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ON SOME NUDIBRANCHS FROM EAST AFRICA  
AND ZANZIBAR. Part III. By SIR C. ELIOT,  
K.C.M.G., H.M. Commissioner for the East Africa  
Protectorate, F.Z.S.—Dorididæ Cryptobranchiatæ, I.

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On some Nudibranchs from East Africa and Zanzibar.

Part III.\* By Sir C. ELIOT, K.C.M.G., H.M. Commissioner for the East Africa Protectorate, F.Z.S.—  
Dorididae Cryptobranchiate, I.

(Plates XXXII.-XXXIV.†)

This paper contains the results of an examination of a number of Cryptobranchiate Dorids from Zanzibar and the East Coast of Africa referable to Bergh's subfamilies Archidorididae, Discodorididae, Diaululidae, Kentrodorididae, and Platydorididae. They include the following species:—

*Archidoris* Bergh.

- 1.     "     *africana*, sp. n.
- 2.     "     *minor*, sp. n.

*Staurodoris* Bergh.

- 3.     "     *depressa*, sp. n.
- 4.     "     *calva*, sp. n.

*Discodoris* Bergh.

- 5.     "     *boholiensis* Bergh.
- 6.     "     *cærulescens* Bergh, *variegata*, subsp. n.

*Peltodoris* Bergh.

- 7.     "     *angulata*, sp. n.
- 8.     "     *aurea*, sp. n.

*Thordisa* Bergh.

- 9.     "     *villosa* (A. & H.).
- 10.    "     *stellata*, sp. n.
- 11.    "     *crosslandi*, sp. n.

\* For Part II. see P. Z. S. 1903, vol. i. p. 250.

† For explanation of the Plates, see p. 385.

*Trippa* Bergh.

12. " *areolata* (A. & H.).  
 13. " *monsoni*, sp. n.

*Fracassa* Bergh.

14. " *tuberculosa*.

*Halgerda* Bergh.

15. " *willeyi*, sp. n. (From the Loyalty Islands.)  
 16. " *wasinensis*, sp. n.

*Kentrodoris* Bergh.

17. " *rubescens* Bergh.

*Platydoris* Bergh.

18. " *eurychlamys* Bergh.  
 19. " *scabra* (Cuvier).  
 20. " *formosa*? (A. & H.).  
 21. " *elliotti*? (A. & H.).  
 22. " *pulchra*, sp. n.  
 23. " *incerta*, sp. n.  
 24. " *papillata*, sp. n.

*Sclerodoris* Eliot, gen. n.

25. " *osseosa* (Kelaart).  
 26. " *tuberculata*, sp. n.  
 27. " *minor*, sp. n.  
 28. " *rubra*, sp. n.  
 29. " *coriacea*, sp. n.

*Asteronotus* Ehrenberg.

30. " *hemprichi* Ehrenberg.

The Cryptobranchiate Dorids are distinguished by having branchiæ which are completely retractile into a permanent pocket. The rhinophores also are retractile into permanent pockets and are perfoliate. A radula is always present. In number of species they form one of the richest groups of the Nudibranchiata, but they show less variety of form than the Dorididae Phanerobranchiatæ, and it is not easy to find good generic characteristics. The most distinctly marked group is that consisting of the large genus *Chromodoris* (with more than 100 species) and some allied genera such as *Casella* and *Ceratosoma*. These possess a characteristic shape, lip-plates, a radula with differentiated teeth, and simply pinnate branchiæ. Well characterised genera are also found in the Miamiradæ (*Miamira*, *Orodonoris*, *Sphærodoris*) and the Cadlinidæ (*Cadlina*, *Tyrinna*). There remain the five sub-families mentioned above, which agree in being usually flat and oblong in form and in having a radula without a central tooth, consisting of numerous laterals which are generally hamate and uniform, though often smaller near the rhachis and degraded or denticulate at the outer end of each row.

Anyone who describes new forms of these Dorids, however much he may disclaim any such ambitious task as a revision of

the group, is bound to consider the value of the existing generic distinctions. The five subfamilies are divided into about 30 genera all created by the great master of the Nudibranchiata, Prof. Bergh, and several of them consisting of a single species. He himself observes (on *Thordisa* in Semper's 'Reisen'\*, xv. p. 666) that the definitions of many of these genera seem to be too precise, and as new forms are discovered the old divisions are found to melt away. The discoverer of a new form often finds that it does not accurately fit in to any of the existing genera, and must ask himself whether he should create a new genus or enlarge the definition. I have little doubt that in most cases the latter is the preferable course. If animals are not divided by natural differences, there is no object in emphasising the importance of minute peculiarities. If *Chromodoris* is allowed to consist of 100 species showing a considerable range of variation, including the presence or absence of median teeth, there seems to be a want of proportion in splitting up the other Cryptobranchiata into so many genera.

The genus *Staurodoris* offers a good example of the difficulty of classifying new forms. Taken by itself, the typical species *St. verrucosa* is remarkably well characterised in both the scientific and popular sense. Anyone could recognise it at first sight. The back is covered with club-like tubercles, the rhinophorial and branchial pockets are protected by similar tubercles which act as valves, and the branchiae are simply pinnate. On the other hand, *St. pseudoverrucosa* (von Ihering) has no tubercles on the branchial pocket and has bipinnate branchiae. Bergh also refers to this genus the *Doris pustulosa* of Abraham, which has bipinnate branchiae and small, but apparently not valve-like, tubercles. I have specimens from the Indian Ocean which have the dorsal surface tuberculate and the following additional characteristics:—  
A. has the rhinophores arising among tubercles and simply pinnate branchiae, but no tubercles on the branchial pocket (*Staurodoris pecten*). B. has five pinnate gills, the anterior margin of the foot entire, and small tubercles set on the edges of the gill-pocket and partly closing it (*Staurodoris calca*). C. has tubercles round the rhinophores, none on the branchial pocket, and thin bipinnate branchiae (*Archidoris africana*). D. has tubercles on the rhinophore pockets but not around the branchial opening, and tri-pinnate gills (*Archidoris minor*). Of these, I think we must admit A. and B. to be *Staurodoris*, if we accept *St. pseudoverrucosa*. But *Archidoris kerguelensis*, *A. australis*, *A. rubescens*, *A. incerta*, and *A. nyctea* are all described by Bergh as having tubercles on the edge of the branchial and rhinophorial pockets, and must come very near the less typical members of *Staurodoris*. It is hard therefore to say whether C. should be classed as *Staurodoris* or *Archidoris*. There seems to be a complete series of links between the two genera, and, this being so, we must either unite

\* The letters S. R. in this paper refer to Prof. Bergh's "Malacologische Untersuchungen," published in 'Reisen im Archipel der Philippinen,' von Dr. C. Semper.

the species in question, or draw an arbitrary dividing line. In the latter case, I think we must say that the typical *Staurodoris* has simply pinnate branchiae and valve-like tubercles closing the rhinophoral and branchial pockets. One or other of these features may be absent or obscure in a species which otherwise possesses the generic characteristics; but when both are absent, as in C., the animal, I think, must be referred to *Archidoris*. Again, *Staurodoris pseudoverrucosa* has the dorsal tubercles sometimes connected by ridges, and the same phenomenon is found in Garstang's *Doris maculata* (which appears to be a *Staurodoris*), and, sporadically, in the true *St. verrucosa*. But, as will be seen from a species described below, *Halgerda wasinensis*, this character brings *Staurodoris* very near to *Halgerda*.

It will be well to examine the value of the chief points by which the subfamilies and genera under consideration can be differentiated. They are as follows:—

(a) The dorsal surface and general texture. The back is rarely quite smooth, as it is in *Chromodoris*; *Halgerda* and *Asteronotus* have the skin smooth but raised into ridges or lumps. As a rule, the surface is covered with projections which may be either minute granulations (*Platydoris*, *Discodoris*, &c.), papillæ (*Thordisa*, &c.), tubercles (*Archidoris*, &c.), clavate tubercles or warts (*Staurodoris*), compound tubercles (*Trippa*, *Fracassa*). There is sometimes a ridge down the centre of the back. Some genera, notably *Platydoris*, are exceedingly hard; others, such as *Trippa*, are so soft as to be almost gelatinous. On the whole, these external characters of the skin and texture form a fairly good indication of relationship. *Platydoris*, in which I should be disposed to include *Hoplodoris*, forms a distinct natural group, and the warty or tuberculate forms (*Archidoris*, *Staurodoris*) also hang together\*.

(b) Rhinophores and branchiae: Neither the rhinophores themselves, nor the pockets into which they are retractile, seem to offer good generic characters, though they may often serve to distinguish species. But even within a species there may be variety: *Archidoris tuberculata* has the rims of the rhinophore pocket sometimes smooth and sometimes tuberculate.

The branchiae also are disappointing as a means of classification. For instance, it does not seem possible to unite *Staurodoris* with the other genera having simply pinnate branchiae (*Chromodoris*, *Casella*, *Ceratosoma*, *Sphaerodoris*, *Halla*, *Thorunna*, *Rostanga*), and these simple branchiae often show a tendency to divide at the tip and become, strictly speaking, bipinnate. Similarly, we cannot bring together bipinnate forms and oppose them to the tripinnate. Perhaps the distinction between ample and scanty branchiae will prove to be of generic importance. The branchial pocket is of various shapes: round, crenulate, or stellate. However,

\* I find it hard to agree with Prof. Bergh's criticism of his own family *Archidoridæ* that it will prove "ganz unhaltbar und künstlich." With the exception of *Peltodoris* the other forms seem to hang well together.

it does not seem possible to make any classification according to this shape, and to unite, for instance, all the stellate forms.

In most of the Cryptobranchiata the tentacles appear to be digitate, but the Archidorididae have a tendency (not without exceptions) towards a flattened and furrowed form. *Sphaerodoris* has no tentacles, and the same is said of *Halla* and *Echinodoris*. No part of preserved Nudibranchs is more liable to distortion than the tentacles, which may be variously contracted, flattened, or crumpled by the action of the preserving fluid or the pressure of the adjacent parts.

(c) The foot appears to offer good characters; as a rule, but not invariably, the forms which have a broad foot and narrow or moderate mantle-margin belong in other respects to groups different from those which have a narrow foot overhung on every side by a wide mantle-margin. The Archidorididae and Discodorididae have both, as a rule, broad feet, but the body of the former is plump, and of the latter flattened. The Platydorididae have flat bodies and narrow feet.

In most forms the anterior margin of the foot is deeply grooved, and the upper lamina notched so as to form two flaps, which in the Kentrodorididae are very ample. Many (though not all) of the Archidorididae have the anterior margin simply grooved and otherwise entire. In a few genera (*Trippa*, *Halla*\*, *Sphaerodoris*) the divided upper lamina is attached to the sides of the head, but it does not seem possible to bring together the forms which present this peculiarity.

(d) In the internal anatomy, the mouth-parts are perhaps the most important for classification. It is clear that considerable structural differences in other organs are generally accompanied by a difference in the radula. For instance, *Acanthodoris* and *Lamellidoris*, which bear a strong superficial resemblance to the Cryptobranchiata but have no permanent gill-pocket, have also a totally different radula, and most of the larger divisions of the Nudibranchiata have a characteristic arrangement of teeth. But it is hazardous to conclude from this that small differences of the radula have a generic value. One common variation from the ordinary hamate type of radula is the serrulation of the outer teeth. This may be present or absent in the same genus (e. g. *Staurodoris verrucosa* and *St. bicolor*), and in some species (*Platydoris argo* and *Halgerda formosa*†) is only found in some of the rows of teeth. As a general rule the innermost and outermost teeth are smaller: the latter often rudimentary or degraded. But it appears that these characters are only of specific, not of generic importance.

