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On some Nudibranchs from East Africa and Zanzibar.  
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(Plates III. & IV. †)

In my last two papers I treated of the Dorididæ Crypto-branchiatae as a group, but no systematic importance is to be attached to the order in which the species now to be described are arranged.

PTERAEOLIDIA SEMPERI.—Since writing my description of this species in my second paper (P. Z. S. March 17, 1903, p. 255), I have read Prof. Bergh's account of *Nossis*, characterised by a lateral ridge similar to that found in some of my specimens ('Opisthobranchiata of Danish Expedition to Siam,' 1899-1900, p. 52), and accordingly carefully re-examined them to see if they should not be referred to this new genus. It appears that they should not. The radula is uniseriate, consistently of 18 teeth, and the same in the specimens which have and those which have not the lateral ridge. It therefore seems clear that the ridge is found in the genera where the radula is uniseriate as well as in those where it is triseriate, and, further, that in alcoholic specimens, at any rate, it may be present or absent in the same species.

\* For Part IV. see P. Z. S. 1904, vol. i. p. 330.

† For explanation of the Plates, see p. 105.

## NOTODORIS Bergh.

[Bergh, "Nene Nacktschnecken d. Südsee," p. 111, in Jour. d. Mus. Godeffroy, viii. 1875; Eliot, Nudibranchiata in J. S. Gardiner's Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. ii. part 1.]

This genus, which is recorded from three parts of the Indo-Pacific, seems allied to *Egires* and the little-known *Triopella*, with which it forms a small group of phanerobranchiate Dorids characterised by a hard texture, valves or other appendages protecting the gills, and undifferentiated teeth. Both *Egires* and *Notodoris* have simple unperfoliate rhinophores.

The body of *Notodoris* is hard and rough, often marked with prominent ridges. The frontal veil is large. The branchiæ, and sometimes the rhinophores, are protected by valves. There is no labial armature, and the teeth are hamate with indications of an accessory denticle. Three species have been described, each from a single specimen—*N. citrina* B., *N. gardineri* Eliot, and the present *N. minor*. They are all yellow, differing chiefly in size, shape, and the form of the branchial valves. It is just possible that *N. minor* may be a young and undeveloped form. It is smaller than the others, and superficially resembles a *Phyllidia*. It has no distinct tail, no rhinophore valves, and no longitudinal ridges. The branchial valve is three-lobed and not much subdivided. Possibly the gill is constructed differently from those of other species. Both *N. citrina* and *gardineri* have rhinophorial valves and a body tapering off into a tail: the former has a single dorsal ridge running from the rhinophores to the branchial valve, which is eight-lobed: the latter has four dorsal ridges and a branchial valve three-lobed, with elaborate subdivisions.

## NOTODORIS MINOR, sp. n. (Plate III. figs. 1 a–1 g.)

One specimen from Chuaka, east coast of Zanzibar.

The living animal was 13 millimetres long, 5 broad and 4 high. It was light lemon-yellow in colour, with sharply-marked transverse black lines. The flat sole occupied the whole ventral surface. The back was not quite smooth, the yellow parts being really low broad lumps between black depressions. The whole body was very stiff and rigid, superficially resembling a *Phyllidia*. The animal was never seen to move.

In the preserved specimen the yellow has become whitish, but otherwise the shape and markings of the living animal are preserved. The integuments are very hard and full of spicules. There is no trace of any mantle-edge, and the body slopes straight down to the sides of the foot. Over the mouth-parts is a strong rounded frontal veil (figs. 1 a & 1 e), also descending right down to the sides of the foot, and extending laterally about as far as the rhinophores. At the beginning of the posterior third of the body are the three gill-valves (figs. 1 a–1 c). They are not noticeable except in profile, as they lie rather flat, and are not much subdivided. Beneath them lie the gills (fig. 1 d), which appear to

consist of about 27 small tufts, pinnate, bipinnate, or tripinnate according to their size, and spread over three areas corresponding to the valves. Possibly each area represents a separate axis, and the gills should be described as three tripinnate or quadripinnate plumes. But this arrangement cannot be demonstrated with certainty in the preserved specimen, and the living animal never raised the valves at all. The rhinophores are thick, conical, and without a trace of perfoliations; they are retracted into simple holes, provided with neither valves nor raised edges. No oral tentacles and no groove in the anterior margin of the foot could be discovered (fig. 1*e*).

There is no trace of armature on the labial cuticle. The radula consists of 33 rows, the largest of which contain about 25 teeth on each side of the rhachis. The teeth are transparent and crowded: the innermost are smaller and close over the rhachis; the outermost are longer and show no trace of irregularity. The shape of all is much the same, hamate with a rudimentary denticle under the tip of the hook. They much resemble the teeth of *Notodoris citrina* (Bergh, *l. c.* pl. ix. figs. 39, 40), but are somewhat more erect and hardly ever show indications of more than one denticle (fig. 1*g*). The glans penis spreads out somewhat as in *Nembrolha*, and appears to be trifid. The lower part is armed with a thick mass of minute blunt spines (fig. 1*f*).

#### TREVELYANA Kelaart.

[Kelaart, in *Ann. Mag. Nat. Hist.* 3rd ser. vol. i. p. 257, 1858; Bergh, in *Semper's Reisen*, Heft xi. p. 441, & xvi. 2, p. 850.]

This genus is recorded only from the Indo-Pacific, where it seems to be the commonest representative of the Polyceradae, being frequent under stones between tides. The animals are limaciform, but some specimens at any rate show indications of a division between the back and sides. The body is smooth, bears no appendages, and is usually of a light bright colour varying from red to white. The branchiæ are rarely less than ten, often numerous, and generally small. There is no labial armature or central tooth. The radula is fairly wide, and composed of hamate or awl-shaped teeth, which are often irregular. The hermaphrodite gland, instead of being spread over the liver, is collected into two globular masses.

Several of the species, *e. g.* the *T. ceylonica* and *T. bicolor* given below, are very imperfectly described by the original authorities, and hence identification is uncertain. It is clear that the whitish forms with yellow lines and spots show considerable variety, but it is hard to say how many of these varieties are specific.

#### TREVELYANA COCCINEA, sp. n. (Plate III. figs. 2*a*-2*f*.)

One specimen, dredged between Shimoni and Wasin at 6-8 fathoms.

The notes on the living animal describe it as the largest species

of *Trevelyana* yet found in East Africa, 3 inches long, and stout in proportion. The colour was bright vermilion, plentifully besprinkled with slightly projecting spots of a deeper shade. The rhinophores and gills were small and deep vermilion in colour.

The preserved specimen has greatly shrunk, and is 25 millimetres long, 14 high, and 11 broad. The colour is dirty white, and no spots or tubercles are visible. There is no trace of tentacles or of a mantle-edge, but the frontal veil is a distinct hard ridge. The foot is grooved in front. The tail is very short. There are 12 small gills set in a circle, bipinnate and in parts tripinnate. The vent is subcentral and not raised.

Though there is nothing that can be called a labial armature, the labial cuticle is strengthened with scattered rods of various shapes. The radula is larger than usual in the genus. It consists of 36 rows, some of which contain as many as 51 teeth, so that the formula is  $36 \times 50 + 1.0.1 + 50$ , but the rows towards the front are much smaller. The first lateral is large and hamate (fig. 2 *a*), sometimes with irregular notches or denticles on the outside of the hook (figs. 2 *c* & 2 *d*). In several cases the top seemed to be broken off, and the remaining part was bifid or trifid (fig. 2 *b*). The other teeth are slender and hamate (figs. 2 *e* & 2 *f*). In all the teeth the hook is directed forwards, not backwards.

