The author proposes to continue these experiments, at still higher pressures, with a modified apparatus, which will enable him to measure the temperature effects by means of a thermo-electric junction. The present process, with thermometers, is applicable only to liquids and to semi-liquid substances like lard.

BUSINESS.

Dr G. A. Gibson was balloted for, and declared duly elected a Fellow of the Society.

Monday, 17th January 1881.

PROFESSOR FLEEMING JENKIN, Vice-President,
in the Chair.

The following Communications were read :—

1. Preliminary Report on the TUNICATA of the “Challenger” Expedition. Part III. By W. A. Herdman, D.Sc., F.L.S.

(By permission of the Lords Commissioners of the Treasury.)

III. CYNTHIADÆ.

This family includes two of Savigny’s genera—*Boltenia* and *Cynthia*, and may be defined by their common characters if we omit or modify one point on which considerable stress is usually laid, namely, the number of lobes round the branchial and atrial apertures.

The amended definition of the family is as follows :—

Body attached, sessile or pedunculated ; apertures four-lobed, or having less than four lobes.

Test coriaceous ; rarely cartilaginous or gelatinous.

Branchial sac folded ; internal longitudinal bars present, no papillæ ; stigmata straight (rarely absent).

Tentacles simple or compound.

In the “Mémoires sur les animaux sans vertèbres,” the genus *Cynthia* is broken up into four tribes, viz., *Cynthiæ Simplicis*, *Cynthiæ Cæsiræ*, *Cynthiæ Styelæ*, and *Cynthiæ Pandociæ*. Of these the second contains only one species, *Cynthia dione*, which does not belong to this family but to the MOLGULIDÆ. Another tribe, the *Cynthiæ Pandociæ*, containing three species, *Cynthia mytiligera*, *C. solearis*, and *C. cinerea*, was distinguished from the *Cynthiæ Styelæ* solely by the position of the ovary in the intestinal loop. R. Hertwig* has, however, shown that the body which Savigny took for the ovary is really merely a fold of the lining membrane. The *Cynthiæ Pandociæ* may therefore be merged in the *Cynthiæ Styelæ*. The remaining two of Savigny’s tribes, the *Cynthiæ Simplicis*, and *Cynthiæ Styelæ* are natural groups, and as it has been necessary to divide them both into genera, should be retained as subfamilies which may be called *Cynthinæ* and *Styelinæ*.

To these I add a third sub-family, the *Bolteninæ*, representing the old genus *Boltenia*, and including, in addition, a new genus, *Culeolus*, and probably also Macleay’s *Cystingia*.

The following table shows the arrangement of the sub-families and genera of the CYNTHIADÆ.

* Jenaische Zeitschrift, Bd. viii. p. 96.

Microcosmus, Heller.

This genus is distinguished from *Cynthia*, according to Heller,* by the possession of a plain-edged dorsal lamina and a narrow intestinal loop; while in all species of *Cynthia* proper the dorsal lamina is denticulated on the free margin, and the intestine forms a wide loop.

It is undoubtedly convenient to separate the two groups of species, and they form very natural sections of *Cynthia*; but whether the denticulation of the dorsal lamina, and the amount of curvature in the intestine are sufficient characters for the formation of a separate genus is, I think, rather doubtful.

Microcosmus helleri, n.sp.

External appearance.—Shape longish, elliptical, with a projection at the anterior end; posterior end broad and rounded. Attached by a small area at the posterior end of the ventral edge. Branchial aperture at the anterior end of the dorsal edge, terminal, on a large projection, directed anteriorly. Atrial aperture on the dorsal edge, two-thirds of the way down, on a hemispherical projection, not so prominent as the branchial aperture, directed dorsally and posteriorly. Surface wrinkled and rough, but not covered with excrescences; branchial and atrial projections much corrugated and thickened; a few zoophytes, polyzoa, &c., adhering, especially on

* Heller, Untersuchungen über die Tunicaten des Adriatischen und Mittelmeeres, iii. Abth., Wien, 1877, p. 3.

the left side and posterior end. Colour, dull gamboge yellow, with a little reddish-brown at the posterior end and the left side. Length, 8 cm. ; breadth, 4 cm.

Test leathery, rather thin except at the area of attachment and on the siphons. Inner surface white, with a few yellowish-brown patches.

Mantle strongly muscular on the right side and the dorsal part of left, membranous on the ventral part ; musculature strong and regular.

The muscular band at the base of the branchial siphon, and just above the tentacle ring, bears four large bluntly conical processes projecting into the lumen of the tube.

Branchial sac with six folds on each side. The alternate transverse vessels larger than the intermediate ones. Internal longitudinal bars numerous, eight or nine on the folds and about twelve on the interspace, which has six wide and six narrow rows of meshes. The largest meshes have each six to eight stigmata.

Dorsal lamina plain.

Tentacles compound, twenty in number, large and small alternately.

Olfactory tubercle broadly cordate, both horns rolled inwards.

One specimen from Station 188 (between Australia and New Guinea), 28 fathoms.

This species externally is not unlike *Microcosmus polymorphus*, Heller, but differs from it notably in having only six folds in its branchial sac, in the condition of the test, and in having projections on the branchial siphon above the circlet of tentacles.

Microcosmus polymorphus, Heller.*

One large specimen from Station 162 (Bass' Strait), 38 to 40 fathoms.

Microcosmus propinquus, n. sp.

External appearance.—Shape oblong-ovate, or almost triangular, flattened laterally ; anterior end narrow, dorsal and ventral edges

* Heller, *loc. cit.* p. 6.

sloping backwards to the broad and rounded posterior end. Attached by the posterior two-fifths of the ventral edge. Branchial aperture terminal, on a large projection turned ventrally and to the left side; atrial aperture also prominent, on the dorsal edge, three-fourths of the way down, and directed dorsally. Surface wrinkled and minutely grooved, but not covered with excrescences; somewhat corrugated round the apertures, a few foreign bodies adhering. Colour pale yellow, with a reddish-brown tinge here and there. Length, 7·5 cm.; breadth, 5 cm.

Test leathery, tough, rather thin. Inner surface white and glistening.

Mantle strongly muscular on the right side; membranous over the viscera. A narrow membrane projects into the branchial siphon above the tentacular circlet; it is slightly crenated, but does not bear large conical processes as in *M. helleri*.

Branchial sac with seven folds on each side. Internal longitudinal bars numerous; about six on the folds, and the same number on the interspaces. Meshes transversely elongated, containing each about twelve stigmata; generally a fine transverse vessel divides the mesh horizontally.

Dorsal lamina not broad, but rather thick; edge plain.

Endostyle very broad.

Tentacles about twenty in number—six large, six small, and some intermediate very minute ones not present in all the interspaces.

Olfactory tubercle irregularly cordate; both ends turned in.

One specimen from Station 162 (Bass' Strait), 38 to 40 fathoms.

This species is nearly allied to *M. helleri*, from which it differs chiefly in having fourteen folds in its branchial sac instead of twelve, and in the condition of the diaphragm in the branchial siphon.

Cynthia, Savigny.

This genus is used here in the most restricted sense, as proposed by Heller: *—

* Untersuch. u. d. Tun. Adriat. u. Mittelm., iii. Abth. p. 9.