\* [I venture to point out that the generic name *Halla* is preoccupied by a Polychaete (Lumbriconereid) worm named by A. Costa in 1844 (cf. Ann. Acad. d. Aspiranti Naturalisti Napoli, ii. p. 63 (1844).—C. CROSSLAND.]

† In a specimen of *Halgerda formosa* from the Berlin Museum, given me by the courtesy of Prof. Martens, I found at the end of some but not all of the rows small rudimentary teeth, some but not all of which bore a few irregular serrulations. This is not quite the same arrangement as observed by Prof. Bergh.

Another point of importance is the presence or absence of a labial armature, that is to say, of a ring or plates on the labial cuticle composed of a compact mass of minute hooks or rods. There is some reason for dividing the group into those which possess and those which do not possess this armature, but still I think that an absolute dichotomy of this kind presents difficulties. Firstly, a rudimentary labial armature is of some inconvenience in classification. Bergh has described such an instance in *Platydoris variegata*; and the animal described below as *Thordisa crosslandi* has two small areas on the labial cuticle which cannot be called plates, but consist of a loose collection of minute rods. In *Platydoris pulchra* the labial cuticle is strengthened with similar rods, distributed through its extent, but not collected into rings or plates. Secondly, though *Discodoris* B. is a well-defined genus, the same can hardly be said of the family Discodorididae, the genera of which mostly agree only in having a labial armature. Thus *Fracassa* and *Carminodoris* appear to be akin to *Trippa*, *Hoplodoris* to *Platydoris*, and *Halla* to *Chromodoris*. It would seem that the more primitive forms of the Cryptobranchiata are those which have a labial armature and some differentiation of the teeth, such as occurs in *Chromodoris* and *Cadlina*, and that the forms with no labial armature and uniform hamate teeth are more recent developments. If this be so, it is easy to understand that in many groups a few forms have survived in which the labial armature has persisted. Thus *Fracassa* is practically a *Trippa* which has preserved this character, and it appears to me that its analogies to *Trippa* are greater than those to *Discodoris*.

(e) Considerable use has been made by Prof. Bergh of the reproductive organs as a character for classification\*. That great weight must be attached to important variations in these organs—such as the presence of one or two spermathecae—is obvious; but while fully admitting the necessity of examining the internal anatomy and the futility of describing only the external characters of Nudibranchs, it must also be admitted that it is not convenient to found genera of fairly large animals upon minute internal characteristics which can only be discovered by an expert microscopist, and by him only in a well-preserved and mature specimen. Such a criterion seems desirable only if it is of great anatomical importance. But what are the variations presented by these organs in the Cryptobranchiata? (i.) Accessory organs are sometimes present. These are generally accompanied by other characters of systematic importance as in *Kentrodoris* and *Asteronotus*. (ii.) The male branch of the hermaphrodite system sometimes broadens and sometimes does not into a dilatation called the prostate. It does not appear that this difference is generally accompanied by other characters of importance: e. g. a

\* But see System. d. Nud. Gast. p. 1088. "Bei dem jetzigen Stande unserer Kenntniss . . . ist es sehr gewagt eine systematische Gruppierung derselben zu versuchen. Es ist es um so mehr als der generische Werth der bei der hier versuchten Gruppierung dem genital System, besonders den verschiedenen Conformatio-  
nen seiner Ausführungsgänge, beigelegt ist, als solcher kaum sicher gestellt ist."

prostate is present in both *Discodoris* and *Platydoris*, which are otherwise so distinct, and is absent in *Archidoris* but present in *Anisodoris*, which are otherwise identical. (iii.) In many genera is present an armature of the reproductive organs, that is, one or many spines, hooks, or plates generally only on the male branch. The value of this feature, as estimated by the concomitance of other important characters, varies. In the families of Doridopsidae and Phyllidiidae and in the well-marked genus *Platydoris* of the Cryptobranchiata an armature is, so far as we know, characteristic. On the other hand, we find two genera like *Diaulula* and *Gargamella* apparently identical but for its presence or absence. In the Aeolidiidae also a hook or spine is present or absent in closely allied genera. It appears to me that such an armature is not sufficient to constitute generic rank without other characters.

(f) The other internal organs do not offer many features which serve our purpose of classification. It does not appear that we can unite the forms in which the stomach is enclosed in the liver, or in which there is only a single instead of a double blood-gland, or in which the nervous system is very concentrated.

As a result of these considerations, I think that the most profitable way of classifying new Dorids of the group treated of here, is to refer them when possible to the following genera taken in a wide sense:—*Archidoris*, *Discodoris*, *Thordisa*, *Trippa*, *Halgerda*, *Kentrodoris*, *Platydoris*, *Asteronotus*, and *Sclerodoris* (gen. n.). No doubt, remarkable forms have been and will be found which require special genera for their accommodation, but the majority of species seem to me to fall under one or other of the divisions mentioned.

*Archidoris* is distinguished by a fairly plump shape, broad foot, and a warty or tuberculate back. No member of this group is known to possess a labial armature, and a genital armature is rare. The radula generally consists of uniform, simply hamate teeth: more rarely some or all are denticulate. I include in this genus, in its wide sense at least, *Anisodoris*, *Homoiodoris*, and *Artachaea*. As mentioned above, though it is easy to define the generic characters of a typical *Staurodoris*, the genus seems to pass into *Archidoris* by a complete series of connecting links.

*Discodoris*.—I should be inclined to extend this genus so as to mean flat, oval animals, not hard, with both foot and mantle-brim fairly broad. Back granulate. A genital armature is usually absent; a labial armature is either present (Section *Discodoris*) or absent (Section *Peltodoris*).

*Thordisa*.—Flat, soft animals, much like *Discodoris*, but with the back neither granulate nor warty, but covered with soft pointed papillæ. No member of this group is known to possess a well-developed labial armature, though a rudimentary one is found in *Th. crosslandi*.

*Trippa*.—Soft, and sometimes spongy or gelatinous. The back is covered with tubercles which themselves bear smaller prominences or filaments. A labial armature is occasionally present (Section *Fracassa*). Some species have special glands set round the buccal mass, and the sides of the head connected with the foot, but it does not appear to me that the absence of these characters ought to exclude a form from the group.

*Halgerda*.—The texture is entirely smooth and somewhat stiff, though ridges may be present. In the known species the branchiae are scanty. No member of this group is known to possess a labial armature.

*Kentrodoris*.—Broad, soft, and flat, with the dorsal surface minutely granulated. The broad foot is deeply grooved in front, and the upper lip, which is notched in the middle, is developed into wing-like expansions on each side. The reproductive system is sometimes armed, and accessory organs are present. In some species, at any rate, the branchiae are unusually large.

*Platydoris*.—Very flat forms, of a peculiar hard consistency. The back is minutely granulated and rough to the touch. The foot is narrow. The branchial pocket is stellate in the known forms. A labial armature is rare (*Pl. variegata*). There is a characteristic genital armature of scales bearing hooks.

*Asteronotus*.—Of a characteristic leathery consistency. The back is quite smooth in texture, but bears lumps and ridges. No labial or genital armature.

*Selerodoris*.—This new genus is proposed for certain forms which appear to have never come into the hands of Prof. Bergh, though I think Alder & Hancock's *Doris osseosa*, *carinata*, *apiculata*, and *tristis* ("Notes on a Collection of Nudibr. Moll. made in India," Trans. Z. S. vol. iii. 1864) should be referred to this genus. It is characterised by having the same hard texture as *Platydoris*, but the back, instead of being smooth, is marked with various ridges and depressions. In the known species there is no labial or genital armature. I should wish to bring my *Selerodoris* under Prof. Bergh's *Dictyodoris*, but the generic characters as formulated by him do not include the hard texture and raised reticulate pattern.

Of the above-named genera, *Asteronotus* and *Kentrodoris*, though well characterised and not rare, have not hitherto proved numerous in species.

#### 1. ARCHIDORIS AFRICANA, sp. n.

One specimen marked "Chuaka, shore." No notes as to living animal.

Alcoholic specimen 5 centimetres long, 1·6 high, with a fairly uniform breadth of 2·7, plump and not flat. The colour is a dirty greyish yellow, with traces of violet. The back is covered with tubercles: those in the middle are largest and measure 4 millimetres across; they decrease in size outwards, and are quite small at the mantle-edge. The top of each is lighter, and

was probably of a different colour in life. It is noticeable that the tubercles in the middle are all large and not mixed with small ones. The mantle-brim is moderately ample, thick, and stiff, and bears numerous irregular tubercles *on the lower side* which are probably glandular in character. The rhinophore openings are indistinctly bilabiate, not much raised, and bear small tubercles on the sides and edges. The rhinophores are large, ample, and deeply perfoliate. The branchial pocket is also not much raised, indistinctly bilabiate, and at the same time with five irregular and not very distinct crenulations. There are tubercles on the sides but none on the edges. The branchiae are eight, tripinnate, but not ample: the two hindermost are smaller than the others. The foot is large and broad, with a shallow groove anteriorly and a split upper lip. The tentacles, which are set at right angles to the head, are unusually large and long (5 millimetres). The labial cuticle is black, and corrugated but unarmed. The radula consists of 33 rows containing about 60 simple white hamate teeth; the innermost are smaller, but the outermost are much the same size as the rest. No prostate or genital armature was discernible. There was a large purple double blood-gland, deeply cleft in both parts so that it seemed to have four divisions.

## 2. ARCHIDORIS MINOR, sp. n.

One specimen from Wasin. There are no notes on the living animal.

The alcoholic specimen is 2·9 centimetres long, 1·8 broad, and 9 millimetres high. The colour is rather bright yellow, with traces of a darker tint near the mantle-edge. The back is covered with flat warts, largest towards the centre, and decreasing towards the mantle-edge, but smaller ones are mingled with the larger; they show indications of a lighter colour at the top. The underside is of a uniform yellow. Round the rhinophore pockets are two or three tubercles, which look as if they had been high in life. The rhinophores are high, straight, and narrow, strongly recalling Bergh's figure of those of *Staurodoris januarii* (S. R. Supp. i. plate C, fig. 14). The branchial pocket is slightly raised, bilabiate, and indistinctly crenulate. Though there are tubercles near the edge, these in no sense close over it or act as valves. The branchiae are eight, tripinnate, but high, thin, and scanty. The central papilla, also, is very high and thin. The foot is fairly broad, and grooved in front, with the upper lamina notched. The tentacles are small and conical. There is no labial armature. The radula consists of 30 rows, each containing about 50 long hamate teeth on either side of the rhachis; the innermost are crowded and smaller, the outermost not much smaller. At the side of the base is a groove, terminating in a slight projection at the bottom of the hook.

This specimen has many points of resemblance with *Archidoris africana*, but I am inclined to think that it is specifically distinct, for the following reasons:—(1) The prevailing colour is yellow,

whereas in *A. africana* it is violet, both externally and in the intestines; (2) the tentacles are small; (3) there are no tubercles on the underside of the mantle-edge; (4) the rhinophores and their pockets are somewhat different from those of *A. africana*; (5) so are the teeth.

It is possible that this is the *Doris rusticana* of Alder & Hancock ("Notes on a Collection of Nudibranchiate Mollusca made in India," Tr. Z. S. iii. p. 120), but in view of their statement "No oral tentacles (?); the head with lateral angles; branchial plumes five," identification is not possible.

### 3. STAURODORIS DEPRESSA, sp. n.

One specimen from Wasin. No notes as to living animal.