The liver is greyish and not very large. In front of the liver, but quite separate from it and from one another, lie two large spherical hermaphrodite glands with a diameter of about 5 and 7 millimetres respectively. They are yellowish in colour, and the surface is covered with knob-like follicles. The verge is armed with transparent spines. The large pericardium lies in front of the branchiæ, and in the alcoholic specimen is much inflated.

This form is possibly the *Stenodoris rubra* of Pease (Am. Journal of Conch. ii. 1866, p. 206), though, if so, "light red papillæ" is a strange description of the raised spots; but the account given of the animal is not sufficient to admit of identification.

TREVELYANA CEYLONICA Kel. (Plate III. figs. 3 *a*-3 *c*.)

[Kelaart, Ann. & Mag. of Nat. Hist. 3rd ser. vol. i. p. 257, 1858.]

One specimen from the East Coast of Zanzibar.

The notes on the living animal describe it as about an inch long, creamy white, with bright red dots. The gills were yellow, with bright red lines down their backs; larger and more feathery than is usual in the genus. There was a line of bright red round the edge of the foot.

The preserved specimen is colourless, 15 millimetres long and 6.5 broad. The back is quite smooth, and there is no sign of a mantle-rim. The pericardium forms a large, much swollen prominence. The rhinophores are completely retracted. There are 12 branchiæ set in a circle open behind; one is large and bifid, one is rudimentary. The foot is deeply grooved in front. No tentacles could be discerned.

The buccal mass is rather large, the radula fragile, with a wide rhachis. There are 21 rows in all, some of the longest of which contain 24 teeth on each side. The first tooth (fig. 3 *a*) is larger than the rest, and projects into the rhachis; it is slightly bent, but hardly hamate. All the first teeth are similar and regular in shape. The base is somewhat wavy and as if hollowed out. The other teeth are awl-shaped, with an irregular and somewhat bifid base (fig. 3 *c*). The liver is yellowish grey and not very large. In front of it are two hermaphrodite glands, much as in *T. coccinea*, but smaller. The verge is armed with numerous short thorns of very varying shape.

I think this animal is probably Kelaart's *T. ceylonica*, for which the genus was founded, and which appears not to have been described since; but it is difficult to be certain of the identification, as he gives no information respecting the radula. The form and colour agree well, including the red lines on the branchiæ and round the foot. The chief difference is that whereas his specimen has 15-16 pure white branchiæ "set round a large disk," mine had 12 yellow branchiæ set in a circle open behind. But his specimen was nearly twice the size of mine, and probably the larger individuals develop extra plumes which close up the posterior gap. On the other hand, both specimens agreed in having rather large feathery branchiæ, an unusual character in the genus. Kelaart says "they resemble a small tuft of marabout feathers."

TREVELYANA CROCEA B. (Plate III. fig 4.)

[Bergh, in Semper's Reisen, xvi. 2, p. 850, figs.]

More than 100 specimens from the East and West Coasts of Zanzibar, where it is one of the commonest littoral molluscs at certain seasons.

Mr. Crossland, who collected them, informs me that this form provided a most striking case of the migration of molluscs in flocks to shallow water for the deposition of spawn.

But few specimens were collected before a certain period of a few days' duration, when the sand of Chuaka Bay just below low-tide mark was occupied by astonishing numbers of these delicate little nudibranchs. These were not washed up by accident, but were all actively crawling on the sand among the weeds &c. Many were *in coitu*, and when placed in basins of sea-water most of the specimens were soon engaged in copulation or the deposition of yellow egg-ribbons. By-and-by the swarm disappeared to some unknown permanent habitat. If this were in the deeper channels of the bay (1 to 2 fathoms deep at low tide) they must have been found there by dredging. As this was not the case, it seems most probable that the migrations of these tiny animals extend to and from the deep sea three or more miles away. An almost equally conspicuous swarm was formed by individuals of *Melibe fimbriata*, and other species (e. g. *Ceratosoma cornigerum*, *Chromodoris* spp., and *Pleurobranchus delicatus*) appeared occasionally for a few days in considerable though

smaller numbers, being rare or completely absent from the shore of the Bay at other times.

Most of the animals were of a bright dark yellow with the black liver showing more or less conspicuously through the transparent integuments, but the colour ranges in exceptional cases from deep orange to almost colourless transparency. Many specimens were infested with small light yellow copepoda found adhering to the body, especially on and near the gills.

The alcoholic specimens are of a more or less yellowish white. The largest is 29 millimetres long, 12 high, and 8 broad, but, as a rule, the back is proportionately broader. The whole body is smooth and very soft. In most specimens the dorsal area is bounded by a distinct lateral ridge. It is not visible behind the branchiæ, but extends from them to the front of the head, where, however, it is not continuous but divided by a deep notch in the middle. In several specimens this ridge is only clear in places and in a few it is absent altogether. The rhinophores bear about ten perfoliations and are set in such shallow pits that they can hardly be called retractile. They are exposed in the alcoholic specimens. The edges of the pits are smooth. The gill consists of from 20 to 34 leaflets\*, set in a horseshoe or circle open behind, and placed rather far back. The leaflets are flat and compressed and decrease in size posteriorly. The largest bear on each side about ten lamellæ, the smallest two or three. The whole appearance of the branchial apparatus is quite unlike what is usual in the circum-anal plumes of nudibranchs and recalls the prosobranch gill. The foot is a narrow groove, but has a thin expanded margin, including which the breadth is 6 mm. in large specimens. The anterior margin of the foot is grooved and united with the corners of the mouth, where it is joined by a second ridge, which runs above it and apparently represents the tentacles. The tail is bifid.

The radula has a wide bare rhachis, and the formula varies from about  $11 \times 10 + 2.0.2 + 10$  to  $15 \times 14 + 2.0.2 + 14$ . The innermost tooth is irregular in shape, but consists of a basal portion from one end of which rises a more or less bent spine, while another spine is more or less completely developed at the other end. The second tooth is larger and is more distinctly bicuspid. The other teeth are unicuspid, awl-like, and hardly bent; and those nearer the rhachis are rather stout, but they become slender towards the end of the row. All the different forms of teeth are well represented in Bergh's plates. In the nervous system the ganglia are very distinct. The liver is large, black, and very soft. On its anterior portion, and less detached from it than usual in the genus (*e. g.*, than in *T. coccinea* described above), are two yellowish hermaphrodite glands of a somewhat irregular shape. Indeed, though separable from the liver, they cannot be said to be separate from it. This may be possibly due to the fact that the specimens are in good condition, so that the membranes connecting the

\* The gills as represented in the Plate are not sufficiently numerous.

various organs are fresh and strong, whereas in other cases they may have dried up or decayed. The verge is armed with numerous small spines of very variable shape, simple, bifid and trifid. From the genital mass to the tail extends on each side a long, ramified, almost arborescent gland, distinctly visible through the transparent body-wall with which it is united.

TREVELYANA BICOLOR (?). (Plate IV. figs. 1 a-1 c.)

[A. & H., Notes on a Coll. of Nud. Moll. made in India, p. 132, pl. xxix. figs. 11, 12.]

