XXV. NOTES ON NUDIBRANCHS FROM THE INDIAN MUSEUM.

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The following notes deal with some nudibranchs kindly sent to me for examination by Dr. N. Annandale, Superintendent of the Indian Museum, Calcutta. Many of the specimens are of some age and so discoloured and distorted that it hardly seems profitable to describe them. They indicate, however, that the genus *Pleurophyllidia* (or *Linguella*) is abundant in Indian waters. The specimens noticed here are in good condition, and the characters of the new species appear to be certain. Both these species are connecting links which bridge over the differences dividing recognized genera, and indicate, like so many nudibranchs discovered in the last decade, that these genera have been too rigidly defined.

The collection also contains specimens which, though in a poor state of preservation, appear to belong to *Pleurobranchæa morula*, Bergh. This form also is of interest as a connecting link, for though it has most of the characters of *Pleurobranchæa*, the dorsal parts are clearly separate from the foot and overhang it, much as in *Pleurobranchus*.

The species described below are:—

1. *Linguella quadrilateralis*, Bergh.
2. *Cuthona annandalei*, sp. nov.
3. *Thordisa annulata*, sp. nov.
4. *Doris* (*Staurodoris*) *pustulata*, Abraham.
5. *Chromodoris albo-pustulata* (?), Pease.

Linguella quadrilateralis, Bergh.

See Bergh; Anat. Unters. af *Sancara quadrilateralis*, *Naturh. Tidsskr.*, 1863, pp. 484—538, and Malac. Unter. in Sempers Reisen, Heft vi, pp. 266—268.

Two specimens from the Andamans, the largest 39 mm. long and 14 mm. broad. The shape is squarish and clear-cut. The ground colour in both is brownish green, marked in one with light longitudinal lines, and in the other with small white spots, arranged in fairly regular rows. This variation between stripes or ridges and spots or tubercles arranged in rows is found in other Phyllidiidæ. The rhinophores are whitish with green perfoliations. The lateral lamellæ are whitish and about 30 on either side: in the

branchial cleft are about 25 white lamellæ. There is no caruncle but a few projections in front of the rhinophores.

The jaws are rather long and narrow with about 8 rows of denticles, which are especially plain on the masticatory process. The formula of the radula is about $30 \times 40 + 1 + 1 + 1 + 40$. The broad and high central tooth bears about 5 ridges and denticles on either side, and six more on the median cusp. The first tooth is low, bearing about 5 denticles on both sides. The other teeth bear about 8 denticles, decreasing in number outwards until there are only one or two. The nine outermost teeth or so are smooth.

Judging by the dentition, this appears to be the *Linguella* (*Sancara*) *quadrilateralis* of Bergh. According to his descriptions the number of denticles on the laterals varies from 32 to 8, which is an unusually wide range. But perhaps the former figure is a misprint.

The colour appears to be better preserved in these specimens than in those previously described, and it seems probable that the living animal is greenish with white dots, sometimes united into longitudinal lines.

Cuthona annandalei, sp. nov. (Plate xix.)

Three specimens were found on stones at Port Canning on the Mutlah River in the Sunderbands. A coloured drawing was made of one while still alive, and all three were examined by me in the Calcutta Museum when they had not been long in spirits. They are 70—80 mm. long and 50—70 mm. broad, including the cerata, but were probably about 1·50 mm. long when living and extended. The colours, as far as preserved, agree with the drawing.

The head is expanded into a roundish disk bearing two nearly equal pairs of simple tentacles with no trace of perfoliation. The eyes are small, but distinct and black. The foot is not angulate, but, like the head, is expanded into a disk. The tail is short and rounded.

The purplish diverticula of the liver are visible through the skin. They communicate with a distinct purple hepatic tract in the body cavity posterior to the stomach. The branches of this tract are simple and clear, as in *Tergipes*. The cerata are disposed in two divisions. The first consists of four groups lying immediately behind the rhinophores[1] and supplied from the right and left diverticula of the stomach. Then comes a gap, and behind it are 6-7 rows of cerata, the rows on the right and left hand sides not being accurately opposite to one another. There are 5-6 cerata in each row, and all are supplied from the posterior diverti-

[1] It would appear from the figure that this is not the case in the living animal, but due to contraction.

culum of the stomach. The cerata are cylindrical and moderately tapering. In the preserved specimens the swelling below the tip is less marked than in the figure (fig. 2).

