

XXVI.—On *Ancylus oblongus* and *A. fluviatilis*.

By WILLIAM CLARK, Esq.

*To the Editors of the Annals of Natural History.*

GENTLEMEN,

Norfolk Crescent, Bath, March 1855.

I PRESENT an account of two very interesting members of the subaquatic pulmoniferous family of the *Limneadæ*, the *Ancylus oblongus*, often termed "*A. lacustris*" or *Velletia lacustris*, and the *A. fluviatilis*, which have heretofore caused some difficulty with respect to their relations with each other and to natural position, and even now excite attention; but I believe these animals have been brought to a pretty safe anchorage by the Rev. M. J. Berkeley. I have in some of our scientific publications read his observations on one or both (?) these species, but they have escaped my memory, and I have not at present the means of reference; the ground therefore is almost new to me, with this advantage, that whatever errors I may commit, will be corrected by consulting that eminent naturalist's notes; and perhaps my comparison of the two animals with each other, and with the *Limneadæ*, may offer some new points of view, both as regards their internal anatomy and external aspects, and the generic considerations connected with natural position. I have been tempted to enter on this memoir in consequence of the extraordinary abundance, at Exmouth in 1854, of both these species, and one of the standards of comparison, the *Limneus pereger*.

No genus has received greater changes of position than *Ancylus*; the only two British species have even been consigned to separate genera, the *Velletia lacustris* and *A. fluviatilis*,—a most unfortunate dismemberance, as the organs of both are all but identical. The animals have been pronounced at one time Pectinibranchiates, at another Cervicobranchiates, and agreeably to the surmises of conchologists have been passed to and fro, from their most ancient site as Cyclobranchiates, to *Haliotis*, *Crepidula*, &c. The zoologists who have assigned them a natural location are Mr. Berkeley, Dr. Gray, and M. de Férussac: as to the Rev. L. Guilding, whom M. Deshayes quotes as a dominant authority, his account of the animal of *Ancylus* is very incorrect.

As I consider *Ancylus* more in harmony with the Limneadan type *L. pereger* than either *Physa* and *Planorbis*, I should have preferred depositing it as a section of that genus, but I fear the present race of malacologists are not prepared for so decided a measure. I have adopted the *A. oblongus*, the *Velletia*, nonnull., from having given it a close examination, and as being the dextrorsal species, for the type of the genus *Ancylus*, and the

standard of comparison with the *A. fluviatilis* and *Limneus pereger*.

*Ancylus oblongus*, Brit. Moll. vol. iv. p. 188. pl. 122. fig. 5.

*Ancylus lacustris*, auct.

*Velletia lacustris*, nonnull.

*Shell* an elongated, subdepressed, laterally compressed, coarsely wrinkled light horn-coloured cone, with a posterior somewhat horizontal vertex.

*Animal* pale yellow drab, aspersed with dark lead- or cloud-coloured minute points varying in intensity ;—we have thus at the outset the characteristic colouring of the Limneadan tribe.

Though the shell is of similar character with the *A. fluviatilis*, the organs instead of being heterostrophe as in that species are dextrorsal.

The mantle is even with the margin of the shell and bounded by a frosted line, within which are three irregular, somewhat distant, peripheral cordons of minute, hyaline white, comma-shaped fillets, the whole having the aspect of a spangled fringe : this, and the form of the shell-cone, are the nearest approaches to *Patella*, with which genus it has generally been associated by the older authors. The head is flat and broad, springing from a short thick neck, and forming a rather elongated hood or veil, emarginate in the centre, so as to appear bilobed, having the edges finely crenate : there are no head or neck lappets, but there is a medial rib terminating in a small limited erect flap at the anterior point of the head, beneath which is the crosial puckered buccal orifice leading to a palate of two soft fleshy lobes rounded in front and pointed behind ; between these a tolerably long tongue, with the rachis garnished by extremely close-set fine wiry laminæ, that incline posteriorly like the strands of a feather, and pass through the œsophagus into the stomach.

The two tentacula are contractile, short, flat, subtriangularly tapering to a rounded termination, very divergent, with large eyes in front at their bases, with rather an internal inclination. The foot is a narrow elongated oval disk, rounded at both ends, and has a very limited locomotion.

The œsophageal collar or brain consists of two principal and other smaller ganglia in close contiguity, which throw off the usual nervous threads, and on each side of them are the pale yellow subrotund lobular salivary glands. The muscular system exhibits no peculiarity, distributing to every part of the body the necessary strands, and displaying their interlacements at all angles and planes.

