

NUDIBRANCHS FROM NEW ZEALAND AND THE FALKLAND ISLANDS.

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PLATE XXVIII.

THESE notes on New Zealand nudibranchs are based partly on material kindly sent to me by Mr. Henry Suter and Mr. Charles Cooper, and partly on P. Abraham's type-specimens preserved in the British Museum and most courteously placed at my disposal by Mr. E. A. Smith. Abraham described very imperfectly a number of old specimens. In some cases they are so decayed and the descriptions so deficient in definitely formulated characters that his names can be set aside. In other cases such as *Doris muscula*, *D. lanuginata*, etc., the characters of the labelled specimens, if not those given in the descriptions, are sufficiently clear and the names must be respected.

In the nudibranch fauna of both New Zealand and the Falkland Islands one is struck by the fact that similar or identical forms occur in the Pacific as well as in the Atlantic on both sides of the equator outside the tropics, although they are absent or scarce within the tropics. Thus *Acanthodoris pilosa* is recorded from the North Atlantic, the North Pacific, and New Zealand, and *Æolidia papillosa* (or *Æ. serotina*, a very similar form) from the North Atlantic, North Pacific, and Falkland Islands. But I think that in cases where the identity is not absolute, it is better to create or recognize separate species. Considering how greatly preserved nudibranchs change their colour and shape, a considerable assumption is always involved in identifying an alcoholic specimen from the southern hemisphere with a species from the Northern Atlantic, and, if any points of difference are found, it seems to me safer to emphasize them, though they may be minute. Identifications of northern and southern species are generally accepted without criticism and made the basis of important theories. The creation of a new species challenges re-examination and really contains less of the speculative element.

Nevertheless, there can be no doubt that these southern seas contain a considerable number of forms which are either specifically identical with northern forms, or so closely allied to them, that they must be supposed to be sprung from the same immediate ancestors. The same is true of Antarctic Pteropods (see my report on the collection made by the 'Discovery'), but the coincidence is less noticeable in the case of Antarctic nudibranchs, which offer many new types that have not yet been found elsewhere.¹ For drawing any general conclusions the nudibranchs of New Zealand should probably not be regarded as

¹ *Archidoris tuberculata* is recorded from 65° 5' S. (Vayssière), and perhaps *Doto antarctica*, Eliot, is *Doto fragilis* (Forbes).

representing a separate province, but be taken in conjunction with the nudibranchs of South Australia and Tasmania. This fauna seems to show much the same characters as the New Zealand fauna.

In classification I follow the arrangement of Bergh, but this system was based chiefly on an examination of forms from the Northern Atlantic and Pacific, the Mediterranean, and Indo-Pacific, hardly any specimens from the Southern Atlantic or Southern Pacific being available. But recent investigations (particularly Bergh's account of the Opisthobranchiata of South Africa in the Transactions of the South African Philosophical Society, vol. xvii, 1907) show that these southern forms necessitate both additions and rearrangement. As explained elsewhere,¹ I think wider generic definitions advisable and in particular I should wish both for convenience and correctness of nomenclature to revive the old name *Doris* and to recognize *Staurodoris*, *Archidoris*, *Anisodoris*, and *Homoiodoris* as subgenera of it. To these subgenera I add in this paper a new one, *Ctenodoris*, proposed for *Doris flabellifera*, Cheeseman, and *Staurodoris pecten*, Eliot, both characterized by a peculiar arrangement of the branchiæ.

The following is a list of New Zealand nudibranchs. It makes no pretension to bibliographical completeness and merely endeavours to give the names of such forms as are known with sufficient certainty to warrant conclusions being drawn as to their distribution. The forms marked with * are described below:—

NAME.	DISTRIBUTION.
1. * <i>Stiliger felinus</i> , Hutton	An allied form, <i>St. bellulus</i> (= <i>St. Mariæ</i>), is found in the N. Atlantic.
2. <i>Hervia</i> (?) <i>Corfei</i> , Hutton... ..	Genus recorded from N. Atlantic, Mediterranean, Ceylon, Amboina, E. Africa.
3. * <i>Facelina</i> sp.	Genus recorded from Atlantic, Mediterranean, E. Africa, and California.
4. * <i>Antiopella</i> (= <i>Janus</i>) <i>Novozelandica</i> , n.sp.	Genus recorded with certainty only from N. Atlantic. <i>Janus sanguineus</i> of Angas is uncertain. The allied <i>Janolus</i> is recorded from California and the Arafura Sea.
5. * <i>Alloiodoris lanuginata</i> (Abr.)	Allied and possibly identical species from Tasmania and S. Australia.
6. * <i>Archidoris Wellingtonensis</i> (Abr.)	Species not recorded from elsewhere. Genus probably cosmopolitan, but most abundant in temperate seas.
7. <i>Archidoris violacea</i> , Bergh	} Perhaps identical with E. African forms.
8. <i>Archidoris nanula</i> , Bergh	
9. * <i>Ctenodoris flabellifera</i> (Cheesem.)	Genus recorded from the Maldive Islands.
10. <i>Homoiodoris</i> (?) <i>Novozelandiæ</i> , Bergh	Genus recorded from Japan.
11. <i>Atagema carinata</i> (Q. & G.)	Not recorded from elsewhere.
12. * <i>Rostanga muscula</i> (Abr.)	} Genus recorded from N. Atlantic, Mediterranean, and California.
13. <i>Rostanga rubicunda</i> (Cheesem.)	

¹ Notes on some British Nudibranchs in Journal of Marine Biological Association for June, 1906, p. 336.

NAME.		DISTRIBUTION.
14.	* <i>Garganella Novozealandica</i> , n.sp. ...	Genus recorded from S.W. Atlantic.
15.	* <i>Aphelodoris Cheesemani</i> , n.n. (= <i>D. luctuosa</i> , Cheesem.) ...	Genus recorded from W. Indies and Tasmania.
16.	<i>Aphelodoris</i> (?) <i>purpurea</i> , Bergh ...	
17.	* <i>Aphelodoris affinis</i> , n.sp. ...	
18.	* <i>Chromodoris amana</i> , Cheesem. = <i>Chr. figurata</i> , Bergh ...	The genus is specially characteristic of the tropical Pacific, but extends to Puget Sound and Japan. It also occurs in the tropical Atlantic, in the Mediterranean and S. African waters.
19.	* <i>Chromodoris aureo-marginata</i> , Cheesem. ...	Perhaps identical with a Polynesian form.
20.	<i>Chromodoris atopa</i> , Bergh ...	
21.	* <i>Doridopsis mammosa</i> , Abr. ...	The genus has much the same distribution as <i>Chromodoris</i> .
22.	* <i>Doridopsis citrina</i> , Cheesem. ...	Closely allied to <i>D. fulva</i> from California and perhaps identical.
23.	<i>Goniodoris castanea</i> , A. & H. ...	The same species is recorded from the N. Atlantic and Mediterranean. The genus is also represented in the Indian Ocean.
24.	* <i>Goniodoris punctata</i> , Bergh ...	
25.	<i>Euplocamus pacificus</i> , Bergh ...	The genus is also recorded from the N. and S. Atlantic, the Mediterranean, and Japan.
26.	<i>Acanthodoris pilosa</i> , var. <i>pallida</i> , Bergh ...	The species is recorded from the N. Atlantic and N. Pacific. The genus is characteristic of the colder seas, and is not recorded from the tropics.
27.	* <i>Acanthodoris mollicella</i> , Abr. ? = <i>Ac. pilosa</i> , var. <i>Novozealandica</i> , Bergh ...	
28.	* <i>Acanthodoris globosa</i> , Abr. ...	Nearly allied to <i>A. metulifera</i> from Tasmania or identical.
29.	<i>Tritonia incerta</i> , Bergh ...	Genus probably cosmopolitan, but specially frequent in colder seas.

