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XXIII.—On some undescribed Animals of the British *Rissoæ*.
By WILLIAM CLARK, Esq.

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

GENTLEMEN,

Norfolk Crescent, Bath, Sept. 1852.

IT is stated in the 'Annals,' N.S. vol. viii. p. 48, that I had examined some unrecorded animals of the British *Rissoæ*, and when the minutes were reduced I would communicate the result; I now fulfil that engagement; and to show that an account of these minute species is considered a desideratum, I need only quote the learned authors of the 'British Mollusca,' who, speaking of the *Rissoa striatula*, remark, "The animal of this, as of too many other *Rissoæ*, is yet unknown." The following observations were taken in 1851, but in the present summer I have reviewed, at Exmouth, the several species alluded to, and added some new ones; I may therefore speak with increased confidence of their descriptive accuracy as far as regards the external organs, but I apprehend that a correct anatomy of such minute creatures is a vain expectation; we must therefore rely on analogy, for at least the general characters of their interior organization.

It is necessary to mention that the almost microscopic organs of these diminutive species require the aid of good glasses to see their true forms and attributes; the present descriptions are the result of the organs being viewed through Coddington lenses of as high powers as were consistent with distinctness: inferior means give false appearances, and are often the cause of discrepancies between observers of the same animal.

Rissoa striata, Montagu.

Animal inhabiting a white shell of 5-6 rather tumid, semiplicated, spirally striated volutions; it is hyaline white in most parts; an exception is the upper and under surface of the rostrum and buccal fissure, which are of a sordid light red brown. Mantle even with the shell, except that a minute cirrhal filament, very difficult to be seen, issues from it at the upper angle of the aperture, as in the type *R. parva*, in which it is never absent.

The head is a long flat muzzle deeply grooved above and below, with minute lappets on the upper surface near its termination, and on the march is carried a little in advance of the foot: the tentacula are moderately long, divergent, strong but flattened, very little setose; they do not attenuate to points like the type, but are of the same breadth throughout, and of opaque

snow-white; in progression they are extended considerably beyond the head: the eyes are conspicuously black, and placed on minute scarcely projecting external offsets. The foot is truncate in front, grooved so as to form a labium, and slightly auricled; it is altogether stronger than in *R. parva*, and like it rarely extends to the limit of the body volution, and terminates posteriorly in a moderately pointed lanceolate shape; there is very slight trace of a longitudinal line in the centre of the sole; the operculigerous lobe has the margins laterally so lax and disunited as to form wings, which, on the march, at the will of the animal, continually change their appearance; on it, near the junction of the foot with the body, is the light horny oval operculum of three spires, the two first minute and scarcely traceable; the last enlarges rapidly, and shows distinct striæ of growth. There is no caudal cirrus on the opercular lobe, which is nearly coextensive with the main foot, and so pointed as to appear like one, and in some specimens is unequally emarginate at the sides.

The animal is not shy, and marches with vivacity; it has been remarked that it is disproportionately small for the shell, and the tentacula very short; I do not think our southern examples confirm this view: it inhabits all the districts. The records of this common species are so scanty, that it may almost be looked on as undescribed.

Rissoa semistriata, Montagu.

The animal occupies a shell of six moderately convex volutions, each partially striated, the middle portions being smooth. Its colour is nearly white, with the palest tinge of yellow. The mantle is even with the shell, except a short minute filament that is protruded by the animal from the portion which lines the upper angle of the aperture, like that I have mentioned in the *Rissoa parva* above, and in the *R. ulva*, in the 'Annals,' N.S. vol. vi. p. 33. The head is a short muzzle, not so long as in the type, but similarly grooved in the centre above, and cloven at the extremity and below. The tentacula are flattish, rather long, divergent, frosted, pale yellow or white, with the tips slightly clavate; the eyes are on gently raised prominences at the external bases. The foot is nearly the shape of the type, contracted in the middle, pointed behind, and sometimes emarginate, but it is proportionately longer, larger, and thicker; there is no groove or longitudinal line on the sole; the upper lobe anteaally expands into narrow white wings, and terminates behind with three caudal processes, whereof the middle is the longest, and writing of it to Professor Forbes I termed it a bashaw of three tails; it carries the light corneous suboval oper-

culum at some distance from the end of the foot, but the two first turns of the spire are nearly obsolete; the third occupies the greater portion of the plate, and is well marked with oblique lines of growth.