The stomach is white, submedially transversely contracted,

and divided by a depressed line which gives a bilobed aspect ; it is ridged externally at the cardia, and within is furnished with muscular fillets ; the intestine is simple throughout, and on leaving the pylorus winds to the dexter side, terminating just within the respiratory cavity. The liver is a large pale greenish-yellow granular mass, deposited below the muscle around the upper part of the cone.

The sac of viscosity is in close union with the pericardium, inclining to the left of the dorsal region, the canal of which from its minuteness escaped our research, but it doubtless is concurrent with the intestine and rectum. The heart and auricle, of pale yellow, are at the bottom of the left side of the respiratory vault. The ovary at the apex of the spire, of a yellowish-white colour, is attached to the hindermost lobe of the liver, and presents the figure of a subrotund granular mass or minute bunch of grapes, having a slender twisted or sinuated white oviduct that enters the matrix at its lowest point. The very small bladder is white, sometimes pale blue, elongated or flask-shaped ; it floats by its long canal between the testicle and matrix, and probably pours its contents into the latter, but the extreme minuteness of the parts did not permit us to verify that point. The testicle is a large granular mass, and can be seen through the mantle, lying on the dorsal region posterior to the heart and auricle, partially united to the lower portion of the matrix, which is of very irregular diameter ; the *vas deferens* is easily traced to the termination of the verge.

The verge is under the right tentaculum and is retractile : we have seen it in every phase : in the genial season it is large, fleshy and subcylindrical. The orifice of the matrix is very considerably below it, close to the valve of respiration. It is difficult to conceive how such a constituted animal should be mistaken for a Pectinibranchiate, unless, as is mentioned below, the packet of parasites has passed for branchial filaments. The mantellar collar, which is more or less an attribute of all the Pulmonifera, is in the *Ancyli* a slender cord, plain on the left side, but forms at the respiratory cavity a rather elongated narrow expansion or fillet, which we have often seen the animal elevate for respiration, or to eject the fæcal rouleaus : when the organ of respiration is opened, the network does not appear greatly developed : the artery, vein, and the descending aorta could not be verified. The heart and auricle are with difficulty observed in the pericardium.

The above observations show that this animal is a true Limneadan : we do not pretend that they are without error, for it is extremely difficult to separate and define the exact position and precise form of the organs of so minute a creature.

We hope to prove that the next species, the sinistrorsal *A. fluviatilis*, is an undoubted *congener* of our present animal, and that both will be acknowledged to have every essential character of the *Limnei*.

The reproduction of the *Ancyli*, and *Limneadæ* in general, is that of the *Helicidæ*, a congressional hermaphroditism, though differing in some curious particulars. Our dredger has repeatedly verified in this species the recorded accounts of the singular androgenous concatenations of this family when under the genial influences,—another proof of their race, from habitudes, independent of animal structure.

This species abounds at Exmouth on aquatic plants. I have never seen it on stones, as is generally the case with *A. fluviatilis*. The animal at this season (July) is infested with fourteen to twenty or more of a species of *Gordius* or *Filaria*, which are slender, cylindrical, and very vivacious, blunt or rounded at both extremities; they fix themselves between the mantle and the body around the pedicle of the foot, and are in constant vibration,—so much so, that a novice might mistake them for branchial filaments. One would suppose that such a colony of vigorous parasites must greatly annoy the “*bénéficiaire* :” I have examined 100, and all had this retinue.

*Ancylus fluviatilis*, auct.

The *shell* presents a more elevated and regular cone than that of the *Ancylus oblongus*, and when cleansed from its ferruginous coat, is of a clear, very light, delicate horn-colour, and adorned with fine close-set raised striæ that diverge from the apex to the periphery of the aperture; the vertex is posterior.

The *animal* is so generically similar to the preceding species, that it will not be necessary to do more than to present a comparative view of their organs.

This species is sinistrorsal, but that is a mere accidental condition involving only a transposition of the organs. The principal variation as regards the shell is its more circular figure, and in respect of the animal, the foot is shorter and broader, the result of the less elongated cone; otherwise it is of similar shape and rounded at both ends; the colours only differ in being of a more quiet drab, speckled with white points, instead of the pale golden-yellow hue and minute lead-coloured lines or dots that prevail in the *A. oblongus*.