Branchial sac with six folds on each side.	{	Tentacles simply pinnate		<i>C. fissa.</i>
		{	Opening of olfac- tory tubercle lateral; horns much coiled.	<i>C. cerebriformis.</i>
			Opening of olfac- tory tubercle anterior; horns slightly coiled.	<i>C. formosa.</i>
		Tentacles much branched.		<i>C. arenosa.</i>
Branchial sac with seven folds on each side			Languets borne on a broad lamina.	<i>C. irregularis.</i>
„ „ eight „ „			Languets not borne on a lamina.	<i>C. pallida.</i>
„ „ nine „ „				<i>C. hispida.</i>
„ „ eleven „ „				<i>C. complanata.</i>

Cynthia cerebriformis, n. sp.

External appearance.—Shape irregularly pyriform; anterior end wide and bent over greatly to the right side, which is concave, while the left is prominent and convex; posterior end drawn out into a short stalk, tapering to the point of attachment. Apertures not distant, both terminal, at the anterior edge of the right side, slightly projecting, directed to the right and a little anteriorly. Surface sulcated all over so as closely to resemble the convoluted surface of a brain; four large convolutions lead up to each aperture; posterior end and stalk wrinkled, but not sulcated like the rest. Colour dirty yellowish-white, becoming brown on the stalk. Length, 6·5 cm.; breadth, 4·7 cm.

Test thick, very stiff and solid; white on section and on the inner surface.

Mantle very thick; muscular at the anterior end. Branchial siphon short and wide; atrial narrower, but nearly twice as long.

Branchial sac with six folds on each side. Internal longitudinal bars numerous, about nine on a fold, and the same number in the interspace. Meshes occasionally divided by narrow horizontal membranes, and containing each six stigmata.

Dorsal lamina represented by a series of closely-placed stout tapering languets.

Tentacles branched, twenty in number—ten large and ten small placed alternately.

Olfactory tubercle rather large, elliptical in outline, placed with

its transverse axis directed anteriorly and posteriorly, the opening being at the right side; both horns turned in and forming moderately large spirals.

Viscera.—Œsophageal opening very far forwards in the branchial sac.

One specimen from Port Jackson, 6 to 15 fathoms.

Cynthia fissa, n. sp.

External appearance.—Shape ovate, with a deep cleft at the anterior end of the dorsal edge extending nearly half-way down, slightly flattened laterally; attached by the posterior end and nearly the posterior half of the left side. Apertures prominent, at the extremities of the two projections formed by the cleft; branchial projection terminal, atrial on the dorsal edge, fully half-way down, not so long as the branchial. Surface very irregular, much wrinkled and rough; on the right side the chief wrinkles run transversely. Colour yellowish-brown. Length, 2 cm.; breadth, 1.6 cm.

Test strong and stiff; white on the inner surface.

Mantle thick.

Branchial sac with six folds on each side. Six internal longitudinal bars on a fold, and three in the interspace. Meshes containing each six to eight stigmata, and sometimes divided by a narrow horizontal membrane.

Dorsal lamina with tentacular languets.

Tentacles simply pinnate, about twelve in number.

Olfactory tubercle large, irregularly oblong, aperture anterior; both horns turned to the left.

Several specimens adhering to the test of *Microcosmus polymorphus*, from Station 162 (Bass' Strait), 38 to 40 fathoms.

Cynthia formosa, n. sp.

External appearance.—Composed of a spherical body and a narrow stalk. Posterior end of the body rounded, anterior rather flatter; dorsal edge slightly more convex than ventral. Stalk about as long as the body, twisted, narrow, expanding slightly at the lower end where it is attached. Apertures both at the anterior end,

not distant, prominent. Surface smooth on the posterior half of the body; covered with fine silky spines on the anterior half, these increase in size towards the anterior end and culminate in sheaves of long bristles, which surround and hide the apertures. Colour grey. Length of body, 1·5 cm.; breadth, 1·3 cm.; length of stalk, 1·6 cm.

Test thin but tough; semi-transparent on the posterior half of the body.

Mantle thin but muscular; muscle bands forming a close network.

Branchial sac with six folds on each side. Internal longitudinal bars ribbon-like, about eight on a fold and four in the interspaces. Meshes transversely elongated, divided horizontally by three narrow membranes, and containing each nine or ten stigmata.

Dorsal lamina consisting of a series of small closely-placed languets borne on the edge of a broad lamina.

Tentacles large and much branched, about twelve in number.

Olfactory tubercle simple, transversely elliptical, opening anterior, horns turned inwards.

One specimen from Torres Straits, 3 to 11 fathoms.

Cynthia arenosa, n. sp.

External appearance.—Shape irregularly ovate or sub-triangular, elongated transversely, not compressed laterally; posterior end broad and rather flat, anterior narrow; dorsal and ventral edges convex; unattached. Apertures both at the anterior end, inconspicuous, placed close together, cross-slit. Surface entirely covered, with the exception of the siphons, by a close layer of sand grains. Colour grey. Length, 1·5 cm.; breadth, 1 cm.

Test thin, but very stiff on account of the imbedded sand.

Mantle thin, but strong; muscle bands well developed.

Branchial sac with six folds on each side. About five internal longitudinal bars on each fold, and the same number in the interspace. Meshes square, containing each about four stigmata, divided horizontally.

Dorsal lamina formed of a series of small tentacular languets.

Tentacles compound, few, long and short alternately.

Olfactory tubercle simple, rudely cordate in outline, opening anterior, both horns turned inwards.

Several specimens from Station 186 (Torres Straits), 1 to 8 fathoms.

Cynthia irregularis, n. sp.

External appearance.—Shape very irregular. Attached to a fragment of a shell by the right side near the dorsal edge and half-way up from the posterior end. Posterior end small, nearly flat; anterior end broad, deeply cleft between the large divergent siphons, on the extremities of which the apertures are placed. Branchial aperture at the ventral edge of the anterior end, prominent, turned ventrally and a little to the left; atrial aperture at the dorsal edge of the anterior end, not quite so prominent as the branchial, turned dorsally and a little to the left. Surface very uneven, deeply wrinkled, and rather rough. Colour yellow and dark brown. Length, 4.5 cm. ; breadth, 3 cm.

Test thin, except at the posterior end where it is thickened, tough, and opaque; white on section and on the inner surface.

Mantle rather strong and muscular.

Branchial sac with the folds very slight and distant, seven on each side. Internal longitudinal bars numerous, about nine on a fold and eight in the interspace, which has four wide and four narrow rows of meshes. Meshes containing each four stigmata, and often divided by a narrow horizontal membrane.

Dorsal lamina formed of a series of narrow tentacular languets.

Tentacles compound, very small, twelve larger ones with either one or two very minute ones between each pair of these.

Olfactory tubercle very large but irregular; broken up into a number of curved pieces.

One specimen from Port Jackson, 2 to 10 fathoms.

Cynthia pallida, Heller.*

One specimen of this species from Simon's Bay, 10 to 20 fathoms; two from Kandavu, Fiji; and several small specimens from Papeete Harbour, Tahiti, 10 fathoms.

* Beiträge zur nähern Kenntniss der Tunicaten, p. 14, Taf. iii. figs. 17, 18 (Sitzb. d. k. Akad. d. Wiss., lxxvii. Bd., i. Abth., 1878).

The curious spicules mentioned by Heller as occurring in the mantle and branchial sac of this species are present in all the specimens. Smaller ones are also to be observed in the test. Similar spicules occur in a new species of *Cynthia* still to be described.