It would appear from the above list that the nudibranch fauna of New Zealand contains at least three elements. (1) A tropical element, represented by such genera as *Chromodoris* and *Doridopsis*, which are particularly abundant in the Equatorial Indo-Pacific. (2) Forms which are characteristic of the colder seas. In some cases, such as *Archidoris*, these genera appear to be cosmopolitan, though they are more noticeable in colder waters; in others, such as *Acanthodoris*, they are not recorded at all from the tropics, but are abundant in temperate climates both to the north and south. The close agreement in species is very remarkable. *Goniodoris castanea* is found in the North Atlantic, Mediterranean, and New Zealand seas. The distribution of *Acanthodoris pilosa* has already been mentioned. In a list of New Zealand Nudibranchs kindly sent me by Mr. Suter is *Archidoris tuberculata*. I have not seen myself specimens of this form from the Southern seas, but Vayssière (Expéd. Antarct. Française, Moll. Nudib., 1906, p. 4), records it from Wandel Island. It is found in the North Atlantic, Mediterranean, and N. Pacific. It is noticeable that forms

which are either identical or very closely allied occur on the coasts of California and New Zealand, e.g., *Doridopsis citrina* and *D. fulva*, *Rostanga muscula* and *R. pulchra*. (3) There is a small element which appears to be peculiar to New Zealand and the adjacent waters of Australia, as far as our present records go. It is represented chiefly by the remarkable genus *Alloiodoris*. *Atagema* also is not recorded from elsewhere, but has less decided characters. On the other hand, none of the remarkable Antarctic forms which have been recently described, such as *Bathydoris*, *Charcotia*, *Notæolidia*, *Tritoniella*, and *Tritoniopsis*, have yet been recorded from New Zealand.

I have added to this paper a description of a fine species of *Archidoris* from Australia which seems new.

STILIGER FELINUS (Hutton).

Calliopæa felina, Hutton: Trans. New Zeal. Inst., vol. xv, p. 133, 1882.

Eight specimens from Te Onepoto, South Island. They vary greatly in colour, ranging from uniform dirty white to almost unbroken dark brown of various shades. The foot, anal papilla, and at least in part the rhinophores are white in all specimens. In a dark specimen, which appears to have preserved the natural coloration, the dorsal surface and the inner side of the larger anterior cerata are of a deep, rich, purplish brown, almost black. The outer sides of the larger cerata, the whole of the posterior cerata, and the sides of the body are lighter brown. At the tip of each of the cerata is a lighter but not very conspicuous spot. Conspicuous, however, and bright white are the anal papilla and the tips and under-sides of the rhinophores. From each rhinophore a band runs downwards; the two bands meet and form a white border across the head. In the lighter specimens, either from alcohol or from natural variation, the cerata and sides of the body have become much lighter, while the back retains more or less dark pigment. Two specimens are quite white.

The largest specimens are about a centimetre long, 4.5 mm. broad, and 3.3 mm. high. The largest cerata are about 3.5 high, with a maximum breadth of nearly 2.5. They are set in from 6 to 10 transverse rows, consisting of from 2 to 3 cerata each, but the third longitudinal line of cerata is not perfectly developed in any specimen. The inner cerata are considerably larger than the outer, and in some specimens one or two of them are markedly larger than the others. In most specimens there is visible a large bare area down the centre of the back. The pericardium is large and prominent. From it there runs in all specimens a conspicuous, long bladder-like prolongation or ridge, extending to nearly the end of the body. The rhinophores are distinct, but not large; entire, not perfoliated or grooved. The white band which runs from them to the mouth appears in some specimens to be a ridge. They point outwards, right and left, and do not stand vertically. The anal papilla is dorsal, behind the pericardial prominence, and slightly to the left of it. The genital opening is just behind the rhinophores. The foot is fairly broad, white, truncated in front, not grooved or notched, and not produced into tentacular

processes at the corners. Its margins are not expanded at the sides, and it is prolonged into a short flat tail behind the body.

The integuments are very thin, and allow the follicles of the hermaphrodite gland to be seen through the foot, sides, and back. These follicles are white and fill up almost the whole of the internal cavity, and it is only with difficulty that the alimentary canal and other organs can be distinguished between them. The buccal mass is small, of the shape usual in the genus, and without jaws. In the specimens dissected the radula was consistently composed of 5 teeth in the ascending portion, 8 in the descending, and about 10 in the sac, still retaining a spiral arrangement, though somewhat in disorder. The teeth are, as usual, in the Ascoglossa: they are rather large, colourless, spoon-shaped, indented in the back, and not denticulate in any part. No dilatation of the alimentary canal sufficient to be called a stomach was found. The bases of the cerata are connected by colourless tubes from which they rise, and which run between them under the dorsal integuments, being presumably part of the hepatic system.

The central nervous system is small, and apparently consists of seven ganglia, arranged as usual in the Elysiodea. The spermatheca is large, full, and irregularly pear-shaped. In spite of a careful search, no spine was found in the male genitalia. The mucus gland is large and diffused among the other organs.

This species is allied to the *Stiliger bellulus* (= *St. Mariae*) of European waters, but differs in having more cerata and a ridge-like prolongation of the pericardium visible on the back, perhaps also in the absence of a spine in the genitalia.

FACELINA sp.

One specimen from Dunedin Harbour, of a uniform dull olive, as preserved. Long and narrow (length 13, breadth 3 mm.), with a tapering tail and curved tentacular projections on the anterior margin of the foot. Oral tentacles very large and stout; rhinophores stout, deeply ringed. Cerata sparse and small. Many have been lost, but they seem to have been set in four groups. Radula: a single series of 18 teeth of the usual horse-shoe shape, with a long prominent central cusp and four very distinct denticles on either side of it. Jaws decayed, but apparently bearing a single row of irregular and not very clear denticles. Penis armed with numerous small prominences or spines.

This seems to be a typical *Facelina*. The dentition agrees with *F. Stearnsi*, recorded from California, but without more data as to the colour and appearance of the living animal identification is impossible.

ANTIOPELLA NOVOZEALANDICA, n.sp.

One specimen. It is stoutly built (length 14, breadth 6, height 4 mm.), and greyish in colour. Down the middle of the back, both before and behind the rhinophores, runs a purplish stripe which becomes dissolved into a multitude of dots posteriorly. In the middle of this stripe, just behind the rhinophores, is a lozenge-shaped,

light-coloured area. The rhinophores are grey with purplish spots, large (4 mm. high), and have between them a large crest of the same colour. Both the rhinophores and the crest are so amply and deeply perfoliate that the whole arrangement superficially resembles the branchial rosette of a Dorid. The anal papilla is large, prominent, medio-dorsal, and nearly terminal, with a crenulated edge.