The head, hood, veil, and buccal apparatus of the two, scarcely vary, beyond the crosial orifice of the latter organ in this animal being more rayed and finely puckered, within which is a similar palate of two fleshy lobes rounded in front and pointed behind; from thence a rather shorter and broader tongue passes through

the œsophagus to the stomach; the œsophagus is inserted a little on one side of the cardia, and when withdrawn by force presents a bluish-white, bulbous, minutely perforated termination. The configuration of the stomach is nearly the same in both species; it is ridged externally at the cardia, and at one-third of its length from thence becomes slightly constricted, and then expands into a subglobose or bursiform sphere oblate at the pyloric axis; in the interior it is furnished with muscular raised fillets, and is usually filled with a white pulp; the duodenum and intestine make about a fold and a half in the liver, terminating as rectum close to the respiratory cavity; these organs are of a pale brown colour, finely circularly striated, and when placed in extension are less than half an inch long; they have no twists, cæca, or inflations; the stomach is of a brownish-gray; the liver is dark brown, and more granular than in the last species. The tentacula and eyes scarcely differ: in this, the mantle is plain, and without the comma-shaped points of the *A. oblongus*. The verge is white, long, large, fleshy, subcylindrical, retractile, issuing under the left tentaculum; the orifice of the matrix is quite as distant from it as in its congener, being close to the respiratory vault, and accompanied by a minute vesica. The mantellar collar is a gently inflated cord, expanding on the right and left hand, according as the condition is dextrorsal or sinistrorsal, into a small, oval, flat fillet, which the animal elevates when it respire or evolves the rejectamenta. In both, the rectum and canal of the viscous lobe debouche in close connexion with the respiratory cavity, which is situated about one-third from the posterior end, so that the interval of separation between the matrix and verge is nearly at opposite extremities. The pulmoniferous cavity displays, though only with high powers, the heart, auricle, and principal veins, as in its fellow. The lobular salivary glands, and the brain, of two principal and smaller ganglia, differ but slightly; here the nervous masses are more concentrated. All these points, with those not mentioned, as the ovary, testis, *vas deferens*, are so essentially alike, as to render distinction only amenable to very insignificant specialties.

If we compare our *Ancyli* with one of the principal Limneadan types, the *L. pereger*, we shall find the generalities substantially the same; and in respect of the specialties, the stomach of the '*pereger*' is more contracted and taper at the cardia, with the constriction lower, and the intestine more than proportionately longer. The mantellar collar is also more firmly pronounced, in consequence of the shape of the aperture. As to other external variations, the head may be flatter, the tentacula broader and more membranaceous, and the shell of a greater or

less extended spire. The salivary glands are conspicuous, and the nervous masses of the brain, as in *Ancylus*, consist of larger and smaller ganglia. The muscular structure of the *Limneadæ* offers no points for particular remark.

Some naturalists, as already stated, have removed from *Ancylus* the *A. oblongus*, their *Velletia lacustris*, on the grounds of generic considerations; we think our present notes will dissipate these views. They adduce as an argument for distinction, independently of structural contour, that the woof or histology of the lingual riband is very different in the two. We do not dispute this point, but consider it of no importance except as a specialty, and observe, that if such variations are to be regarded as the elements of generic composition, we feel confident that naturalists who adopt them will involve their generic states in inextricable confusion. We have examined the lingual ribands of many species, and found singular discrepancies, not only in the species of a genus, but in the same species, that have convinced us of the unfitness of such bases for generic dispositions. It may be admitted that the dentition of the Vertebrata has been of use, especially in fossil cases, as generic aids, but there is little analogy between it and the tongues of the Gasteropoda.

In the many *Rissoæ* we have examined, we have found the persistent frame of the riband, independent of the *uncini* and other accessories, vary. We believe the same may be said of the other Gasteropodan groups; at the same time we do not deny that some of them show a rough similarity of conformation, but it is unsatisfactory, and inapplicable for stable and decisive generic determination.

The late Professor Forbes at one time thought favourably of M. Lovén's views, and sent me a copy of the Swedish pamphlet, requesting my opinion of the value of the gasteropodan lingual riband. After a laborious and painful examination, in consequence of the minuteness of the Rissoidean ribands, I replied, that I did not think the employment of the tongue of the Gasteropoda, as a means of a new generic distribution, would be attended with valid results, and that I was bound to say, I greatly feared, if adopted, it would prove a source of much confusion and unnatural determination. Professor Forbes, in reply, informed me that, in consequence of a severe attack of fever, he could not for a week or two make any comments on my communication, and the subject was never afterwards renewed.