I have lately examined many lively specimens, and can confirm the fact of the operculigerous lobe terminating in three filaments, as well as the presence of the short mantellar process that is produced and retracted, at the will of the animal, from the upper angle of the aperture. What are the functions of this organ is doubtful; it has not the aspect nor is in the position of a reproductive element; it has more the resemblance of a tentacular instrument; but in some *Rissoæ* it acquires an imperfect tubular appearance, as in the *Chemnitzia*, in which, particularly *Ch. acuta*, it seems to perform the office of the branchial siphon of the *Canalifera*. I believe that this appendage has scarcely been noticed by authors; it appears to exist in many of the *Rissoæ*, but if in all is doubtful; it has no connexion with the operculigerous lobe, or its wings or caudal cirrhi, but is a strictly mantellar process. The animal is free, unusually rapid on the march, inhabits all the zones, and has not before been observed.

Rissoa costata, Montagu.

Animal inhabiting an elaborately sculptured, costated, spirally striated, basally ridged pale yellow shell of 5-6 rounded volutions, hyaline white, except the large black eyes and pale red buccal disk. Head a long proboscoidiform muzzle finely corrugated in quietude, cloven vertically at the orifice as in *R. parva*, but showing more partially than in that species the corneous jaws and buccal apparatus. The mantle is plain and even. The tentacula are long, flat, not filiform, rather thick at the base, tapering gradually to a rounded extremity; they are not setose: the large eyes are fixed on prominences at the external angles. The foot at rest is short, on the march it extends to the middle of the antepenultimate volution; it is labiated in front, but not auricled, constricted above instead of in the middle, as is more usual in *Rissoa*, and then expands and tapers to a narrowish attenuated rounded termination. The operculigerous lobe dilates into subcircular lateral alæ, bearing close at the junction of the foot with the body, a suboval corneous faintly spiral operculum with the turns rapidly increasing, as in the paucispiral *Littorinæ* and typical *Rissoæ*. It has a distinct caudal cirrhus.

Malacologists, from the curious sculpture and entire flat striated broad margin of the peristome of the shell, have thought that this hitherto unrecorded animal would display singular features; that is not the case; it is a very simple creature, and

scarcely differs from the *R. parva*, except in having the tips of the tentacula rather flatter, more rounded, and in the different position of the constriction of the foot. The animal is active, marches up a glass with uncommon rapidity, and displays a freedom beyond the usual habits of the tribe. It is found in all the zones.

Some live examples of this species having occurred, I add to the above account, that the front part of the foot is marked with an intense snow-white flake of the figure of the letter V, visible in consequence of its transparency above and below; I have also to remark, that the anterior terminal line of the foot is unusually deeply incised, so as to form two labia; the lower, or that of the sole, at the centre part, on the march is produced much beyond the upper lip. I have never before seen this feature so extensively developed in any *Rissoa*.

And lastly, I state, that I failed to detect satisfactorily the small pendent process in the mantle at the aperture, which is so conspicuous in *R. parva* and *R. semistriata*; yet it may exist: I had the same difficulty in *R. striata*, but afterwards I saw it in several examples.

Rissoa reticulata, Montagu.

Rissoa Beanii, nonnull.

Rissoa sculpta, nonnull.

The animal occupies a spiral, cancellated, pale yellow or brown shell of 5-6 tumid volutions; its ground colour is yellowish white. Mantle even with the shell, except the filamentary process at the angle of the aperture. Head proboscidiiform, furnished with the usual cloven disk and buccal appendages; the rostrum near its termination at the upper surface appears to have attached to it two very small similar shields, one on each side, independent of the terminal minute subcircular flat lobes. The tentacula are compressed, slender, rather long, rounded at the extremities, not setose; the eyes are at the external angles, on short light yellow or orange pedicles. Foot subrotund, scarcely auricled, but grooved in front sufficiently to form a shallow labium, slightly constricted anteriorly, at one-third the length, gently tapering to a rather obtuse lanceolate but not emarginate termination; the operculum is carried on an upper plain moderately alated lobe, at nearly the point of the junction of the foot with the body; it is pyriform, with indistinct rapidly increasing paucispiral gyrations; the terminal part of the lobe, like the *R. semistriata*, is furnished with three blunt, cylindrical, short cirrhi, and occasionally one of the sides of the main foot is emarginate. The branchial plume is composed of 12-15 single, pale yellow, short strands, which are visible when the neck is greatly

exserted. The animal is active and freely shows its points. Common in the coralline zone, but rather rare alive.