The specimens from Tahiti may turn out to be a new but closely allied species.

Cynthia hispida, n. sp.

External appearance.—Shape ovate or irregularly circular, flattened laterally, nearly as broad as long; dorsal and ventral edges strongly convex; anterior end broadish, straight. Attached by the rather narrow posterior end. Apertures both at the anterior end, moderately far apart, on short dome-like projections, the ends of which are conspicuously four cleft and covered with strong echinated hairs, which fringe the apertures; branchial directed anteriorly; atrial directed dorsally. Surface more or less wrinkled, and closely covered with a short down of prickly hairs, which occasionally at the posterior end, and most markedly round the apertures, increase in size and form large branched bristles. Colour dull brown, rather lighter round the apertures. Length, 6·6 cm.; breadth, 5·6 cm.

Test not thick, leathery, tough; smooth and glistening on the inner surface.

Mantle thick, musculature very strong and close, especially on the siphons.

Branchial sac with nine folds on each side, the ventral folds, or those next the endostyle on each side, being very slight, and only reaching half-way to the dorsal lamina. The alternate transverse vessels wider than the intermediate ones. Internal longitudinal bars numerous, about twelve on a fold, and the same number in the interspace. Meshes containing each about four stigmata.

Dorsal lamina formed by very small languets.

Tentacles compound, about fourteen in number, and all about the same length.

Olfactory tubercle small, but very prominent, situated on a hemispherical projection, elongated transversely; both horns coiled inwards.

Two specimens from Station 162 (Bass' Straits), 38 to 40 fathoms. The larger specimen has the surface considerably more wrinkled and the apertures more prominent than in the other. Both are attached to the interior of bivalve shells.

Cynthia complanata, n. sp.

External appearance.—Shape elongated, oblong, pointed at the anterior end, flattened laterally; dorsal edge straight or slightly concave, ventral convex; posterior end wider than anterior, but narrow. Attached by the ventral edge of the posterior end. Branchial aperture terminal, quadrangular, tubular, wide; atrial on the dorsal edge one-third of the way down, slightly projecting, also quadrangular and wide. Surface irregular but smooth, slightly creased. Colour dirty white. Length, 5·6 cm.; breadth, 2·7 cm.

Test soft, cartilaginous; varies greatly in thickness; is thin on the anterior half, then becomes thicker, and the posterior third is a solid mass of test substance.

Mantle thin; musculature rather feeble; siphons very wide. Spicules in the mantle like those in *Cynthia pallida*, Heller, but longer and thinner.

Branchial sac with eleven folds on each side. Eight internal longitudinal bars on a fold and four in the interspace. Meshes slightly elongated transversely, containing each about five stigmata, and generally divided horizontally.

Dorsal lamina formed of short blunt membranous languets.

Tentacles branched, nine large and nine small placed alternately, and about eighteen very minute intermediate ones.

Olfactory tubercle.—Outline nearly circular, both horns turned inwards, much coiled.

One specimen from Port Jackson, 6 fathoms.

Styela, Macleay.

This term was proposed by Savigny to denote a tribe of the genus *Cynthia*, and was first, I believe, used as a generic name by Macleay * in 1823.

* Trans. Linn. Soc., vol. xiv,

Styela bythia, n. sp.

External appearance.—Shape between cubical and hemispherical; anterior end broad and obtuse, dorsal and ventral edges sloping backwards and slightly outwards. Attached by a wide posterior end slightly expanded at the margin. Apertures sessile, inconspicuous, four cleft; branchial at the ventral and atrial at the dorsal end of the anterior extremity. Surface of the test flat but rough, especially at the anterior end. Colour dark-brown, paler at the posterior end. Length, 2 cm.; breadth, 1 cm.

Test thick, very stiff, but rather brittle; white on section and on the inner surface.

Mantle reddish-brown, moderately thick, closely united to the test.

Branchial sac with four folds on each side. There is a considerable space on each side between the endostyle and the ventral fold. Internal longitudinal bars extremely numerous and much crumpled. Meshes small, elongated vertically, containing each one or two stigmata, and divided horizontally.

Dorsal lamina in the form of languets.

One specimen from Station 160 (South of Australia); 2600 fathoms.

Styela flava, n. sp.

External appearance.—Shape rudely spherical, slightly elongated laterally; anterior end convex. Attached by the posterior end and half of each side to a piece of coral; dorsal and ventral edges free and rounded. Apertures sessile, 4-lobed, moderately far apart, at the opposite ends of the anterior extremity. Surface of the test flat, but minutely scaly; scales largest and most distinctly marked round the apertures. Colour light yellow, with a brownish tinge at the apertures; white on the area of attachment. Length (antero-posterior), 1.6 cm.; breadth (from side to side), 2.4 cm.; thickness (dorso-ventral), 2 cm.

Test thin, but very tough, opaque; white and glistening on the inner surface.

Mantle rather thin. Muscular bands numerous, but very fine.

Branchial sac with four folds on each side; folds very slight, being merely the approximation of a number of internal longitudinal bars. There are about ten at these places, and ten in the intermediate opener parts. Meshes square or elongated vertically, containing each four stigmata, and divided by a narrow horizontal membrane.

Endostyle conspicuous, rather wide, reddish-brown.

Dorsal lamina ribbed transversely, and slightly toothed at the edge.

Tentacles simple; three sizes—fifteen large, fifteen small, and about thirty very minute ones.

Olfactory tubercle, placed at the bottom (posterior extremity) of a rather deep peritubercular area; small and irregular in shape.

Intestine rather narrow ; loop open.

One specimen from Station 320 (off the coast of Buenos Ayres), 600 fathoms.

Styela oblonga, n. sp.

External appearance.—Shape oblong, erect, broadest in the middle, tapering slightly towards the anterior end and more towards the posterior; anterior end straight, dorsal and ventral edges slightly convex; posterior end by which it is attached narrow. Apertures four-lobed, sessile, placed at the extremities of the anterior end. Surface finely wrinkled and rough on rather more than the anterior half, smoother and slightly encrusted with sand on the posterior part. Colour yellowish-brown, dull on the anterior half, brighter posteriorly. Length, 3·5 cm. ; breadth, 2 cm.

Test not thick, but tough on the upper part; thinner below, except at the posterior end, where it is considerably thickened.

Mantle thin, musculature very delicate.

Branchial sac with four folds on each side, formed, as in the last species, merely by a crowding together of the internal longitudinal bars, six to nine being placed close together, and separated by wide spaces containing only three bars. Meshes elongated vertically, containing each only three stigmata, divided by a narrow horizontal membrane.

Dorsal lamina narrow, much crumpled, neither ribbed nor toothed.

Tentacles simple, rather large, twelve.

Olfactory tubercle rather prominent, cup-shaped; opening anterior, wide.

One specimen from Station 320 (off the coast of Buenos Ayres), 600 fathoms.

This species was probably buried in sand for nearly half its length.

Styela glans, n. sp.

External appearance.—Shape regular, between conical and hemispherical, the highest point at the ventral edge of the anterior

end; posterior end large and flat, attached to a piece of coral; dorsal edge more convex than ventral. Branchial aperture anterior, at the highest part near the ventral edge; atrial on the dorsal edge two-thirds of the way down; both are sessile and inconspicuous. Surface roughish, but regular. Colour dark reddish-brown. Length, 1.5 cm.; breadth, 1.2 cm.

