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XXXVIII.—*Observations on the Genus* Polycera *of Cuvier, with Descriptions of two new British Species.* By Joshua Alder, Esq.

[With a Plate.]

In consequence of the small number and rarity of the species constituting the genus *Polycera* of Cuvier, its characters and limits are at present very imperfectly understood. I shall, therefore, make no apology in bringing under the notice of naturalists two or three species belonging or allied to this pretty genus, which have lately occurred to me on the coast of Northumberland, near Tynemouth and Cullercoates, in the hope that the more detailed descriptions and figures which I shall be able to give, from having examined the animals in a living state, may furnish materials for estimating the value of those characters on which a generic distinction ought to be founded.

Cuvier describes the genus as having the branchial plumes accompanied by a pair of membranous lamellæ capable of covering and defending the branchiæ in cases of danger*. Though the number of these appendages is stated by Cuvier to be two, it seems doubtful whether the character of the genus should be thus limited. Rang, who had the opportunity of examining some exotic species, does not confine his generic character to that number, but merely says in his description of the branchiæ, that "quelques appendices membraneux les environnent." Without giving any opinion in this matter, it will suit my convenience on the present occasion to adopt the latter and more enlarged view of the characters of the genus, for the purpose of including in it two new species about to be described, which, though they differ in some other respects from the typical form, I feel reluctant in the present imperfect state of our knowledge to raise to the rank of genera. They constitute, however, two very marked divisions, the characters of which may probably afterwards be found of sufficient value to constitute generic distinctions. Until lately the only known British species of this genus was the *Doris flava* of Montagu, to which Dr. Fleming has added, with some doubt, the anomalous *Doris pennigera* of the same author. Neither of these species appear to have been recognized by later observers. Very recently the indefatigable researches of Mr. Thompson of Belfast have brought to light two other British species of this genus, (if, indeed, one of them be not

* The use here attributed to these appendages appears to be in part, at least, imaginary. Such an use is not and cannot be made of them by some of the species; their position and small degree of motion preventing their being so applied.

identical with the *Doris flava* of Montagu,) which have been described in a preceding Number of this Journal*. Of the three species which I have met with on our coast, one is probably the same with *D. quadrilineata*, Mull., and *D. flava*, Mont.; the varieties I have met with inducing me to bring these two together. A detailed description may enable others to judge whether or not I am right in this view of the subject.

MOLLUSCA NUDIBRANCHIA, Cuvier.

Fam. DORIDÆ, Johnston.

Gen. POLYCERA, Cuv.

a. *With two branchial appendages, body without spiculæ.*

P. quadrilineata, Plate IX. fig. 1. to 6.

Doris quadrilineata, Mull. Zool. Dan. t. 17†; Prod. 2771.
Doris flava, Mont. Linn. Trans. vii. 79. t. 7. f. 6.

P. White, with 5 rows of orange tubercles, 4 to 6 tentacular filaments, 7 to 9 branchial plumes, and 2 branchial appendages.

Variety, marbled with dark brown and orange, with 4 dark lines along the sides, uniting the orange tubercles.

Body nearly half an inch long, limaciform, prismatic, tapering to a point behind, smooth, white, semi-transparent; with two moderately sized clavate and strongly lamellated tentacula, mucronated at top, tipped with orange, non-retractile; at a little distance behind which are two very small black eyes. The anterior portion of the body is produced into a kind of veil, the margin of which is adorned with four, or sometimes six, linear tentacular filaments tipped with bright orange. The sides of the mouth are produced into two angular points, but not tentacular. Seven, or rarely nine, plumose branchiæ are situated about two-thirds along the centre of the back. They are white tipped with orange; the three anterior ones largest, the others very small, surrounding the vent in an incomplete circle. At the sides of these, and slightly posterior, are two plain, linear, branchial lobes, about three times the length of the longest plumes, abruptly tapering to an obtuse point, tipped with orange. Two rows of orange or golden yellow tubercles, extending from the margin of the veil, form an elevated ridge on each side of the back to the branchial lobes, beyond which they unite and form a central carina to the tail. Another row of orange tubercles, not always regular, occupies the centre of the back, and two others adorn the sides between those first mentioned and the foot. Foot linear, very narrow, truncated in front, where it forms two sharp angles, and ending in a point behind. There is a strong groove down the centre, and the margins can be brought together like the leaves of a book. No cloak. The skin smooth and without any spiculæ. Aperture of the sexual organs on the right side, as in *Eolidia*.