The cerata are very numerous, often flattened as preserved, but apparently originally fusiform. The innermost are the largest and as much as 6.5 mm. high. They are not set in regular rows, but in a reticulate pattern which is generally 4-6 mm. deep transversely. Two or three lines of small cerata extend round the head in front of the rhinophores. The hepatic diverticula within the cerata are of irregular shape and often conspicuously granulate or folliculate, but not bifid or branched. Some parts of them are much darker than others and spotted with purple.

Below the anterior mantle-edge is a small oral veil bearing two distinct purple tentacles. The foot is broad, with expanded lateral margins which are not, however, broader than the body. Its anterior margin is bilobed and connected with the mouth, but not grooved or produced into tentacular processes. The genital orifices are rather far back, 6 mm. from the anterior end. The tail is very short.

The central nervous system consists of three very distinct pairs of symmetrical ganglia which are all strongly granulated. The pedal ganglia lie a little lower than the others at the sides of the œsophagus, and are connected by a very short commissure.

The buccal mass is very large. The jaws are long, but narrow, bright yellow, but darker near the hinge and edges. There are accessory pieces near the hinges. There appears to be some denticulation on the cutting-edge, but it is not large or distinct. Possibly the jaws have been injured. The radula consists of 23 rows (of which three are undeveloped) of white transparent teeth. The maximum formula is $37 + 1 + 37$. The central tooth is not conspicuous, and differs from the others only in its central position and in being smaller. The teeth are hamate, not denticulate, and increase in size outwards. Only the outermost of all is smaller.

The stomach is rather large and laminated internally. As far as could be ascertained, it receives two main hepatic ducts in front. They are ramified and transparent, but speckled. The intestine issues posteriorly. No armature was found on the genitalia, and the verge is not very long. The mucus and albumen glands extend far forward and lie under the mouth. At the sides of the back beneath the cerata is a spongy layer composed of minute tubes out of which rise the hepatic diverticula contained in the cerata.

This species appears to have the characters of a typical *Antiopella*, except that the jaws are not distinctly and strongly denticulate. It differs from the British *A. cristata* in its colour and in the size of the rhinophores and crest, perhaps also in the jaws.

For the synonymy *Antiopella* = *Antiopa* = *Janus*, see Eliot, Notes on some British Nudibranchs, Journ. Mar. Biol. Assoc., vol. vii, p. 373, 1906.

ALLOIODORIS, Bergh, 1904.

This remarkable genus was created by Bergh for specimens from Tasmania in which the hermaphrodite gland is not spread over the liver as in nearly all known Dorids, but is collected into a separate mass. The teeth are denticulate, a labial armature is sometimes present, the male genitalia are armed with spines, and the back is covered with small tubercles. This peculiar conformation of the hermaphrodite gland also occurs in *Bathydoris* and *Trevelyana*, but it seems impossible to associate *Alloiodoris* (which in other respects is a normal cryptobranchiate Dorid) with either of those forms. The condition in which the hermaphrodite gland is a separate mass is probably older than the condition in which it is a mere layer spread over the liver, and it would seem that very different families of the Dorididæ sporadically preserve or revert to the older arrangement. Abraham's *Doris lanuginata*, of which I have examined the type and also more recent specimens sent by Mr. Suter, proves to belong to this genus, which thus contains:—

1. *Alloiodoris marmorata*, Bergh.
2. *A. lanuginata* (Abraham).

A. lanuginata possesses a not very solid labial armature, which is not recorded of *A. marmorata*, but I do not think this character justifies the creation of a new genus.

ALLOIODORIS LANUGINATA (Abraham). Pl. XXVIII, Figs. 1, 2.

Doris lanuginata, Abraham: Proc. Zool. Soc., p. 255, pl. xxix, figs. 15–17, 1877.

Alloiodoris marmorata, Bergh: Malac. Untersuch. in Semper's Reisen, vi, p. 42, 1904. Basedow & Hedley: Trans. R. Soc. South Austr., vol. xxix, p. 152, 1905.

The following description is based upon fresh material sent me by Mr. Suter, because the type-specimen, described by Abraham, is old, and has naturally suffered in the lapse of time. It is, however, certain that it is an *Alloiodoris*, and hardly less certain that it is the same species as the *Alloiodoris* sent by Mr. Suter. (1) Allowing for the loss of colour and the flabbiness produced by decay, the external characters are the same. (2) The radula and the peculiar shadowy labial armature are exactly the same. (3) So are the armature of the vas deferens and of the verge, as well as the arrangement of the hermaphrodite gland, which is the chief character of the genus.

I have examined Abraham's type-specimen preserved in the British Museum, and two recent specimens from New Zealand, one from Cook Strand and one from Takapuna. These agree, except in colour. With the Takapuna specimen is a note saying: "The ground colour, which is gone, was a dirty red with numerous white pustules." By a curious change it has become greenish grey with blackish mottlings. The specimen from Cook Strand is 50 mm. long, 33 broad, and 16 high. The dorsal surface is flesh-coloured, with 25 scattered brownish spots. There are also a few spots on the under-side of the mantle, near the junction with the foot. The consistency is firm, but soft

and fleshy. The mantle-edge is thick. The back is entirely covered with small tubercles, which extend to the pockets of the rhinophores and branchiæ, but are not specially large there. They are about .75 mm. high and stiffened by spicules, four of which usually project from the tip. The tubercles are not tapering, but either of uniform diameter or larger at the top. Under the microscope it can be seen that their sides bear minute projections. They are all whitish, the dark colour of the spots residing entirely in the level dorsal surface.

The openings of the rhinophores form gently swelling hillocks, but are not protected by raised sheaths. The large rhinophores are yellowish with darker mottlings, and bear at least 30 deep perfoliations. The branchial pocket has a slightly raised, crenulate rim. The branchiæ, which are deeply retracted, are tri- and in places quadripinnate. There is one separate plume in front, and at the sides two groups of two plumes each, so that the branchiæ can be counted as 5 or 9 according as these groups are regarded as two plumes or a bifid plume. They are greenish with darker mottlings.

The tentacles as preserved are long and flat, furrowed on the upper surface, and almost auriculate. The foot is very large, being nearly as long and wide as the body. In front it is grooved, and the thin upper lamina is divided by a median notch.

The blood-gland is white, fairly large, and lies in two divisions, one before and one behind the central nervous system, which is yellow and distinct. Seen from above the divisions between the ganglia are not very marked, but they are plain from below. The cerebral ganglia are continuous with the pleural and bear the sessile eyes in front. The pedal ganglia are separable and roundish; the buccal are fairly large, round, close together, and bear the small gastro-cesophageal ganglia. The salivary glands are large and band-like. No ptyaline glands were found, but some hardened tissues adhering to the buccal mass may have originally been glandular.

