

	♂. millim.	♀. millim.
Total length.....	228	200
Head .....	28	28
Width of head .....	20	20
Body.....	76	72
Fore limb.....	41	39
Hind limb .....	65	57
Tail .....	114	100

From the Sierra de Uspallata and the desert west of Catamarca.

Differs from *U. torquatus*, to which it is closely allied, in the longer head, shorter digits, and shorter tail.

#### EXPLANATION OF PLATE XV.

- Fig. 1. *Gymnodactylus horridus*, with enlarged view of chin.  
2. *Urostrophus scapulatus* ♀, with upper view of head.

### 3. On the occasional Persistence of the Left Posterior Cardinal Vein in the Frog, with Remarks on the Homologies of the Veins in the Dipnoi. By W. NEWTON PARKER, Ph.D., F.Z.S., Professor of Biology in the University College of South Wales and Monmouthshire.

[Received March 8, 1889.]

According to the recent researches of Hochstetter<sup>1</sup>, the postcaval vein arises in part independently ("Leberabschnitt"), and in part from that portion of one (Amniota) or of both (Amphibia) posterior cardinal veins which receive the venæ renales revehentes ("Urnierenabschnitt"). The part of the cardinals which lies anterior to the kidneys either disappears, or else gives rise to the azygos (and hemiazygos) veins.

In the Salamander, and apparently in most Urodeles, the right and left azygos are present normally, while in the greater number of Anura they disappear entirely in the adult. In *Bombinator*, however, they persist (Götte<sup>2</sup>, Hochstetter), and this is also the case occasionally in *Alytes* and *Discoglossus*<sup>3</sup>.

Howes has recently described an interesting case of the persistence of the left azygos in a female of the Common Frog (*Rana temporaria*)<sup>4</sup>, the vessel being of large calibre and continuous anteriorly with

<sup>1</sup> "Beiträge zur vergl. Anat. u. Entwicklungsgeschichte des Venensystems der Amphibien und Fische," Morphol. Jahrbuch, Bd. xiii. 1887-8. "Ueber die Bildung d. hinteren Hohlvene bei den Säugethieren," Anat. Anz. ii. Jahrg. 1887. "Beiträge zur Entwicklungsgeschichte des Venensystems der Amnioten," Morphol. Jahrbuch, Bd. xiii. 1887-8.

<sup>2</sup> Entwicklungsgeschichte der Unke.

<sup>3</sup> G. B. Howes, "On the Azygos Vein in the Anurous Amphibia," Proc. Zool. Soc. 1888, p. 122.

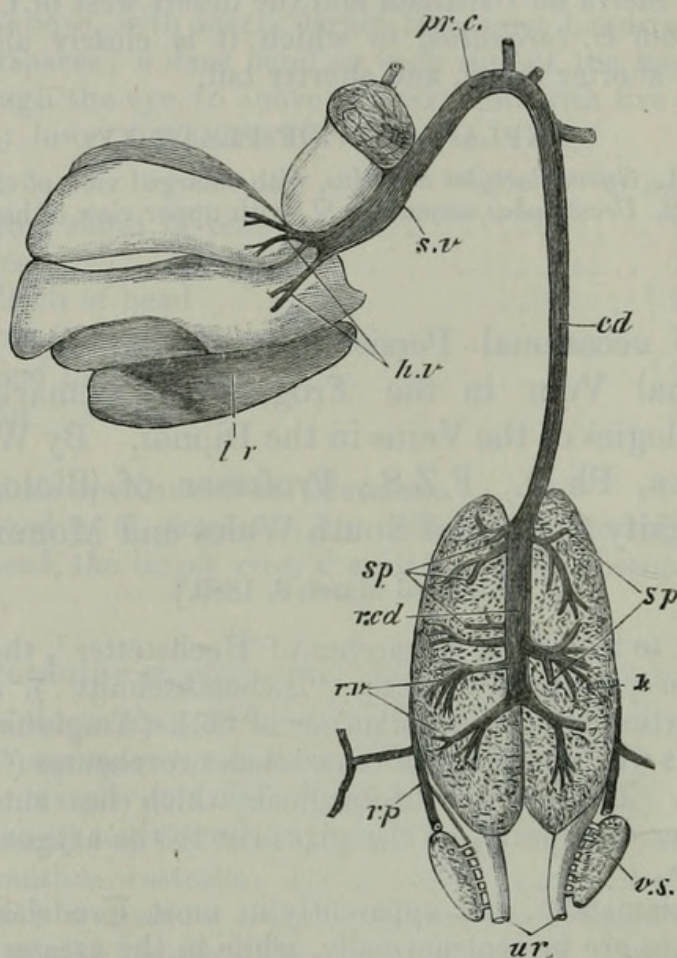
<sup>4</sup> Loc. cit.



the corresponding precaval, while posteriorly it opens into the postcaval just at the anterior border of the kidneys, sending an anastomosing branch to the renal portal. Professor Howes informs me that he has since come across another Frog in which a similar arrangement occurred, except that the azygos here entered the subclavian instead of the precaval.