* Annals, vol. v. p. 92.

† For the quotation from Muller I am indebted to my friend Mr. E. Forbes.

Variety, white, beautifully marbled with dark reddish-brown and orange. Two bands of dark chocolate-brown extend along each side of the back, connecting the orange tubercles, and interrupted by them. Branchial plumes speckled with brown and yellow.

On first discovering this elegant variety I took it to be a distinct species, especially as the tentacular filaments amounted to six, while in the ordinary forms before examined they never exceeded four. Further investigation, however, brought intermediate stages to my notice, and also taught me that the number of tentacular filaments was extremely variable. The veil, in fact, is surrounded by six prominent points, any number of which may be elongated into filaments, the rest remaining merely tubercles. Thus I have found individuals with only one, two, or three of these elongated. Usually, however, the four anterior ones become tentacular, the two lateral ones very rarely so. The other appendages of these animals are equally liable to variation. Specimens have occurred with only one branchial lobe, and others without any, though no appearance could be found indicating that they had been deprived of them by accident.

The excellent description of Muller agrees perfectly with this, excepting in the number of branchial plumes. These have already been seen to be irregular, but I am inclined to think the discrepancy to have arisen from his observing the larger ones only and overlooking the smaller. No individual coming under my observation has had fewer than seven plumes.

Several specimens of this pretty little mollusk have occurred to me on small sea-weeds at low-water mark between Tynemouth and Cullercoates, and also on the roots of *Laminaria digitata* thrown up by the tide. When kept in a glass of sea water they are very active, but usually prefer swimming at the top in an inverted position. I have never observed them suspend themselves by threads, but they are very fond of making a cup or sucker with the hinder part of the foot, and suspending themselves by that means either from the surface of the water, or by adhering to any foreign substance. The spawn I have found associated with them is in the form of a short, broad riband, with a slight curvature, and glued by one of its edges to sea-weeds.

The pulsations of the heart observed at various times and in different individuals, were from ninety to one hundred in a minute*.

* The question of the connexion between quick pulsation and rapidity of movement in animals, is worthy of more careful investigation. I have found some of the molluscous animals, whose motions are proverbially slow,

b. *With 4 branchial appendages, body with spiculæ.*

P. citrina, n. s. Plate IX. fig. 7—9.

P. minute, lemon-yellow, with 5 rows of tubercles down the back. Veil surrounded with numerous small tubercles, 5 branchial plumes, and 2 pair of short branchial lobes.

Body limaciform, prismatic, about 2 lines long, rounded in front, tapering to a point behind, pale lemon yellow, studded with five rows of tubercles of a deeper shade of the same colour. Tentacula two, short, broad, and strongly imbricated, behind which are two very minute eyes. Veil strongly sinuated in front, and rounded at the sides, the margin divided into 12 or 14 short tubercular expansions; from the sides of the veil an elevated ridge, studded with tubercles and capable of a slight expansion, runs along each side of the back, uniting behind the branchial lobes and extending in a strongly tuberculated keel to the tail. Branchial plumes about five, transparent, forming a semicircle in front of the vent, a little behind which are four short, opake, rounded branchial lobes, two on each side. Mouth without tentacula. Foot linear, a little expanded and angulated in front. Body containing imbedded spiculæ.

A single specimen was found on a coralline from deep water in a fishing boat at Cullercoates.

When put into a watch-glass of sea water, so fond was this little creature of swimming inverted on the surface (a treat which one would think it could scarcely have in its natural place of abode), that it could with difficulty be made to remain at the bottom a sufficient time to allow of a drawing being made of it.

The *Triopa Nothus* of Johnston is probably a *Polycera* of this division.

c. *With 10 branchial appendages, without veil or spiculæ.*

P. cristata, n. s. Plate IX. fig. 10, 11.

P. smooth, white, without veil, with 2 pair of tentacular filaments, 3 plumose branchiæ, and 10 branchial appendages.

Body nearly half an inch long, limaciform, of a transparent watery white, smooth. Tentacula two, large, club-shaped, pale yellow, not retractile, strongly imbricated on the upper part and terminated by a mucro; from the bases of these spring two pair of simple, linear, tentacular filaments tipped with bright orange, and also non-retractile; two inferior tentacular processes are situated at the sides of the mouth, capable of considerable extension and contraction. No eyes? The vent is in the centre of the back rather nearer the posterior end, and is surrounded by three beautifully plumose, transparent white

to have a quickness of pulsation quite unexpected. In *Vitrina pellucida*, for instance, I have found the heart to beat so many as 120 times in a minute, while in other states of the same animal the pulsations have been very slow, and sometimes suspended for several seconds.