Test not thick but tough, white on the inner surface.

Mantle very thin and membranous.

Branchial sac with four slight folds on each side, about five internal longitudinal bars being crowded together, and the same number placed further apart alternately. Meshes elongated vertically, containing each three stigmata, divided by a narrow horizontal membrane.

Dorsal lamina narrow.

Tentacles simple, few, of a moderate size.

Olfactory tubercle simple, nearly circular in outline.

One specimen from Station 320 (off the coast of Buenos Ayres), 600 fathoms.

Styela squamosa, n. sp.

External appearance.—Shape roughly hemispherical, the anterior end very large and rising somewhat to its ventral extremity; ventral edge nearly straight, dorsal gently convex. Attached by the wide posterior end. Apertures sessile, distant, and inconspicuous; branchial at the ventral end and atrial at the dorsal end of the anterior extremity. Surface smooth but scaly. Colour creamy white, slightly yellow in parts. Length, 2 cm.; breadth, 1.5 cm.

Test thick and solid, but soft.

Mantle very thin, adhering slightly to the test.

Branchial sac with two distinct folds on each side near the dorsal edge, and one or two more indistinct ones ventrally. Internal longitudinal bars numerous. Meshes slightly elongated vertically, containing each four or five stigmata, and divided horizontally.

Dorsal lamina plain; no ribs or teeth.

Tentacles larger and smaller alternately. The larger ones are short and stout.

Olfactory tubercle a simple elliptical tubercle, with no visible markings.

One specimen from Station 160 (South of Australia), 2600 fathoms.

Styela gyrosa, Heller.*

A considerable number of specimens, many of them united into masses and supported by a common stalk, from Port Jackson, 6 fathoms.

Styela grandis, n. sp.

External appearance.—Shape irregularly pyriform, the anterior end being large and somewhat globular, while the posterior narrows into a short thick stalk, by which the animal is attached. Ventral edge straight or slightly concave, dorsal long and strongly convex. Branchial aperture a little to the ventral edge of the anterior end, directed ventrally; atrial on the dorsal edge about one-third of the way down, directed dorsally and slightly anteriorly; both apertures sessile, and not distinctly lobed, but conspicuous. Surface irregular, but not rough, towards the base much corrugated transversely, the rest of the surface more or less seamed and wrinkled. Colour dirty-white, becoming slightly darker towards the base. Length, 9·5 cm.; breadth, 6 cm.

Test thin and soft, but fairly strong.

Mantle very delicate; closely united to the inner surface of the test. Musculature consisting chiefly of a number of fine bundles of fibres running longitudinally.

Branchial sac with four folds on each side, the most dorsal one on each side placed very close to the dorsal lamina. There are three internal longitudinal bars on each side of a fold, and about six in the interspace. The alternate transverse vessels are wider than the intermediate ones. The meshes are immensely elongated transversely, and contain each about twenty stigmata.

Dorsal lamina rather wide and perfectly plain, having no ribs or teeth.

* C. Heller, Untersuchungen über die Tunicaten des Adriatischen und Mittelmeeres, iii. Abth. p. 15, 1877.

Tentacles simple, there are twenty long ones with occasional small intermediate ones.

Olfactory tubercle heart shaped, both horns turned inwards.

Two specimens from Station 150 (south of Kerguelen Island), 150 fathoms.

Styela lactea, n. sp.

External appearance.—Shape nearly rectangular, from oblong to spherical, erect, not compressed; anterior end straight and wide; posterior end straight and nearly as wide; dorsal and ventral edges slightly convex. Attached by the whole of the posterior end. Apertures both anterior, nearly sessile, four cleft; branchial at the ventral edge of the anterior end, directed ventrally; atrial at the dorsal edge of the anterior end, directed anteriorly and dorsally. Surface smooth, but seamed with transverse creases and slight folds, longitudinal ones here and there. Colour creamy white. Length, 4.5 cm.; breadth, 3.5 cm.

Test thick, but soft and flexible, quite opaque.

Mantle closely attached to the test. Musculature fine, longitudinal and transverse bands intersecting at right angles.

Branchial sac with four folds on each side. Internal longitudinal bars rather few; about six on a fold, few and distant in the interspace. Meshes greatly elongated transversely, some of those near the endostyle containing thirty to forty stigmata, they are occasionally divided by a narrow horizontal membrane.

Dorsal lamina plain, no ribs, margin even.

Tentacles filiform, about thirty very long thin ones, with intermediate shorter ones.

Olfactory tubercle large, transversely elliptical; both horns rolled inwards and forming large spiral coils.

Three specimens from Kerguelen Island, 10 to 100 fathoms.

Styela exigua, n. sp.

External appearance.—Shape quadrangular, a little longer than broad, somewhat compressed laterally; anterior end broad and nearly flat; posterior rather narrower and more rounded. Attached

slightly by the posterior end of the left side. Apertures sessile, inconspicuous ; branchial terminal and median ; atrial on the dorsal edge, one-fourth of the way down. Surface even, but partially covered by a thin coating of sand. Colour dirty grey. Length, 1 cm. ; breadth, .8 cm.

Test cartilaginous, thick but soft.

Mantle very thin, closely united to the test.

Branchial sac wide, with four folds on each side. The alternate transverse vessels wider than the intermediate ones. Internal longitudinal bars stout, six on each fold, and only one in the interspace. Meshes transversely elongated, containing each about six stigmata.

Dorsal lamina narrow, margin plain.

Tentacles simple, numerous, long and short alternately.

One specimen from Port Jackson, 2 to 10 fathoms.

Styela convexa, n. sp.

External appearance.—Shape rudely hemispherical or bluntly conical, not flattened ; anterior end and sides convex, posterior end large, attached to a stone and slightly expanded at the edge. Branchial aperture terminal, rather to the ventral side of the middle of the anterior end, but forming its most prominent point ; atrial aperture moderately distant, at the dorsal edge of the anterior end ; both are sessile and inconspicuous. Surface moderately smooth, finely creased in all directions, especially round the apertures. Colour dull yellowish-brown, lighter on the margins of the posterior end. Length, 2 cm. ; breadth (dorso-ventral), 2.6 cm.

Test thin but very tough, white on section.

Mantle closely united to the test, musculature fine but close.

Branchial sac with four folds on each side. About eight internal longitudinal bars on a fold, and the same number in the interspace. Meshes elongated vertically, containing each about three stigmata, and divided by a narrow horizontal membrane.

Dorsal lamina slightly crimped but plain, edge even.

Tentacles simple, stout, rather curled, about thirty in number, and all of much the same length.

Olfactory tubercle simply oval, aperture at the narrower anterior end; horns not coiled, nearly touching.

One specimen from Station 150 (South of Kerguelen Island), 150 fathoms.

Styela clava, n. sp.

External appearance.—Club-shaped, the pyriform body being supported on a stalk of variable length, erect, not compressed; anterior end narrow but generally straight for a short distance, from this the body widens rapidly for the first two-fifths of its length and then narrows more gradually in the remaining three-fifths, the posterior end being prolonged into the stalk, which is generally about equal to the body in length. Apertures at the anterior end, four cleft, more or less projecting, but minute and inconspicuous; branchial at the ventral edge of the anterior end, directed ventrally; atrial at the dorsal edge of the anterior end, more prominent than the branchial, and therefore more anterior, directed anteriorly. Surface very irregular; posterior half of the body and stalk creased longitudinally, anterior half of the body nearly covered by irregularly-shaped but smooth and blunt knobs mostly directed anteriorly: Colour dirty white, with occasionally a slight yellowish tinge. Length (total), about 7 cm.; breadth (at broadest part of head), about 2 cm.