The alcoholic specimen is 6·3 centimetres long and 4·9 broad. The general shape is broad and flat. The thick and fleshy mantle-brim is 2 centimetres wide, and the foot consequently unusually small compared with the dorsal surface, being only 2·7 mm. long and about 8 mm. broad. The colour is a uniform greyish white, with a slight tinge of violet anteriorly and down the middle of the back. The whole upper surface is covered with warts, which are small at the mantle-edge but increase in size towards the centre. The top of the larger ones, which measure 5 millimetres across, is flat and hard, consisting of a mass of densely-crowded spicules, and is of a somewhat different shade from the rest and in life possibly distinctly coloured. On the underside of the mantle-edge are numerous small tubercles of glandular appearance. The openings of the rhinophores and branchiae are tuberculate. The latter orifice is indistinctly stellate and also indistinctly bilabiate, but it is not clear what its original shape may have been. Both the branchial and rhinophorial orifices are closed in the alcoholic specimen. The branchiae are six in number, but the hindermost pair are deeply bifid so that there appear to be eight. They are mostly bipinnate and rather scanty. The foot is grooved and notched in front. The tentacles are large, distinct, and somewhat flattened, with rather uncertain traces of a groove. There is no labial armature. The radula is broad and white, the formula being about  $70.0.70 \times 32$ . The teeth are simply hamate and all of much the same size. On some of the inner ones I was able to see eight or ten very minute denticles on the inside of the hook. This extremely fine serrulation is difficult to detect, but I expect that it is present on all the teeth except the outermost. The stomach is not free, but is enclosed in the liver. The female reproductive organs are armed with small transparent brick-like scales.

This form offers analogies to both *Homoiodoris* and *Artachaea* Bergh, particularly the latter, and the thick leathery mantle and large warts also remind one of *Asteronotus*. On the whole I class it, though very doubtfully, as *Staurodoris*, mainly because the openings of the rhinophores and branchiae are closed by the surrounding tubercles.

#### 4. STAURODORIS CALVA, sp. n.

One specimen from Kokotoni Harbour, Zanzibar; dredged in about 5 fathoms.

The living animal was of a dirty grey colour, but with very little pigment at all; the gills and rhinophores sandy, the under surface and the smooth band near the rhinophores pinkish. The dorsal surface was covered with tubercles, large and small, of various sizes, but decreasing towards the mantle-edge, where they were minute; small tubercles were set on the edge of the slightly raised gill-pocket, which was partly closed by them. The anterior portion was prolonged into a nose-like projection. Across it extended a smooth pinkish strip, which bore no tubercles. Immediately behind this strip were set the rhinophores. It is possible that this singular arrangement may have been an unnatural distortion. Some species of *Platydoris* undoubtedly remain fixed in crevices until their shape is altered. Still, the present specimen showed no trace of tubercles having been effaced on the bare patch, and there is no reason to suspect the character except that it is, as I believe, unique among the Dorididae.

The alcoholic specimen, 2 centimetres long and 1·3 broad, is much like the living animal. The broad foot has the anterior margin entire and not grooved. The dorsal tubercles are surrounded by numerous very distinct spicules arranged in a stellate form. The tentacles are small and furrowed. There is no labial armature, and the radula consists of 48 rows of simple hamate teeth containing about 70 teeth on each side of the rhachis. The stomach is large and free. The branchiae are five in number and bipinnate. The branchial pocket is almost closed by the valve-like tubercles on the edge of it. No reproductive armature was discovered.

This form seems referable to *Staurodoris*. Though the branchiae of this genus are typically only pinnate, they appear to be bipinnate in both *S. pseudoverrucosa* (v. Iher.) and *S. pustulosa* (Abr.).

#### 5. DISCODORIS BOHOLIENSIS B.

[S. R. xii. p. 519, xvii. p. 897.]

Two specimens from Zanzibar.

The body of the living animal was flat, with a very ample flexible mantle. A high, narrow dorsal keel extended from the branchial pocket to between the rhinophores. The ground-colour was yellowish drab, with a black edging round the wavy mantle-edge, which in places extended inwards. The whole back was covered with small papille, some brown, some white. The dorsal keel was blotched with brown and black. The rhinophores and branchiae were black. The underside was dirty white, with black and brown blotches at the side of the foot. The living animal was 2½ inches long and 2 broad. The large specimen displayed the phenomenon of self-mutilation. The rhinophore openings

were raised and crenulate, the rhinophores bent backwards. The branchial opening is a transverse slit, the two lips almost meet in the middle but separate at the sides. The branchiae are six, tripinnate, the posterior pair bifid. The labial cuticle bears two small yellowish plates composed of minute rods. The radula formula is about  $23 \times 40.0.40$ . The teeth are simply hamate; the two or three outermost are rudimentary, the innermost are smaller and have rather shorter hooks as described by Bergh.

#### 6. *DISCODORIS CÆRULESCENS VARIEGATA*, subsp. n.

[Bergh, in Semper's Reisen, xvi. Hälft i. p. 805.]

One specimen from Jembiani, Zanzibar.

The living animal was about an inch long and of a light slaty blue, with many small blackish blotches. The coloration of the underside was similar but rather lighter.

In alcohol the blue parts have become yellow, a remarkable change of tint which has also occurred in *Trippa monsoni*. The texture is leathery and stiff but not hard. The whole dorsal surface, including the rims of the rhinophore and gill-pockets which are raised, is covered with minute tubercles. The branchial pocket is roundish, with a jagged edge and very deep. Within it are six tripinnate branchiae. The foot is grooved and the upper lip deeply cleft. Immediately above this cleft is the mouth, with a white, tapering, digitate tentacle on each side. In the upper part of the oral tube are two roughly triangular collections of minute rods, less definite in outline and consistency than the type of armature generally described as labial plates, but sufficiently large to warrant us in describing the cuticle as armed. The radula consists of 30 rows, containing about 45 white, simply hamate teeth on each side of the rhachis. The innermost and outermost are somewhat smaller, but not degraded in shape. The reproductive system is not armed. The prostate is bent and fairly large, but I was not able to discover the peculiar structure of the hermaphrodite gland mentioned by Bergh.

This animal appears to have all the chief characteristics of Bergh's *D. cærulescens*, and comes from much the same part of the world. Möbius's specimen (from Mauritius) was apparently of a uniform bluish white, whereas this one is mottled with darker blotches. Hence I describe it as a variety.

#### 7. *PELTODORIS ANGULATA*, sp. n.

One specimen from Chuaka.

The animal has a close superficial resemblance to *Thordisa villosa*, but has six violet-brown spots symmetrically arranged in rows of three on each side of the median dorsal line between the rhinophores and branchiae, and some round chocolate spots on the under edge of the mantle near the foot. The violet spots seem to be under the surface and visible through the dorsal skin. On a closer examination the superficial resemblances disappear:

the peculiar tubercles of *T. villosa* are absent; the general texture, though flexible, is not quite soft, but rather stiff; the back is minutely granulate but not harsh. The rhinophore pockets are raised and have jagged edges. The branchial pocket is raised with round smooth edges, turned very distinctly outwards. The branchiae are six and tripinnate. The anterior pair are smaller than the others. The most characteristic feature of this specimen is the foot, which has a wide thin margin all round, dilated anteriorly into tentacular expansions, similar to those found in the Aeolididae, and 3·5 millimetres long. The front part seems to be grooved in the middle and the upper lamina to be attached to the head on each side. Admitting that it is dangerous to speak positively of such characteristics on the strength of a possibly distorted alcoholic specimen, I think it is clear that the anterior portion of the foot must be expanded in a way unique among the hitherto described species of Dorididae. The tentacles are thin and digitate. No labial plates were discernible. The buccal mass was large for the size of the animal. The formula for the radula appeared to be about  $45.0.45 \times 38$ . The teeth are the ordinary simple hamate type; the innermost are not smaller; the 3-5 outermost are degraded but are not serrulated. The stomach is large and free, laminated internally. There seemed to be traces of an inconspicuous armature of transparent scales on the glans, but I was not able to satisfactorily make out its arrangement.

The dorsal spots in this specimen seem to resemble those described by Bergh in *P. mauritiana*, but this animal must be specifically distinct from that form.

#### 8. PELTODORIS AUREA, sp. n.

Three specimens captured near Wasin.

The living animal is flat, with an ample mantle which extends far beyond the head and tail. The texture is not hard but also not flabby; one specimen is much stiffer than the others. The general colour is a rich light orange, due to the back being covered with little flat orange warts on a sandy ground. At regular intervals round the mantle-edge are spots of dull violet; there is also a spot just in front of the gills and one behind the rhinophores. The under-side is yellowish with a few brown spots. The dimensions are 2·2 centimetres length, and 1·4 centimetres breadth. Both the rhinophore and gill-pockets are somewhat projecting, but though they rise among tubercles they cannot be described as tuberculate. The gill-pocket is large, somewhat contracted in the middle and expanded at the sides, so that the 8 tripinnate gills fall in two bundles, right and left. The foot is 1·6 centimetres long and only 3 millimetres broad; grooved and notched in front. The tentacles are small and button-like. There is no labial armature. The radula is small and fragile: it consists of twenty rows, each containing about 25 white, simply hamate teeth; the innermost and outermost are somewhat, but not conspicuously smaller. The

stomach is quite free from the hepatic mass. No armature was discernible in the reproductive organs.

I have some hesitation in classifying this specimen as *Peltodoris*, as the back is not minutely granulated but covered with small warts. The shape, however, is not that of *Archidoris*, and both the stiffness and small radula are in favour of the position here assigned to the form.

**9. THORDISA VILLOSA (A. & H.). (Plate XXXII. figs. 1 & 2; Plate XXXIII. figs. 1-3.)**

[Alder & Hancock, Trans. Zool. Soc. Lond. vol. iii. (1864) p. 119, pl. xxxiii. fig. 1; Bergh, Semper's Reisen, Heft xii. (1877) p. 540; Bergh, Danish Exped. to Siam, Opisthobranchiata, 1902, p. 182.]

One specimen was dredged in Zanzibar Harbour on a sandy bottom with a little *Zostera* (Pl. XXXII. figs. 1 & 2). The ground-colour of the living animal is a translucent yellow, like a bit of crystallised fruit. On the ample and transparent mantle-margin were blotches of peaty red and of different sizes. Smaller spots of the same colour are scattered over the whole body, particularly above the visceral mass. The under surface is uniform bright yellow with a few brown dots. The whole dorsal surface is covered with colourless transparent papillæ (Pl. XXXIII. fig. 2), some simple (especially on the mantle-edge), and some compound with two or more filaments. It is also plentifully supplied with spicules set in a stellate arrangement, but the general consistency is quite soft and not stiff. The rhinophore and branchial openings are slightly raised and tuberculate, but not stellate. The rhinophores are large and slightly bent back; the stalk is rather longer than the laminated portion. The branchiae are six and mostly only bipinnate, though tripinnate branches also occur (Pl. XXXIII. fig. 3). They are grey with a brown rhachis. The foot is grooved in front but not notched. The tentacles are thin and digitate. There is no trace of labial armature. The radula consists of about 47 rows of simply hamate teeth, each row containing 40-50 on either side of the rhachis. They are all of the same shape and size, except the outermost five or six, which bear from seven to ten long fine hair-like denticles on each side of the much reduced central hook. No armature was discoverable in the reproductive system.

The alcoholic specimen is quite flat, and is 2·5 centimetres long by 1·6 broad, but the living animal was capable of assuming two shapes—one flat with a broad mantle-edge, and one high with a much narrower edge (Pl. XXXIII. fig. 1).

I think this animal may be safely identified with the *Doris* (*Thordisa*) *villosa* of A. & H. Bergh seems to think that this species is probably identical with his *Thordisa maculigera*, and I share this view, though the formation of the outermost teeth is not exactly like either his description or his plate, as the denticles are longer and the central hook, though much reduced, has not vanished.

10. *THORDISA STELLATA*, sp. n.

One specimen from Chuaka.