The single specimen, which was captured at Prison Island, Zanzibar, was 20 millimetres long, with a very long narrow foot, tapering to a point posteriorly. The whole animal was white, with projecting spots of bright yellow. The tips of the rhinophores and edges of the gills were also bright yellow. The liver showed through the dorsal integuments as a black mass before and behind the branchiæ, and in front of it were seen the yellow reproductive organs. The branchiæ were simple and leaf-like and shrunk together when touched.

The preserved specimen is contracted into a spherical shape, showing no trace of the raised spots or of a mantle-margin. The head-parts are much retracted and distorted, but the anterior margin of the foot seems to have been deeply grooved. The colour is white, but the black liver is still conspicuous. The twelve branchiæ are set in a complete circle.

The radula consists of 26 rows, the widest of which contain 24 closely packed teeth. The first lateral is large and hamate and the next much like it. The other teeth are rather stout, of the bradawl shape or slightly curved. In the pharynx were found the remains of a small tectibranch, which, to judge from its radula and stomach-plates, was probably *Atys*.

I think this form is probably A. & H.'s *T. bicolor*. Their description was made from the drawing which they reproduce and they saw no specimen. The bicoloration there depicted was probably due to the liver being seen through the integuments, for though the picture certainly suggests a black patch on the skin, it will be seen that this patch occupies exactly the position of the liver, and that it bears yellow spots like the white part. It is also possible that Ruppell and Leuckart's *T. impudica* is identical with this form. They describe it (Neue wirbellose Thiere des rothen Meers, p. 33) "corpore dilute lacteo; tentaculis superioribus, maculis ocellisque dorsalibus, branchiis pedisque limbo aurantiacis; dorso tuberculato; branchiis 12 medium dorsi versus sitis; pallio indistincto."

#### NEMBROTHA B.

[Bergh, S. R. xi. p. 450, figs., xvii. p. 980, figs.; id. Beitr. zu einer Monographie der Polyceraden, ii. p. 658, figs., and iii. pp. 164-5.]

This genus is allied to *Trevelyana*, but both internally and externally can be readily distinguished from it. The coloration is

generally rather sombre but gorgeous, a prevalent tint being very dark green or blue with brilliant lighter markings. The gills are few (3-5), but large and strong. The hermaphrodite gland is as usual, and not collected into globules. A very narrow labial armature is present in some species, but usually there is none. The radula is never very wide and sometimes is very narrow, consisting of a median plate with from three to twelve laterals, of which the first is large and hamate and the rest plate-like. The species are not all equally well known, all our information as to *N. morosa* and *cristata* coming hitherto from drawings by Semper. It would appear, however, that some of my specimens should be referred to the latter species. *N. nigerrima*, *kubaryana*, and *cristata* have a fairly broad radula, with about twelve laterals, and are distinguished by their dark coloration. They are evidently closely related, and may prove to be merely varieties, including *N. morosa*. *N. gracilis*, *diaphana*, *gratiosa*, and *affinis* are lighter in colour, and have a narrow radula with only three or four laterals.

*Nembrotha* is recorded from the Indo-Pacific and West Coast of Mexico. It is fairly common on the East Coast of Africa.

NEMBROTHA CRISTATA B. [?= *N. nigerrima*, var.] (Plate IV. fig. 2.)

[Bergh, S. R. xi. p. 458, pl. xxxiii. fig. 6.]

Three specimens from the East Coast of Zanzibar. The living animals are described as having a sloping back, long tail, and narrow foot, somewhat like *Ceratosoma*. The texture was soft, and the colour a very dark but brilliant green with black spots, and also narrow stripes of brighter and lighter green. The gills were counted as five, and the rhinophore-pockets were raised.

The measurements of the largest alcoholic specimen are : length 54 millimetres, breadth 15, height of body 13, height of branchiæ above body 8. The texture has become hard and wrinkled, the animals having evidently been strongly contracted. The main stem of the gills is very thick, strong, and muscular, so that it almost forms a valve to protect the pinnæ as in *Notodoris*. The anterior plume is distinct and separate, but the lateral pairs are almost confluent, and it is consequently hard to say where one begins and the other ends, or whether the total number of branchiæ should be reckoned as three, four, or five. The rhinophores are not very large and are completely retracted within smooth projecting sheaths about 2.5 mm. high. The foot is narrow. The relations of the external mouth-parts are much obscured and distorted by the strong contraction which has affected the whole anterior portion of the body, but it appears probable that the foot is grooved and notched with the upper lamina attached to the corners of the mouth, and that the tentacles are horizontal ridges. There is a very narrow labial armature, about half a millimetre wide and hardly visible to the naked eye. It appears to form a complete ring, and is composed

of a loose mass of long, yellow, transparent rods, irregular in shape and often bent.

In the two specimens dissected, the radula consists of 30 and 31 rows respectively, and the formula of each row is, as a rule,  $10 + 1.1.1 + 10$  or more rarely  $11 + 1.1.1 + 11$ . The median tooth is squarish, not very broad, and bears, as a rule, five denticles on the anterior edge, but sometimes only four, while in one specimen there were only three denticles in the hinder rows. The first lateral tooth is large and sickle-shaped. The corner of the basal part projects over the rhachidian tooth and creates a false impression that it is an accessory denticle. The remaining teeth are generally ten, but sometimes an additional rudimentary one at the end of the row raises the number to eleven. They are little more than flat squarish plates, decreasing in size outwards. Only the first of them shows some traces of a hamate shape.

All the internal organs are of a deep black colour, which rendered their examination difficult. The blood-gland is large. I was not able to make any satisfactory preparations of the reproductive organs, but the glans seemed to be armed with a dense mass of curved rods.

I think this form must be identified with *N. cristata* B., of which, however, no specimen has been described, all that is known of it being Semper's drawing and apparently a few notes. But it is also not improbable that it is a variety of *N. nigerrima* B., from which it differs externally in little except the absence of any red coloration. The number of branchiæ is, as explained, uncertain, but the arrangement shown in Bergh's plate of *N. nigerrima* is certainly not that of these specimens. On the other hand, the presence of the narrow labial armature is an argument for identity.

#### NEMBROTHA CÆRULEA, sp. n.

Four specimens from Sii Island, near Vanga. No notes on the living animal, except that it was blue and had apparently no red or green mottlings.

The colour of the freshly-preserved specimens was a fine bright indigo, varying in intensity in different parts. One of the specimens was much lighter than the others and also smaller. The whole of its body and the lighter parts of the other individuals were marked with deep indigo spots.

The largest preserved specimen is 43.5 millimetres long, 18 high, and 12.5 broad. The space from the head to the branchiæ is 12 mm. and from the branchiæ to the end of the tail 22 mm., but the tail is longer in this specimen than in the others. The shape is somewhat like that of *Ceratosoma* without lobes, as the back rises considerably from the head to the branchiæ. The integuments are leathery and not at all transparent. The surface is quite smooth, and there is no indication of a mantle-edge. The rim of the rhinophore-pockets is only slightly raised. The rhinophores themselves are large, entirely retracted, with 25-30 deep

perfoliations. As in the last species, the gills are very thick, strong, and muscular, apparently five, but in this case, too, the lateral pairs sometimes coalesce, so that the whole number may be counted as three or four. They are bipinnate. The oral tentacles appear as large, distinct tubercles on each side of the mouth, and were doubtless fairly long in life. The foot is rather broad, with a shallow groove in front; the upper lamina is connected with the sides of the mouth under the tentacles.