Test tough but thin, and almost papery except on the knobs and processes.

Mantle very delicate and closely united to the test, musculature very feeble.

Branchial sac with four narrow folds on each side. Internal longitudinal bars rather numerous, about nine on a fold and twelve in the interspace. Meshes transversely elongated, containing each six stigmata, and occasionally divided by a narrow horizontal membrane.

Dorsal lamina smooth and plain, no ribs and no teeth.

Tentacles about thirty, rather closely placed, not large, all about the same length, but some rather stouter than others.

Olfactory tubercle transversely elongated, horns simply curled inwards.

Several specimens from Station 233*a* (Kobé, Japan), 8 to 50 fathoms.

Polycarpa, Heller.

This genus is very closely allied to *Styela*. It is convenient, however, to separate them on account of the large number of species in the *Styelinæ*. The chief difference between the two genera is in the condition of the genital glands.

Polycarpa pedata, n. sp.

External appearance.—Irregularly club-shaped, consisting of a long stalk supporting a somewhat globular body produced anteriorly; posterior end broad and rounded, passing rapidly into the narrow stalk which is nearly as long as the body; ventral edge nearly straight, dorsal strongly convex in its posterior half, straight in the

anterior part. Attached by the extremity of the long narrow stalk. Branchial aperture terminal, very prominent, directed anteriorly; atrial on the dorsal edge about half-way down the body, projecting, directed anteriorly and dorsally; both are distinctly four cleft. Surface smooth but grooved and creased somewhat. Colour yellowish-white with a tinge of red on the stalk. Length (total), 10.5 cm.; breadth, 4 cm.

Test thin but tough.

Mantle moderately thick, adhering here and there to the test; musculature close but not strong.

Branchial sac with four folds on each side. Transverse vessels all one size. Internal longitudinal bars numerous. Meshes slightly elongated transversely, containing each five or six stigmata.

Dorsal lamina plain.

Tentacles long, of a brown colour, twenty-five, all one length.

Polycarps large; tentacular endocarps present.

One specimen from Station 212 (Philippine Islands), 10 to 20 fathoms.

Polycarpa irregularis, n. sp.

External appearance.—Shape irregularly oblong, somewhat pyriform, erect, rather compressed laterally. Anterior and posterior ends narrow, middle two-fourths wide, and having the dorsal and ventral edges parallel; ventral edge straight throughout, dorsal sloping in its anterior and posterior fourths, straight in its central two-fourths. Attached by the narrow but irregular posterior end. Branchial aperture terminal, prominent, surrounded by four large lobes and four small ones; atrial on the dorsal edge, rather more than one quarter of the way down, distinct. Surface very irregular, cut up by deep grooves and folds, and partially covered by foreign bodies. Colour dirty yellowish-white. Length, 6 cm.; breadth, 3.5 cm.

Test rather thick, tough; white and glistening on inner surface.

Mantle thin, musculature not strong.

Branchial sac with four folds on each side. Three narrow transverse vessels between each pair of wide ones. About eight internal longitudinal bars on the folds and twelve in the interspace. Meshes transversely elongated and containing each six stigmata.

Dorsal lamina narrow and smooth.

Tentacles linear, rather distant, twenty-four in number, coloured black, some rather smaller than others but not placed alternately.

Olfactory tubercle ovate, but with the narrow end placed posteriorly, much convoluted and marked with black. Intestinal loop wide.

Endocarps numerous, yellow, and rather small.

One specimen from Station 208 (Philippine Islands), 18 fathoms.

Polycarpa sulcata, n. sp.

External appearance.—Shape between ovate and pyramidal, not compressed; anterior end narrow but rounded, posterior end broad and rounded; ventral edge very convex, dorsal convex posteriorly and concave anteriorly. Attached by the posterior end of the ventral edge. Branchial aperture not terminal but twisted round to the dorsal edge, prominent, directed dorsally; atrial on the dorsal edge about half-way down, directed dorsally; both four-lobed, wide and conspicuous. Surface smooth but uneven, cut up by deep creases and folds into rounded pad-like projections. Colour dull creamy-white. Length, 5.5 cm.; breadth, 3.5 cm.

Test thick and tough but soft, not stiff. Inner surface white, with small dark dots over it.

Mantle thin, not adhering to the test, dark brown; musculature not strong.

Branchial sac with four narrow folds on each side. Three narrow transverse vessels between each pair of wide ones. Internal longitudinal bars few. Meshes transversely elongated, containing each about eight stigmata.

Dorsal lamina smooth, very narrow.

Tentacles, twelve, rather large but not very long, distant, with two or three very minute ones between each.

Olfactory tubercle large and irregular, spongy.

Three specimens from Banda, 17 fathoms.

Polycarpa pilella, n. sp.

External appearance.—Shape a little variable but generally spherical or ellipsoidal, occasionally rather pyriform, the posterior

end being narrower ; not compressed, erect ; anterior end wide, convex. Attached by the posterior end. Apertures both at the anterior end, moderately far apart, not conspicuous. Surface entirely covered by a layer of sand. Colour yellowish-brown. Length, 6 mm. ; breadth, 4 mm.

Test thin but strong.

Mantle rather strong, muscular fibres delicate but very numerous, forming a close network.

Branchial sac with four folds on each side. Transverse vessels all equal in size. About eight internal longitudinal bars on the folds and the same number in the interspaces. Meshes vertically elongated, containing each three stigmata.

Dorsal lamina plain.

Tentacles filiform, about twenty large ones, with one or two smaller between each pair.

Olfactory tubercle irregularly horse-shoe shaped, both horns rolled inwards.

About a dozen specimens from Bahia, 7 to 20 fathoms.

Polycarpa tinctor, Quoy and Gaimard.*

About a dozen specimens of this species from Port Jackson, at depths varying from 2 to 15 fathoms.

Polycarpa viridis, n. sp.

External appearance.—Shape more or less pyriform, the anterior end being the broadest, and the posterior forming a short stalk, sometimes more elongated and twisted, by the lower end of which the animal is attached. Both apertures at the anterior end, generally a little to the right side ; branchial terminal, or subterminal ; atrial a short way down the dorsal edge, not distant from branchial ; both four-lobed, sessile, inconspicuous. Surface not uneven but generally more or less covered by animals, sand, shell fragments, &c., adhering to it. Colour dull green, darkest in the neighbourhood of the apertures. Length, 3 cm. ; breadth, 2.5 cm.

Test not thick but tough, rough externally from adhering sand, &c., of a beautiful dark-green colour throughout. Vessels very numerous, anastomosing frequently.

* Voyage de l'Astrolabe, Zoologie, tom. iii. p. 608, pl. xci. figs. 1, 2.

Mantle muscular, united to the test, of a dull green colour.

Branchial sac with four folds on each side. Three small transverse vessels between each pair of large ones. About eight internal longitudinal bars on the folds and four in the interspace. Meshes transversely elongated, containing each nine to twelve stigmata.

Dorsal lamina narrow, not ribbed, margin plain.