The living animal was soft, but yet distinctly harsh to the touch. The colour is a yellowish grey with small sandy patches and also dull chocolate blotches, the latter at the mantle-edge and round the visceral mass. The underside is of a greyish white, with pronounced chocolate blotches round the foot, and a much fainter ring of the same halfway to the mantle-edge.

The preserved specimen, which is much bent, is 2·8 centimetres broad, and would be at least 3·5 centimetres long if straightened out. The texture is rather leathery, but the back is covered with small soft papillæ of various sizes and colours, and all simple. The rhinophore-openings are slightly raised, closed, and apparently crenulate. The branchial pocket is slightly raised, stellate, and entirely closed by six lobes. The branchiae are yellow, tripinnate, five or six in number according as one much smaller than the others is reckoned separately or as an appendage. The rhachis is very thick and broad. The foot is grooved and notched in front. The tentacles are close together above the mouth and somewhat flattened. No labial armature could be found. The radula consists of 36 rows, each containing about 70 hamate teeth of the ordinary type. The innermost are smaller and the outermost less distinctly formed, but neither rudimentary nor denticulate. No genital armature was discoverable.

This specimen appears referable to *Thordisa* and bears a strong resemblance to *T. villosa*, but differs in the more leathery consistency, the stellate branchial opening, and the outermost teeth of the radula.

11. *THORDISA CROSSLANDI*, sp. n. (Plate XXXII. fig. 3 & Plate XXXIII. figs. 4-8.)

Many specimens of this form were captured at Chuaka, on the East Coast of Zanzibar, in 1901-02.

The animals are large, the measurements of a fine alcoholic specimen being, length 12·5 centimetres, breadth 9·1, height 2·5. The shape is therefore flat and oval. The coloration is in its general effect inconspicuous. The upper surface is sandy with blotches of brown irregularly bordered with black. The under surface (Pl. XXXIII. fig. 3) is whitish with numerous brownish spots and a brownish border. But when the upper surface is carefully examined it presents a great variety of shades of light and dark brown which cannot be easily described or depicted. The back is covered with thick-set pointed papillæ, some of which are developed into distinct filaments at their extremities. The general texture is soft. The openings for the rhinophores and branchiae are slightly raised, and may be described as tuberculate since they open among tubercles, but they do not appear to be provided with special tubercles. The branchial pocket is an irregular oval and not stellate or crenulate. The branchiae (Pl. XXXIII. fig. 5) are six in number and tripinnate. The

rhinophores are bent backwards. The foot is fairly broad: it is grooved anteriorly, and the upper lamina is notched and developed into fairly ample flaps on each side of the division. The oral tentacles are digitate, and white with yellow ends. On the white labial cuticle are two small yellow patches, measuring 1 millimetre in length in the largest specimens. They are composed of an irregular collection of rods, similar to those which form the labial armature of the Discodorids, but can hardly be described as plates since the outline is ill-defined and the texture loose. The radula consists of about 45–55 rows, containing about 80 teeth, on each side of the naked rhachis, over which the innermost teeth close so as to render it invisible. The teeth (Pl. XXXIII. fig. 4, *a* & *b*) are of the ordinary hamate shape and all alike, except that the innermost are distinctly smaller. At the outer end of some, but not all the rows, is found a small degraded tooth. The stomach is free from the hepatic mass, and the lower part is somewhat muscular and laminated internally. The genitalia are remarkable for the structure of the glans (Pl. XXXIII. figs. 6 & 7), which is long, twisted spirally, and provided with two rows of tubercles. The central nervous system (Pl. XXXIII. fig. 8) is much concentrated, as in *Asteronotus*, and the different ganglia cannot be distinguished.

All my specimens were found adhering to the underside of stones in a manner suggestive of sedentary habits. The animal is able, however, to swim well upon occasion with a motion somewhat resembling that of a sole. It has also some power of self-mutilation, and can cast off portions of the mantle, though it does so less readily than some allied forms. The branchiae are very sensitive, and retract if the shadow of a hand is allowed to fall on them. The dorsal papillæ are kept in constant motion.

It is extremely difficult to determine the true affinities of this species. It has the general form and soft pointed papillæ of *Thordisa*, and to that genus I think it had better on the whole be referred. But it has also a rudimentary labial armature, a concentrated nervous system, and a peculiar conformation of the genitalia. In this last point it offers some, but not complete, analogies to *Phialodoris*, in which, however, the back is minutely granulated and not covered with papillæ.

#### 12. TRIPPA AREOLATA (A. & H.).

[A. & H., "Notes on a Collection of Nud. Moll. made in India," Tr. Z. S. iii. 1864, p. 119.]

Two specimens, one from Mombasa, the other from Wasin.

Alder and Hancock's figure gives a good idea of the living animal, but hardly emphasises sufficiently its extraordinary resemblance to a piece of old worm-eaten sponge. Though conspicuous enough when placed by itself in a basin, it is invisible in its natural haunts, among sponges and seaweeds. Both my specimens were detected by touch only, not by sight, and I suspect that the creature is really common.

The living animal was spongy and almost gelatinous in texture. The alcoholic specimens though flabby have become considerably shrunk and hardened. The larger one (to which all the measurements given below refer) is 5·7 centimetres in length, 3·8 in breadth, and 2·3 in height. Down the centre of the back runs a somewhat indistinct ridge, on each side of which is a row of five pits, with black bottoms. There is one similar pit behind the branchial pocket. In the smaller specimen the distribution of the pits is different, and it would appear that no particular arrangement can be regarded as characteristic of the species. In this specimen also the dorsal ridge and a knotty crest between the rhinophores are much more distinct than in the larger one, bearing out Alder and Hancock's remark that these features are most conspicuous in the young individuals. In both specimens the back is covered with irregular tuberculate warts or prominences. The rhinophores project out of tubes which are about 5 millimetres high and thickly studded with tubercles, about five being set round the edge. The branchial pocket projects about 6 millimetres and opens backwards. In the larger specimen it is distinctly bilabiate. The upper lip is thickly tuberculate in its whole extent and bears three compound tubercles on its edge which close like a valve; the lower lip has no tubercles on the edge and is altogether smoother than the other. In the smaller specimen the pocket opens backwards, but is round and not two-lipped. It is probable that the tubercles increase in number and size as the animal grows older. The branchiae are large and strong, tripinnate, and apparently five in number, but so deeply bifid that it would hardly be wrong to call them ten. In both specimens the foot is deeply grooved and notched in front and the upper lamina united to the head below the mouth, an arrangement which differs from that seen in *Sphaerodoris (leoris)*, where the mouth seems to be between the two laminae.

The labial cuticle is very strong and much puckered, but no armature was discernible. Round the buccal mass, at the posterior end of the oral tube, are set a number of glands, of which I found ten in one specimen and eight in the other. They are mostly three-fingered in shape. The radula consists of only 23 rows, each containing about 40 teeth on either side of the naked rhachis, but looks large and broad on account of the unusual size of the teeth, which are simply hamate with yellowish bases and colourless hooks. The innermost teeth are very small, but gradually increase in size up to the 15th, after which they are equal. The two or three outermost are reduced. The stomach is small but free. No armature was discernible in the reproductive organs.

I think these specimens are clearly the *Doris areolata* of A. & H., and equally clearly referable to the genus *Trippa*, Bgh. Probably *Doris spongiosa* Kelaart (Ann. Mag. Nat. Hist. (3) iii. 1859, p. 303) is the same species. *Trippa (Phlegmodoris) mephitica* Bgh. is a closely allied form, and I should not be surprised if it even turned out to be a variety of, or identical with,

this species, for these animals evidently undergo great changes, both of shape and colour, in alcohol.

**13. TRIPPA MONSONI, sp. n. (Plate XXXII. fig. 4.)**

One specimen dredged at Chuaka on the East Coast of Zanzibar.

I made the following description of the living animal:—About one inch long and lively in its movements. The mantle ample, covering both foot and head completely. The foot narrow, grooved in front and slightly notched on the upper lip. The tentacles on each side of the mouth white and conical. The whole body is of a soft, spongy texture. The back is covered with small purplish-white prominent reticulations and also bears white tubercles, particularly on the edges of the mantle, branchial and rhinophore pockets. Both the tubercles and reticulations bear small papillæ or bristles. Between the reticulations are small purple pits and, as a result, the general colour seems purple. Besides these, there are four large pits, set symmetrically in a square in the centre of the back. They are brownish at the sides and deep purple at the bottom. There are five other similar but rather smaller pits, three in front of the rhinophores, one behind the gills, and one placed quite symmetrically at the side of the upper right-hand large pit. A white line runs round the edge of the mantle. The rhinophores are yellow and finely perfoliate. The gills are usually exposed, though they are completely retractile into a rather small pocket. They are six in number, yellowish and tripinnate. The under surface of the animal is purplish white; there are no spots on the foot, but two rows of purplish blotches on the underside of the mantle.

The alcoholic specimen is 1·1 centimetre long and ·5 broad. It is very spongy, like the living animal, but the colour has changed to a uniform light yellow. Only the four central pits remain distinct, the others having disappeared. There is no labial armature. The radula consists of 28 rows of hamate teeth, bearing three very small triangular denticles on the side of the hook. The innermost teeth are small and less distinctly formed than the others; the three or four outermost are rudimentary, and sometimes bifid or trifid. There is no genital armature.

I think this form may be referred to *Trippa*: the spongy texture, the pits, and the small internal teeth all seem characteristic. In making the dissection, I unfortunately omitted to search for the ptyaline glands, and am now unable to say whether they are present or not.

**14. FRACASSA TUBERCULOSA, sp. n.**

One specimen from the East Coast of Zanzibar on the reef.

The living animal was of a dirty-white colour with dull green patches on the centre and edges of the back; the whole upper surface was sprinkled with small bright blue dots with chocolate borders; also there were several dull yellow spots. The under surface was white with an irregular and indefinite network of dull green. The junction of the foot with the under surface of the mantle

was marked by a thick line of chocolate with numerous small bright blue blotches. The dorsal surface was arched and covered with large irregularly shaped tubercles bearing secondary knobs.

The alcoholic specimen is of a uniform greyish white. It is 4·7 centimetres long, 2·9 broad, and 1·9 high. The margins of the rhinophore-pockets are raised and smooth. The branchial pocket is not much raised and in itself forms a fairly regular circle, which is, however, somewhat distorted by the surrounding tubercles. The margin, however, is not tuberculate as *e.g.* in *Staurodoris*. The branchiae are eight and tripinnate, the anterior pair being much larger than the others. The anal papilla is large. The spots at the junction of the foot and mantle appear to be glandular. The foot is grooved and notched in front. On each side of the mouth are two small conical tentacles. There is a labial armature of two small yellowish plates composed of minute rods. The short but very broad radula consists of only 28 rows, containing about 65 yellowish teeth on each side of the rhachis. The teeth are hamate; the innermost fold over the rhachis: there is an accessory denticle in the four or five outermost, and the outermost of all are smaller and rudely formed. The reproductive system is unarmed; there are ample folds surrounding the orifices and a prostate is present.

#### 15. HALGERDA WILLEYI, sp. n. (Plate XXXII. fig. 5.)

One specimen captured by Dr. A. Willey, at Lifu, Loyalty Islands, and kindly given by him to me, seems referable to this genus. It was accompanied by a drawing (*vide* Pl. XXXII. fig. 5) and this note:—"Lifu, Sandal B., 3.10.96. Reddish yellow (rich ochreous) ribbed Doris. The ribs are ochreous and intervening valleys have black linear pigment. Tentacles (*i.e.* rhinophores) white tipped with black girdle. The rest of ground-colour is dull greyish black. Cloacal rim a dirty white. Foot orange, produced behind. On passing the hand over branchiae so as to produce a shadow they were retracted." I have captured an Ophimoid at Zanzibar, the coloration of which exactly resembled Dr. Willey's drawing, so that it is possible that this remarkable pattern may be cryptic in certain surroundings.