The internal organs are mostly of a greyish yellow, not deep black as in the last species. Though the labial cuticle contained a few scattered yellowish rods, no connected armature is visible. The radula much resembles that of *N. cristata*, and has for formula about  $27 \times 10 + 1.1.1 + 10$  or occasionally  $11 + 1.1.1 + 11$ , but the median plate is broader, with five distinct denticulations which do not vary in number. The first lateral has a groove near the end of the hook, and the next two or three teeth have a rudimentary hamate shape. The liver is large. The upper wall of the pericardium is very thick and strong. The verge resembles the figures in Bergh's plates of *Nembrotha nigerrima*, the glans being armed with a profuse mass of hamate teeth. Those on the top seemed rather larger and more curved than in his figures.

This species is closely allied to *N. nigerrima*, but appears to be sufficiently distinguished by (a) its coloration, (b) the only slightly projecting edges of the rhinophore-pockets, (c) the absence of a labial armature, (d) slight differences in the radula, (e) another form of tentacles.

NEMBROTHA AFFINIS, sp. n. (Plate IV. figs. 3 a-3 d.)

[Cf. *N. gratiosa* Bergh, Nudibr. of 'Blake' Expedition, pp. 172-175.]

One specimen caught in a trawl in Chuaka Bay on the East Coast of Zanzibar. Very long and narrow, being 5 centimetres in length and 1 in height.

The living animal was extremely soft, dull violet-black in colour, with dull yellow stripes on the sides and somewhat brighter ones of the same colour on the back. The stems and bases of the gills were light green, and the same colour occurred between the rhinophores and round the edges of their pockets. The pinnae of the gills looked black, but when seen by transmitted light were of a fine purple. The foot was very narrow, and the animal could not adhere strongly to anything.

The alcoholic specimen is flabby, 28 millimetres long, 5 broad, and 10 high. As the result of this reduction in size, the yellow parts look wider and the black parts narrower, so that the animal appears to be yellow with black stripes, rather than black with yellow stripes as in Mr. Crossland's figure. No doubt, however, the latter is correct; it represents four lateral yellow stripes and one medio-dorsal. The stripes are interrupted in places, particularly on the tail, and there are some long yellow spots between them. The branchiæ are distinctly only three in number, smaller

than usual in the other species, but with a very thick rhachis and bipinnate. The rhinophores are large and exserted, each bearing about 35 perfoliations. The rims of the pockets are very slightly raised. The oral tentacles are two hard black ridges, curved downwards and sideways. The foot is narrow and grooved in front.

The buccal mass was extracted, but the animal was not further dissected in order to preserve the specimen. There is no labial armature. The formula of the radula is  $13 \times 3 + 1.1.1 + 3$ . The teeth closely resemble those of *N. gratiosa*, the chief difference being that the anterior margin of the wide median tooth (fig. 3 *c*) is indistinctly bilobed, the right half being always a little higher than the left. The first lateral (fig. 3 *d*) is large, rather irregular in shape, and with a double hook at the apex.

This form is closely allied to *N. gratiosa*, and were the latter found in the Indo-Pacific region, I should be inclined to regard them as varieties of one species. But *N. gratiosa* is recorded from the West Coast of Mexico\*, which lies outside of the Indo-Pacific area; and it is therefore probable that the differences presented by the present animal are real and greater in living individuals. (*a*) It is not mentioned that *N. gratiosa* is remarkably soft. (*b*) The present specimen shows no traces of ridges near the rhinophores or on the tail. (*c*) The coloration of *N. gratiosa* is not dissimilar, but the pattern is spotted whereas here it is striped. (*d*) The tentacles do not look as if they had ever been ear-shaped. (*e*) The anterior margin of the median tooth is indistinctly bilobed.

#### MARIONIA.

[See especially Bergh, in Semper's Reisen, xv. p. 737, & xvii. p. 890.]

All the Tritoniadæ which I have collected in East Africa belong to this genus, unless the form described as *Marionia* sp. is regarded as sufficiently certain to constitute a new generic type. *Marionia* is distinguished from its near allies *Tritonia* and *Candiella* by the presence of a circle of horny plates or leaves in the stomach. The velum bears distinct processes, which are often ramified. The edge of the jaw has one or more rows of denticles, and the radula is moderately wide. The central tooth is broad and more or less distinctly tricuspid. The laterals are hamate, but the first one is larger and clumsier than the others. Provisionally I think it best to divide the forms here described among six species, but am by no means certain that they will all prove valid. When more material can be examined it will probably be found that the species of *Marionia* exhibit many varieties in form and colour and run one into another. It is also not impossible that the denticu-

\* In Bergh's 'System der Nudibr. Gasteropoden,' p. 1145, the locality is given as "mare indicum, Amboina," but this appears to be a slip. The animal is described by Bergh among the molluscs of Amboina, but is expressly said to come from Mexico.

lation of the jaw varies with age. Of the six species, *M. pellucida* seems distinct from the others, which are all nearly related to *M. arborescens*. *M. levis* is distinguished by being quite smooth and not at all tuberculate. *M. ramosa* is closely allied to *M. arborescens*, and differs chiefly in having unusually large branchiæ and appendages. *M. viridescens* and *albo-tuberculata* differ from these last two forms in having branched processes on the velum, and are closely allied one to another in structure, though by no means similar in external appearance.

It is noticeable that in none of these forms is the interior of the buccal cavity black, and that most of them have only one fully-developed row of denticles on the jaw.

#### MARIONIA PELLUCIDA, sp. n.

One specimen dredged in 10 fathoms near Wasin, East Africa.

The living animal showed very little colour but for the pink liver which shone through the transparent integuments. The back was sparsely reticulated with vermilion, turning to deep crimson near the bases of the branchiæ, and also bore some opaque white raised spots. The sides of the body were white and the edge of the velum sandy-coloured. The velum was not bifid, and bore 12 processes, of which 8 were 3-branched. The branchiæ were 13, of moderate size, directed backwards. The finer branches very delicate and transparent.

The alcoholic specimen is yellow, with small tubercles of a lighter colour on the back and sides. It is 15 millimetres long, 5 broad at most, and 4 high. The 13 branchiæ are rather far apart from each other; none are large, and the first pair as well as the last three are minute. The dorsal margin is not very prominent. The rhinophores are large. The velum as described above, but though the outermost processes probably represent the tentacles, they do not seem to be grooved as usual. The long narrow jaws bear three or four rows of denticles on the edge. The radula is at most  $22 + 1.1.1 + 22 \times 25$ , but many of the rows are much shorter. The central tooth is not very wide and tricuspid, the side cusps being as high as that in the middle. The stomach has a circular band of about 70 small yellowish plates, all of much the same size and usual triangular shape.

#### MARIONIA LEVIS, sp. n. (Plate IV. fig. 4.)

Six specimens from Chuaka, East Coast of Zanzibar, and Wasin, East Africa. Two were dissected.

The living animals were high and narrow in shape, with a flat back. The sides were described as white, mottled with translucent patches. The ground-colour of the back was a light purplish brown, with stripes of the same colour but darker and others of white. The branchiæ and rhinophores were pink with dark red blotches.

An uninjured alcoholic specimen is 26 millimetres long, 10 high,

and 7 broad in the widest part, but one which was dissected was about twice as large. The colour has become pale green, with a white reticulation on the sides and white stripes on the back. The skin is quite smooth, and there are no tubercles whatever. There are nine or ten pairs of branchiæ, of which the last three are quite small. The rhinophores have long raised sheaths with simple edges; the club is surrounded by six bipinnate plumes. The velum bears at each end a small grooved tentacle of the usual shape and six processes. The two in the middle are simple and smaller; the other four are larger and branched.

