

THE ANATOMY OF THE BRITISH SPECIES OF THE GENUS SOLEN. Pt. II.*

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(Plate viii.)

CIRCULATORY SYSTEM.

The circulatory system of *Solen* presents not a few difficulties. In the following account I have been guided very largely by the valuable work of Menegaux, but the whole system has been subjected to very careful investigation, particularly the venous system.

Venous System.—*Solen ensis*, L. (Pl. viii, fig. 17).

As in all the Pelecypoda, the venous system of *Solen* is very complicated and difficult to make out. There are no defined vessels conveying the venous blood from the tissues, but it finds its way through the lacunous parts of the animal and accumulates in the various sinuses.

Running along the elongated foot is a large canal, the homologue of the posterior pedal sinus of other pelecypoda (*P.S.*). It is nearly median and enclosed by the bundles of longitudinal and transverse muscles, leaving between them, openings by which the blood passes to it from the secondary sinus, the latter being situated dorsally (*A.P.S.*).

The posterior pedal sinus branches at the proximal end of the foot into anterior and posterior divisions, the latter following inferiorly the visceral mass, from which it receives the blood, and describing a curve terminates just opposite the viscero-renal orifices (*V.R.O.*). In the retraction of the foot the orifices open and allow the blood to pass through the kidneys (*K.*). The blood then accumulates in the pallial sinuses (*Pa. S.*), which are situated on the inner surfaces of the mantle lobes near to the line of their dorsal concrescence, and just behind the posterior adductor muscle (*P. A.*). The

* See ante, p. 36.

anterior division of the posterior pedal sinus bifurcates and communicates with the sinus lying over the anterior adductor muscle (*A. A. S.*), this sinus extends posteriorly over the viscera and laterally down the sides of the same.

The sinus of the viscero-parietal ganglion (*V. P. S.*) is situated between the bifurcated parts of the posterior retractor pedis muscle and the posterior adductor muscle, and dorsal to the viscero-parietal ganglion.

The venous system in the mantle does not possess well-walled passes, but being very lacunous and very soft it is capable of receiving an enormous quantity of blood. In its posterior part the venous blood mixes with the arterial, and collects in the pallial sinus. The siphonal tentacles exhibit large lacunae opening directly into the siphonal sinus (*Si. S.*). The afferent branchial vessel (*A. B. V.*) originates from the sinus of the viscero-parietal ganglion (*V. P. S.*). The efferent branchial vessel (*E. B. V.*) conveys the arterial blood to the auricle (*Au.*), opening into it at the posterior end, and as the gills extend a little anterior to this part of the auricle, the vessel has consequently, one portion of it anterior and the other posterior to the point of junction.

Solen siliqua, L., and *Solen marginatus*, Pult. and Don.

There is nothing calling for comment in the venous system of these species.

The Heart.—This is typical of the Pelecypoda, a median fusiform ventricle and lateral triangular auricles.

Arterial System.—*Solen ensis*, L.

Arising from the anterior end of the ventricle is the anterior aorta (*A. Ao.*), it proceeds dorsally over the viscera and shortly gives off an artery which passes to the wall of the pericardium, from there to the sinus of the foot, and then to the kidney. The anterior aorta in its passage forward gives off various hepatic or gastric branches, and on reaching a position dorsal to the mouth it curves in slightly and then descends perpendicularly. At the point of incurving it sends off a branch to the anterior portion of the right lobe of the liver (*A. A. M.*), after leaving this organ, the branch passes over the anterior adductor muscle to the region of the hinge teeth of the shell; its further course has not yet been traced owing to the injury always caused to this part of the animal in its removal from the shell.

During the descent of the anterior aorta, a large artery is given off, the visceral artery (*A. V.*), which vascularises a large portion of the viscera. Two branches of it pass along the caecum of the crystalline style and cover the latter with their fine ramifications. The largest branches, however, pass on to the intestinal folds and terminate there.

The anterior aorta then turns anteriorly, at which point it gives rise to the pedal artery (*P. Ar.*) and later to the labial branches, and a branch to each bifurcated anterior retractor pedis muscle. It then passes underneath the anterior adductor muscle, vascularising this and finally dividing in the mantle into two branches. Menegaux is of opinion that it continues by the circumpallial, although he has not been able to trace the connection very clearly.