The preserved animal is considerably shorter and broader than the drawing. The length is 3·1 centimetres and the breadth 1·8. The general shape is flat; the foot long and narrow (2·3 centimetres long by ·5 broad), grooved but not cleft in front. The mantle-margin is thin but ample, though a large piece has apparently been bitten out behind. The general consistency is tough and leathery, but there is no rough feeling as in *Platydoris*. Though smooth to the touch, the back is covered with a series of low ridges and valleys arranged in an elaborate pattern, which will be best understood from the figure (Pl. XXXII. fig. 5). It starts partly from the mantle-edge and partly from the median dorsal line, by which it is divided into two parts, though there is no raised crest. On the dorsal surface the ridges are yellowish brown and the valleys black. On the lower surface the coloration is much the same, there being

numerous black lines instead of valleys. The tentacles are knob-like but large and distinct. The rhinophore-openings are quite smooth, whitish yellow, and fairly large; they are flattened, but look as if they had once projected. The branchial pocket is fairly large, quite smooth, and whitish yellow. The rim is thin but projects amply. The direction of the opening is posterior, not vertical. The branchiae (as shown in the figure) consist really of two plumes arising one on each side of the anal papilla, but each is split into three subdivisions, so that there appear to be six. They are scanty and irregular; mostly bipinnate, but partly tri-pinnate. The buccal parts are protruded and are yellowish white with black spots. There is no trace of labial armature. The radula consists of whitish and simply hamate teeth; the outermost are not denticulate or degraded; the innermost are smaller and more crowded than the others. On the left side under the mantle is a curious gland-like projection, which is perhaps merely a blister caused by alcohol. On the right side in the usual place is a large yellow lump with black spots on which are placed the genital orifices; they are surrounded by strong folds, but no armature was discoverable in the organs themselves.

I propose to call this species *Halgerda willeyi*.

#### 16. HALGERDA WASINENSIS\*, sp. n. (Plate XXXIV. figs. 1 & 2.)

Three specimens captured by Mr. Crossland at Wasin Island, East Africa.

They differ from *H. formosa* and *H. willeyi* in having not only a pattern formed of ridges on the back, but also distinct knobs at the points where the lines of this pattern join one another.

In the living animal (Pl. XXXIV. fig. 1) the mantle-edge was white, but the ground-colour was a dull red-brown; numerous brown spots of a deeper colour were arranged round the mantle-edge and a few scattered over the central dorsal area. Over the whole dorsal surface was a raised pattern in brilliant orange. The white foot was also spotted with deep reddish brown. This colour also appeared on the rhinophores in broad bands alternating with white, and in broad lines on the rhachis of the white gills. The foot projected behind the mantle in crawling.

The largest alcoholic specimen is 1·9 centimetres long, 1·2 broad, and 0·7 high; the contracted foot is 1·4 long and 0·4 broad. Traces of the original colour remain, but the yellow has mostly disappeared. The raised network starts from a central ridge and is developed in a pattern composed of roughly triangular spaces. The foot is 1·2 centimetres long and only 3 millimetres broad; the tail is 5 millimetres long. The anterior margin of the foot is grooved and the upper lip notched. No oral tentacles are visible, but in all the specimens the head is so contracted that it would be unsafe to say none exist in life. The rhinophore-openings are set in a tubercle and are very difficult to see. The rhinophores are long, but only a small part is lamellate. The branchial pocket is quite

\* This name is wrongly spelt "wassincusis" on Plate.

round, very small, with a thick white rim round it, so that in the preserved specimen it resembles a dorsal tubercle. The bipinnate branchiae are somewhat scanty and irregular; they are arranged as in the diagram (Pl. XXXIV. fig. 2), the three posterior plumes being quite small. There is no labial armature. The radula consists in one specimen of 18 and in another of 24 rows; in both specimens the longest rows contain 26 teeth on each side; the rows bend downwards near the rhachis, the ten or twelve innermost teeth being smaller and more crowded than the others. All are simply hamate except the outermost. These are rudimentary; sometimes they bear three or four long denticles and sometimes seem to be split up into small separate rods. There is no trace of any armature in the genital apparatus; the organs are small and possibly even the largest specimen is immature.

This form presents resemblances to *Staurodoris*, some species of which have bipinnate branchiae, but the dorsal tubercles are few, and none are present round the pockets of the branchiae or rhinophores, both of which openings are differently formed from those of *Staurodoris*.

#### 17. KENTRODORIS RUBESCENS B. (Plate XXXIV. fig. 7.)

[Bergh, S. R. x. p. 411.]

Several specimens were obtained at Chuaka in August 1901. The distribution was apparently very local and the species was found only on this one occasion. The alcoholic specimens have unfortunately been lost, but I give a figure drawn from the living animal and the following notes:—

The animal was large (about 17 cm. long and 5 broad), soft and almost gelatinous. Its most remarkable feature was the great size and elevation of the seven quadripliunate gills, which were retractile into a large cup. Their tips were as much as 8 centimetres above the level of the back. The mantle projected anteriorly and formed an ample loose hood over the head. The ground-colour was a light pinkish drab with dull yellow spots and brown blotches dorsally. There were also a number of thin chocolate lines running more or less longitudinally but often branching laterally. The under surface was of a light drab-brown, with similar chocolate lines on the foot. The dark colour of the gills was due to a multitude of such lines.

The animals were infested by a number of yellow parasitic Copepoda.

I think this animal is Bergh's *Kentrodoris rubescens*, though, as the specimens are unfortunately lost, it is hard to be quite sure. The huge erect gills are even a more prominent feature here than in Semper's figure (*loc. cit.* pl. xxxiii. fig. 8).

#### 18. PLATYDORIS EURYCHLAMYS B.

[Bergh, S. R. xii. p. 510, Suppl.-Heft i. p. 61, xvi. p. 802.]

Two specimens from Chuaka.

According to notes made from the living animal, the texture was hard and rough. The larger specimen was 8 centimetres long

and 4·5 broad. The dorsal surface was covered with reddish-brown granulations, each surrounded by a grey or white ring, and there were also in one specimen eight chocolate-coloured blotches with white edges, four around the rhinophores and four in front of the branchial pocket. The rhinophores were dark brown, the gills grey, with a thin white line down each pinna. In the smaller specimen (which appeared to be indubitably the same species) there were no blotches and the gills were drab-coloured. The blotches have also vanished from the alcoholic specimen, which is of a dull reddish brown, darker in places owing to aggregations of minute black spots. The under surface is of a uniform reddish brown. The texture is hard and rough, as usual in the genus. The visceral mass is 3·2 centimetres high and arched, but the mantle-margin is low and flat. This margin is exceedingly ample, measuring as much as 2·6 centimetres at the sides, 2·2 behind the tail, and 1·7 before the head, although the dimensions of the whole alcoholic specimen are only 6·9 by 6·1. The small foot is grooved and notched in front but not very deeply. The rhinophore-pocket is slightly raised and crenulate. The branchial pocket is entirely closed by six lobes. The anterior and posterior lobes are broad flaps, and considerably larger than those at the side, which are narrow and pointed. The gills are six, tripinnate, not very large or very sensitive. There is no labial armature. The radula was injured, but was clearly large and composed of closely-packed simply hamate teeth. Perhaps the formula may have been about  $50 \times 100.0.100$ . The innermost teeth are smaller than the rest; the outermost irregular in shape. The stomach is large and free, thin, and only partly laminated. The large double blood-gland is partly anterior and partly posterior to the central nervous system. There is a genital armature of discs and hooks as described by Bergh.

#### 19. PLATYDORIS SCABRA (Cuv.).

Three specimens from Wasin.

The alcoholic specimens have preserved the hue of the living animal unusually well. The ground-colour is yellowish white, with irregular violet mottlings of varying intensity formed mostly by minute rings of the same colour with yellowish-white centres or by spots. The underside is a clear yellowish white, with no markings except at the sides of the foot which are mottled like the back. The branchiae are light yellow with grey axes; the rhinophores, buccal mass, and viscera all light yellow, and there is a thin rim of the same colour round the pockets of the rhinophores and branchiae.

The largest specimen is 9 centimetres long, 5·2 broad, and 2·2 high. The visceral mass is somewhat arched and the wide mantle-margin undulated. It is 1·9 centimetres broad at the sides, 1·5 in front of the head, and 1·2 behind the tail. The foot is small and narrow; it is grooved and notched in front but not very deeply, and the upper lip is thick. The branchial pocket has six lobes, as in *Platydoris eurychlamys*, the anterior and posterior lobes being

larger than the others. The branchiae are six, tripinnate, very ample and delicate. The tufts at the side of the posterior pair are almost separate, so that the whole number might be reckoned as eight. The rhinophore-pockets are closed by indistinct crenulations. The oral tentacles are of a fair size, white and conical. There is no trace of labial armature. The radula formula is about  $48 \times 60.0.60$ . The teeth are simply hamate, the innermost smaller, the two or three outermost irregular. The penis is armed with the hamiferous disks characteristic of the genus apparently set in four rows, and the vagina provided with strong folds.

The animal, both when alive and when preserved, is exceedingly hard and rough. It is very sluggish, and I have always found it fitted into crevices on the underside of stones, as if it had not moved for a long period.

20. *PLATYDORIS FORMOSA* ? (A. & H.), var.

[Alder & Hancock, "Notes on a Coll. of Nudibr. Moll. made in India," Tr. Z. S. iii. 1864, p. 116.]

One specimen from Chuaka.

The notes on the living animal describe it as bright scarlet, shaded in places by minute brown specks, very flat, and rough to the touch all over. The end of the mantle had been thrown off, probably by self-mutilation, so that the body terminated abruptly behind the gill-pocket.

The alcoholic specimen is much bent, but if straightened out would be about 5 centimetres long; the maximum total breadth is 4 and the maximum width of the mantle-margin 1·4. The somewhat projecting rhinophore-pockets have slightly crenulate edges, as has also the branchial pocket, which is nearly round. The branchiae are six, tripinnate, and rather small. The foot is somewhat broader than usual in the genus, grooved and notched in front. The oral tentacles are large and slightly grooved on the outer side. The buccal mass is very large and muscular. There is no labial armature but a large dark radula, consisting of simply hamate teeth, the innermost smaller, the outermost irregular in shape. The formula is about  $60.0.60 \times 40$ . The genital organs are very strong and muscular, the male branch set with numerous yellow hooks of the shape usual in the genus: the female branch with strong folds and lumps.

I think this specimen may be referred to *Pl. formosa*, or at least that there is not sufficient ground for creating a new species. It is certainly not *Pl. arroyans (cruenta)*, which has scarlet blotches but a pattern formed by minute dark *lines*, not spots. Allowing for the variations so common in this genus, the coloration corresponds fairly well with Alder and Hancock's description, and the grooved tentacles are a remarkable point in common. The chief discrepancy is that the branchial pocket is not distinctly lobed or stellate, as in the typical *Pl. formosa*; but I have noticed in many species of *Platydoris* that though on an average this character may be very well marked, it may be indistinct in some individuals.

## 21. PLATYDORIS ELLIOTI (?) (A. &amp; H.).

[Alder & Hancock, "Notes on a Coll. of Nud. Moll. made in India," Tr. Z. S. iii, 1864, p. 116.]

One specimen from Wasin, dredged in 10 fathoms.

The notes on the living animal describe the dorsal surface as being on the whole of a reddish brown, very beautifully mottled with various shades of sandy colour, the visceral mass being darker than the rest. The under surface was white: just outside the edge of the foot was a row of dark brown spots, and nearer the mantle-edge a bright orange border formed of spots set near together.