The jaws are white and membranous in the smaller and probably immature specimen, yellow and corneous in the larger one. In both there are from 20-30 very large blunt denticles, and also undulations near the edge of the jaw, which in the larger specimen sometimes develop into denticles, so that in about half the length there are two rows of denticles and here and there three. The radula consists in one specimen of 47 and in the other of 45 rows, with a formula of about  $80 + 1.1.1 + 80$ , which rises to as much as 85 marginals in one and 100 in the other for a few rows. The central tooth is broad and tricuspid; the median cusp is taller than the others, but not very pointed; all the cusps are rather irregular in shape, and have indentations here and there on the edges. The first lateral tooth is large, blunt, and very different from the rest in appearance. The others are hamate. The stomach has a girdle of about 150 horny, yellow, triangular plates of different sizes.

I do not think that this species can be identified with any of the forms the descriptions of which I have seen\*. The coloration somewhat resembles *Tritonia rubra* Leuckart and *Tr. hawaiiensis* Pease, but the other details do not coincide. The species differs from the others hitherto found in East Africa in being quite smooth and having no tubercles.

#### MARIONIA ARBORESCENS B.

[Bergh, in Semper's Reisen, xvii. pp. 890-894.]

One specimen from near Wasin.

The notes on the living animal suggest that it is the same species as *M. ramosa*, and say that it differs chiefly in that the branchiæ, rhinophores, and processes of the velum are much smaller. The colour appears to have been the same as in that species (*i. e.* cocoa and green), and it is noted that there was a greenish tinge in the branchiæ. The back was warty.

The alcoholic specimen does not look much like *M. ramosa*. It is rather bent, but the length appears to be about 21.5 millimetres, the breadth 11.5, and the height 9. The back and sides are covered with flat low tubercles and the epidermis comes off in flakes. The dorsal margin is unusually prominent and projects 3.2 mm. It

\* In this group as in others I have not access to the descriptions of a few forms by the older writers, e. g. *Tr. palmeri*.

bears eleven pairs of branchiæ, the main axis of which is bifid and the secondary axis bifid again. The first pair of branchiæ are set at the side of the rhinophores, which appear not to be on the dorsal margin, but this arrangement may be due to the contraction of the anterior part of the animal. The velum bears eleven simple processes of irregular length; the outermost are tentacular and grooved as usual.

The jaws bear a single row of very large, bent, almost hamate denticles with slight indications of a second row. The radula consists of 36 rows, with a maximum formula of  $27 + 1.1.1 + 27$ , but in most rows it is only about  $15 + 1.1.1 + 15$ . The central tooth is broad, and, as in *M. ramosa*, seems to bear five cusps. The stomach is provided with the usual girdle of about 100 triangular plates, all of much the same size.

This form appears referable with tolerable certainty to *M. arborescens* B.

#### MARIONIA RAMOSA, sp. n.

One specimen dredged in 5 fathoms, north of Kokotoni, Zanzibar.

The notes on the living animal are as follows:—"Colour cocoa-like. Two rows of big branched processes which are greenish in their finer divisions. The rhinophores and processes of the velum very long. The neck part is long and the whole creature has the shape of *Limax*. Length about  $2\frac{1}{2}$  inches."

The preserved specimen is of a uniform light yellowish green, much bent, but about 27 millimetres long if stretched out. The back is only 8 mm. across, but the whole animal looks much broader on account of the large branchiæ. These are thirteen in number, set on the somewhat projecting dorsal margin. The first are a little behind the rhinophores and the last at the end of the tail. None are rudimentary, and the longest are 11 mm. long and almost ribbon-like. The largest tufts consist of three main stems, each of which is trifid again. The velum is ample and bears, in addition to two tentacles of the usual grooved shape, twelve simple digitate processes. The largest are 2 mm. long; the four in the centre are much smaller than the others. The sides and back are tuberculate. The rhinophore sheaths are 5.5 mm. high, with simple but ample and spreading margins. The club is surrounded by five plumes, once or twice pinnate.

The jaws are not very strong, and, except that the cutting-edge is yellow, colourless. Both bear about thirty large pyramidal denticles, at the base of each of which is a small accessory denticle. In parts there are traces of a second line, which might be regarded as mere ridges on the first line of denticles, but which in seven or eight cases seem to be independent formations. The transparent radula consists of 45 rows, containing at most 29 laterals, so that the formula is  $45 \times 29 + 1.1.1 + 29$  as a maximum. The central tooth is much as in Bergh's plates of *Marionia arborescens* (S. R. Heft xvii. pl. lxxxviii. fig. 34), and, as

there, looks as if there were five cusps, but the median cusp is in this specimen thinner and more pointed than in the plates. The liver is large and yellowish. Embedded in the front part of it is the stomach, consisting internally of a large, soft, laminated portion, and a ring of about 120 yellowish, fairly stiff, horny plates. They are not all of the same size, the largest being 2 millimetres long and 1 high, and the smallest about half as large.

This species will perhaps prove to be only a variety of *M. arborescens*, from which it is distinguished chiefly by its long ribbon-like branchiæ, which give it a remarkable appearance. The jaws also present some differences.

*MARIONIA ALBO-TUBERCULATA*, sp. n.

One specimen from the neighbourhood of Wasin, East Africa. Dredged.

According to the notes on the living animal the sides were opaque white, with a reticulate pattern of red-brown. At the centre of each mesh was a small white projection. The back, which was dark brown at the sides and greyish in the centre, bore a similar arrangement of reticulations and projecting spots. The sheaths of the rhinophores were tall, and the wavy edges were turned over outwards. The branchiæ were much subdivided, and very large when fully extended. The main stems were of a light greenish grey, and the finer branches of a dark yellowish brown. The velum was plate-like, with five processes on each side, three of which were branched.

The alcoholic specimen is 45 millimetres long, 15 high, and 13 broad. It does not taper to a point behind. The colour is dirty yellow with profuse white markings. The stems of the branchiæ are spotted and striped with white. There are nine pairs of branchiæ of which the fourth is the largest, but the left-hand plume of this pair is much larger than the other. The middle and left-hand side of the velum are injured. There remain on the right-hand side, starting from the inside, (*a*) a bifid process, with three branches on each bifurcation, (*b*) a simply quadrifid process, (*c*) a simply bifid process, (*d*) a quite simple process, (*e*) a tentacle grooved below. Taking into consideration the notes on the living animal, it appears that there was a similar arrangement on the left side and that the middle of the velum was smooth. There is a small oval papilla below the fourth branchia, close to the dorsal margin. The genital papilla is lower down between the second and third branchiæ.

The jaws are yellow, horny, and large, being 9 millimetres long and 4 wide. They bear a single row of strong denticles, 10 of which are very much larger than the rest. Under five of the largest are indications of a second row. The radula is yellow, and consists of forty rows with a maximum formula of  $95 + 1.1.1 + 95$ . The central tooth is fairly broad and bears three cusps, of which that in the middle is pointed and those at the sides blunt. The

first lateral is large and clumsy: the rest are of the ordinary hamate shape. The internal organs are whitish. From the large buccal mass issues a tube 14 mm. long and nearly 5 mm. wide. The interior is lined with folds, and there is a pouch-like diverticulum in the floor immediately after the buccal mass. The tube is of much the same size until it dilates into the small stomach (7.5 mm.  $\times$  5.5 mm.), which is under and partly within the liver. The stomach has a girdle of more than 100 plates, very thin and membranous, and all of about the same size, namely, 3 mm. along the base and 1.5 high. They lie in groups so as to produce a superficial impression of about 12 thick plates. The intestine is large.