This is the true *Turbo reticulatus* of Montagu; it is, however, subject to considerable variation of the contour and quality of the cancellations, which have led to the fabrication of some spurious articles.

This species has not before been described. The specific appellation of '*reticulata*' must be substituted for '*Beanii*;'—a complimentary term ought not to take the place of the long-accredited and not doubtful one of the admirable Montagu.

Rissoa punctura, Montagu.

This species has been confounded with the preceding, but having met with many live specimens, it will be seen that Montagu has properly distinguished it. The animal is lively and freely shows its organs, and in this instance I have it in my power to effect a concentrated description; it is in every respect identical with the *R. reticulata*, with the exception of a particular-seated and constant variation of colour; the operculigerous lobe is a very pale muddy reddish brown, but it is marked, on each side close to the junction of the foot with the body, with an irregular rather large dark smoke-coloured stripe, which is invariably wanting in *R. reticulata*.

Though differences of colour are not generally to be received as good specific characters, yet, when we see certain markings in an animal in a particular position, which are always absent in one that resembles it in almost every other point, we are entitled to consider them as fair specific differences; and in this case distinctness is corroborated by a considerable variation in the contour of the two shells, the *R. punctura* being much smaller, with more rounded and less tumid volutions, as well as having the sutures more deeply impressed than in the *R. reticulata*.

Since these observations I have taken many of this and the preceding species, and in the present animal have always found the dark lead-coloured marks on the operculigerous lobe, with the addition under the neck, near the eyes, of a small red dot; but these particulars are absent in the *R. reticulata*, the same parts being pure white. Both inhabit the coralline zone, and at Exmouth the *R. reticulata* is strictly confined to a coralline area, whilst the *R. punctura* occupies the interstitial grounds of that district, in muddy patches, mixed with comminuted shelly spoil. I cannot doubt the distinctness of the two.

Rissoa soluta, Brit. Moll.

The animal occupies a simply elegant minutely spirally striated almost microscopic pale yellow shell of 3-4 rounded volu-

tions. The mantle does not extend beyond the aperture. The colour is hyaline white with a trifling exception. Head proboscidiiform, having its terminal pale red disk vertically cloven, in which the buccal organs are distinctly visible. The tentacula are moderately long, rounded at the tips, very pilose, the setæ springing from them horizontally, but only visible with high powers; eyes at the external angles on small scarcely raised pale sulphur-coloured eminences. Foot subtruncate, slightly auricled, labiated or grooved antecally, and long and narrow. Operculigerous lobe small and not much alated; no caudal cirrus was detected; the light corneous operculum is suborbicular and paucispiral, fixed nearly at the extremity of the foot. The animal is exceedingly vivacious and free, marching up a glass with singular rapidity. It is very abundant alive in the coralline zone, in 14 fathoms water, off Budleigh Salterton, Devon.

Rissoa proxima, Brit. Moll.

The animal inhabits a thin sordid white shell of four rounded, deeply separated, rather oblique volutions, which are, particularly the body one, closely but superficially spirally striated; the caducity of the striæ renders this species very liable to become glabrous from attrition. The general colour of the external organs is a brilliant subhyaline white, but, though aspersed with minute opaque snow flakes, the transparency is scarcely impaired. The mantle is even, and does not emit a process from the portion that lines the upper angle of the aperture. The head when quiescent is a short subcylindrical rostrum, quite smooth and rounded at the termination; it is not tunicated, lobed, grooved, nor vertically cloven on the upper part, and on the lower area it forms a disk, which has not a distinct vertical fissure as in *R. parva*, but shows a fine crosial incision, which is the alimentary orifice, and within it are probably the corneous jaws and buccal apparatus, but I could not detect them, perhaps from being of the hyaline colour of the rostrum, which is so pellucid as to allow the intenser white canal or œsophagus leading to the stomach to be seen through the walls.

When the animal is on the march it often suddenly evolves the rostrum to double its usual length, at the same time expanding the termination into a large disk or finely dentated flattened rose, which it throws back on the margin of the upper point of the aperture, and then as quickly withdraws the extension to its usual limits; whether this curious manœuvre is part of the animal œconomy, or of the nature of that which is sometimes seen in the typical *Rissoæ* when disturbed, I cannot determine until more specimens are observed; at present, I think the action peculiar to this species.