The jaws are yellowish and bear a single row of distinct denticles, which have blunt, but not square, tips. In the specimen dissected the radula consists of a single row of 40 teeth, white, transparent, and in some respects resembling the type found in the genus *Aeolidiella*. There is a single, low, central cusp, and on either side of it 10—15 (rarely more) long, pointed denticles. The basal part of the tooth (fig. 3) is large and squarish, not thin and crescent-shaped as in *Aeolidiella*.

The verge is conical, and appears to terminate in a small curved process which may be a chitinous tube.

The animals spawned in captivity. The egg ribbon is white, and consists of a single simple coil.

A first view of the radula of this animal suggests that it should be referred to *Aeolidiella*, but when the teeth are separated and the broad bases become visible, the resemblance to this genus is less striking. Also in *Aeolidiella* the jaws are not denticulate. It is better, on the whole, to refer the present specimens to the group of animals described under the names of *Cratena*, *Hervia*, *Amphorina*, *Cuthona*. Its dentition is not unlike that of *Cratena bylgia*, but the number of teeth and of denticles on the teeth is larger. I have discussed the nomenclature of these forms (which have been unnecessarily subdivided into many genera) in the Journal of the Marine Biological Association, vii, 1906, pp. 363—366, and think that the present specimens should be called *Cuthona*. It is doubtful, in my opinion, if this genus is really separable from *Amphorina*, but that genus has usually a tapering radula, a peculiarity not found in the radula here examined.

In any case this species shows how the dentition of *Aeolidiella* may have developed out of that of *Cuthona*.

[The specimens for which this species has been founded were obtained in the Matlah River, a brackish tidal creek, at a distance of about sixty miles from the open sea. This is, I believe, the nearest approach to a freshwater locality from which Nudibranchs have yet been recorded. A sample of water taken from the Matlah at Port Canning for analysis not more than a fortnight later three years ago was found to contain 25·46 parts of soluble salts per thousand (see *Rec., Ind. Mus.*, vol. i, p. 36). The molluscs were found among some stones that have been deposited a few hundred yards below the town of Port Canning in shallow water near the left bank of the river. These stones are partially uncovered at low tide. The banks of the river are entirely composed of the dense mud that forms so persistent a feature of the Gangetic delta. The food of these Nudibranchs probably consisted of a Hydroid (? *Bimeria vestita*), with which they were associated on the stones.—F. H. GRAVELY.]

Thordisa annulata, sp. nov.

One specimen from the Andamans. It is much bent, but about 25 mm. long and 14 mm. broad. The general colour of the dorsal surface is yellowish white, diversified with strongly contrasting brown rings. The general texture is soft, and the whole dorsal surface is covered with soft papillæ, about 1 mm. high in the central area and smaller near the edges. The openings for the rhinophores and branchiæ are also surrounded by small papillæ. A certain number of dorsal papillæ have their bases enclosed by perfect or imperfect brown rings. The rest are colourless. These rings are more numerous and more regular at the sides of the visceral mass, where they form two lines on either side. They are also numerous at the anterior and posterior ends of the mantle margin. But in the mid-dorsal space they are faint and imperfectly formed. On the underside of the mantle are a few scattered deep brown spots. The branchiæ are six, tripinnate and greyish. The anterior portion of the foot is contracted, but appears to be grooved and notched. The tentacles are represented by two roundish lumps.

There is no labial armature. The radula is crowded and rather confused, but the formula is about $35 \times 50.0.50$. Most of the teeth are hamate, rather tall and thin, decreasing towards the centre, the first six or so on either side of the rhachis being quite low with long bases. At the outer ends of the rows the last five teeth are small, very transparent, and difficult to see. Often they are merely jagged or serrulate, but in some rows, at any rate, the last three teeth bear a tuft of fine hairlike denticles.