MARIONIA VIRIDESCENS, sp. n.

[? = *Tritonia hawaiiensis* Pease.]

One specimen from near Wasin.

The notes on the living animal are as follows:—"Sides of foot light greenish brown, netted with light bright green, which becomes white near the edge of the back. There is a broad line of opaque white and green (a mixture resembling verdigris), which sends out prolongations to the bases of the branchiæ. Apart from this line the colour is reddish brown with a greenish network and white spots. This coloration extends into the main stems of the branchiæ, but the finer ramifications are white and the finest of all bright pinkish brown. The whole coloration is strikingly beautiful. The velum bears seven processes on each side; only the largest are branched. The rhinophores project but little from their pockets, which are as in *M. albo-tuberculata*. The branchiæ are kept moving continually, expanding and contracting. The animal is about 4 inches long."

The preserved specimen is 42 millimetres long, 21 broad, and 14 high. The shape is not tapering. The back and the sides bear small flat tubercles. The velum is large; besides the two small grooved tentacles it bears on each side seven processes, the largest of which have 2-4 short branches. The central space is wide and bears four rather indistinct tubercles not amounting to processes. The rhinophores are entirely retracted, and the club is surrounded by six bipinnate plumes. There are ten pairs of branchiæ, of which the fourth is the largest; they still bear traces of green colour. The stout and strong main stem divides into four branches, each of which bifurcates, and each bifurcation is then 3-4-pinnate. The arrangement of the smaller tufts is simpler; but none are rudimentary. The foot is very narrow, being, as preserved, only 2.5 mm. wide. The mouth is large and open, showing the jaws. It is surrounded by a circular disk with thin free margins. All this portion of the specimen seems to have been somewhat distorted by the preserving fluid.

The jaws are 9 mm. long and bear a single row of coarse denticles, of which ten are very large, the rest gradually decreasing

in size. There are only very faint traces of a second row. The radula consists of 37 rows, with a maximum formula of about  $90 + 1.1.1 + 90$ . The teeth are of the shape usual in the genus. The central tooth is finely striated, moderately wide and tricuspid, the central cusp being pointed, those at the sides blunt. From the buccal mass issues a long broad tube (4.5 mm. wide), which passes above and to the left of the genital organs, and then enters the liver, where it dilates into a stomach bearing a girdle of plates. These are about 120 in number, horny, fairly strong, brown, triangular, and of various sizes, the largest being 4 mm. long and 1.5 high, the smallest only a quarter of the size and white. The liver is large, yellowish externally, blackish internally.

In coloration this animal resembles *M. chloanthes* B., but can hardly be identified with that species on account of the differences in the velum, jaws, central tooth of the radula, and stomach-plates. I think it is very probably identical with Pease's *Tritonia hawaiiensis* from the Sandwich Islands, but his description is not sufficiently detailed to make identification certain, and the expressions "Veil strongly digitate," "Tentacles [*i. e.* rhinophores] retractile into . . . lacinated sheaths," hardly apply to the present specimen.

*M. virescens* and *M. albo-tuberculata* are closely allied and possibly only varieties of one species; but the present specimens exhibit some differences in the velum, median tooth, and digestive organs, as well as in coloration.

#### MARIONIA, species.

One small specimen, dredged in 10 fathoms off Wasin.

It was dead when found and of a uniform opaque white. The velum was hardly digitate, but presented six undulations. The foot was broad.

The alcoholic specimen has become deep brown and is somewhat decomposed. It is 5 millimetres long, 2 broad, and 1.5 high. The back is tuberculate, with a slightly projecting margin, which bears on each side 6 small branchiæ set at a considerable distance from one another. The rhinophore-pockets are raised and simple. The velum appears simply circular.

No jaws could be discerned. The radula was extremely small, and on a superficial examination appeared to be uniseriate, but on careful investigation was found to have the formula 5.1.5. The laterals are all alike, thin and hamate. They are folded over the central tooth, a narrow plate with slight indications of being tricuspid. The stomach contained about 80 yellow plates, all of much the same size.

This is perhaps an immature form in which the jaws are membranous; but, if so, it is remarkable that the stomach-plates are fully developed. The extreme narrowness of the radula is also remarkable. The characters as described above are sufficient to constitute a new genus, but I hesitate to do this on the evidence of one minute specimen.

## BORNELLA.

The members of this genus are slender, elegant animals, having on either side of the back a row of cerata mostly divided into 2-4 branches and bearing gills. On either side of the mouth is a compound tentacular process consisting of a number of conical tubercles set in a sort of rosette. Over the head are a pair of large organs called in the following descriptions for brevity's sake rhinophore-sheaths, but apparently formed by a fusion of the true rhinophore-sheaths with a pair of cerata. The pair of cerata after these organs are called the first pair. The vent is latero-dorsal between the first and second pair of cerata. The buccal mass is not large, but very muscular; besides the jaws and radula, there is also a labial armature of scales. The radula consists of a median tooth, roughly triangular, either smooth or denticulate, and a few (9-19) smooth hamate laterals, bent somewhat forward. The innermost are generally very small, and the size increases towards the outside of the row. There are two stomachs, of which the second is armed with spines, and two accessory livers, besides the main mass. As a rule ramifications of the liver enter the cerata, but there is some irregularity in this respect. The hermaphrodite gland lies on the liver; the præputium is smooth or armed with spines.

There is considerable difficulty in dividing the genus into species. The colour presents little variety, being in all the known forms whitish yellow, with a red or yellow reticulation on the back. On the other hand, there is some variety in both the external and internal organs. The number of the cerata and their subdivisions appears not to be specifically characteristic, but to increase with age, and is not always the same on the two sides of the body. The ramification of the liver may be present or absent in the same species (*B. excepta*; see Bergh's two descriptions), and, when present, may not extend to all the cerata. The armature of hooks on the præputium may also be present or absent in the same species (*B. digitata* and *B. arborescens*; see Bergh). Nine species are recorded, but *B. hermanni* Angas, *caledonica* Crosse, *adamsii* Gr., *semperi* Crosse, and *hancockiana* Kel., will hardly prove valid, for even if they represent specifically distinct forms they are insufficiently characterised. Of the remaining species *B. calcarata* Mörch, from the West Indies, is distinguished by having appendiculate rhinophore-sheaths and smooth median teeth. The Indo-Pacific forms fall into two groups—the one represented by *B. digitata*, with a single process behind the rhinophores, cerata divided into rather long erect fingers, and median teeth with faint denticulations; the other by *B. excepta*, with several processes behind the rhinophores, small fingers on the cerata protecting the external branchiæ, and much more distinctly denticulate median teeth. Whether *B. digitata* and *B. arborescens* are really distinct is discussed below. *B. simplex*, n. sp., is certainly a separate species, unless it is a monstrosity.

My specimens seem to be on the whole smaller than those of Bergh and to have fewer cerata.

*BORNELLA DIGITATA* Adams. (Plate IV. fig. 5 a.)

[A. & H., Notes on a Coll. of Nud. made in India, p. 140, pl. xxxiii. figs. 8, 9; Bergh, S. R. vii. p. 301; id. Danish Exp. to Siam, Opisthobranchiata, p. 199.]

Several specimens from Zanzibar Harbour (Bawi and Prison Island).