Tentacles simple, filiform, crowded, about seventy, long and short alternately.

Olfactory tubercle rudely circular in outline ; left horn coiled outwards, the right inwards.

Polycarps numerous, on the inner surface of the mantle, 1 to 3 mm. in length.

Several specimens from Port Jackson, at depths of 6, 2 to 10, and 6 to 15 fathoms.

Polycarpa radicans, n. sp.

External appearance.—Club-shaped, erect ; consisting of a globular body, supported on a narrow stalk equalling it in length. Anterior end rather broader than posterior, which is continuous with the stalk ; edges convex ; stalk long and narrow, spreading out somewhat at the lower end, where it is attached. Apertures both at the anterior end, sessile, inconspicuous, lobes indistinct ; branchial on the ventral edge of the anterior end, atrial about the centre, and slightly the more anterior of the two. Surface even, slightly sandy. Colour dull greyish-yellow. Length (total), 3·5 cm. ; breadth, 1·7 cm. ; length of body, 2 cm.

Test moderately thick, strong but not stiff.

Mantle closely united to test, thin.

Branchial sac with four folds on each side. Three narrow transverse vessels between each pair of wide ones. Internal longitudinal bars ribbon-like, close and numerous on the folds, few between. Meshes transversely elongated, and containing each six to twelve stigmata.

Dorsal lamina narrow.

Tentacles simple, numerous, about fifty, crowded, of different sizes, but not alternating.

Olfactory tubercle circular, one end turned out and one turned in.

Polycarps well-marked, yellow.

One specimen from Station 163 (off the south-east coast of Australia), 120 fathoms; and one specimen from Port Jackson, 6 fathoms.

Polycarpa molguloides, n. sp.

External appearance.—Shape transversely ovate or sausage-shaped; elongated dorso-ventrally and depressed; attached by the wide posterior end. Apertures distant, both on the anterior end (upper surface), inconspicuous. Surface entirely covered by a thick layer of sand, shells, &c. Colour dark-brown. Length (antero-posterior), 3 cm.; breadth (dorso-ventral), 7 cm.; thickness (lateral), 4 cm.

Test moderately thick, leathery, covered with branched hair-like processes, like these of *Molgula*, to which the sand-grains, &c., are attached.

Mantle closely adhering to the test, thick and rough, musculature feeble.

Branchial sac with four folds on each side. Transverse vessels all of one size. Six internal longitudinal bars on the folds, and four on the interspace. Meshes transversely elongated, containing each twelve stigmata.

Dorsal lamina plain.

Tentacles numerous, crowded, all one length, of a dark-brown colour.

Polycarps only slightly projecting, imbedded in the thick mantle.

Two specimens from Station 162 (Bass' Straits), 38 to 40 fathoms.

Polycarpa rigida, n. sp.

External appearance.—Shape oblong, erect, anterior end pointed, dorsal and ventral edges nearly straight and parallel, posterior end nearly straight, moderately wide; attached by the posterior end. Branchial aperture terminal, projecting; atrial on the dorsal edge, fully one-third of the way down, projecting; both very indistinctly lobed. Surface even, but roughish, and partly covered by foreign bodies. Colour dull greyish-brown, dull yellow round the apertures. Length, 8 cm.; breadth, 3 cm.

Test not very thick, and not tough, but very stiff, like cardboard ; white on section and on the inner surface.

Mantle thin and closely adhering to the test, musculature feeble.

Branchial sac with four folds on each side. Transverse vessels all one size. About twelve internal longitudinal bars on the folds, and six on the interspace. Meshes transversely elongated, and containing twelve stigmata each.

Dorsal lamina narrow, plain ; edge even.

Tentacles simple, close, crowded, stout, about forty, all one length.

Olfactory tubercle oblong, lying in a very large triangular peritubercular area, and directed forwards and to the left.

Polycarps deeply imbedded in the mantle. Intestinal loop very wide.

Two specimens from Station 162 (Bass' Straits), 38 to 40 fathoms.

Polycarpa longisiphonica, n. sp.

External appearance.—Shape oblong or somewhat flask-shaped, erect, posterior end large and rounded, anterior end narrow and pointed. Apparently not attached, or only slightly by the posterior third of the left side. Apertures conspicuous, at the ends of very long siphons ; branchial terminal, directed anteriorly ; atrial on the dorsal edge half-way down, directed dorsally and anteriorly, fully as long as the branchial siphon. Surface covered, except on the siphons, by a fine coating of sand and shell fragments. Colour dark-brown. Length, 7 cm. ; breadth, 4 cm.

Test thin and brittle, but rather stiff.

Mantle thin, closely adhering to the test ; musculature feeble.

Branchial sac with four folds on each side. Every fifth or sixth transverse vessel wider than the intermediate ones, which are all one size. Eight internal longitudinal bars on the folds, and about the same number on the interspace. Meshes square, occasionally divided by a narrow horizontal membrane, containing each four to six stigmata.

Dorsal lamina narrow and plain edged.

Tentacles not very long, rather distant, about eighteen, some shorter than others, but not placed alternately.

Olfactory tubercle circular in outline.

Polycarps numerous and large, yellow.

Three specimens from Port Jackson, 6 to 15 fathoms.

Polycarpa quadrata, n. sp.

External appearance.—Shape oblong or oval, erect, somewhat compressed laterally, both ends broad and rounded, dorsal and ventral edges nearly straight and parallel. Attached by the posterior end. Branchial aperture terminal, sessile, inconspicuous, minute; atrial more than one-third of the way down, on the dorsal edge, also minute and inconspicuous. Surface considerably creased in all directions, especially round the apertures. Colour dirty white. Length, 2 cm.; breadth, 1.6 cm.

Test not thick, tough and strong, but not stiff; white and glistening on the inner surface.

Mantle closely adhering to the test, very thin.

Branchial sac with four slight folds on each side. Internal longitudinal bars very numerous and close in the places where they form the folds. Meshes vertically elongated, usually divided by a narrow horizontal membrane, and containing each one to three stigmata.

Dorsal lamina plain.

Tentacles simple.

Olfactory tubercle ovate, very minute, placed at the posterior end of a deep peritubercular area.

Polycarps few, only three or four on each side. *Endocarps* numerous. Intestinal loop wide.

Three specimens adhering to the spicules of *Labaria hemispherica* from Ki Island, 129 fathoms.

Polycarpa minuta, n. sp.

External appearance.—Dome-shaped or nearly hemispherical; anterior end convex, posterior wide, flattened, attached, slightly expanded at the margin. Apertures both anterior, not distant, sessile but distinct. Surface perfectly smooth and even. Colour pale yellowish-brown. Length, .6 cm.; breadth, .9 cm.

Test thin, but tough and strong.

Mantle closely adhering to the test, very thin,

Branchial sac with four folds on each side. Transverse vessels all of the same size. Internal longitudinal bars very few, there being only two between each pair of folds. Meshes transversely elongated, containing each six to eight stigmata.

Dorsal lamina plain.

Tentacles many, filiform.

One specimen from Station 150 (south of Kerguelen Island), 150 fathoms.

Boltenia elegans, n. sp.