The alcoholic specimen measures 6·4 centimetres in length, 4·4 in breadth, and 2·4 in height. Like *Pl. scabra*, it is hard and rough. The colour is a mottled pattern of white, a sandy tint, and reddish brown. Beneath, the sides of the foot and the adjacent parts of the broad mantle, which is 2·2 centimetres wide, are thickly spotted with chocolate marks arranged so as to give the impression of a continuous band. Seventeen chocolate spots are irregularly arranged round the foot on a yellowish ground; then comes a fainter band also composed of chocolate spots; then a yellowish border extending to the mantle-edge. The foot is long and narrow, grooved and notched in front but not deeply. The rhinophore-pockets are closed by six projections. The branchial opening is also six-lobed, the anterior and posterior lobes being larger than the others, as in *Pl. eurychlamys* and *scabra*. The branchiae are six, tripinnate, not very large. The oral tentacles are much retracted, white and conical. The buccal mass is large and muscular, the labial cuticle very strong but unarmed. The radula about  $40 \times 70.070$ ; the teeth yellowish, simply hamate, the outermost smaller but not much degraded. The stomach is large and free, strongly laminated in parts; it appeared to contain sand, as well as alimentary matter. The penis is armed with two rows of hook-bearing scales of the usual type, but set very close together, each fitting into the next; the vagina with lumps but no scales.

I feel somewhat doubtful whether this animal should be called *Pl. ellioti*. Neither my specimen nor those described by A. & H. present any very definitely distinguishing characters. But, on the other hand, there is no feature of importance which militates against the identification, and the colours (which A. & H. record as varying) are sufficiently alike.

## 22. PLATYDORIS PULCRA, sp. n.

Two specimens from the neighbourhood of Wasin, dredged in 10 fathoms.

The living animal was of a beautiful orange-red, covered closely with minute lighter spots. Round the mantle was a border of dull white containing purplish-black spots and small specks in one specimen, and in the other dull violet spots. The under surface is described in the notes on living specimens as of uniform lighter orange, but in the alcoholic specimens there is a rim of faint

mottlings round the foot. The rhinophores were dark brown with white lamellæ; the branchiæ sandy-coloured. The animals were very stiff and harsh to the touch.

The larger alcoholic specimen is 3·8 centimetres long, and broader behind than in front, the maximum breadth being 2·2. The whole dorsal surface is covered with extremely minute granulations, which can only be seen under a strong lens. The rhinophore-pockets are very slightly raised and crenulate. The branchial pocket is stellate, with six not very distinct lobes; the branchiæ are six, tripinnate, small and deeply retracted. The anterior end of the foot grooved and notched as usual; the oral tentacles distinct, white and conical. The labial cuticle is strengthened by some minute rods, but they are not combined into a plate or rim. The radula consists of 36 rows, containing about 50 teeth on each side of the rhachis. The innermost and outermost teeth are smaller, the two or three outermost degraded but not denticulate. The male branch of the reproductive organs is armed with colourless scales, bearing erect spines, not hooks. The female branch has strong folds.

### 23. PLATYDORIS INCERTA, sp. n.

Seven specimens, found on brown sponges at low tide, Prison Island, Zanzibar.

The largest of the living animals was about an inch and a half long. They were all very flat in shape, sluggish, strongly adherent, and, though smooth, of the stiff coarse texture characteristic of the genus. The coloration rendered the animal invisible on the sponge, but was somewhat variable. As a rule it was yellowish brown, but one specimen was tinged with red and another with green. On the dorsal surface were collections of minute sandy dots, which in some specimens formed a line down the middle of the back. The underside was lighter in colour and without markings. The rhinophores were tipped with white, the gills brown or sandy.

The alcoholic specimens are all of a uniform dirty yellow. The measurements of the largest are : length 1·6 centimetres, breadth 0·9, height 0·4; the foot is 1·5 long and 0·7 broad. The rhinophore-pockets are crenulate, in some specimens slightly raised, in others closed and almost flat. The rhinophores have an unusually long stalk bearing a thick bunch of perforations, out of which rises a narrow bare tip slightly bent backwards. The gill-pocket is rather indistinctly stellate, with about six lobes, and contains six somewhat small bipinnate branchiæ. The foot is grooved in front and the upper lamina notched. The tentacles are narrow and digitate. There is no trace of labial armature. The radula formula is about 35.0.35 × 60. The teeth are white and simply hamate, of a rather thick and clumsy shape; the innermost are smaller but formed like the rest, the two or three outermost are degraded. The reproductive organs appear to be immature, but both the penis and vagina are armed with transparent, colourless, brick-like scales, apparently arranged in four

rows, each containing about ten scales. The central nervous system is as usual, with very large and distinct eyes.

The idea that the specimens are immature is supported by the size, which is small for the genus, and perhaps by the fact that a good many were found together. They are possibly the young of some already described form, and offer certain analogies with *Pl. vicina*, in which, however, only the male reproductive organs appear to be armed with scales (Bergh, Semper's Reisen, Suppl.-Heft i. 1880, p. 63).

#### 24. PLATYDORIS PAPILLATA, sp. n.

Nine specimens from Chuaka.

The living animals were of varying but somewhat sombre coloration, ranging from dark peaty brown to yellowish brown, in all cases blotched with grey or black markings, greatly varying in extent and pattern. The under side of the ample mantle had a whitish border, then a yellowish area covered with minute brown dots, and, lastly, chocolate-brown blotches near the foot, sometimes few and separate, sometimes united in a band. The foot was greyish. The gill-pocket closed as in *Asteronotus*. The dorsal surface was covered with numerous small simple papillæ, and also bore some much larger-branched papillæ, which may have been as much as half a centimetre long. In the living animal they looked exactly like bits of sand. Their number varied greatly in different specimens: in some they were numerous, in others there were only a few near the mantle-edge. The largest living specimen was 11 cm. long and 7 broad.

The measurements in alcohol are: length 8·1 cm., breadth 5·1, height 2·8. The mantle-brim very thick and 1·6 wide. The texture of all the specimens, particularly on the mantle-brim, is very distinctly leathery, but not hard or rough. One specimen, with an almost smooth back, presents the appearance of *Asteronotus*, but is clearly distinguished by the presence of a few branched papillæ. Also, in all specimens the back is granulate, and not smooth as in *Asteronotus*. The rhinophore-openings are slightly raised and indistinctly crenulate. The branchial pocket can be closed by six lobes which meet over it; they are not all of the same size, and vary in different specimens. The branchiae are six, tripinnate, and large. The foot is fairly broad and rather amply developed in front, where it has the usual notch and groove. It is, perhaps, as a consequence of this development that the oral tentacles, being pressed between the foot and head, appear flattened in most of the alcoholic specimens, and in some expanded into lobes as in *Herabranchus*. There is no trace of labial armature. The radula is broad, and consists of from 30 to 40 rows, containing from 60 to 70 teeth on each side of the rhachis. The teeth are long and simply hamate, the two or three innermost are somewhat degraded; the two innermost are not parallel to the rest of the row, but are set almost at right angles to it and project into the large bare rhachis (a somewhat similar though less-marked arrangement may be seen in Bergh's figure

of the radula of *Asteronotus bertrana* S. R. plate lxviii. fig. 9). The male reproductive organs are armed with two rows of hook-bearing disks, each disk set at some distance from the next one. There appears to be an accessory gland on the female branch like the glandula amatoria of *Asteronotus*, but no hasta was discoverable. The central nervous system is much concentrated; above it anteriorly and posteriorly lie the two very distinct divisions of the blood-gland.

This species seems in many ways intermediate between *Platydoris* and *Asteronotus*. But as it has the characteristic genital armature of the former, and as one of the principal characters of the latter is that the back is quite smooth and neither granulate nor papillous, I have thought it better to refer my specimens to *Platydoris*.

The chief specific character is no doubt the branched dorsal papillæ. I think it probable that this animal is identical with the *Doris sordida* of Quoy & Gaimard from Mauritius, but as neither their description \* nor their plate shows the branched papillæ, identification is impossible.

### 25. SCLERODORIS OSSEOSA (Kelaart).

[See Kelaart, "On new Species of Ceylonese Mollusca," in Annals & Mag. of Nat. Hist. vol. iii. 3rd ser. p. 298, 1859; and Alder & Hancock, "Notes on a Collection of Nudibranchiate Mollusca made in India," Tr. Z. S. iii. 1864, p. 121.]

Three specimens from the neighbourhood of Wasin. The notes on the living animals are unfortunately not forthcoming.

The alcoholic specimens vary in colour from pale yellow to greyish brown. They are hard and rough to the touch like *Platydoris*. The largest is 3·8 centimetres long, 2·2 broad, and 1·2 high. In all the specimens there is an indistinct dorsal ridge, and the back is irregularly reticulate and honeycombed; but while these markings extend over the entire upper surface in two specimens, they are confined to patches in the third. In all three there is one pit, larger and more conspicuous than the others, and surrounded by a protuberance in front of the gills. The mantle-brim is wide, and extends about 5 mm. beyond the head and tail. The rhinophore-openings are somewhat raised and closed by valve-like crenulations. The rhinophores are conical and not much bent back; the perfoliations cease before the tip. The branchial pocket lies at the end of the dorsal ridge and has raised edges; it is directed somewhat backwards and is crenulate. The branchiæ are six or seven, with the stem very large compared with the scanty perfoliations, which are bi- and sometimes tripinnate. The long and narrow foot is grooved and notched anteriorly. The tentacles are small, white, and conical. There is a strong bluish labial cuticle without any armature. The radula consists of about 40 rows, containing about 45 simply hamate teeth on

\* Unless this feature is meant to be included under the observation "Cette espèce a un peu la forme d'une Onchidie."

either side of the rhachis; the innermost are smaller, the two or three outermost degraded and sometimes bifid. The vestibulum genitale, like the rest of the body, is full of rod-shaped spicules, but no armature could be discovered in the ducts.

I think this is undoubtedly the animal described by Kelaart (*l. c. p. 298*) and said to resemble a piece of bone or worm-eaten white stone. It is also not unlike Alder and Hancock's plate (*l. c. xxviii. figs. 9 & 10*). But their description does not entirely correspond with my specimens, particularly in speaking of the branchial pocket as "a cup, the margin of which is scalloped and produced into a large lobe in front." Kelaart, on the other hand, says there are four or five branchial plumes which emerge horizontally from under the posterior termination of the dorsal ridge, which is correct. The branchiae seem to be somewhat variable in number, and, as is often the case with Dorids, admit of being counted in more than one way.

## 26. SCLERODORIS TUBERCULATA, sp. n.

One specimen from Prison Island, Zanzibar Harbour.

The following notes were made on the living animal:—"Dark brown with sandy spots, exactly like a sponge splashed with sand. Underside clear bright brownish red. Branchial pocket crenulate. The middle part of back covered with conical warts, which form an irregular keel; smaller warts on mantle-edge. Rhinophores red; branchiae eight, voluminous; axes red, tips white. Animal alters shape, sometimes rather high, sometimes quite flat like *Platydoris*. Consistency quite hard and rather rough. Two depressions with deep black markings as in some species of *Trippa*." The alcoholic specimen bears a strong general resemblance to *Trippa areolata*, but is stiff and spiculose like *Platydoris*, and has nothing of the flabby gelatinous feeling which characterises *T. areolata*. The back is covered with irregular tubercles, simple and compound, of all shapes and sizes, all granulate and sometimes connected by ridges so as to form a reticulation. There is an indistinct median ridge and two large pits with black bottoms, one in front of the branchial pocket and one about half-way up on the right-hand side. The general colour is greenish grey. The length is 6·5 centimetres, the breadth 4·2, and the height 2·2. The oral tentacles are distinct, digitate, and white. The foot is grooved and notched in front, the upper lamina being attached to the head below the mouth. The labial cuticle is strong and puckered, but no armature was discovered nor any ptyaline glands as in *Trippa areolata*. The radula consists of 40 rows, containing about 50 teeth on each side of the rhachis. These teeth are white and simply hamate; the innermost are smaller than the rest, the two or three outermost degraded and often bifid. The stomach is free and laminated internally. No genital armature was discernible.