The living animals were white, with a granulated surface. On the back was a reticulate pattern of deep orange. The cerata were tipped with opaque white, below which was a band of bright orange. The transparency of the body-walls varied in different specimens. In some the liver and its ramifications were clearly visible.

The following description, when not otherwise stated, applies to the largest alcoholic specimen; the others are much like it, but the smaller ones are only half the size. Length 30 millimetres, breadth 4, height 8.5; much compressed laterally. On each side of the mouth is a large branched process with about fifteen subdivisions; of these the four or five uppermost are larger and digitate; the remainder are round and tubercular. The back bears a pair of rhinophores with appendages, and, as a rule, four pairs of cerata behind them. The largest specimens have a fifth pair of small cerata, which in one case are fused together into a single process. The rhinophore-sheaths are raised; they bear in front three small digitate processes, and behind one long tapering process which rises 5.5 mm. above the rhinophores. The first pair of cerata are divided into two large and two small fingers; the right-hand member of the second pair into two approximately equal fingers, and the left into two large and one small; the third into one large and one small finger; the fourth are simple; the fifth are merely small warts. In the smaller specimens the first pair of cerata are trifid only, and in the smallest bifid, with indications of an incipient third digit. It appears probable that the number of digits increases with size and age. The first pair of cerata bear three branchiæ, the second, third and fourth two, the fifth none. The branchiæ are all on the inner side of the cerata and set close together.

The labial armature consists of small overlapping scales, arranged in fairly regular rows. The edge of the jaws is quite smooth. The radula consists of 34 rows. The median tooth has a long central cusp, with from 8 to 10 denticulations or ridges at the base. In most rows there are 9 laterals, increasing in size from the innermost outwards, but in some the number rises to 13 and 15. The walls of the second stomach are raised into folds on which are set large brown thorns, with rather blunt tips. The ramification of the liver appears to be very irregular and to vary in different specimens. In the largest the arrangement is as follows:—A single branch runs up into the tall tapering process behind each

rhinophore; the first pair of cerata receive no branches at all; the second and third receive on the right hand a branch which bifurcates, and on the left a simple branch which, in the third, stops at the base of the cera and does not enter it. The remaining cerata receive no branches.

I think these specimens are the *B. digitata* described by A. & H. and by Bergh. The best external character seems to be the tapering, finger-like shape of the cerata and of the process behind the rhinophores, to which no doubt the specific name is due.

BORNELLA ARBORESCENS Pease.

[Bergh, "Neue Nacktschnecken, No. ii.," Journ. Mus. Godeffroy, Heft vi. 1874, p. 96; id. S. R. xvii. p. 886.]

Several specimens from Mombasa Harbour. Note on living animals: "Yellowish white, with red reticulations on back and red tips to cerata."

The alcoholic specimens are all much of the same size. All are whiter and more compressed than those of *B. digitata*, and the cerata are much smaller. The average dimensions are:—Length 20 millimetres, height 6, breadth 3; rhinophores and cerata about 2 mm. high. The tentacular processes at the side of the mouth consist of only about six digitations. The rhinophores are as in *B. digitata*, but the posterior process is not so long. In most specimens there are five pairs of cerata, of which the first three are bifid and the remaining two simple. Each, from the first to the fourth, bears two gills, the fifth none. The jaws and labial armature are as in *B. digitata*; the formula of the radula is about  $40 \times 9.1.9$ , rising sometimes to  $12.1.12$ . The teeth are much as in Bergh's plates (Journ. Mus. Godef. *l. c.* plate iv. 12), but the central cusp of the median tooth is rather longer. The median tooth is more erect than in *B. digitata*, and the 8-10 denticles which it bears less distinct and very hard to see. The other characters are as in *B. digitata*.

It is not easy to say whether this form is specifically distinct from *B. digitata* or, if so, whether it should be called *B. arborescens*. It represents, however, at least a well-marked variety or stage of growth in which the tentacular processes, rhinophores, and cerata are less amply developed. It could hardly be identified with *B. arborescens* on the strength of the original description by Pease (Amer. Journ. of Conchol. vi. 1871), but in the revised description by Bergh (Mus. Godef. *l. c.*) the chief specific character seems to be "*papillis anterioribus ut plurimum bipartitis*." In these specimens they are invariably bifid. With regard to the hooks on the præputium, I was unable to see the difference mentioned by Bergh, and found only simple or bifid hooks, not trifid, in both species.

BORNELLA EXCEPTA B. (Plate IV. fig. 5 b.)

[Bergh, Challenger Reports, Nudibranchiata, p. 36; id. Danish Exp. to Siam, Opisthobranchiata, p. 202.]

One specimen from the East Coast of Zanzibar. Notes on living animal: "Rhinophore bearers very large indeed; colour whitish, netted with orange."

The alcoholic specimen is more stoutly built than those already described. It is somewhat bent, and would be at least 30 millimetres long if stretched out. It is 5 mm. high and 4.5 broad. The rhinophore-sheaths are 8 mm. high, the cerata 5.5.

The tentacular process consists of 11 fairly long digits, all distinct and none of them merely tubercles. The large rhinophores bear 7 digits, three in front quite separate, and five behind united at the base. Posteriorly there are traces of what may be a crest. Behind the rhinophore-sheaths are three pairs of cerata, somewhat resembling those of *Doto* in general appearance. They all bear three digits, above which rises the top, covered with knobs. They also all bear three stout branchiæ, two of which are visible from the outer side and are protected by the digits.

The jaws and labial armature are much as usual; the former have blunt indentations on the edge. The radula consists of 27 rows with a maximum formula of 16.1.16. In the median tooth the central cusp is rather longer than depicted by Bergh, and there are 10-12 denticles and ridges on each side. The second stomach and the præputium are armed with black spines as described by Bergh (Chall. Rep. l. c.). The liver sends branches into all the cerata except the right-hand member of the first pair, but not into the rhinophore-sheaths.

I am somewhat doubtful if this is really Bergh's *B. excepta*: there are differences in the arrangement of the cerata and branchiæ and the rhinophore-sheaths are relatively much larger. On the other hand, the two specimens examined by Bergh did not agree in details, and the present animal possesses more or less the characters common to them.

BORNELLA SIMPLEX, sp. n. (Plate IV. fig. 5 c.)

One specimen from Chuaka, East Coast of Zanzibar. The following are the notes on the living animal:—"Very like *B. digitata*, but a distinct species. Anterior tentacles short and simple. Whole coloration transparent, so that the walls of the heart are distinctly visible. No opaque white or orange rings on tips of cerata, but an orange network on the back and a row of opaque white dots on the sides. Eyes not visible. Length 12 millimetres."

Superficially the alcoholic specimen looks much like *B. excepta* as described above and has the same *Doto*-like cerata, but it is at once distinguished by having on each side of the mouth not the usual tentacular rosette, but a single simple tubercle. The left tubercle is larger than the right. The rhinophore-sheaths bear six short digitations and a larger rounded knob behind. There are four pairs of cerata, of which the hindmost are simple warts. The others are similarly constructed, though the third pair are smaller than the first two. Each is divided into four knob-like

divisions, and bears a pair of trifold feathery branchiæ, one anterior and one posterior.

The mouth-parts were taken out soon after the specimen was captured, and as preserved consist of a labial armature and radula, but no jaws. It is very likely, however, that the jaws had been lost and were not really absent. The labial armature is much as in *B. digitata*. Many of the scales are heart-shaped. The formula of the radula is  $21 \times 9 + 1 + 9$ , the number of laterals being constant in all the rows. The median tooth has 7-8 very strong denticles on each side of the central cusp, which does not project much. The laterals are rather short and straight. The second stomach is armed with spines as in *B. excepta*. The liver sends off diverticula into the process behind the rhinophores and all four pairs of cerata. Those which pass into the rhinophore-sheath and the fourth pair of cerata are simple, while those that pass into the other cerata are divided into four branches corresponding to the divisions of the cerata.