External appearance.—Shape of body quadrangular ovate, not flattened; anterior and posterior ends bluntly rounded, dorsal and ventral edges nearly straight. Peduncle long and thin, wiry, attached to the ventral edge of the anterior end, and turned slightly ventrally. Apertures conspicuous, branchial at the dorsal edge of the anterior end, directed anteriorly and dorsally; atrial on the dorsal edge, two-thirds of the way down, directed dorsally and posteriorly; behind the atrial aperture the dorsal edge sinks in somewhat towards the posterior end. Surface smooth and glistening, marked by a few creases. Colour of the body white, with a satiny lustre; stalk light yellowish-brown. Length of body, 5.5 cm.; breadth of body, 4 cm. Length of stalk, 36 cm.; thickness of stalk, 2 mm.

Test thin but tough.

Mantle strong, musculature regular.

Branchial sac with nine folds on each side, those next the endostyle being closer than the dorsal ones. Transverse vessels wide and distant. Stigmata transverse, running between narrow longitudinal bars which connect the transverse vessels. Internal longitudinal bars narrow but well marked, running at right angles to the transverse stigmata. Stigmata rather long and narrow, about fifteen in each mesh.

Dorsal lamina represented by a series of closely-placed, large, tapering languets.

Tentacles large, branched, sixteen in number, placed long and short alternately.

Olfactory tubercle large and distinct, elongated transversely but directed vertically, the opening being on the right side; both horns coiled inwards.

Two specimens from Station 48 (south of Halifax, N.S.), 51 fathoms.

This species is probably nearer to Savigny's *Boltenia ovifera* than to any other known species, but differs from it in many particulars.

Boltenia legumen, Lesson.*

Station 312 (Straits of Magellan), 10 to 15 fathoms, one specimen.

Station 315 (East of Falkland Islands), 5 to 10 fathoms, eight specimens.

Station 316 (East of Falkland Islands), 4 to 5 fathoms, one specimen.

Boltenia pachydermatina, n. sp.

External appearance.—Shape of body ovate to fusiform, compressed laterally; posterior (upper) end bluntly pointed, anterior end narrow, becoming gradually continuous with the stalk; dorsal edge more convex than ventral. Stalk long, thick, twisted, and creased, rather tapering downwards towards the point of attachment. Apertures conspicuous but not prominent, not distant, placed at the points of junction of the middle with respectively the anterior and posterior thirds of the body. Surface of body smooth but deeply grooved longitudinally, stalk closely wrinkled transversely. Colour of the body dull creamy-white, of the stalk yellowish-brown. Length of body, 10 cm.; breadth, 5 cm.; length of stalk about 20 cm.

Test very thick and stiff, between cartilaginous and coriaceous, tough; white and glistening on the inner surface.

Mantle thin but muscular, slightly adhering to the test.

Branchial sac with about six folds on each side. Internal longitudinal bars numerous, about eight on the folds and six in the interspace. Meshes transversely elongated, containing each about nine stigmata, always divided horizontally by a narrow bar.

Tentacles compound, densely branched, sixteen in number, placed large and small alternately. One tentacle much larger than any of the others.

Olfactory tubercle large, circular, the surface marked with a close and elaborate pattern.

One large and one small specimen from Canterbury, New Zealand.

* *Centurie Zoologique*, p. 149, pl. liii. fig. 1, 1830.

Culeolus, n. gen.

Body more or less ovate, stalked.

Branchial aperture three-lobed.

Atrial aperture bi-lobed.

Branchial sac longitudinally folded, consisting of longitudinal and transverse bars. No stigmata, the fine longitudinal vessels being absent.

Tentacles compound.

This genus is formed for the reception of a remarkable little group of six deep-sea species of stalked Simple Ascidians, which were at the first glance referred to *Boltenia*. They must still be considered as near allies of that genus but they differ from it in several important details of structure.

In addition to the characters in the above description, mention must be made of a system of branched calcareous spicules found

Branchial sac in *Culeolus*.

tr., Large transverse vessel; *tr'*, small transverse vessel; *i.l.*, internal longitudinal bar; *mh.*, mesh; *sp.*, spicula.

in the vessels of the branchial sac, &c., and more or less developed in all the species (see woodcut).

The most remarkable peculiarity of this genus is the structure of the branchial sac. It is merely a skeleton compared with that organ in other Simple Ascidians. The system of fine longitudinal or inter-stigmatic vessels is entirely wanting, so that the large meshes are not broken up into true stigmata. It seems probable from Macleay's description * that the branchial sac of *Cystingia griffithsii* has a similar simple structure.

Culeolus murrayi, n. sp.

External appearance.—Shape of the body irregularly pyriform, anterior end attenuated, ending in the stalk; posterior end blunt and broad, dorsal and ventral edges nearly straight and parallel in their posterior two-thirds, tapering suddenly in the anterior third. Stalk of moderate length, turned towards the branchial aperture. Branchial aperture placed rather on the dorsal side of the anterior end, being under the stalk, which is terminal. Atrial aperture in the middle of the posterior end, and directed posteriorly. Surface very irregular, thrown into deep creases; a belt of close-set minute projections surrounds the atrial opening, cutting off the posterior third by a very irregular line. The rest of the surface is finely granulated, the granulations being larger in the neighbourhood of the apertures. Length of body, 6 cm.; breadth, 4 cm.; length of stalk, 15 cm.

Test moderately thick, tough but soft and flexible; quite opaque.

Mantle adhering to the test, but easily separated, thin; muscle bands strong, but distant.

Branchial sac large and delicate, having six folds on each side, those at the dorsal edge closer and more distinct than those at the ventral, the pair next the endostyle being very slight. Transverse vessels alternately larger and smaller. Internal longitudinal bars wide, four between each pair of folds. Meshes vertically elongated, large. Spicules in the vessels large and branched.

Endostyle conspicuous, white, and very irregular in its course; richly supplied with large and much branched spicules, having a definite arrangement.

* Trans. Linn. Soc., vol. xiv. 1823.

Dorsal lamina represented by a series of large languets placed close together.

Tentacles much branched, of various sizes, some being very large.

Olfactory tubercle small but distinct, crescentic in shape, with the opening on the left side; both horns rolled inwards.

Viscera.—Wall of stomach remarkably folded. Genital masses about twelve in number, united in pairs and placed on the inner side of the mantle on both sides of the endostyle, the majority being on the right side.

Two specimens from Station 241 (Pacific Ocean, east of Japan); 2300 fathoms.

Culeolus wyville-thomsoni, n. sp.

External appearance.—Shape of the body irregularly pyriform or wedge-shaped, the anterior end being narrow, while the posterior is broad and blunt; dorsal and ventral edges sloping irregularly from the broad posterior end to the narrow anterior end, where the stalk is attached. Stalk thin, not long, wiry, running a slight way along the ventral edge from its point of attachment, turned towards the branchial aperture. Branchial aperture a little dorsal to the anterior end, being behind the stalk, directed anteriorly and a little dorsally; atrial aperture in the centre of the posterior end, directed posteriorly. Surface irregular, deeply seamed and raised between the seams into eminences, capped with slight papillæ. Colour pale slaty grey. Length of body, 5 cm.; breadth, 4 cm.; thickness (lateral), 3.5 cm.; length of stalk, 10.5 cm.

Test cartilaginous, thick but soft, not flexible.

Mantle thin; muscle bands strong, but rather distant.