A week or two ago, while examining a number of specimens of

Fig. 1.



The venous system of an adult male Frog (*Rana temporaria*), in which the left posterior cardinal vein persisted, and the postcaval was absent. From the ventral aspect,  $\times 2$ .

*cd*, left cardinal vein; *h.v*, hepatic veins; *k*, kidney; *lr*, liver; *pr.c*, precaval; *r.cd*, vessel formed by the union of the posterior part of the two cardinals, and which normally gives rise to the inter-renal portion of the postcaval; *r.p*, renal-portal vein; *r.v*, revehent renal veins; *sp*, spermathecae; *s.v*, sinus venosus; *ur*, ureter; *v.s*, vesicula seminalis.

*Rana temporaria* during a class demonstration, I found that in one of them (a male) the embryonic state of the veins was retained to a still greater extent than in the cases quoted above (see fig. 1). A large vein (*cd*), having similar relations to that described and figured by



Howes (except that there was no anastomosis with the renal portal), could be seen opening into what appeared to be the inter-renal portion of the postcaval (*r.cd*). Upon further examination it was found that there was no postcaval trunk extending from this inter-renal vessel to the heart, and the apparent azygos was thus the completely persistent left posterior cardinal. The renal portion of the right cardinal must therefore have fused with its fellow in the usual manner to form the large median vessel, which ordinarily gives rise to the posterior part of the postcaval, while its anterior part disappeared, although the hepatic portion of the postcaval remained undeveloped. The left cardinal, united with the renal portion of the right, had thus to serve as the channel for all the blood from the posterior extremities, &c., except that which entered the liver by the anterior abdominal vein, which had the usual relations. The hepatic veins (*h.v*) opened directly into the sinus venosus. The spermatic vessels (*sp*) were very asymmetrical, as were the ovarian vessels in Howes's specimen.

Hochstetter states that the hepatic portion of the postcaval remains undeveloped exceptionally in the Salamander, in which case either one or the other cardinal becomes correspondingly enlarged. It is known, too, that in Man the lower portion of the left cardinal is occasionally present, and that the postcaval sometimes remains undeveloped, the blood being returned to the heart by a persistent posterior cardinal, in which case the hepatic veins open independently into the right auricle<sup>1</sup>.

It is extremely interesting to find these exceptions to the rule that all air-breathing animals (Amphibia and Amniota) possess a postcaval, and they seem to completely support Hochstetter's views as to the mode of formation of the postcaval.

The observations described and referred to above have helped me considerably in the determination of the homology of the two veins in *Protopterus* which have usually been described as *venæ cavæ posteriores*. At the time when my paper "Zur Anatomie und Physiologie von *Protopterus annectens*"<sup>2</sup>, giving a preliminary account of the work on which I am still engaged, was published, I had made only a very cursory examination of the veins, and this had led me to the conclusion that "das was man bisher bei Dipnoërn als *Venæ cavæ posteriores* bezeichnet hat, sind sicherlich keine solchen, sondern entsprechen den (allerdings einigermaßen modificirten) *Venæ cardinales posteriores*."

Owing to the extreme difficulty in following out the venous system in preserved specimens of *Protopterus*, I have not even yet completely satisfied myself as to the exact relations of all the vessels. But since the above-mentioned paper appeared, I have succeeded in elucidating some important points which were then by no means clear.

Dr. Hochstetter has recently been good enough to make several

<sup>1</sup> Quain's Anatomy, 9th ed. vol. i. pp. 514, 518.

<sup>2</sup> Berichte der naturforschenden Gesellschaft zu Freiburg i. B., IV. Band, 3 Heft. See also 'Nature,' vol. xxxix. 1888, p. 9.



valuable suggestions to me by letter on this subject, for he could not believe that the two so-called "venæ cavæ posteriores" were

Fig. 2.