The rhinophore-pockets are raised and provided with nine valve-like tubercles, of which two are much larger than the others. The rhinophores are short and thick, with about 50 perfoliations. The branchial pocket is entirely closed by ten valve-like tubercles,

some of which are grooved outside and thus appear double. The branchiae are eight in number, tripinnate, and very much retracted. The rhachis is very stout and strong.

### 27. SCLERODORIS MINOR, sp. n.

One specimen from Chuaka.

The living animal is described as superficially resembling *Platydoris papillata*, differing only in that the dorsal surface is covered with ridges which form a raised reticulate pattern. The colour was a uniform greyish brown, with a few patches resembling adherent sand. The underside of the mantle was warm grey with minute brown spots, the foot dirty orange. The gill-pocket did not close completely when the branchiae were retracted.

The alcoholic specimen is 2·7 centimetres long, 1·6 broad, and 1·1 high. The texture is rough and leathery, with the peculiar feeling common in *Platydoris*. All the dorsal surface, including the reticulations, is covered with minute tubercles. There is a rather indistinct median keel, from each side of which extends a somewhat irregular reticulate pattern. The rhinophore-openings are slightly raised and very slightly crenulate. The branchial pocket is also slightly raised, of irregular shape, but not crenulate, ridged vertically, and nearly but not quite closed. The branchiae are eight, the two posterior shorter than the rest; the others are tall, thin, and sparse, so that in the alcoholic specimen they appear simply pinnate, though they are really bi- and sometimes tripinnate. The foot is rather broad; the front notched and the upper lamina apparently attached to the head, at the side of which are the conical oral tentacles. The snout is protruded. There are scattered minute rods in the labial cuticle, but they are not combined into plates. The radula consists of 33 rows of yellow, regular hamate teeth, which do not diminish much in size, either at the rhachis or at the end of the rows: there are about 45 on the complete rows on each side of the rhachis. No genital armature was discernible.

This specimen bears a strong general resemblance to *Sclerodoris tuberculata*, and may perhaps be a young individual of the same species. The radula is, however, not quite the same, there are no pits on the back, and the reticulate pattern is more distinct than in the larger animal. It is possible that as the animal becomes older the tubercles and pits may develop at the expense of the pattern.

### 28. SCLERODORIS RUBRA, sp. n.

One specimen from the reef off the East Coast of Zanzibar.

The living animal bears a most remarkable resemblance to a vermillion sponge which is common at Zanzibar. It was not, however, found on the sponge, but alone among *Zostera* near the shore, and not in any way concealed. It was picked up under the impression that it was a species of sponge. The colour was red, with some very natural-looking sandy patches. The texture was

firm and fleshy, with something of the rough feeling characteristic of *Platydoris*.

The alcoholic specimen is dirty white in colour with greyish blotches. The measurements are: length 5·5 centimetres, breadth 2·7, height 2·6. It will therefore be seen that the shape is very distinctly arched. In the middle of the minutely granulated back is an indistinct keel from which extends on either side a low fleshy reticulation. Independent of this reticulation, and sometimes concealing it, are a number of excrescences which, even in the alcoholic specimen, present the most extraordinary resemblance to the miscellaneous growths and accretions found on old shells and sponges. Some are as much as 4 millimetres high. I endeavoured to pull them off, being sure they could not be part of the mantle. They are so, however, and afford an even more remarkable case of mimicry than *Trippa areolata*. The edges of the rhinophore- and gill-pockets are crenulate, but not raised. The eight tripinnate branchiae are deeply retracted into the bottom of the pocket. The anal papilla is large and has a cleft down the posterior side which appears natural. In the alcoholic specimen the foot is narrow with the edges turned inwards, but it was probably fairly broad in life: it bears a shallow groove in front, the upper lip of which is notched. The tentacles are very small and digitate. The blood-gland is large, reddish, and double: the central nervous system in a reddish capsule and much concentrated. There is no labial armature. The radula, which is large and wide, consists of 42 rows, containing about 55 large blunt hamate teeth on each side of the rhachis: the innermost are smaller than the others, and one or two of the outermost are also smaller and distinctly bifid. The reproductive system is unarmed.

29. *SCLERODORIS CORIACEA*, sp. n. (Plate XXXIV. figs. 3 & 4.)

One specimen from a cave near Chuaka on the East Coast of Zanzibar.

The living animal was yellowish brown in colour above and light orange underneath. The preserved specimen is 2·4 centimetres long, 1·7 broad, and .8 high in the middle of the back, the sides of the mantle being very low. The foot is large, being 1·9 centimetres long and 1·1 broad: the sides are developed into wide and very thin expansions. The anterior margin is deeply grooved, but the upper lip is not split though it is indented. The rhinophore-openings have somewhat raised and indistinctly crenulate edges. The branchial pocket is wide, conspicuous, and somewhat two-lipped in shape. The edge is turned outwards and is not at all crenulate. The branchiae are six and tripinnate. The general texture of the animal is leathery, and the whole dorsal surface is covered with a distinctly raised but somewhat irregular reticulate pattern. Both this pattern and the ground surface are granulate. The buccal tentacles are long, thin, and pointed. There is no labial armature. The radula consists of 40 rows, with about 40 teeth on each side of the naked rhachis.

The teeth are simply hamate; the innermost are smaller; the outermost smaller and imperfect in shape, bifid or irregularly serrulate. The stomach is large, muscular, and free from the liver. No armature was visible in the reproductive apparatus, and the genital orifices were unusually small and inconspicuous.

On the right side of the liver was found a parasite (Pl. XXXIV. fig. 4), extending from the fore end halfway down, the head being bent downwards round the fore end of the liver. The impression of the parasite on the liver was very distinct.

This form has not the hard feeling characteristic of *Sclerodoris*, but as the back is leathery, reticulate, and granulate, I hardly think it advisable to create a new genus for its reception.

### 30. ASTERONOTUS HEMPRICHI Ehr. (Plate XXXIV. figs. 5 & 6.)

[Ehrenberg, Symbolæ Physicæ, Animalia Evertebrata, 1831.]

This large animal is common under rocks at Zanzibar and in all parts of British East Africa, between tides.

It has a characteristic feeling like leather or india-rubber, and not hard or rough like *Platydoris*. The ground-colour varies from black to olive or chocolate-brown. The skin is quite smooth, but bears a number of irregular lumps, resembling blisters in appearance. Towards the edges of the mantle they are smaller and somewhat confluent. Down the centre of the back runs a more or less elevated ridge, varying much in different specimens. All these protuberances are of a much lighter tint than the rest of the body. In some specimens there are small white lines round the lumps. The large branchiæ are white or pinkish. The under-side of the mantle is light yellow, with a row of chocolate blotches forming a line round the margin of the mantle and another round the foot. The coloration shown in the figure (Plate XXXIV. fig. 5), though an accurate representation of some specimens, is not the commonest. The greater number of individuals are more distinctly green. The animals are sluggish and show little inclination to move. The branchiæ are comparatively insensitive. Though completely retractile, they are not hidden when the teeth close over the pocket, but can be clearly seen at the bottom of the cavity (Pl. XXIV. fig. 6).

The largest alcoholic specimen measures 8·3 cm. in length by 6, and is 2·4 cm. high. The foot is 6 in length by 1·5; the anterior margin is deeply notched and grooved, the upper flap being very ample. The tentacles are large and in two specimens show a rudimentary foliation resembling that of *Hexabranchus*. This may be due to artificial compression, but I am not sure. The lips are also ample and protruding, so as to look like a second pair of tentacles. The rhinophore-pockets are somewhat raised and smooth, sometimes distinctly bilabiate. The branchiæ are six, ample, and quadripinnate. The margin of the pocket is produced into six lobes, which partially close over it. The radula consists of about 32 rows, each containing about 45 large yellow teeth on either side of the wide, naked rhachis. The teeth are simply hamate: the outermost two or three are smaller, and the inner-

most are set almost at right angles to the rhachis. The stomach is large and free, but thin and not laminated nor muscular. The blood-gland is large, and the nervous system is very concentrated. The generative system appears to be as described by Bergh, but the glandula and hasta amatoria are difficult to see and were satisfactorily detected only in one specimen.

These specimens are, I think, clearly Ehrenberg's *Asteronotus hemprichi*, from Massaua. He describes it as "sex-pollicaris, oblongus, glaber, vesiculosus, supra fuscus, lineis circulisque niveis sparsis, vesicas dorsuales cingentibus, subtus lateritus, pede flavido, branchiarum apertura lobulis sex stellatim positis praeccludenda. . . . Branchiarum e dilute laterito seu carneo albicantium fasciculus amplus."

Prof. Bergh seems inclined to think (S. R. xvii. p. 917) that the real species of this genus are not more than three, *hemprichi*, *mabilla*, and *cospitosus*. The differences between these three do not seem to me to be clearly defined, and my numerous specimens, which I unhesitatingly refer to one species, present connecting links, especially in colour, which make me think that the three species are merely varieties of one.

#### EXPLANATION OF THE PLATES.

N.B.—Except in the cases noted, the figures are drawn from the living animal.

#### PLATE XXXII.

- Fig. 1. *Thordisa villosa* (p. 367), ventral view.  
 2. Dorsal view of the same.  
 3. *Thordisa crosslandi* (p. 368), ventral view. The margin of the mantle is inturned here and there, showing the mobile papillæ which cover the dorsal surface.  
 4. *Trippa monsoni* (p. 371), dorsal view, much enlarged.  
 5. *Halgerda willeyi* (p. 372), from a drawing by Dr. Arthur Willey.