branchiæ of about five pectinated branches each, the points of which are tipped with pale yellow. The anterior plume is longest, the two side ones shorter, and all having a graceful curve inwards. Surrounding these are ten linear, subclaviform, branchial appendages; generally arranged five on each side, and tipped with orange or pale yellow. The hinder part of the body tapers to an obtuse point, is slightly keeled, and sometimes marked with an orange central line. The viscera are seen in a brown or pinkish mass through the transparent skin. There is no cloak, nor are the sides of the body angulated as in the other *Polyceræ*, but gradually rounded off to the foot. Foot linear, narrow, grooved down the centre, and cloven at the hinder extremity. No spiculæ. The orifice of the sexual organs on the right side.

A few specimens of this elegant and graceful little animal were found in pools among the rocks near low-water mark at Cullercoates.

Occasionally this species is entirely white, the body being semi-transparent and the tips of the appendages opake. The number of branchial appendages varies, one or two of them being sometimes rudimentary or entirely deficient. One individual spawned while confined in a glass of salt water. The spawn was deposited in a single broad gelatinous band forming a semicircle, and strongly glued to the side of the glass*.

The pulsations of the heart varied from 45 to 75.

The first of the species here described may be considered the type of the genus *Polycera*.

The second agrees with it in the prismatic form of the body, and longitudinal rows of tubercles; in the presence of a veil and of eyes; but differs in the number and form of the branchial lobes, and in having imbedded spiculæ.

The third has much fewer points of resemblance; it agrees with the former in general contour, in the presence of tentacular filaments and of branchial lobes; but the prismatic form of the body and the lines of tubercles are no longer seen. The frontal veil and eyes † are also absent, and the branchial lobes, becoming greatly more numerous, completely encircle the plumes‡. Taken collectively, these variations from the

* A specimen of *Eolidia rufibranchialis*, contained in the same glass, deposited its spawn in a narrow waved thread, many times convoluted, and forming a pattern something like a true lover's knot. This was in the month of July.

† In none of the individuals I examined did I observe any appearance of eyes. Since the above was written, however, my friend Dr. Johnston had kindly favoured me with a drawing and description of a very similar mollusk discovered by him at Holy Island, in which he observed two "very minute eyes." I must therefore admit the possibility of my having overlooked these obscure organs.

‡ The whole three species agree in all the characters of the genus given by Rang, with the exception of the tentacula being "contractiles dans une cavité;" a character not to be found in any of the British species.

typical form might perhaps be considered sufficient to warrant the establishment of a new genus. Mr. Forbes has stated that the absence or presence of eyes is generic in this group. I am by no means confident of this. In groups where these organs are fully developed, the function performed by them is of sufficient importance to give them a primary character; but where these or any other organs are reduced to their minimum of development, so as, in fact, to become merely rudimentary, their absence then becomes of little importance. In the present case we are unable to prove that these minute black spots perform any of the purposes of vision: why then may they not be mere indications of organs which are to receive a further development in other forms of the same group? Such rudimentary organs, incapable of performing any real function, are not unknown in other departments of zoology, and form a beautiful illustration of the very minute gradations through which the development of organs is carried in the whole range of animated nature.

The number of parts in this class of animals is not to be depended upon in estimating generic distinctions, and, as shown above, cannot even be taken as specific; but at the same time there is always a number so far predominant in each species as to be characteristic of it, though, like the number of arms in Starfish and the leaves of some plants, occasionally varying within certain limits. In the Nudibranchia this variation is most frequently attributable to imperfect development.

Through the whole of this genus the orange colour is predominant; generally adorning the prominent parts in each species. This colour, however (passing on the one side into yellow and into scarlet on the other), is more or less prevalent throughout the family. Colour is sometimes characteristic of species in this group, but cannot always be relied upon. Intensity of colour I take to be of no value.

EXPLANATION OF PLATE IX.

Fig. 1, 2, 3. *Polycera quadrilineata*, in different positions.
Fig. 4, 5, 6. Variety of the same.
Fig. 7, 8, 9. *Polycera citrina.*
Fig. 10, 11. *Polycera cristata.*
Fig. 12. A branchial plume of the same.
The whole of them are magnified; the lines opposite each indicating the natural size.