The pedal artery (*P. Ar.*) passes to the foot and buries itself in the tissues. It supplies the pedal ganglion, follows the length of the foot dorsal to the anterior pedal sinus, and gives off numerous alternating branches before dividing into two divisions at the extremity of the foot.

Arising from the posterior end of the ventricle is the posterior aorta (*P. Ao.*), which very shortly after leaving the ventricle forms the dilatation known as the bulbus arteriosus (*B. A.*). The latter is separated from the ventricle by a small valve, it is of considerable length, and extends to the posterior adductor muscle (*P. A.*), surrounding the rectum like a sheath and attached to it by small muscular columns.

From the bulbus arteriosus a small artery arises which passes to the dorsal part of the pericardium.

Near the posterior adductor muscle the posterior aorta divides into the two posterior pallial arteries (*P. P. A.*), one going to the right and the other to the left, and both passing underneath the muscle and communicating with the rectal lacunae, these two branches then open into the two pallial sinuses. They further communicate with the tissues surrounding these organs; sinking into the walls, they reach the connected marginal borders of the mantle lobes, passing round these, they enlarge very much and give off on the external surface numerous small branches, not a fused network, and finally return anteriorly to the level of the attachment of the dorsal integument to the shell. Owing to the damage sustained in the removal of the animal from the shell, as mentioned above, it has not yet been possible to trace any connection between the anterior and posterior aortae.

The branches of the posterior aorta are themselves true arteries, but the existence of an endothelium in them has not yet been demonstrated. In all cases these are walled canals exhibiting, laterally, orifices leading to the pallial lacunae. Everywhere in all the arteries of the mantle Menegaux states that he has found this character to exist.

In the Pelecypoda generally the arteries open into the lacunae, but in the visceral mass of the foot these are only fine ramifications,

which have their walls pierced with small holes. In the mantle these are large trunks which form lateral openings. This fact may be explained by the rapid displacement which the blood has to submit to at times. Besides this, in consequence of the respiratory function of the mantle, the blood must spread over as large a surface as possible.

S. siliqua, L.

The arterial system of *S. siliqua* is similar to that of *S. ensis*, and only differs from it in a few minor details which it is unnecessary to enumerate.

S. marginatus Pult and Don.

The arterial system of *S. marginatus* is somewhat different owing to the anterior portion of the animal being shorter than in the species *ensis* and *siliqua*. The anterior aorta is dorsal to the anterior end of the right lobe of the liver, before curving and proceeding in a ventral direction.