On the labial cuticle is an armature (Fig. 1*a*), which, though large enough to be seen by the naked eye, is curiously shadowy, being, not a compact plate, but a loose collection of rods, almost transparent in some places, thicker in others. But though so unsubstantial it is fairly definite in outline, consisting of two plates prolonged into tail-like appendages. The elements (Fig. 1*b*) are longish rods, often wavy and transversely striated, sometimes but not consistently hooked at the tip. The radula consists of 26 rows containing 40-45 teeth on either side of the rhachis. There is no rhaehidian tooth, but the first laterals (Fig. 2*a*) project into the rhachis and almost meet. They have a few denticles on the outside and on the inside a jagged prominence bearing 1 to 3 denticles. The second tooth (Fig. 2*b*) has a small prominence near the base on the inner side and denticles on the outer side. The succeeding teeth increase rapidly in size until they assume the normal form. This is short, stout, and strongly hamate; on the outer side of each tooth is a ridge terminating above in a rather blunt point; in the first 10-15 teeth this ridge bears several (generally about 6) very irregular (Fig. 2*c*) denticles; after the fifteenth tooth these denticles disappear, and only the point remains as a single denticle (Fig. 2*d*). It

is found in all the teeth except the last three, which are thin and irregular in shape, but not serrulate. The œsophagus is thin and rather wide. The large stomach lies in front of the liver, and is not at all enclosed in it. In the British Museum specimen its upper wall is strongly laminated. Beneath the stomach lies the rather large gall bladder. The liver is shorter than in ordinary Dorids, and abruptly truncated in front where the stomach and hermaphrodite gland fit into it.

The hermaphrodite gland does not form a layer over the liver as usual in Dorids, but is a separate yellowish mass about 15 mm. long and 10 broad. The ampulla of its duct is moderately large; the vas deferens is not much convoluted, but lies in one long loose coil. The part nearer the bifurcation of the male and female branches is soft and glandular, but not dilated. The lower part is muscular and begins with a very small swelling. The end of the vas deferens and the glans penis are armed with minute hooks, rather thick in shape, but often with pointed tips. The verge terminates in a sharply defined tip, which may perhaps have been a hard tube in life. The spermatheca is spherical, greyish, with thin walls and a short duct, whereas the spermatocyst, which rises close to it, is yellow, with thick tough walls and a rather long duct.

This species is undoubtedly an *Alloiodoris*, and Abraham's specific name has in any case priority. Bergh's *A. marmorata* is perhaps a distinct species. The first lateral tooth is differently formed; no labial armature was found, and it is not mentioned that the tentacles are grooved. It is not clear that the animal figured by Basedow & Hedley is either *A. marmorata* or *A. lanuginata*. It differs somewhat in coloration, and they state that the teeth were not denticulate. They say nothing about the hermaphrodite gland.

ARCHIDORIS WELLINGTONENSIS (Abraham).

Abraham: Proc. Zool. Soc., pp. 211, 259, pl. xxix, fig. 27, 1877;
 Eliot, Proc. Malac. Soc., vol. vi, pp. 236-238; Hutton, Trans.
 New Zealand Inst., vol. xiv, p. 166, 1881.

One specimen almost rolled up into a ball, but with external characters corresponding, as far as they can be seen, with previous descriptions. It is labelled *Doris Wellingtonensis*, and as preserved is 27 mm. long and 25 mm. broad.

The central nervous system is pinkish and much concentrated, the separate ganglia being hardly distinguishable either from above or below. The eyes are sessile. The blood-gland is pinkish white, much branched before and behind. The salivary glands are band-like and very long. The radula consists of 33 rows, of which the first three are fragmentary and the last two imperfectly developed. There are from 55 to 65 teeth on either side of the rhachis. There is no rhachidian tooth, as erroneously stated by Hutton. The first 15 teeth on either side are rather low, with long bases and short, strongly bent shafts. The rest are more erect, slender, with long shafts hollowed out on each side near the base, so that the lower part of the back is a mere lamina. The three outermost are thinner and smaller.

None are denticulate. The stomach is rather large and not enclosed by the liver. Its upper wall is laminated internally, one fold being much larger than the others. Near the pyloric end is a diverticulum of roughly cylindrical shape.

The liver is covered with a fairly thick layer of the hermaphrodite gland. The duct of this gland is long; the ampulla not large. The vas deferens is soft, extremely long, and convoluted. It exhibits no dilatation which can be called a prostate until the end, when it enters a spongy elongate cone, which seems to be the penis-sac, with glands adhering to it. No armature was found.

Abraham observes that mantle spicules are absent, and I was not able to find any. Otherwise the species seems to be a typical *Archidoris* and does not belong to the section *Anisodoris*. Hutton's statement that there is a central tooth cannot be correct, for, even if the identity of the present specimen is disputed, it is absent in the type-specimen of the British Museum (see Eliot, l.c., 1905). Hutton must either have examined a wrongly labelled specimen or have been misled by the way that the first laterals project into the rhachis.

ARCHIDORIS FULVA, n.sp.

Two specimens kindly sent me by Dr. Hoyle from the Manchester Museum. They are labelled "E coll. Prof. Spencer, Australia. B.," and preserved in formaline. The largest is 54 mm. long, 37 broad, and 22 high. The other is a little smaller.

Both are plump and of a remarkable texture like a stiff jelly, except for the hard excrescences noticed below. These excrescences are white, but the colour is otherwise a dull brownish orange, rather deeper on the under than on the upper side. The branchiæ and rhinophores are paler than the body.

The back is covered with low soft tubercles of various sizes, the largest about 2 mm. broad, but the majority smaller. All round the dorsal margin, extending inwards as much as 20 mm. in some places, are hard excrescences, looking like a deposit of some white salt. They spread over the tubercles, which they partly conceal. They do not form lumps, but a layer with prominences not exceeding granulations. There are similar excrescences, but fewer, on the under-side of the mantle, on the sides of the foot and even on the sole, but there are none in the centre of the back. Professor Palmer Wynne, Professor of Chemistry in the University of Sheffield, who has courteously examined them for me, says that they consist of calcium carbonate and are not of the same composition as the spicules found in the integuments, which do not effervesce in contact with hydrochloric acid, but dissolve. The excrescences look to me as if they were found on the animal in its natural state, but it is conceivable, particularly in view of their occurrence on the sole of the foot, that they are a deposit due to the chemical action of the fluids with which it has been treated. They occur on both specimens, but are more numerous on one than on the other.

The foot is nearly as long as the body, broad (28 mm.), with a thick

expanded margin. The anterior margin is divided by a groove which runs a long way back on either side, but there is no median notch.

The tentacles are two lumps on either side of the mouth, much as in *Archidoris tuberculata*, and slightly furrowed. The rhinophore pockets are not raised or large. They are surrounded by tubercles similar to those found on other parts of the back and not specially modified. The rhinophores are retracted, thick at the base, somewhat tapering at the top, and bearing 20-25 perfoliations. In one specimen the white excrescences extend to the rhinophores.

The branchial pocket also is not raised and is surrounded by tubercles not specially modified. The rim is bent into about six indistinct undulations. There are nine branchial plumes, of which one is much larger than the rest, and there seem to be some rudimentary, subsidiary plumes round the central anal papilla. The branchiæ appear to be tripinnate, not very ample, but prettily shaped and coloured. The stems are stout and reddish, the tips whitish. Nearly all the internal organs are pinkish orange. The blood-gland is large, composed of two clearly separate divisions, each subdivided into 3-4 not very distinct lobes. The ganglia of the central nervous system are elliptical in shape and separate, the cerebral portion being distinctly divided from the pleural portion. Below the buccal mass are two elliptical buccal ganglia.

