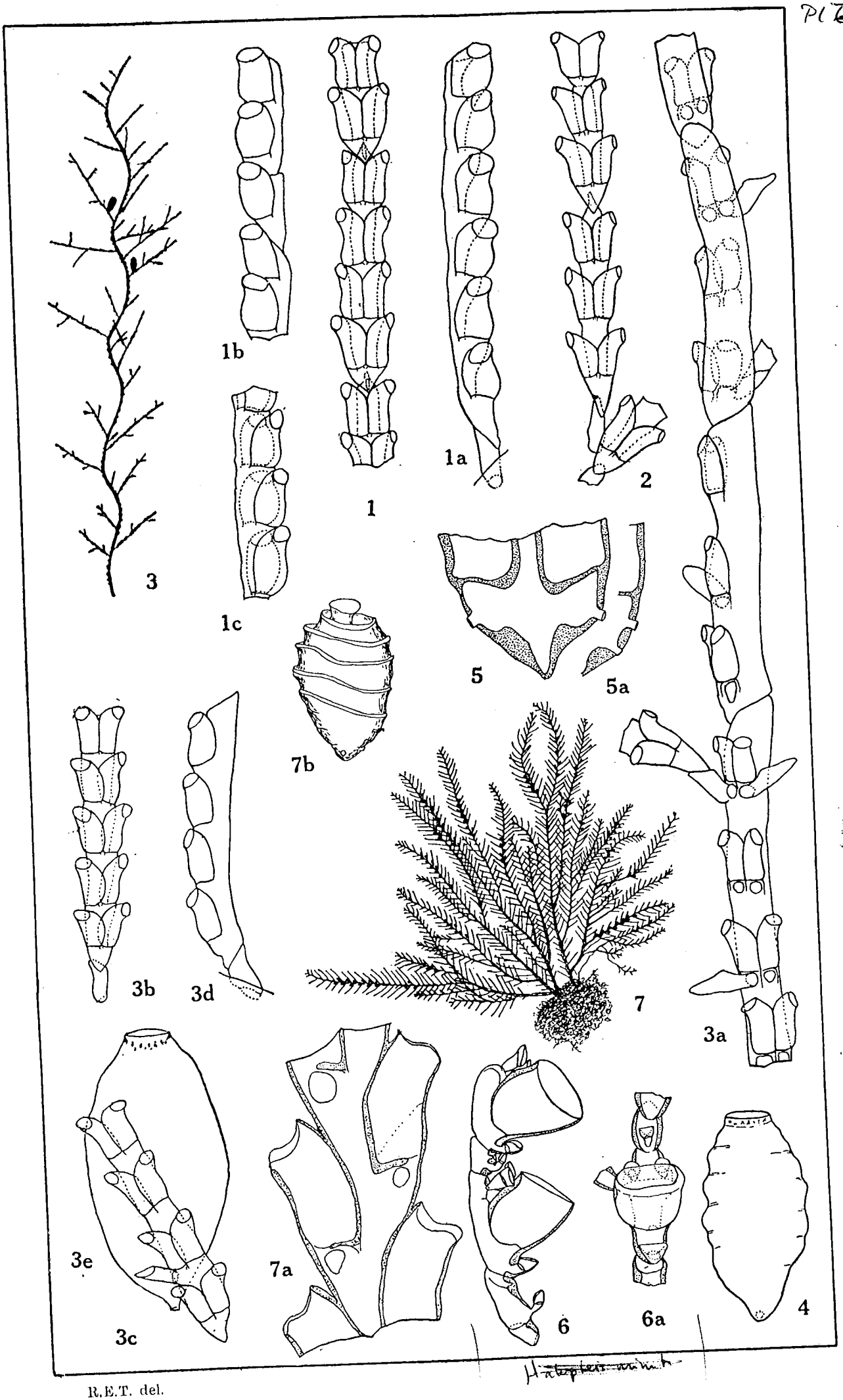

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Fig. 4.—*Thuiaria farquhari* Bale, gonotheca. ×15.

Fig. 5.—*Sertularia minima* Bale.

5. Infrathecal chamber, showing a pair of pores, with tubes. ×110.

5*a*. Side of another specimen, showing two pores on one side. ×110.

Fig. 6.—*Thecocaulus minutus,* n. sp.

6. Hydrocladium. ×50.

6*a*. Front view of part of hydrocladium. ×50.

Fig. 7.—*Sertularella subarticulata* (Coughtrey).

7. Small complete colony. ×½.

7*a*. Hydrothecae. ×50.

7*b*. Gonotheca. ×15.