

dusae, and upon which the genus was originally based, differ in several important particulars from the forms living on the sea bottom (which I call *Heteralepas*). M. Gravel argues that the characters are adaptive and not of generic significance; yet strangely enough, he adopted the genus *Gymnolepas* Aurivillius, which was based upon one of the medusa parasites, and is really a species of *Alepas* as that genus was originally understood. In this case I am satisfied to have shown clearly the distinctions between the two groups. I have demonstrated that the name *Alepas* belongs to the Medusa parasites. I am content to leave to students of cirripedes the question of whether *Heteralepas* is to be considered of generic value. After all, the conceptions of genera are ever changing. Linnaeus would have called all these creatures „*Lepas*“.

It has given me little pleasure to refute the criticisms of an author to whom all students of cirripedes are deeply indebted. In concluding, I am glad to be able to say that his contention that *Conchoderma* belongs to the lepadine series seems to be well founded. I was probably wrong in placing that group in the Alepadinae.

Philadelphia, July 1910.

## 2. Two cases of abnormal hearts and one of an abnormal Anterior Abdominal vein in the frog.

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(With 3 figures.)

eingeg. 18. Oktober 1910.

The abnormality about to be described was obtained during class-work dissection in this college. It was apparently a normal specimen of an adult male frog (*Rana temporaria*). On removing the ventral part of the pectoral girdle however, it was seen that the heart was in quite an abnormal condition<sup>1</sup>. Instead of being of the usual shape it was a bilobed structure 18 mm long, one lobe of which was situated in the position normally occupied by the front end of the heart and the other ran forward from this inclining to the right, thus coming to lie underneath the hyoid bone and between it and the muscles on the ventral side of the head (Fig. 1). It was not attached in any way to the surrounding tissues, although it had a membranous covering, in all probability the pericardium, and was apparently kept in place by the veins and arteries connected with it. The anterior lobe which was 8,5 mm wide by 8 mm long proved to be the ventricle and from it was given off

<sup>1</sup> This was noticed by Miss Gamgee who kindly handed the specimen to me for examination.

the conus arteriosus. The truncus bifurcated and each branch gave rise to the three arterial arches, but owing to the displacement of the ventricle the direction of the bifurcation was the reverse of the normal. The posterior lobe, 10 mm by 6,5 mm was found to be the two auricles into the left of which opened the pulmonary veins and into the right the sinus venosus. In addition to the moving of the ventricle the sinus venosus was much more posterior than is usually the case and the two pre-caval veins opened into it just behind the auricles. This causes the main trunks of the venous system and arterial system to cross one another in a manner totally different from that in the normal frog but apart from this both systems appeared to be quite normally constituted (Fig. 2).

Dissection showed that the auricles were completely divided but the obliquely running septum appeared to be very thin. The opening

Fig. 1.



Fig. 2.

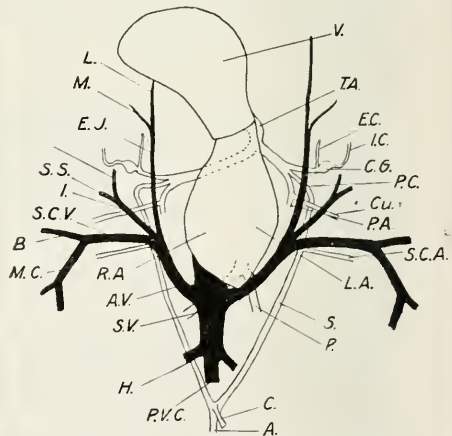


Fig. 1. Photograph of the heart in situ. *L.A.*, Left Auricles; *P.V.C.*, Posterior Vena Cava; *T.A.*, Truncus Arteriosus; *V.*, Ventricle.

Fig. 2. Diagram of the heart and main vessels. *A.*, Aorta; *A.V.*, Anterior Vena Cava; *B.*, Brachial Vein; *C.*, Coeliaco-mesenteric; *C.G.*, Carotid gland; *Cu.*, Cutaneous artery; *E.C.*, External Carotid; *E.J.*, External Jugular; *H.*, Hepatic vein; *I.*, Innominate; *I.C.*, Internal Carotid; *I.J.*, Internal Jugular; *L.*, Lingual vein; *L.A.*, Left Auricle; *M.*, Mandibular vein; *M.C.*, Musculo-Cutaneous; *P.*, Pulmonary vein; *P.A.*, Pulmonary artery; *P.C.*, Pulmo-cutaneous; *P.V.C.*, Posterior Vena cava; *R.A.*, Right Auricle; *S.*, Systemic Arch; *S.C.A.*, Sub Clavian Artery; *S.C.V.*, Sub Clavian Vein; *S.S.* Sub-scapular vein; *S.V.*, Sinus venosus; *T.A.*, Truncus arteriosus; *V.*, Ventricle.

into the ventricle was guarded in the usual manner by an auriculo-ventricular valve with its tendinous threads. The conus also was normal containing a spiral valve and guarded at its base by semi-lunar valves.