Though the learned Professor, in his excellent 'British Mollusca,' has frequently mentioned the lingual ribands, I believe he never considered them as likely to become the accre-

dited bases of generic construction, for it is apparent throughout his descriptive notes that almost every species of each genus not only varies in its accessorial garniture, but also often in its fundamental structure. The only instance in which he speaks with anything like impression on the gasteropodan tongues, is on the transference of the minute *Murices* to his *Conidæ*. Yet, strange to say, though he admits that they, his *Mangelia*, have the vital organs of the *Murices*, he removes them from their legitimate station as species of that genus to one different, both as regards the structure of the shell and animal,—to the *Convolutidæ*, on the ground of their dentition approaching that of the Cones. But even here there is error, as some of the tongues of his *Mangelia* are of muricidal type. Notwithstanding our deference, we think that this great zoologist has *here* failed to define the true limits of generic composition.

To attempt a classification on such elements will assuredly induce deplorable results, by the disseverance of groups and families that are now indissolubly united by nature through the identity of every essential organ. The dispersion consequent on such a proceeding cannot fail to dislocate, more or less, every genus, and consign its species to a false malacological position. We need go no further than our present memoir to prove the fallacy of the lingual riband test, which has split our *Ancyli* into two genera, *Ancylus* and *Velletia*, the tongues of which differ materially in composition, whilst every other organ pronounces them congeneric and of true Limneadan extraction.

We ask, then, can zoologists for a moment put into competition the essential consentaneity of all the important organs of the *Ancyli*, excepting the details of the lingual riband, and contend that the variations in its fabric ought to swamp an identical concatenation of every other source of vitality, and entitle it to become the dictator of natural position? The supporters of such a doctrine might with more reason have adopted the variations of the nervous ganglia, or of any other organ, for the basis of a new scheme of generic arrangement, instead of the very worst and most fallacious: and even if there were any value in their view, it cannot be used, from the difficulty, in a thousand instances, of being put into practice: then why make the attempt, when we have other means of easier and more sure application,—the comparison of the united organs and physiological states of the different animals? We think that the tongue of the Gasteropoda will never exercise a greater influence than as a specialty of excessive variableness.

The habitat of this species greatly differs from *A. oblongus* in being rarely attached to aquatic plants, and then only in deep, slow rivers, whilst its congener is never fixed to stones. At

Exmouth and its vicinity every brook abounds with these creatures, adhering like limpets to pebbles, and encrusted with a ferruginous deposit from the waters. It is difficult to conceive how they can with safety come to the surface to breathe pure air, as in winter and spring during the freshes, and even in summer, the gentlest current would probably drive such light and delicate animals down the stream, and cause them to perish if they ventured to quit their moorings; they must therefore of necessity remain at anchor under the influence of a *Patella*-like adhesion, unless they have the power, when they wish to breathe pure air, of veering out a filamentary cable, by which they can withdraw again after respiration to their original site; or, that they, and all the *Limnei*, though pulmoniferous, can, from some peculiarity of the respiratory organs, extract, for an almost indefinite time, sufficient vital fluid for aëration. These alternatives are not, perhaps, very improbable hypotheses, but at present we cannot determine which of them may solve the difficulty.

The animal, though its habitat is so different, is infested by the same parasites as the *A. oblongus*. We sum up and conclude with the single remark, that both our British *Ancyli* are congeneric, and have essentially similar organs as all the *Limneadae*.

I am, Gentlemen,

Your most obedient servant,

WILLIAM CLARK.

XXVII.—On Actinophrys Sol. By E. CLAPARÈDE.

[Concluded from p. 217.]

I ASCERTAINED nothing new with regard to the mode of propagation of *Actinophrys*. I have never witnessed decided instances of conjugation, but have often observed circumstances which indicated either a division or a conjugation. One instance of actual division has however occurred to me. Kölliker, Cohn, and Stein have mentioned perfect conjugations. Perty also refers to a similar phænomenon in his *Actinophrys brevipilis* (*brevicirrhis*?), and even mentions a mutual conjugation of seven individuals of *A. Eichhornii*. Stein also speaks of the conjugation of several individuals of his *A. oculata*, and states that he has found seven individuals in conjugation. It does not however appear probable, from the words he employs, that he saw these seven individuals separate, and it appears to me that we