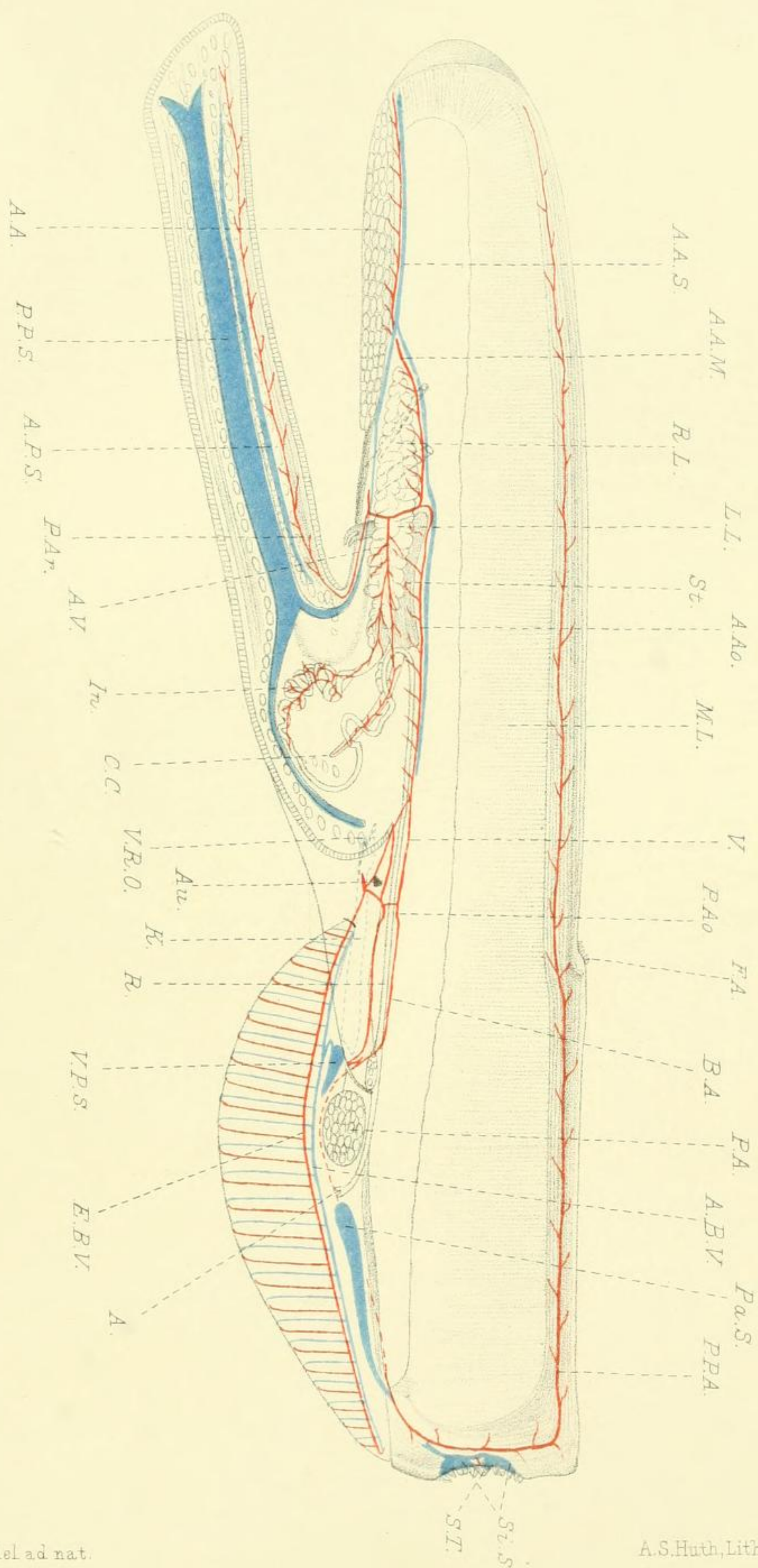
From the pedal artery arises a large branch which also vascularises the viscera and particularly the caecum of the crystalline style. The pedal artery being more superficial forms fewer branches, but at the point of the terminal curve of the intestine it gives off a large lateral branch which passes between the muscular bundles of the distal end of the foot.

EXPLANATION OF PLATE VIII.

Fig. 17. Semi-diagrammatic view of *Solen ensis* from the left side, showing the circulatory system.

REFERENCE LETTERS.

<i>A.</i>	Anus.	<i>M. L.</i>	Mantle lobe.
<i>Au.</i>	Auricle.	<i>P. A.</i>	Posterior adductor muscle.
<i>A. A.</i>	Anterior adductor muscle.	<i>P. Ao.</i>	Posterior aorta.
<i>A. Ao.</i>	Anterior aorta.	<i>P. Ar.</i>	Pedal artery.
<i>A. A. M.</i>	Artery of the Anterior adductor muscle.	<i>P. P. A.</i>	Posterior pallial artery.
<i>A. A. S.</i>	Anterior adductor sinus.	<i>P. P. S.</i>	Posterior pedal sinus.
<i>A. B. V.</i>	Afferent branchial vessel.	<i>Pa. S.</i>	Pallial sinus.
<i>A. P. S.</i>	Anterior pedal sinus.	<i>R.</i>	Rectum.
<i>A. V.</i>	Visceral artery.	<i>R. L.</i>	Right lobe of liver.
<i>B. A.</i>	Bulbus arteriosus.	<i>R. P. A.</i>	Retractor pedis anterior artery.
<i>C. C.</i>	Caecum of crystalline style.	<i>Si. S.</i>	Siphonal sinus.
<i>E. B. V.</i>	Efferent branchial vessel.	<i>St.</i>	Stomach.
<i>F. A.</i>	Fourth aperture.	<i>S. T.</i>	Siphonal tentacles.
<i>In.</i>	Intestine.	<i>V.</i>	Ventricle.
<i>K.</i>	Kidney.	<i>V. P. S.</i>	Viscero-parietal sinus.
<i>L. L.</i>	Left lobe of liver.	<i>V. R. O.</i>	Viscero-renal orifice.



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ANATOMY OF SOLEN.

