

- Adams (A. Leith), F.R.S. Monograph on the British Fossil Elephants. 4to. *London* 1881. The Author.
- Bowman (F. H.) The Structure of the Cotton Fibre. 8vo. *Manchester* 1881. The Author.
- Brunton (T. Lauder), F.R.S. The Bible and Science. 8vo. *London* 1881. The Author
- Cooke (Josiah Parsons) Chemical and Physical Researches. 8vo. *Cambridge* 1881. The Author, per Professor Williamson, F.R.S.
- Cremona (Luigi) et E. Beltrami. Collectanea Mathematica. In Memoriam Dominici Chelini. 8vo. *Mediolani* 1881. L. Cremona, For. Mem. Royal Society.
- Duncan (P. M.), F.R.S. Cassell's Natural History. Vol. V. 4to. *London* 1881. The Publishers.
- Frederick the Great. Politische Correspondenz. Band VI. 4to. *Berlin* 1881. The Berlin Academy.
- Gill (David) A Determination of the Solar Parallax. 4to. *London* 1881. The Author.
- Moore (F.) The Lepidoptera of Ceylon. Part 3. 4to. *London* 1881. The Government of Ceylon, per the Crown Agents.

December 8, 1881.

THE PRESIDENT in the Chair.

The President announced that he had appointed as Vice-Presidents :—

The Treasurer.  
Sir Risdon Bennett.  
Dr. Hirst.  
Professor Huxley,  
Professor Roscoe.

Dr. Alexander Macalister and Mr. Bernhard Samuelson were admitted into the Society.

The Presents received were laid on the table and thanks ordered for them.

The following Papers were read :—

VOL. XXXIII.

I

- I. "On the Genus *Culeolus*." By W. A. HERDMAN, D.Sc., F.L.S., F.R.S.E., Demonstrator of Zoology in the University of Edinburgh. Communicated by Professor Sir WYVILLE THOMSON, F.R.S. Received November 1, 1881.

(Abstract.)

The genus *Culeolus* has been formed for a series of six new species of pedunculated Simple Ascidians, belonging to the family Cynthiidae, and having several anatomical peculiarities distinguishing them from all hitherto described genera. The nearest ally of *Culeolus* is *Boltenia*, and these two genera have been placed together as a sub-family, the Bolteninæ, characterised as Cynthiidae which have the body pedunculated, the tentacles compound, and the branchial sac with more than four folds on each side.

*Culeolus* is distinguished from *Boltenia* by its remarkable branchial sac (which will be described shortly), and by the external character that its branchial aperture is triangular, and its atrial aperture bilabiate, while in *Boltenia* both apertures are four-lobed.

One of the species, *Culeolus murrayi*, is described in detail—anatomical and histological—while the other five are not so fully treated, but the different systems in each are compared with those of the type, and the modifications are pointed out. The following are a few of the more interesting peculiarities of the genus:—

As regards the test, the disposition of the blood-vessels is the most important feature. In *Culeolus murrayi*, throughout the greater part of the test, blood-vessels are few and feebly developed. In the superficial layer, however, the terminal twigs open into an enormously developed system of globular cavities, separated by extremely thin walls from the external medium, and in direct connexion with the delicate hollow papillæ projecting from the outer surface of the test. The globular cavities and their prolongations, the papillæ, contain masses of blood-corpuscles, and there can be little doubt that the whole system acts, to a certain extent, as an accessory organ of respiration. In another species, *C. wyville-thomsoni*, the vessels are much more developed throughout the thickness of the test, while the number of globular cavities in the superficial layer is very small. The terminal twigs of the vessels, however, are prolonged beyond the general surface in the form of a series of delicate and minute finger-like processes, which, over some parts of the surface, are present in great numbers. These are evidently a modification of the large papillæ of *C. murrayi*, and both are homologous with the long hair-like processes found on the outer surface of the test in most of the Molgulidae.

The branchial sac is the most characteristic organ of the genus, and

is of great morphological interest. As it belongs to the Cynthiad type, it is necessarily so far complicated as to possess a certain number of longitudinal folds on each side, but in all other respects it is the simplest form of branchial sac known among Simple Ascidiæ.

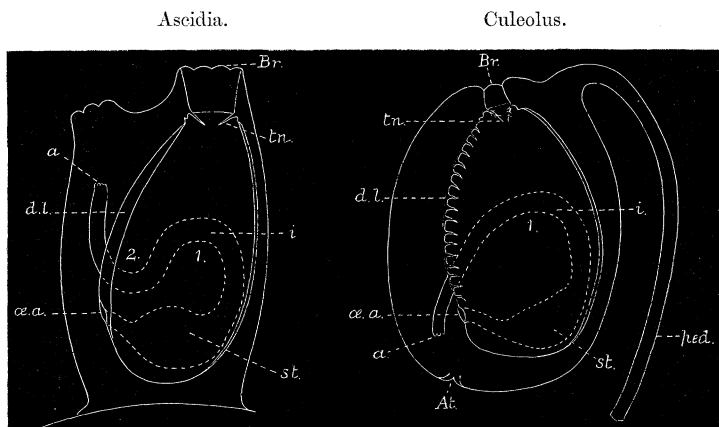
Neglecting for the moment the longitudinal folds, the organ may be described as a simple network, formed by two series of vessels crossing at right angles and communicating at the points of intersection. The two series are the horizontal or transverse vessels, which are sometimes of two or more sizes occurring alternately, and the internal longitudinal bars which run vertically and generally form the strongest part of the network. This is the structure of the branchial sac between two folds in the simplest form, *Culeolus murrayi*, and the great difference between it and the simplest form of branchial sac in the genus *Ascidia* (e.g., *A. cylindracea* or *A. venosa*, where minute longitudinal plication of the sac is not present) lies in the fact that in *Culeolus* no fine longitudinal vessels are present, and consequently the meshes are not broken up into stigmata. In two of the species, however, here and there over the branchial sac, a mesh was found divided more or less irregularly by a delicate longitudinal vessel crossing from one transverse vessel to the adjacent one. These cases were rare, and evidently abnormalities, but they indicate a tendency towards the division of the mesh into stigmata through the development of fine longitudinal vessels. In *Culeolus perlucidus* this process has taken place. Here each mesh is divided into two equal areas by a delicate longitudinal vessel running between the transverse vessels. In this species, consequently, one might correctly describe the branchial sac as having two stigmata in each mesh. Along the free edges of the internal longitudinal bars the epithelium is cubical or low columnar, but never ciliated.