The buccal mass is moderately large and not very broad. At its posterior end enter two long (15 × 3 mm.) salivary glands, not ramified but thin, wavy and somewhat folliculate. There is a strong labial cuticle, containing a few scattered rods, but nothing that can be called a labial armature. The radula consists of about 45 rows, containing 65-70 teeth on either side of the rhachis, which lies in a furrow over which the teeth close, so that it is difficult to see. Owing to the innermost laterals being crowded, some of them appear to be in the median line, but they are of the same shape as the rest and do not seem to be real rhachidian teeth. The teeth have large bases and erect cusps slightly bent and moderately stout. The innermost are smaller. The 2-3 outermost are small, but not denticulate.

The œsophagus is rather wide (15 mm.) and is not very long. After a contraction it enters the lower side of the stomach rather far back. Its walls are thin; those of the stomach are much thicker and bear rather strong laminae inside. The stomach measures 15 mm. by 12, and lies in a cleft in the fore-part of the liver, but is not enclosed in the liver. The pear-shaped gall-bladder (8 × 3 mm.) lies below the stomach. The liver is large (33 × 22 mm.), pinkish white outside and yellowish inside. In parts, but not everywhere, it is covered by the reddish-orange hermaphrodite gland. It is deeply cleft in front, and shows traces of bilobation behind.

The heart and pericardium are large and distinct.

The genitalia are well developed, particularly the large mucus gland, which in one specimen extends from the branchiæ right up to the anterior end of the body above the buccal mass. The duct of the hermaphrodite gland is very thin, and its ampulla about 2 mm. broad and 30 mm. long if stretched out. After the bifurcation the female

branch is narrower and pinker than the ampulla, which is white. The mucus gland is much diffused, semi-transparent, viscous, and hardly solid. Inside it is the white albumen gland, harder and smaller (about 10×8 mm.). It is spread in ramifying tubes before it enters its main duct. The spermatheca is purplish and measures about 7×3 mm.; a duct 4 mm. long leads to the spermatocyst, which is whitish, pear-shaped, and about half the size. The vagina is wide, with strong walls bearing ridges and lumps.

The male branch consists of a pinkish vas deferens, about 10 mm. long as it lies, but three or four times as much if stretched out. It is at most one millimetre wide. It passes into a sausage-shaped sack about 18 mm. long and 5 broad, bent at nearly right angles. The upper part is a spongy mass traversed by the narrow winding tube of the vas deferens, but does not appear to be a prostate as described for *Anisodoris* by Bergh. By a prostate I understand either a gland attached to the vas deferens or a glandular swelling in its course, after which it contracts again into a thin muscular portion. But in the present animal the vas deferens remains constant in size, only before entering the sheath of the penis (which forms the lower part of the sausage-shaped sack) it passes through a spongy mass. The glans penis itself is small, and no spines or other armature were found on it or on the rest of the genitalia. As preserved, the genital orifices open into a large striated chamber with folds or laminae on the walls, but this structure may be the result of contraction and not natural.

This form appears to have all the characters of the section *Archidoris*. It is impossible to say whether the white excreseences are found on the living animal or are an artificial deposit on these specimens, but the species is characterized by its colour and peculiar texture, which seem to be natural features and should render it easily recognizable. It offers many resemblances to *Anisodoris (Montereina) nobilis*, MacFarland, from Monterey, California, but the colour is not mottled, the tentacles are not digitiform, and there are differences in the radula and in the genitalia; also the animal, which seems mature, is much smaller, *A. nobilis* being as much as 20 centimetres long.

CTENODORIS, n.subgen.

As explained above, I regard *Staurodoris*, *Archidoris*, etc., as subgenera or sections of *Doris*, L. (type *Staurodoris verrucosa*), and now propose *Ctenodoris* as a new subgenus parallel to them, to include—

1. *Ctenodoris pecten*, Eliot. (See *Staurodoris pecten* in Eliot, Nudibranchiata of the Maldives, p. 557.)
2. *Ctenodoris flabellifera* (Cheeseman).

These forms have the ordinary characteristics of the Archidorididæ. The back is tuberculate, the teeth simply hamate, and there is no armature on the labial cuticle or genitalia. But the structure of the branchial apparatus is remarkable. Not only are the plumes simply pinnate as in *Staurodoris*, but they are arranged in a line or crescent, and the upper lip of the pocket shuts down over them like a single valve.

CTENODORIS FLABELLIFERA (Cheeseman).

Doris flabellifera, Cheeseman: Trans. New Zealand Institute, vol. xiii, p. 222, 1880.

Three specimens marked "*Doris flabellifera*, Hauraki." Two are of a uniform yellowish white. One has two irregular rows of brown spots. The largest specimen is 21 mm. long, 13 broad, and 5 high; the foot is 12 mm. long and 7 broad. The mantle-margin is ample, and in places as much as 5 mm. broad.

The back is covered with low inconspicuous warts of various sizes. The edges of the rhinophorial pockets are not protected by distinct tubercles and only slightly raised. The rhinophores are large and stout. The branchial pocket is bilobed. The upper and anterior valve or flap is bow-shaped; the posterior valve is somewhat more rounded, and the two enclose a fairly wide space shaped like a crescent, with the ends pointing forward. The pocket is very shallow, and is not protected by any special tubercles; its membranous floor is raised in a dome-like elevation. From either corner of the anterior valve a nearly straight row of thin, simply pinnate branchia extends towards the middle, slightly increasing in size, the two median plumes being the largest and lying just above the anal papilla. There are 22 plumes in all. The foot is rather small, grooved, but not notched in front. The large buccal mass is protruded; on either side of it is a flat tentacular fold with traces of a groove.

The central nervous system is strongly granulated, and the ganglia are not distinctly separated. The eyes are sessile and rather large. No armature was found on the labial cuticle. The radula consists of 40 rows (of which three are rudimentary) with a formula of about 50 . 0 . 50. The teeth are white, strongly hamate, not denticulate, and with long bases. There is no median tooth, but the first laterals project into the rachis one behind the other. The inner teeth, particularly the first 6-7, are smaller than the rest. Then the size goes on increasing until almost the end of the row. The last three, especially the outermost of all, are smaller, but not much degraded and not denticulate.

The stomach is entirely outside the liver and is lamellated longitudinally inside. It contains gastropod shells, one 1.5 mm. long. The hepatic mass is whitish externally, pinkish within. The genitalia are small and undeveloped, but appear to be of the type usual in *Staurodoris*. No hooks or spines were found, but the vagina bears strong zigzag folds. The verge is conical, but somewhat bent at the tip.

ROSTANGA MUSCULA (Abraham). Pl. XXVIII, Fig. 3.

Doris muscula, Abraham: Proc. Zool. Soc., p. 256, pl. xxix, figs. 6-7, 1877.

Rostanga pulchra, MacFarland: U.S. Bull. of Bureau of Fisheries, vol. xxv, p. 119, 1905. Cheeseman: Trans. Inst. New Zeal., vol. xiii, p. 222, 1880.

Through the kindness of Mr. E. A. Smith I have been allowed to examine the type-specimen of this form preserved in the British Museum.