The stomach is small and lies wholly outside the liver. The œsophagus and intestine are disposed so as to form an apparent circle. The liver is of a deep chocolate-brown, but its whole surface is covered by the white hermaphrodite gland, which is deeply channeled in many places and not even.

The genitalia were rather hardened, and few details could be ascertained, but it was clear that the verge is provided with a very large and striking armature, consisting of scales bearing conical spines of considerable size as in *Platydoris*. Near the tip there are two rows of these scales only. On the lower part of the verge (and perhaps in the vas deferens) there are as many as twelve rows, but the spines are not quite so large and rather elongate.

It is not easy to fix the genus of this form, for it combines (1) rings, like those found in *Diaulula sandiegensis*, (2) pectinate marginal teeth, as in *Thordisa*, (3) a genital armature, as in *Gargamella*. I call it *Thordisa*, simply because that is the oldest of the three genera (1877), and the most likely to survive as a name, if as a result of further investigation several of Bergh's genera are amalgamated.

Doris (*Staurodoris*) *pustulata*, Abraham.

See Abraham, *Proc., Zool. Soc.*, 1877, p 205: Basedow and Hedley, *Trans., Roy. Soc., S. Australia*, xxix, 1905, p. 151.

One specimen from the Andamans. About 60 mm. long and 23 mm. broad—colour yellowish. The branchiæ are grey and darker than the rest of the body.

Over the dorsal surface are scattered large flat warts or knobs of various sizes, and the rims of the branchial and rhinophorial pockets are protected by special tubercles. The foot is grooved: the tentacles appear to be represented by a lump on either side of the head.

There is no regular labial armature, but the labial cuticle bears a granulate stripe, which, if a little more developed, would be called a ring of short rods. The formula of the radula is about 40×55.0.55, but many of the rows are incomplete. The teeth are simply hamate and erect. The innermost and outermost are smaller, but not denticulate or degraded.

No armature was found in the genitalia.

This specimen appears to be the *D. pustulosa* of Abraham, of which Basedow and Hedley have given a coloured figure. It seems referable to Bergh's genus *Staurodoris*, but, as I have pointed out elsewhere, if the type of that genus is the *D. verrucosa* of Linnæus, then the genus ought to be called *Doris*, and *Staurodoris* can be retained as at most a subgeneric designation.

Chromodoris albo-pustulosa (?), Pease.

See Pease, *Proc. Zool. Soc.*, 1860, p. 30.

One specimen from the Andaman Islands, 15 mm. long and 5 mm. broad. It is white with traces of a darker border. The tubercles are yellowish. They are fairly numerous on the dorsal surface, especially in the middle, and there are also several in front of the rhinophores. They are flattish, about 1 mm. in breadth and ·5 mm. in height. The rhinophorial and branchial pockets are not raised and are not tuberculate. The branchiæ are small and slender, 11 in number, and greyish in colour, with a white stripe on the outside of the rhachis. The tentacles are inverted. On the underside of the posterior mantle margin are eight spherical glands.

The labial armature is distinct and greyish. It consist of rods swollen at the tip and bifid. The formula of the radula is about 100×40.0.40. When looked at as a whole, it gives an impression of a great number of long denticles. The teeth are bifid with two strong prongs at the tip and 4—6 large, clear-cut denticles below

them. The three teeth nearest to the rhachis on either side are broader than the others, and the first bears at least 4 denticles on the innerside.

Several Chromodorids bearing tubercles or prominences on the back have been described, but the present specimen does not agree completely with any of them. I do not think its identification with *Chr. scabriuscula*, *verrucosa*, *nodulosa*, *pantherina*, *pustulans* or *papulosa* is justifiable, and as its appearance in life is unknown, and the other characters are not very remarkable, it seems unwise to make it the type of a new species. It is possibly the *Chr. albo-pustulosa*, which was imperfectly described by Pease, without any account of the dentition.