One peculiarity of the branchial sac throughout the genus remains to be mentioned. That is the presence in its vessels of an extensively developed system of calcareous spicules. These are of considerable size, often much ramified, and have a very characteristic appearance from their gentle curves and blunt ends. They vary in size, abundance, and amount of branching according to the species; and are chiefly developed in the internal longitudinal bars, and along the edges of the endostyle.

The dorsal lamina throughout the genus is represented by a series of triangular languets.

The alimentary canal from the œsophageal opening onwards, though differing somewhat in its details in the different species, has in all the same general course. It lies on the left side of the branchial sac, in its posterior half, and nearer to the ventral than the dorsal edge. The œsophageal aperture (*œ.a.*) lies far back in the branchial sac, at the posterior end of the dorsal lamina (*d.l.*) The œsophagus is short, and runs ventrally to open into the large stomach (*s.t.*) which lies

along the ventral edge of the branchial sac. The intestine (*i.*) runs anteriorly from the stomach for a certain distance, and then, turning towards the dorsal region, returns parallel to its first part towards the posterior end, and finally terminates near the posteriorly placed atrial aperture (*At.*).

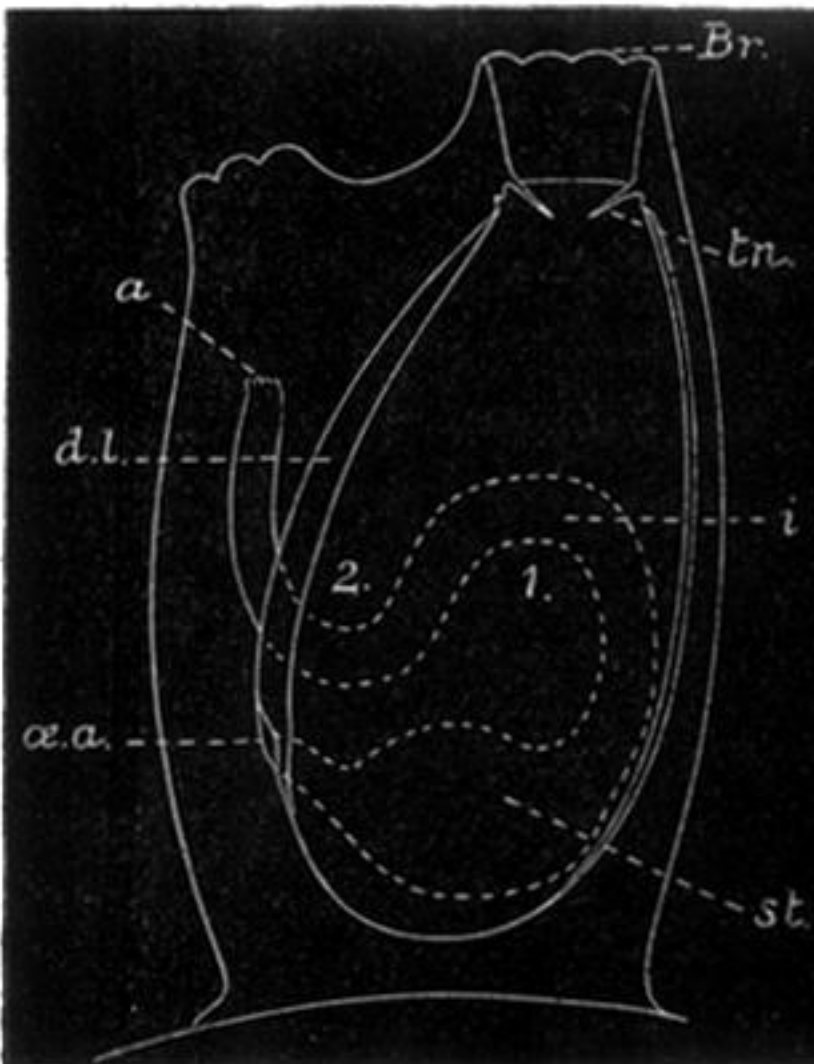


The annexed diagrams show the relation of the course of the intestine in *Culeolus* to the arrangement found in *Ascidia*. The chief difference is that in the latter genus the intestine, after running posteriorly for a short distance, takes a final curve anteriorly, thus making a second loop (2), open anteriorly, which is entirely wanting in *Culeolus*. The cause of the difference is obviously the position of the atrial aperture (*At.*) This lies in *Culeolus* almost at the posterior end of the body, and consequently the last part of the intestine runs posteriorly. In *Ascidia*, on the other hand, the atrial aperture is usually situated near the anterior extremity, therefore the intestine is necessarily twisted forwards again so that it may terminate near the common excretory aperture.

All the species of *Culeolus* are from upwards of 600 fathoms; five are from over 1,000 fathoms, four from over 1,500, and two from upwards of 2,000 fathoms. They all belong to the abyssal fauna.

It is noteworthy 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.

Ascidia.



Culeolus.