The external features are as described by Abraham, and the length is about 13 mm. The colour is greyish, with an indistinct brownish longitudinal band extending from the rhinophores to the branchiæ, and bordered on either side by a bluish band, the colour being due to pigment disposed between the dorsal tubercles in a reticulate pattern, but not on them. These tubercles are minute, cylindrical, twice as long as they are broad, and crammed with straight granulated spicules, which are often swollen in the middle. The borders of both the rhinophorial and branchial pockets are flattened, but appear to have been raised in life and to have borne small pointed tubercles. The branchiæ are small and retracted. They appear to be 9, and simply pinnate or bipinnate. The oral tentacles are distinct, linear, and rather flat. The foot is grooved in front and the upper lamina notched.

In the central nervous system the eyes are large and distinct. The ganglia are granulated and fused into one mass, in which no division is visible, though three lateral projections seem to indicate the cerebral, pleural, and pedal portions.

Small granules or columns were found in the labial cuticle, but they are not arranged in a plate. The formula of the radula is $69 \times$ about $82.0.82$. The innermost lateral (Fig. 3*a*) is hamate, and bears on the inside numerous (30 or more) fine, comb-like denticles. The second to the eighth laterals (Fig. 3*b*) are also hamate; the shaft is slender and pointed, the base stout with a large projection. These teeth gradually pass into the third form, which prevails from 9 to 36 (Fig. 3*c*). The shaft gradually grows longer and the base smaller, until the whole tooth has the shape of a hook on a pedestal. In the remaining 45 teeth (Fig. 3*d*) the base is still smaller, the shaft is longer, and the end is split into 2-4 long denticles, forming a brush at the tip. These teeth resemble filaments rather than the ordinary teeth of Dorids. As preserved they lie in bundles on the top of the other teeth, being apparently set higher up on the sides of the buccal cavity. Their bases are so close together that they seem to be fused, but this is not really the case: each tooth is separately attached to the basal membrane. The genitalia seem small and immature. No armature was found. The hermaphrodite gland is spread over the anterior part of the liver only, and was not visible in sections of the posterior part.

The dentition of this species is remarkable, but appears to be much the same as that of *Rostanga pulchra*, MacFarland, from California. Cheeseman's *Doris rubicunda* seems also to be a *Rostanga*, and is perhaps identical with this species, in which case Abraham's name has priority. The present specimen does not look as if it had ever been scarlet, but Cheeseman's statement that *D. rubicunda* has sometimes a darker line down the centre of the back makes the identification probable, though it is curious that he does not describe the remarkable features of the radula more fully. MacFarland states

that *R. pulchra* loses its scarlet in alcohol, but though it is nearly allied to this species the two are probably distinct specifically. Among other points of difference it has only 8-11 denticles on the first lateral tooth, whereas *R. muscula* has about 30. *R. muscula* appears to have no regular labial armature, but it is possible that the cuticle has decayed and the plate become decomposed.

GARGAMELLA NOVOZEALANDICA, n.sp.

(Cf. Bergh on *G. immaculata*: Bull. Mus. Comp. Zoology, Harvard, p. 175, 1894.)

One small specimen, about 16 mm. long and 7 broad, marked "Auckland Harbour." The dorsal surface is bluish grey and covered with minute, elongate, soft tubercles, the texture being villous rather than warty or granulate. Under the microscope a minute brown reticulation can be seen between the tubercles. The rhinophore openings lie in little hillocks, but are not protected by sheaths. The branchiæ are 10 in number, compressed, and pyramidal in shape. They seem to be pinnate and in places bipinnate. The margin of the branchial pocket is not raised. The integuments and especially the tubercles are full of spicula, straight or slightly undulated, with a granulated surface. They project from the tips of the tubercles. The oral tentacles are small, linear, but distinct. The anterior margin of the foot is deeply grooved and expanded into ample flaps, as in *Kentrodoris*.

The central nervous system is rather large and dark in colour, especially the large common commissure, which is dark brown. The cerebro-pleural ganglia are united in a large pear-shaped mass in which two divisions can be distinguished. The pedal ganglia are separate, round, and dark brown. Dark pigment was found on the labial cuticle, but no armature. The radula is small, the maximum formula being $18 \times 20 \cdot 0 \cdot 20$, and most of the rows are smaller. The teeth are simply hamate with long bases. The innermost are low and have on the inner side a slight projection hardly amounting to a denticle. The teeth increase in size up to the middle of the row, and the two or three outermost are small and thin.

The genitalia are small and hardened, but it was ascertained that what seems to be the vas deferens was armed with transparent disks with central spots and spines exactly like those of *G. immaculata* figured by Bergh (i.e., pl. vi, figs. 14, 15).

The specimen is probably immature, but seems referable to *Gargamella*, which is distinguished from *Thordisa* only by possessing an armature on the genitalia, and is perhaps merely a subgenus. This species is, however, distinct from *G. immaculata*, Bergh (from Cape Delgada¹), and differs in colour as well as in the radula and branchiæ.

APHELODORIS, Bergh.

This genus was created by Bergh in 1879 for *Aphelodoris antillensis* from the West Indies. The shape is as in *Chromodoris*, the back

¹ On the Atlantic coast of Patagonia (Argentine Republic), 42° 25' S., 61° 38' W.

smooth, the branchiæ tripinnate, the tentacles grooved, the teeth hamate, and a prostate is present; there is no armature on the labial cuticle or genitalia. The genus appears to comprise the following species:—

1. *Aphelodoris antillensis*, Bergh.
2. *A. Cheesemani*, n.n. (= *Doris luctuosa*, Cheesem.).
3. *A.* (?)¹ *purpurea*, Bergh.
4. *A.* (?)¹ *pallida*.
5. *A. luctuosa*, Bergh.
6. *A.* (?)¹ *brunnea*, Bergh.
7. *A. affinis*, n.sp.

The two species (*A. Cheesemani* and *A. affinis*) now added to the genus have the typical characteristics as defined by Bergh in describing *A. antillensis*, but it might be useful to enlarge the definition of the genus and make it a convenient, if temporary, receptacle for forms with a smooth dorsal surface, hamate teeth, and no armature on the labial cuticle or genitalia such as the *Doris pseudida*, *D. perplexa*, and *D. glabella*, described by Bergh in his Opisthobranchs of South Africa.

APHELODORIS CHEESEMANI, n.n.

Doris luctuosa, Cheeseman: Trans. New Zeal. Inst., vol. xiv, p. 218, 1882.

? = *Archidoris varia*, Basedow & Hedley: Trans. R. Soc. S. Australia, vol. xxix, p. 150, 1905. See also Bergh, *Aphelodoris luctuosa*: Mal. Unt. in Semper's Reisen, vi, 2, p. 75, 1905.

One specimen labelled "*Doris luctuosa*, Cheeseman—Auckland harbour." It has the general appearance and high, thickset shape of a stout *Chromodoris*. The colour is uniform pale yellow; the length 33·5 mm., the breadth 16 mm., and the height 15·5 mm.

The texture is quite smooth, and not granulate. The dorsal surface, as preserved, shows various wrinkles and swellings, but they are perhaps not natural. The sheaths of the rhinophores are 2·5 mm. high, plain and entire, not tuberculate or denticulate. The branchial pocket is surrounded by a flap which may have formed a raised border in life, but as preserved is reflexed and flattened. Near the pocket are some lumps, but these too may perhaps be due to distortion. The branchiæ are white outside, dull dark-green inside. The two hindmost on either side are deeply cleft, and according as they are reckoned as one bifid plume or two plumes the whole number will be 5 or 7.