The tentacula are flat, strong, rather short, flake-white, smooth, gently attenuating and becoming minutely claviform at the tips, which are each clothed with six comparatively long, intensely aciculate setæ; the eyes are unusually large, black, and fixed on minute demi-semicircular lateral excrescences at the external bases, and are so amalgamated with them as scarcely to present a prominence. The foot is a curious organ, being large, fleshy, anteriorly grooved, so as to form a slight labium, deeply indented in the centre, and produced into large, long, arcuated, pointed auricles; posteaally it becomes divided into two long, distinct tails or streamers, nearly coextensive with the shell in its axial admeasurement; close to the bifurcation is a small opercular lobe without a caudal cirrhus, on which is fixed a beautiful white horny suboval operculum of 4-5 spires; the two or three first are small and concentrated, the last suddenly enlarges and closes the aperture, and is marked with delicate oblique striæ of growth. The neck when greatly protruded is blotched at the sides and on the top with a claret-coloured red: these marks and the eyes also, when not exerted, are conspicuous through the tenuity of the shell.

This rare animal, of which I have taken seven live examples, dwells in a muddy-bottomed shelly district of the coralline zone in Exmouth Bay, eight miles from shore, in 15 fathoms water.

This species has occasioned a difference of opinion; some naturalists have thought it distinct, others have considered it the Montaguan *R. vitrea* in a perfect condition, and looked on his shell as a specimen denuded of its striæ by attrition; they say that many of the so-called *R. vitrea* of the cabinets, when placed under the microscope, exhibit traces of the striæ of the '*proxima*': in this fact they are probably correct, because these smooth examples may really be that species; but they are wrong in their conclusions that it is Montagu's shell, as will appear by the discovery of a perfect specimen and lively animal of a species, which, I think, whatever doubts may still exist, must now be considered the "smooth shell" of that author, long known as the *Turbo vitreus*, and which has not the slightest traces of spiral striæ. The present difficulty has arisen from Montagu's description either suiting a worn '*proxima*,' or the shell I propose to regard as the '*vitrea*.' If I had not made the present capture, I should, like others, have judged the two to be different conditions of the same species; but in the next article I think it will appear that even the shells of the '*proxima*' and '*vitrea*' exhibit a slight but constant variation, and that the animals are very distinct.

August 14.—I have just taken another lively example of this species, and I need only remark, that the peculiar gait above mentioned was less apparent than in the animal already de-

scribed; I therefore am inclined to consider it of that nature which may be observed in the *Rissoæ*, when in creeping they arrive at the level of the water, and commence exerting and retracting with rapidity the buccal apparatus.

In the animal just discovered the curious tails of the foot were well developed, the angle of separation being about that of the fore and middle finger of the hand when placed as far apart as possible. In all the animals I have observed I never met with a similar termination of the main foot.

Rissoa vitrea, Montagu.

The animal occupies a pale yellow essentially smooth shell of $4\frac{1}{2}$ tumid, though less rounded and more taper volutions, with shallower sutures than the *R. proxima*. The general colour of the animal is very pale dirty white. The mantle does not protrude beyond the aperture. The head or rostrum is subcylindrical, double the length of the '*proxima*,' invested with a tunic to near its extremity, grooved above, emarginate at the end, forming two minute, flat, symmetrical, arcuated, terminal lobes, vertically cloven beneath as in *R. parva*; the colour on both surfaces is a moderately suffused pink, through which the buccal apparatus is visible; and when the neck is much exerted it will appear coloured with pale pink hues. The tentacula are flat, much longer than in the '*proxima*,' but not clavate like it at the tips; they have however the same fine sharp setæ at the extremities; the eyes are at the centre of the bases of the tentacula, not raised, nor half the size of those of its congener. The foot is truncate in front, very slightly labiated, with unusually short obtuse auricles; not bifurcated posteriorly, but has an entire somewhat taper and rounded termination not extending beyond the second volution: the operculum is fixed on a simple lobe scarcely distinguishable from the upper part of the foot; it is rather more circular than in the last species, but, though paucispiral, the turns are less distinct, the oblique striæ of increment coarser, and the colour instead of being clear white is a dull yellow. All this is different in the '*proxima*.'

The examples now described are the only two that have occurred of this rare animal; it and the '*proxima*' were placed in the same glass, and being lively I had good opportunities for comparison; the animals are organically different, but I think the '*proxima*' is a greater departure from the rissoidean type than the '*vitrea*'; still it will probably remain with the *Rissoæ*, though some of the specialties are on the verge of generic deviation. In the remarks on these species I fear that conciseness is neglected, but the confusion in which they have long been enveloped must be the

apology, as without the present close examination, the doubts of their identity or distinctness would still have remained, and the slight though constant difference of contour in the two would by many be considered accidental.