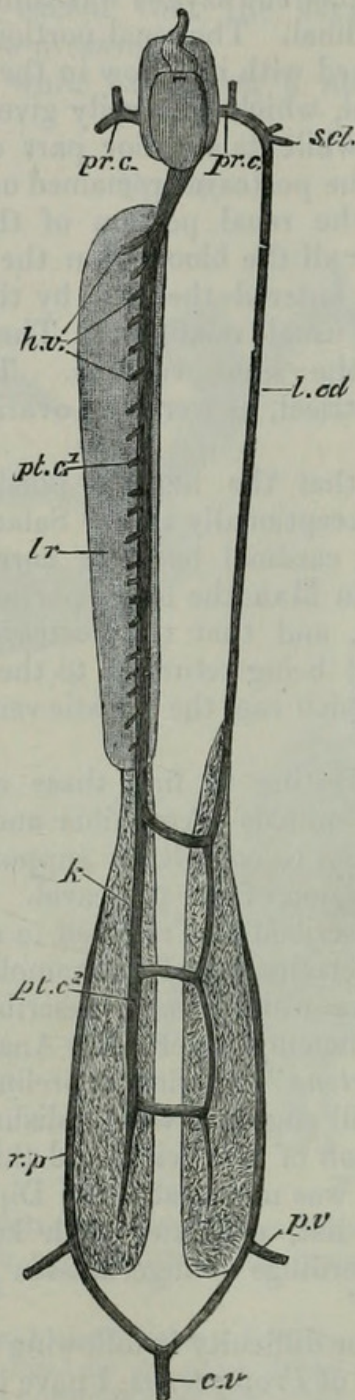


Diagram of the chief veins of *Protopterus annectens*. From the ventral aspect. (N.B.—The veins from the body-walls and generative organs are omitted.)

*c.v*, caudal vein; *h.v*, hepatic veins; *k*, kidney; *l.cd*, left cardinal; *lr*, liver; *pr.c*, precaval; *pt.c¹*, hepatic portion of postcaval; *pt.c²*, renal portion of postcaval; *p.v*, pelvic vein; *r.p*, renal portal vein; *s.cl*, subclavian.

really the cardinals. Although my observations on *Protopterus* do not point to a paired origin of the postcaval, as indicated by



Hochstetter's discovery concerning the paired connection between the cardinals and hepatic veins in certain Elasmobranchs, they confirm his general views as to the development of the postcaval in other types.

My statement concerning the two veins in *Protopterus* which take their origin in the kidneys and also receive blood from the body-walls and generative organs was only partially correct: that is, it was correct so far as the left vessel and the renal portion of the right one are concerned. There can be little doubt that the vein of the left side corresponds entirely with the left posterior cardinal of Fishes (fig. 2, p. 148, *l.cd*). It extends along the ventral surface of the kidney, partially imbedded in the lymphatic tissue which surrounds that organ, and then passes along the dorsal border of the corresponding gonad, between the latter and the lung, to enter the precaval, being packed in by lymphatic tissue all along its course.

The vein of the right side (*pt.c*) is considerably larger than that of the left (*l.cd*), and as it passes along the kidney it is connected with its fellow by three or four transverse anastomoses. A similar asymmetry of the two cardinals is very common amongst Fishes, and there seems often to be a tendency for one or the other to become obliterated, as occurs to a greater or less extent with such remains of them as may persist amongst the Anura and Amniota.

The liver (*lr*) of *Protopterus* abuts closely against the anterior end of the right kidney (*k*), and at this point the right cardinal (*pt.c*<sup>2</sup>) is continuous with a vein (*pt.c*<sup>1</sup>) which passes forwards imbedded in the dorsal border of the liver, from which it emerges anteriorly and turns medianwards so as to extend for a short distance as an independent vessel, which perforates the pericardium in the middle line to enter the sinus venosus. The liver is supported by a net-like peritoneal fold, which is connected with the mesogastrium and is continued on to the vein in its independent portion. This "Hohlvenengekröse" is characterized, according to Hochstetter<sup>1</sup>, as being the bearer of the independently developed portion of the postcaval.

The number and arrangement of the hepatic veins (*h.v*) is rather curious. In several specimens examined there were one or two large ones entering the main vein just before it becomes free from the liver anteriorly, but besides these there are numerous small vessels all along the course of the vein through the liver.

These facts seem to prove conclusively that the right vein described above is a true vena cava inferior, which is made up of the renal section of the right cardinal and of an independently formed hepatic portion. In fact, the figure given by Howes (*loc. cit.*) of the veins of a Frog in which the left azygos persisted resembles very closely the state of things in *Protopterus*, except that the fusion of the renal section of the two cardinals does not take place, but only a reduction of that of the left side, and its connection with what must now be called the renal portion of the postcaval by transverse anastomoses.

<sup>1</sup> "Ueber das Gekröse der hinteren Hohlvene," Anat. Anzeiger, iii. Jahrgang, 1888, p. 965.



I have not been able to find any trace of a right azygos, that is, of the remains of the anterior part of the right cardinal.

The renal-portal veins (*r.p.*) are connected with a single caudal vessel (*c.v.*). They receive a pelvic vein (*p.v.*) on either side as well as the posterior veins from the body-walls and generative organs, the anterior ones passing into the left cardinal and post-caval respectively.