The simple tentacles of this animal are a sufficient specific, if not generic character, provided they are normal. It is possible that they are a monstrosity, for it is not uncommon in nudibranchs for external processes to remain undeveloped, for example, I have a specimen of *Ceratosoma cornigerum* in which the characteristic lobes are wanting. But apart from the tentacles, this specimen does not exactly correspond with *B. excepta*, for instance as regards the rhinophore-sheaths and radula. The median tooth has fewer and stronger denticulations; the laterals are fewer, shorter, and straighter.

#### PLEUROLEURA ALBA, sp. n.

[Cf. *Pl. striata* van Hass., Eliot in Nudibr. of Maldives and Laccadive Archipelagoes, p. 566-7.]

Two specimens from Zanzibar. The following are the notes on the living animal:—"Back white with distinct low ridges, longitudinal but not parallel to median line, each with a yellow line along its summit. The rhinophores stand vertically or point forwards and bear longitudinal perfoliations. The base is white, the main part black, the apex truncated and yellow. They are not retractile into pockets, but can be withdrawn under the mantle-edge. They are not very sensitive. The large velum and the mantle are edged with bright yellow. Foot not half the width of mantle. In crawling, the underside of the mantle is applied to the substratum over which the animal moves. Length 13 millimetres, breadth 4 mm."

The dimensions and colour of the preserved specimen have not much altered, though the yellow has become faint. The shape is elongate and tapering. The maximum breadth just behind the rhinophores is 4 millimetres, rapidly decreasing to 3 mm. and 2 mm. One striation runs down the middle of the back; on each side of it are six to eight others, not parallel to it and starting

from various points. The external characters are those of the genus.

The mouth-parts on the whole resemble those of *Pl. striata* as described by me (*l. c.*). The formula of the radula is  $23 \times 6 + 1.1.1 + 6$ . The rhachidian tooth has a long central cusp and about six denticles on each side. The first lateral is practically half the rhachidian tooth, having one tall cusp and about six denticulations parallel to it and rising from the base on the outside. The remaining teeth are simply hamate. The jaws are more membranous than in *Pl. striata*, and bear six distinct rows of denticles.

This form is closely allied to *Pl. striata*, but differs strikingly in colour, that animal being black with yellow lines. Such variation in colour is not impossible within the limits of a species, but in this case it is accompanied by other differences:—(1) The shape is more elongate; (2) the radula is narrower; (3) the first lateral is differently shaped. These points seem sufficient to constitute provisional specific rank, though it is quite possible that the form may ultimately prove a mere variety of *Pl. striata*.

#### EXPLANATION OF THE PLATES.

##### PLATE III.

Figs. 1 a–1 g. *Notodoris minor*, p. 84.

1 a. Lateral view of living animal. 1 b. Dorsal view of living animal.  
1 c. Hinder part of body with the valves raised and spread. 1 d. Gills with the valves removed. 1 e. Ventral view of anterior part of body.  
1 f. Glans penis. 1 g. Three teeth.

2 a–2 f. *Trevelyana coccinea*, p. 85.

2 a–2 d. First laterals of various shapes. Teeth from (2 e) middle and (2 f) end of row.

3 a–3 c. *Trevelyana ceylonica*, p. 86.

3 a. First lateral tooth. 3 b. Teeth from the middle of a row. 3 c. Three teeth, seen from below and behind.

4. *Trevelyana crocea*, p. 87.

##### PLATE IV.

Figs. 1 a–1 c. *Trevelyana bicolor*, p. 89.

1 a. Lateral view of living animal, with the liver (the blackish tint) showing through the translucent body-wall. 1 b. Ventral view of crawling animal, showing the proportions of the foot and some of the internal organs through translucent body-wall. 1 c. Gills as seen fully expanded. Figs. 1 a and 1 b are  $\times 5$ .

2. *Nembrotha cristata*, p. 90.

Middle of radula.

3 a–3 d. *Nembrotha affinis*, p. 92.

3 a, dorsal and (3 b) lateral views of living animal. 3 c, median and (3 d) first lateral teeth.

4. *Marionia levis*, p. 94.

5. Median teeth of (5 a) *Bornella digitata* (p. 101), (5 b) *B. excepta* (p. 102), and (5 c) *B. simplex* (p. 103).





1a.



1d.



1b.



1c.



1f.



1e.

2a.

2b.

2e.

2f.

3a.

3b.

2d.

3c.

2c.



4.

Crossland, del

Huth, sc et imp.

1. NOTODORIS MINOR. 2. TREVELYANA COCCINEA.

3. T. CEYLONICA. 4. T. CROCEA.



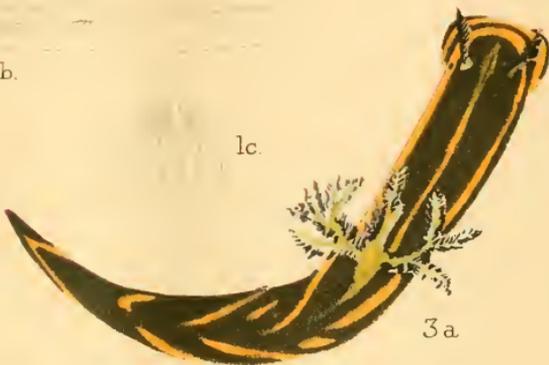


1a.

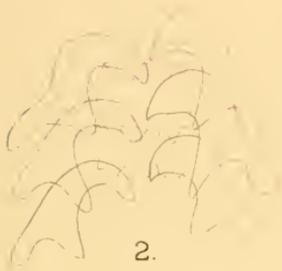


1b.

1c.



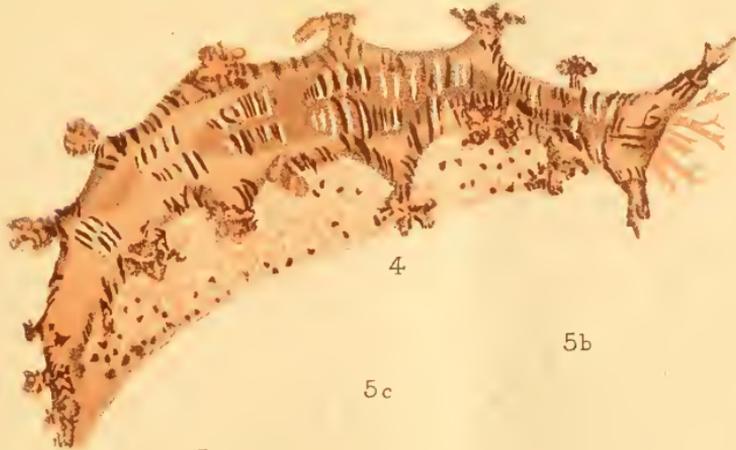
3a.



2.



3b.



4

3d

5b

5c

3c

5a.

C. Crossland, del

Huth, sc. et imp

1. TREVELYANA BICOLOR. 2. NEMBROTHA CRISTATA.

3. N. AFFINIS. 4. MARIONIA LEVIS 5 TEETH OF (a) BORNELLA DIGITATA

(b) B. EXCEPTA AND (c) B. SIMPLEX