It may be useful to the shell collector, to the younger student, and as a memorandum of the remaining desiderata of this genus, to offer a few short remarks on all the British *Rissoa* not enumerated above. The *Rissoa parva*, the type, has been described in the 5th volume of the 'Annals,' N. S. p. 359; I have there mentioned that the *R. rufilabris*, *R. costulata*, and *R. interrupta* are varieties of the type, to which I believe I may add the *R. labiosa*. The *R. inconspicua* has been spoken of by Mr. Alder in the 'British Mollusca;' I will therefore only say, that having examined the animals of numerous specimens of its varieties, I find no marked variation; they all have the lead-coloured stripes on the alæ and sides of the foot. I have also stated in the 'Annals,' N. S. vol. vi. p. 33, that I thought it a coralline zone variety of *R. parva*; I withdraw that opinion, as I am satisfied of its distinctness. The animal of the elaborately sculptured *R. striatula*, the most elegant of the *Rissoa*, if it be one, still escapes observation. I have this summer taken some delicate specimens in the coralline district, and yet hope to see the inhabitant.

The *R. lactea* of Michaud I do not know, but from the figure in 'Brit. Moll.' I should have judged it a variety of the *R. reticulata*, one of the large, short, tumid shells, and would have said the same of the *R. abyssicola*, if it had not been considered distinct by Professor Forbes. The *R. crenulata* is the well-known *Turbo cimex*, as the *R. calathus* is the old '*calathiscus*' of authors: neither of the animals are recorded. The *R. Zetlandica* is a well-established northern species, but the inhabitant is unknown. The *R. rubra* is very common alive in certain localities; I have never seen the animal, and can scarcely believe it to be a true *Rissoa*, as the semitestaceous operculum and its apophysis are more like those of a *Chemnitzia*.

An account of the *R. cingilla* has appeared in the 'British Mollusca.' The *R. pulcherrima*, nonnull., is a dwarf, nearly ribless *R. inconspicua*, which is one of the most variable species in form, size and markings. In comparison, care must be taken not to examine what is called an adult *R. pulcherrima* with a young '*inconspicua*' of the same size, but of larger growth, as it may lead to false ideas of distinctness; adult shells, of whatever growth, and in like manner, young shells, must be compared together, as the aperture in the two conditions is very different, there being in the young ones always a subangularity, but in those with completed peristomes it is nearly orbicular. The

R. littorea, Delle Chiaje, is an apocryphal British species; and the so-called *R. eximia* is an undoubted *Chemnitzia* allied to *C. excavata*; I have described the shell, the animal being undiscovered, under the title of *C. Barleei*. The *R. ulvæ* and its varieties have appeared in the 'Annals,' N. S. vol. v. p. 358. I cannot speak of the *R. anatina* and *R. ventrosa*, not having met with them alive. The account of the animal of *R. fulgida* is published in the 'British Mollusca' from my notes; it differs much in the proportionate dimensions of its organs, but there is no sufficient generic variation to remove it from this genus. At Exmouth it is abundant on the algæ of the half-tide littoral levels. The *Turbo subumbilicatus* of Montagu is still in obscurity; it is perhaps a variety of one of the species of the estuaries, and if it could be identified, its position would probably be in this genus. I mention the *Jeffreysia diaphana* and *J. opalina*, because they have recently been styled *Rissoæ*; they appear from several characters to form the passage to the *Chemnitzia*. I think I have now named every *Rissoa*.

I conclude this still imperfect monograph by calling on the naturalists of this branch of science to make it more complete, by searching in their respective localities after the animals which continue to elude our view; as without the inhabitants of shells, the essential part of this portion of nature is hidden from us. Conchology as a science is little better than the toy of the shell-fancier; we can only admit that these persistent forms, independent of the animal, are useful as objects of comparison with some of the antediluvian relics of our globe, as they prove that nature, at least a part of it, existed in the palæozoic epochs as at the present time.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

XXIV.—On keeping Marine Animals and Plants alive in unchanged Sea-water. By P. H. Gosse, A.L.S.

To the Editors of the Annals of Natural History.

GENTLEMEN,

IN a recent Number of 'Chambers' Edinburgh Journal' (July 1852) a paper has just been pointed out to me, on maintaining the balance between animal and vegetable life in an aquarium. Mr. Warington, whose experiments are there alluded to, has