Hyrtl's account of the venous system in *Lepidosiren paradoxa*<sup>1</sup> agrees in many points with the above description, although he regards the left cardinal as a left vena cava posterior. He, however, states that the caudal vein is paired, and that there is a paired azygos running alongside the aorta in addition to the two main veins which he describes as *venæ cavæ posteriores*. It seems unlikely that such an accurate observer as Hyrtl should have been mistaken in his observations, and I can only suppose that if the paired "azygos" is present, it is not a true azygos, but an independently formed vessel, for there can be little doubt that the left "vena cava posterior" is the left cardinal, as its relations are so similar to those seen in *Protopterus*.

A still further modification of the cardinals appears to have taken place in *Ceratodus*. Dr. Günther<sup>2</sup> states that a single large vena cava posterior is present, collecting the blood from the trunk, tail, and abdominal organs, except the lungs and intestine. The position and relations of this vessel are apparently similar to those of the postcaval of *Protopterus*, except that the caudal vein is said to enter it directly. Unfortunately, Günther's figures do not show the entire course of the vessels described, and it is therefore impossible to judge of their exact relations. But as a renal-portal system is present (see pl. xli. fig. 3), and also, as in fig. 2, pl. xli., the "caudal vein" is shown to enter the postcaval from the body-walls by an anterior and posterior factor so far forwards, I cannot help thinking that the vessel described as the caudal may be simply a large vein from the dorsal body-walls, and not the true caudal. I may add that in fig. 3, pl. xli., a median and two lateral veins are shown entering the renal-portal system, and these, although not described, have very similar relations to those of the caudal and two pelvic veins of *Protopterus*. The hepatic veins are numerous, as in *Protopterus*.

In enumerating the vessels which open into the postcaval, Dr. Günther mentions "a very strong vein from the left testicle, which corresponds in situation and function to the main trunk, and might be called a left vena cava posterior; but the currents of blood in the two run in opposite directions, that of the right (main) trunk running towards the head, that of the left towards the tail." According to this description, it appears that the anterior part of the left cardinal has disappeared, and that Günther's left vena cava posterior corresponds to its persistent renal portion, which now appears simply as a factor of the postcaval. If this is the case, we can compare the condition of the postcaval and cardinals to that found in most Anura,

<sup>1</sup> Abhandlungen der böhm. Gesellschaft der Wissenschaften in Prag, 1845.

<sup>2</sup> Description of *Ceratodus*. Phil. Trans. vol. 161 (1871).



except that no actual fusion of the renal portions of the two cardinals takes place. On the other hand, the state of things in *Protopterus* more nearly resembles that seen in Howes's figure<sup>1</sup> of the venous system of a Frog in which the left azygos was retained, as already mentioned.

A more complete description and detailed figures of the venous system of *Protopterus* I reserve until later; I have brought forward the above points in the present connection in order to make clear my former indefinite statement on the subject, and because they seem to me to be important with regard to the question of the homology of the veins throughout the Vertebrata, which is now engaging much attention. The facts I have mentioned are only some out of a great number which go to prove that a near connection must have existed between the ancestors of the Dipnoi and those of the Amphibia after they had diverged from a common piscine type, for the resemblances between the existing forms of both groups are in many respects exceedingly close. Nevertheless, certain points in the structure of the Dipnoi, more especially that of their fins, show that no *direct* relationship can exist between them and the Amphibia at the present day.

4. Notes on some Fishes new to the Australian Fauna. By J. DOUGLAS OGILBY, F.L.S. (Communicated by Dr. F. DAY, F.Z.S.)

[Received February 22, 1889.]

The present paper contains detailed descriptions of three species of fishes new to the Australian subregion, inclusive of Lord Howe Island; these are *Anthias cichlops*, *A. pleurotænia*, and *Scorpaena cookii*, not one of which appears to be well known to naturalists. I also give notes on a species of *Platystethus* from the above-mentioned island, pointing out differences which may prove to be of specific value; but owing to my limited knowledge of the genus I am loath to describe it as new; however, I append a synopsis of the known species for comparison. Finally I give a description, taken from four specimens, of the life-colours of a species of *Chærops*, which I take to be *C. ommopterus*.

ANTHIAS CICHLOPS, Blk.

B. vii. D. 10/16. A. 3/7. V. 1/5. P. 18. C. 15. L. 1. 50.  
L. tr. 6/14<sup>2</sup>.

The length of the head equals the height of the body, and is two ninths of the total length. The diameter of the eye is contained thrice and two fifths in the length of the head; the snout, which is very obtuse, is three fourths of the diameter of the eye, while the interorbital space, which is almost flat, is equal to the same. The

<sup>1</sup> *Loc. supr. cit.*

<sup>2</sup> Counting obliquely backwards from the first dorsal spine.



Parker, W Newton. 1889. "On the occasional Persistence of the Left Posterior Cardinal Vein in the Frog, with Remarks on the Homologies of the Veins in the Dipnoi." *Proceedings of the Zoological Society of London* 1889, 145–151.

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