The tentacles are thick with a short distinct groove at the tip, and are connected with the foot by a fold. The foot is broad. Its anterior margin is entire and not grooved; the lateral margin ample; the tail short. The mantle-edge is rather narrow and turned upwards, so as to show the sides of the body.

The blood-gland is thick and white. The central nervous system is enclosed in a thick capsule, granulated, and so concentrated that the divisions between the ganglia are only faintly marked. The commissures are thick and short.

¹ The notes of interrogation are as marked by Bergh.

The labial cuticle shows a white granulation here and there, but no armature. The radula consists of 36 rows, of which the three or four in front are short and broken. The rest contain 50-60 hamate teeth on either side of the naked rhachis. The innermost teeth are smaller with long bases and low hooks. The hook of the first lateral is often flat and irregularly-shaped, but no distinct denticulation was seen. The teeth increase in size up to nearly the end of the row; the last 3-4 are lower, but not denticulate and not much degraded. The salivary glands are rather short and thick, with thin ducts. The œsophagus is thin and leads into an ample stomach, which has thin walls and lies wholly outside the liver. This latter is covered by the light-yellow hermaphrodite gland, which is thick and spread all over it, above and below. The substance of the liver is rather darker than the gland and is more diffuse than usual, containing many hollows.

The spermatheca is large and yellow, but broken. The spermatocyst could not be found, and was perhaps confused with the fragments. There is a large prostate lying on the mucus gland. The vas deferens consists of a couple of loose coils and bears many prominences internally, but no hooks or spines were found.

There is no reason to doubt the correctness of the label which describes this animal as Cheeseman's *Doris luctuosa*. It was caught in the same place, and Cheeseman's statements about the external characters and the radula are substantially applicable to the present specimen.

It has also all the characters of the genus *Aphelodoris*, and agrees very closely with the type species *A. antillensis*, except that the first lateral has not a distinct denticle. But it has the chromodoridiform shape, smooth back, raised rhinophore sheaths, grooved tentacles, a prostate, and a radula as described for the genus. It might therefore be called *Aphelodoris luctuosa* (Cheeseman). But Bergh has already described (l.c.) under the name *luctuosa* an *Aphelodoris* from Tasmania which can hardly be the same species, since it is black and differs in various details. It would seem that article 35 of the international rules of nomenclature is applicable here. Although Cheeseman's *D. luctuosa* dates from 1882, still, at the time when it is referred to *Aphelodoris*, viz. 1907, there is already an *Aphelodoris luctuosa* (1905) and Cheeseman's name must be rejected. The animal may be renamed *Aphelodoris Cheesemani*.

It is possible that this may be the animal described and figured by Basedow & Hedley as *Archidoris varia*, which has a somewhat similar coloration, a smooth back, grooved tentacles, elevated rhinophore sheaths, and a similar radula (23 × 70 . 0 . 70). The shape, however, appears to be different. In any case *A. varia* seems to me to be an *Aphelodoris* rather than an *Archidoris*, for it is one of the characters of the Archidorididæ that the back is tuberculate, or at least granulate.

APHELODORIS AFFINIS, n.sp.

One specimen marked Great Barrier Island: 14 mm. long, 8 broad, 8.5 high. It is shaped somewhat as *Chromodoris*: the sides are high and the mantle-edge small. The colour is dirty white with irregular

mottlings of dark reddish-brown. The epidermis peels off very readily, and it is possible that the brown mottlings may have been much more extensive or even that the dorsal surface may have been wholly brown. It is quite smooth and presents no trace of warts or granulations. The foot is large, and the anterior margin is not grooved. The oral tentacles are white: large, flat, and distinctly grooved. The rhinophores are purplish-brown and provided with sheaths 1.5 mm. high. The rim of the branchial pocket is flattened as preserved, but was probably raised in life. The branchiæ are purplish-brown, but the outside of the stems is whitish. They are tripinnate, much contracted, and apparently consist of five or six plumes, the division in one place not being clear.

The intestines are yellow, much hardened, and not well preserved, but the arrangement of the alimentary tract, which is remarkable, is quite plain, and appears to be natural and not the result of distortion. The rather long and straight œsophagus runs to the hinder part of the stomach and enters it on the right side. The stomach, which is somewhat elongate, lies parallel to the œsophagus on its left side; the long intestine issues from the anterior part of the stomach, runs across and above the œsophagus, and then describes a large loop along the right side of the liver. It may possibly be more correct to regard the slight swelling at the base of the œsophagus as the true stomach, but the natural description of the organ seems to me to be that given above. The stomach lies partly in a cleft of the liver, but is not enclosed by it. The œsophagus is lined with soft laminae, and the upper wall of the stomach bears very ample laminae which almost fill it. They are collected in groups so as to form seven ridges. They are strongest near the exit of the intestine, where they seem to act as valves.

A blood-gland was found and two small elliptical salivary glands. They enter the buccal mass in the usual place through their short ducts, and also seem to taper into a thread-like process at the distal ends. In the central nervous system the cerebro-pleural ganglia are distinctly divided into two parts. The pedal ganglia are large and round.

The labial cuticle is darker in some places than in others, but presents nothing that can be called a labial armature. The formula of the radula is about $23 \times 60 . 0 . 60$. The innermost teeth have long bases and lower hooks than the rest. The teeth increase in size up to the middle of the half-row, where they are large, simply hamate, and rather erect. Towards the end of the half-row they decrease in size, and have low, strongly bent, irregular hooks, but are not denticulate. No spines or other armature could be found in the genitalia, which were, however, too much hardened to admit of a proper examination.

DORIS GRANULOSA, Abraham.

Doris granulosa, Abraham: Proc. Zool. Soc., p. 253, pl. xxix, figs. 1-3, 1877.

Several specimens of this form are in the British Museum, and appear to correspond with Abraham's description of the external characters. I opened two, but found the internal organs, including

the ribbon of the radula, entirely decayed. Only scattered teeth of the ordinary hamate type remained.

The form is probably a small *Archidoris*, perhaps *A. nanula*, Bergh, but its appearance in life is unknown, and the preserved specimens present no characters which would justify identification. The species can accordingly be neglected.

DORIS LONGULA, Abraham.

(Abraham: same paper and page as above.)

The same may be said of this form. Like *Doris granulosa* it has lost its colour, the intestines are decayed, and it can only be said that it had rather stout hamate teeth.

Hutton (Trans. New Zeal. Inst., vol. xiii, p. 203, 1881) doubtfully identifies with *D. longula* specimens deposited by him in the Canterbury Museum, but his description is not full, and it is difficult to say whether his animal is really the same as Abraham's or to what genus either are referable.

CHROMODORIS AMÆNA, Cheeseman.

Chromodoris amæna, Cheeseman: Trans. New Zeal. Inst., vol. xviii, p. 137, 1885.

= *Chr. figurata*, Bergh: Mal. Unt. in Semper's Reisen, vi, 2, p. 71, 1905.