Branchial sac with six folds on each side, diminishing in size from the dorsal to the ventral edge, those next the endostyle being very slight. Transverse vessels of three sizes placed in the following manner:—a large one, three small ones, a middle-sized one, three small ones, and then a large one; thus, any two large ones are separated by a middle-sized one and six small ones. Meshes small, transversely elongated. Spicules smaller and not so much branched as in *Culeolus murrayi*, but more numerous.

Dorsal lamina separated by a series of close-set large languets.

Tentacles about sixteen in number, branched, large and small alternately, but rather irregular in size; the tentacle at or just to the left of the olfactory tubercle is gigantic.

Olfactory tubercle distinct, cordate, opening on the right side, both ends turned in.

One specimen from Station 170 (north of the Kermadec Islands, South Pacific Ocean), 500 fathoms.

Culeolus recumbens, n. sp.

External appearance.—Shape of the body irregularly quadrate, with the angles rounded, both ends blunt; anterior rather narrower than posterior, and posterior rather more convex than anterior; dorsal and ventral edges nearly parallel, tapering slightly anteriorly, dorsal nearly straight, ventral a little convex. Stalk attached at the anterior end, on the ventral side of the branchial aperture from which it turns; it is long, thin, and like a piece of string. Branchial aperture terminal and medium; atrial on the dorsal edge two-thirds of the way down, directed dorsally. Surface even and pretty smooth, here and there slightly granulated, a band of close-set slight projections forming a line cutting off about a fourth at the hinder end, from the atrial apertures dorsally to the edge of the posterior end ventrally. Colour pale yellowish-white. Length of body, 2·5 cm.; breadth, 1·7 cm.; thickness, 1·5 cm.; length of stalk about 14 cm.

Test thin but tough, semi-opaque.

Mantle very thin, closely adhering to test, musculature feeble.

Branchial sac.—Folds very straight. Transverse vessels all the same size. Internal longitudinal bars wide. Meshes large, elongated vertically. Spicules very small but ramifying and numerous.

Dorsal lamina formed by large triangular languets.

Tentacles very long, about twenty-four in number, large and small alternately.

Olfactory tubercle small, ellipsoidal, with no aperture.

Viscera. Three genital glands on each side of cloaca.

Several specimens from Station 146 (between Cape of Good Hope and Kerguelen Island), 1375 fathoms.

Culeolus perlucidum, n. sp.

External appearance.—Shape of body ovate, the anterior end being narrow, while the posterior is round but not very broad; dorsal edge slightly, and ventral edge extremely convex. Stalk long and thin, attached to the anterior end, which tapers into it, turned away from the branchial aperture. Branchial aperture on the dorsal edge about one-fourth of the way down from the stalk; atrial at the dorsal edge of the posterior end, directed dorsally and posteriorly; both apertures prominent. Surface even and nearly smooth, being slightly granulated here and there. Colour light grey. Length of body, 2 cm.; breadth, 1.4 cm.; length of stalk about 11 cm.

Test very thin but tough, quite transparent.

Mantle thin, not adhering to the test, musculature fine but irregular.

Branchial sac very delicate. Transverse vessels wide and narrow alternately. Meshes nearly square. Spicules minute and very few.

Dorsal lamina.—Languets rather close and wide, tapering to a point.

Tentacles numerous; a few rather large, much branched, and a considerable number of small intermediate ones of different sizes.

Viscera.—One large genital gland on each side.

Several specimens from Station 147 (between Cape of Good Hope and Kerguelen Island), 1600 fathoms.

Culeolus suhmi, n. sp.

External appearance.—Shape of body between ovate and wedge-shaped; anterior end narrow, posterior end wide; ventral edge nearly straight, dorsal edge strongly convex. Stalk attached a little on the ventral side of the anterior end and turned towards the branchial aperture, of moderate length, thin. Branchial aperture prominent, terminal, and medium; atrial, on the dorsal edge, fully two-thirds of the way down, directed dorsally and slightly posteriorly. Surface even, granulated all over, and having a band of close-set projections cutting off a third of the body posteriorly and dorsally, being directed obliquely from about half-way down

the dorsal edge to the posterior end of the ventral edge, where it forms a projection. Colour dark-brown. Length of body, 1·5 cm.; breadth, ·9 cm.; length of stalk, 6 cm.

Test thin but stiff, quite opaque.

Mantle very delicate, musculature feeble.

Branchial sac.—Folds slight. Transverse vessels all one size. Internal longitudinal bars wide. Meshes nearly square, usually rather elongated transversely. Spicules large and branched, not very numerous.

Dorsal lamina formed of large blunt languets.

Tentacles branched, sixteen in number, long and short alternately.

One specimen from Station 44 (off the east coast of North America), 1700 fathoms.

Culeolus moseleyi, n. sp.

External appearance.—Shape of body regularly pyriform, anterior end attenuated and produced, being continued into the long thin stalk; posterior end wide and rounded; dorsal and ventral edges similar, convex, the anterior half of each tapering. Stalk turned towards the branchial aperture, which is on the dorsal edge, nearly one-fourth of the way down, and directed dorsally and anteriorly; atrial in the centre of the posterior end, directed posteriorly. Surface even but rough, being equally granulated all over. Colour pale yellow. Stalk marked with a fine reticulation of a brown colour. Length of body, 2 cm.; breadth, 1·2 cm.; length of stalk about 9 cm.

Test rather thick and stiff, quite opaque.

Mantle thin, muscle bands strong, but distant.

Branchial sac.—Folds slight. Transverse vessels all the same size. Internal longitudinal bars wide. Meshes square. Occasional fine transverse and longitudinal bars cross the meshes, but they are rarely seen, and do not extend for any distance. Spicules very large and branched, numerous.

Dorsal lamina. Languets.

Tentacles small, very delicate, with only occasional minute branches.

Olfactory tubercle with the opening turned towards the right side; anterior horn turned outwards, posterior coiled outwards.

One specimen from Station 271 (in the centre of the Pacific Ocean), 2425 fathoms.

These six species of *Culeolus* are all from upwards of 500 fathoms; five of them are from over 1000 fathoms, four from over 1500, and two from upwards of 2000 fathoms. They all belong to the abyssal zone.

In connection with the uniformity of the abyssal fauna, it is interesting to note that these six species, the only deep-water Bolteninæ, all belong to one genus, notwithstanding their wide distribution in space;—one species being from the North Atlantic, two from the Southern Ocean, one from the South Pacific, one from the North Pacific, and one from the centre of the Pacific Ocean on the equator.

Besides *Culeolus*, the only genus in the Cynthiadæ represented at depths of over 500 fathoms is *Styela*. Three species, *S. flava*, *S. oblonga*, and *S. glans*, were obtained from 600 fathoms, and two, *S. bythia*, and *S. squamosa*, from 2600 fathoms; these are perfectly normal members of the large and widely distributed shallow-water genus *Styela*. The great majority of the remaining species described in the present part are from depths of less than 50 fathoms.

2. On the Histology of the Pedicellariæ and the Muscles in *Echinus sphæra*, Forbes. By Patrick Geddes, F.R.S.E., Lecturer on Zoology in the School of Medicine, Edinburgh, and Frank E. Beddard, B.A., Assistant-Demonstrator of Zoology, Oxford.

(*Abstract.*)

This paper contains a detailed account of the structure of the soft parts of the four varieties of Pedicellariæ in this species describes particularly certain new pseudo-skeletal structures, and concludes with a reconciliation of the hitherto contradictory views as to the structure of Echinoderm muscles.