#### PLATE XXXIII.

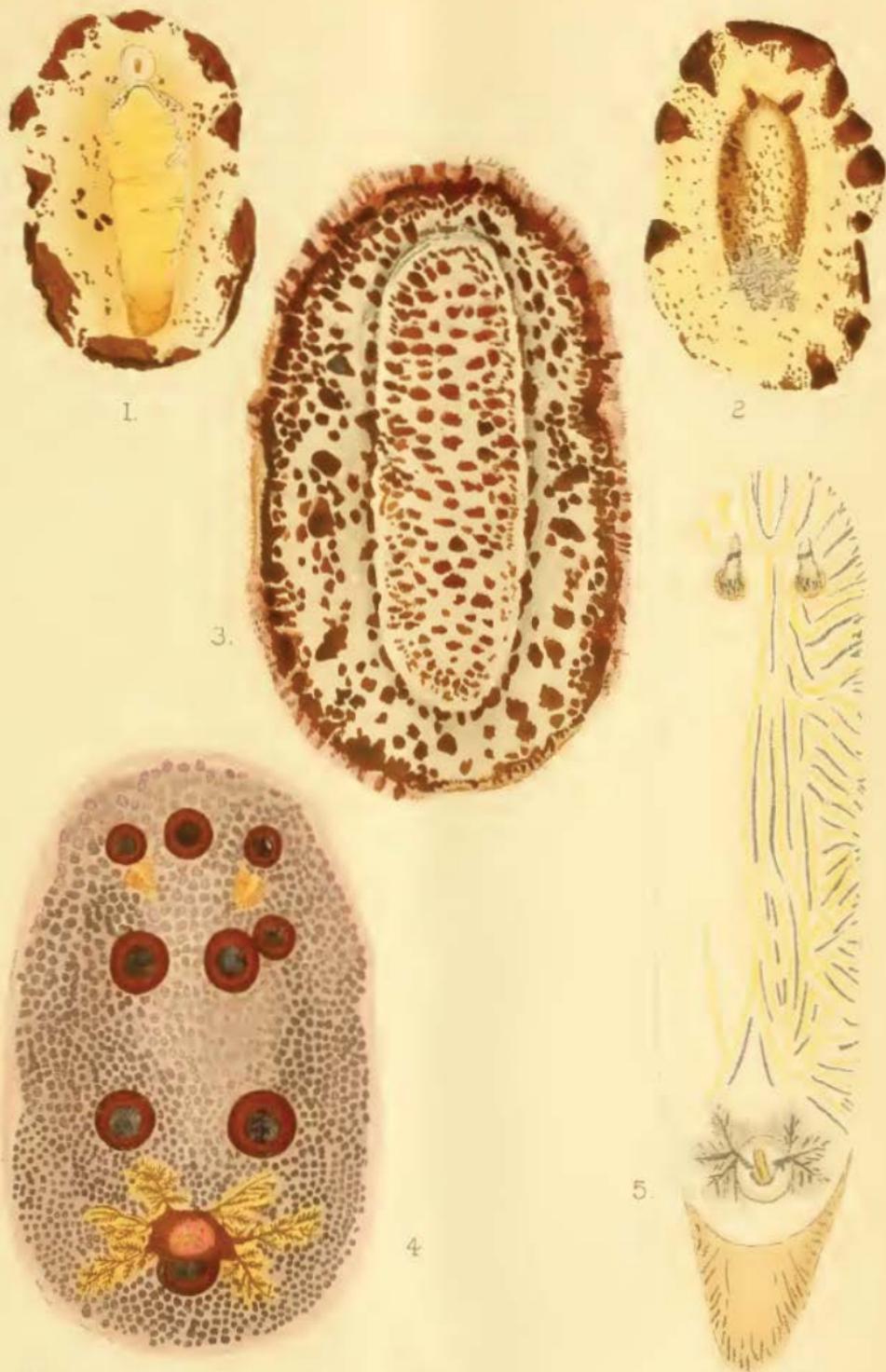
- Fig. 1. *Thordisa villosa* (p. 367), head and anterior end. The figure shows an extreme elevation of the body, which normally is flat.  
 2. Dorsal papilla of the same species, with flexible pigmented end and spicule-stiffened base. Also a portion of the mantle-edge magnified.  
 3. Branchia of the same.  
 4. *Thordisa crosslandi* (p. 368). Teeth from the radula: *a*, upstanding; *b*, laid flat.  
 5. Gills and anus of the same. A ridge (*a*) connects the higher part of the rhachis with the anal papilla (*b*).  
 6. Dissection of the retracted penis of the same, showing the shape and structure of the enclosed *glands*.  
 7. The *glands* penis of the same is slit open, showing it to be hollow and to contain a prolongation of the *vas deferens* which passes to its tip.  
 8. The central nervous system of the same in its sheathing of connective tissue.

#### PLATE XXXIV.

- Fig. 1. *Halgerda wasinensis*\* (p. 373), dorsal view.  
 2. Diagram of the arrangement of its gill on the rhachis.  
 3. *Sclerodoris coriacea* (p. 383). Pencil drawing from the preserved specimen.  
 4. Degenerate Copepod parasite found in the liver of *Sclerodoris* (p. 384).  
 5. *Asteronotus hemprichi* (p. 384).  
 6. Enlarged view of the gill-opening when the branchiæ are as completely retracted as is possible.  
 7. *Kentrodooris rubescens* (p. 374), about half natural size.

\* This name is wrongly spelt "*wassiniensis*" on Plate.



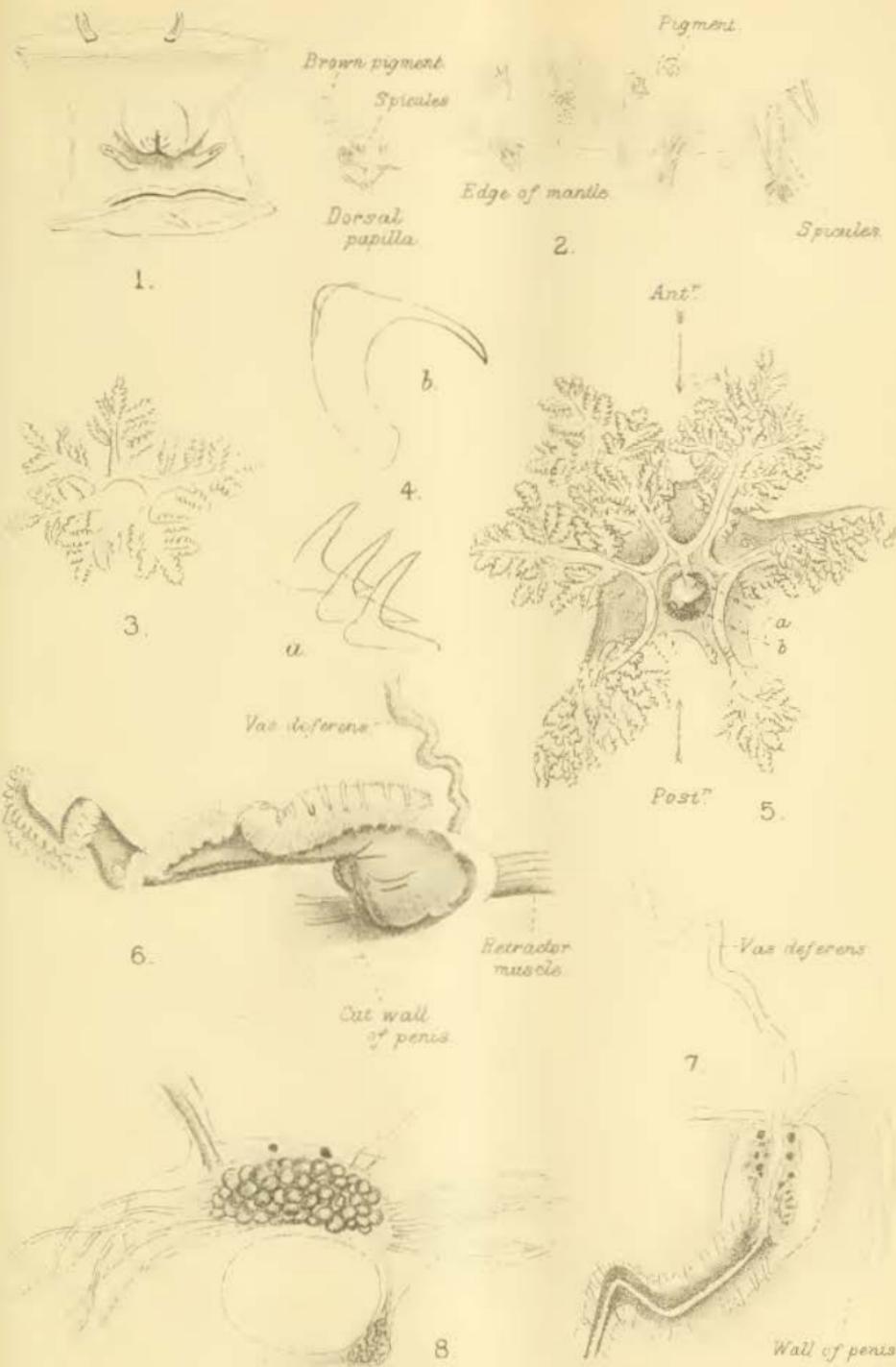


C Crossland del  
A. Willey del fig. 5.

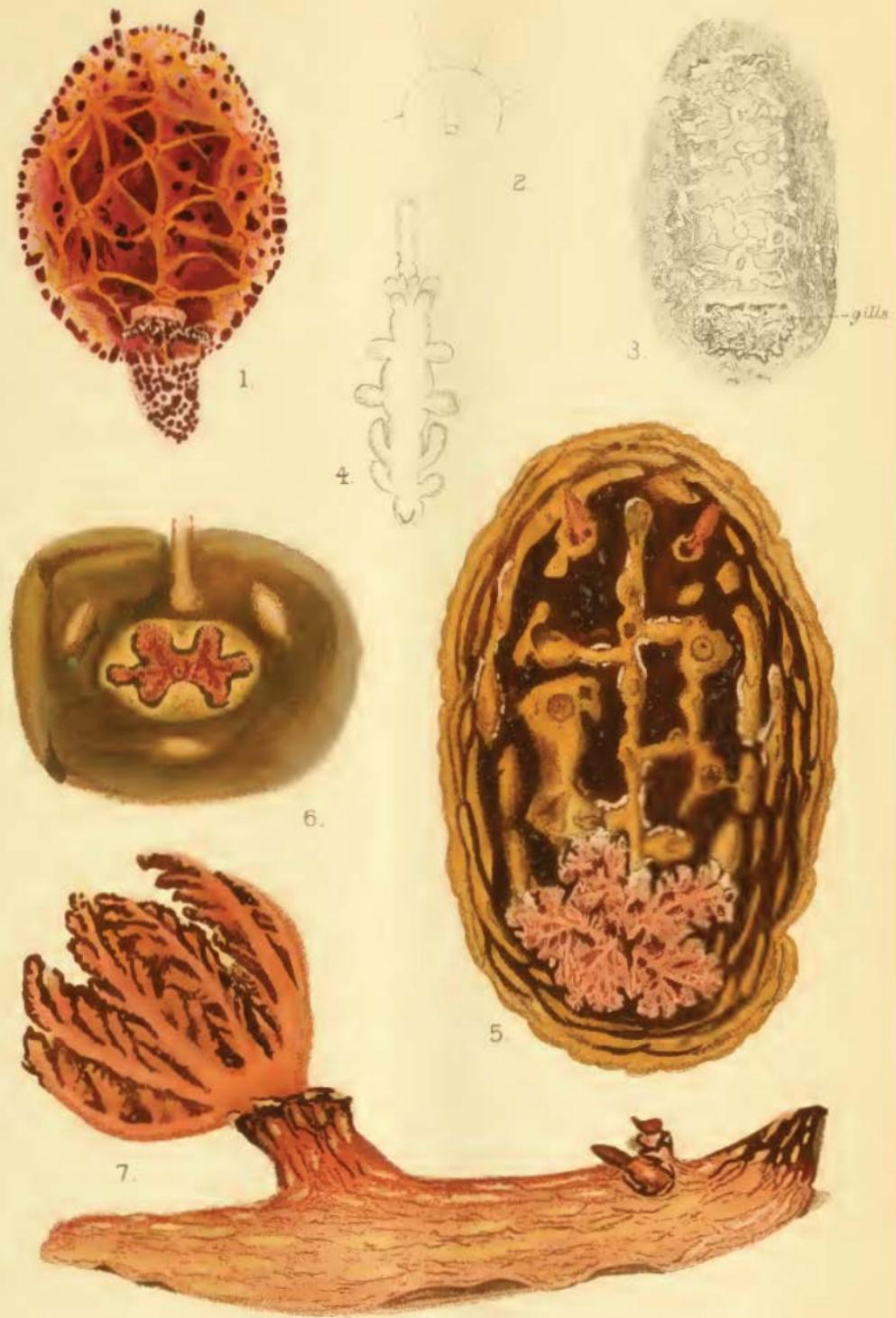
Huth with London

1,2. *THORDISA VILLOSA*. 3. *T. CROSSLANDI*  
4. *TRIPPA MONSONI*. 5. *HALGERDA WILLEI*.









C. Crossland del.

Huth, Lith<sup>r</sup> London.

1,2. HALGERDA WASSINENSIS. 3. SCLERODORIS CORIACEA.  
4. PARASITIC COPAPOD. 5,6. ASTERONOTUS HEMPRICH.  
7. KENTRODORIS RUBESCENS.