It is difficult to account for such an abnormality for there appeared to be no cause why a heart fully adult in most particulars should still remain in its primitive embryonic unflexed condition.

Since the foregoing note was in the hands of the printer another similar abnormality of the heart in the frog was discovered during class work dissection in this college and was kindly handed to me by Dr. Woodland. This specimen was also a full grown male *Rana temporaria* and was normal in other respects except that the anterior abdominal vein opened into the left sub-clavian vein.

The heart was again in a primitive unflexed condition forming a bi-lobed structure 17 mm long, of which the anterior lobe, 9 mm long, was the ventricle and the posterior was the two auricles. It was situated in the median line and was apparently not attached in any way to the surrounding tissues. As the auricles were approximately in a normal position the ventricle was displaced anteriorly and so came to lie between the hyoid bone and the muscles of the throat. The sinus venosus, into which open the three venae cavae, opens into the right auricle and is marked off from it much more distinctly than in the preceding case. The two pulmonary veins open into the left auricle in the usual manner. The arrangement of the arteries is the same as in the previous specimen, so also is the crossing of the arterial and venous systems although this is not quite so marked.

Dissection failed to reveal any further abnormalities in the arrangement of the valves between auricles and ventricle or in the truncus arteriosus (fig. 3).

I have not been able to find any other records of a similar abnormality in the frog's heart and so the foregoing cases are probably unique or at any rate of rare occurrence.

There is also in this second specimen another abnormality in the venous system. The anterior abdominal vein, although formed in the

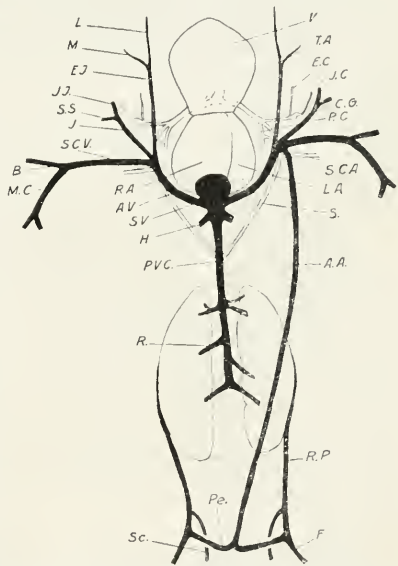


Fig. 3. Diagram of the heart and main vessels in specimen 2. A.A., Anterior Abdominal Vein; F., Femoral Vein; Pe., Pelvic Vein; R., Renal Vein; Sc., Sciatic Vein. Other letters as before.

normal manner by the union of the two pelvic veins, does not enter into the hepatic-portal vein, which is quite normal dividing into two branches one supplying each lobe of the liver, nor is it connected in any way with the liver itself. Instead of so doing it runs forward along the outside of the pericardium and opens into the left sub-clavian vein just at the point where this unites with the innominate and the external jugular veins to form the left pre-caval.

Somewhat similar abnormalities of the anterior abdominal vein have been recorded by Woodland(3) and Buller(1). The former described a case very similar to the one recorded here; the animal was an adult male frog and the anterior abdominal vein, opening into the left sub-clavian had no connection with the hepatic-portal vein or the liver. In the instance recorded by the latter however, the animal was an adult female, in which the anterior abdominal vein opened into the right sub-clavian vein, and also gave off a very slender branch to the liver. Both these writers have called attention to the fact that this abnormal condition recalls that which obtains in *Ceratodus* in which the anterior abdominal vein opens into the right Ductus cuvieri.

These abnormalities appear to be readily explicable in the light of the development of the anterior abdominal vein in the frog as described by Marshall(2). This author states that there are at first a pair of these veins running backwards from the sinus venosus and communicating with the veins of the hind leg. Somewhat later the two anterior abdominal veins unite at their hinder ends in front of the bladder and then the one on the right side disappears leaving only the one on the left. Still later this remaining vein acquires a secondary connection with the hepatic-portal vein and loses its connection with the sinus venosus.

The explanation of these particular cases appears to be that the secondary connection with the hepatic-portal vein has either not been acquired or else it has never replaced the original connection with the sinus venosus. Buller's specimen would appear to suggest also that in this case it was the right anterior abdominal vein that persisted and not the left.

#### Literature.

- 1) Buller, Journ. Anat. and Physiol. vol. XXX. N.S. 1896.
- 2) Marshall, Vertebrate Embryology. London 1893.
- 3) Woodland, Zoologischer Anzeiger. Bd. XXXV. 1910.

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