Four specimens from Whangarei Head, about 80 miles north of Auckland, sent by Mr. Cooper. The general colour of the dorsal surface, including the rhinophores and branchiæ, is greyish-white. The margin is marked by a rather broad stripe of lemon-yellow, in which are seen imbedded a row of round bodies. There are 2-3 rows of lemon-yellow spots on the sides of the body under the mantle and traces of coloured areas on the back, which, though now grey and white like the rest, were perhaps differently coloured in life.

The shape is high and stout, much as in *Chr. Semperi*. The length of the largest specimen is 23 mm., the height 10 mm., the breadth 10.5 mm. The free tail is 6 mm. long. The margins of the rhinophorial and branchial pockets are very slightly raised. The branchiæ vary from 8 to 10 in number. In one specimen they are bipinnate, being divided into 2-4 plumes at the tip. The tentacles are retracted and represented by two pits.

The buccal mass is very large. The labial armature is yellowish-green, and consists of rods somewhat bent or curved at the tip, which in some parts of the armature is bifid, in others entire. The radula consists of 88 rows, of which four are undeveloped and shadowy, and there are 100-120 teeth on either side of the rhachis. The rhachis bears a median tooth with a long base and a low cusp, which is not denticulate, though of somewhat irregular outline. The first lateral is of the shape usual in the genus and is denticulate on both sides, bearing on the inner side about 4 denticles. The other laterals are denticulate only on the outer side, the number of denticles being at least 6. Near the end of the rows the main cusp diminishes and the first denticle increases, so that the tooth appears bifid.

The liver is large and greyish ; there is no stomach outside it.

There can, I think, be little doubt that Bergh's *Chr. figurata* (1905) is the same as the earlier *Chr. amœna* (1885) of Cheeseman. The agreement in colour and external features is as complete as can be expected in two descriptions made, one from living and the other from preserved specimens. Cheeseman's account of the radula, though slight, is not inconsistent with the identification, though he describes it as smaller ($65 \times 70 . 1 . 70$). A rough sketch sent by Mr. Cooper with the specimens represents a pale pinkish *Chromodoris*, with orange blotches on the back and yellow spots on the sides. The rhinophores and the 10 simply pinnate branchiæ are violet-coloured.

CHROMODORIS AUREO-MARGINATA, Cheeseman.

Chromodoris aureo-marginata, Cheeseman: Trans. New Zeal. Inst., vol. xiii, p. 223, 1880.

? = *Chr. marginata*, Pease: Proc. Zool. Soc., p. 30, 1860 ; and Bergh, Siboga Expeditie, Opisthobranchiata, p. 150, 1905.

One small specimen from Takapuna, labelled *Chr. aureo-marginata*, juv. It is therefore probable that when alive it agreed with Cheeseman's description in coloration (pellucid white with a narrow golden border), as it still does in other respects. It is 12.5 mm. long and 5.5 broad, flattish in shape, with the mantle fairly wide at the sides and amply expanded over the head. There seem to be traces of small low tubercles on the back. The margins of the rhinophorial pockets are somewhat raised. The branchial pocket is closed and forms a small papilla. It contains 10 small, simply pinnate branchiæ ; the fifth plume on either side is minute. The foot is rather narrow, with a simple groove in front. On either side of the mouth is a knob-like tentacle.

The labial armature is rather faint. It is an imperfect ring composed of close-set, short, mace-like rods, swollen and bent at the tips. The radula consists of 50 rows, three of which are imperfectly developed, containing about 45 teeth on either side of the rhachis, which bears inconspicuous thickenings. The first lateral is broad and appears trifid, but the prominence on the inner side bears 2-3 denticles. The second lateral is also broad, but lacks this prominence on the inner side. Apart from its greater breadth it has the same shape as the other teeth, namely, two large prongs at the apex, and below them 3-6 denticles, which diminish in size downwards. The outermost teeth bear about four denticles on the tip.

This form is nearly allied to *Chr. marginata* (Psc.), and perhaps merely a variety of it. The coloration is very similar and the radula is rather narrow in both species, $50 \times 45 . 1 . 45$ in this specimen, and $54 \times 35 . 1 . 35$ in that examined by Bergh. But the similarity in coloration is not complete, and there is a difference in the shape of the teeth. In *Chr. marginata* Bergh found them simply hamate and denticulate, but in this species the upper denticles are strongly developed, and the teeth appear bifid as in *Chr. hilaris* and *Chr. pantherina*.

DORIDOPSIS MAMMOSA, Abraham.

Doridopsis mammosa, Abraham: Proc. Zool. Soc., p. 266, pl. xxix, figs. 20-21, 1877.

Three specimens marked by Mr. Suter, "*Doridopsis mammosa*, Abraham, Hauraki Gulf." The largest is 46 mm. long, 26 broad, and 14 high. They are all soft, smooth, and flabby, pale yellow with black markings. Traces of brighter colour seem to indicate that the animal is really bright lemon-yellow when alive.

The dorsal surface bears soft tubercles, both large and small. As preserved, most of them are flattened, but the normal arrangement seems to be that there are 8 tubercles about 6 mm. high, one between the rhinophores, one behind the branchiæ, and two rows of three each on either side between the rhinophores and branchiæ. These larger tubercles are surrounded by rings of smaller ones, and there are 2-3 lines of smaller ones near the mantle-edge. The back also bears three rows of lozenge-shaped or irregularly polygonal figures, boldly outlined in black and contrasting with the yellow surface. The space inside the black outline is yellow like the rest of the back, and there is a spot in the centre. There are 3-4 of these figures in the centre of the back between the two lines of large tubercles and 5 on the outer side of each line near the mantle-edge. The last figures are behind the branchial pocket and imperfectly developed.

The branchial pocket is shallow, with a few black spots on the floor. Its edge is distorted in all the specimens, but seems to have had six lobes, marked by tubercles. The branchiæ are 6, tripinnate, yellow, but the rhachides of the extreme ramifications are black. The rhinophorial sheaths are thin, about 1.5 mm. high, not divided or lobed. The rhinophores are rather large, reflexed, and bear about 30 deep perfoliations. The mantle-edge is fairly ample. The foot has ample lateral margins, is pointed in front and not grooved. Over the mouth are two rather broad flat tentacles.

The intestines are mostly yellow. The blood-gland is very large and yellowish. It lies as preserved not over the central nervous system but on the right, towards the genitalia. The interior of the buccal chamber is bluish-black. Out of the buccal cone issues a thin tube with muscular walls about 4 mm. long and 1 mm. broad. This tube passes into a sausage-shaped dilatation with thinner walls, about 6 mm. long and 3.5 broad, which is bent so as to form a circular loop with the anterior and posterior ends close together. This dilatation is followed by a constriction and a longish tube about 20 mm. long, and of irregular diameter (about 3 mm.) on an average, which dilates again and then enters the liver. The walls of this longish tube are very thin, and in places reticulate with large irregular meshes, like those shown in Hancock's figure of *Doridopsis*.

No salivary glands of the usual type were found, but under the anterior part of the buccal tube lies a large many-lobed yellow gland. It has five principal divisions, but it enters the buccal tube by a single duct.

The central nervous system forms a complete ring surrounding the end of the thin part of the buccal tube. The ganglia form

a granulate mass and are not separately distinguishable. The buccal ganglia seem to be as in *Doridopsis*, not as in *Doriopsilla*.

The stomach is entirely enclosed in the liver, which is yellow within and without, not very compact, cleft behind, and attached to the floor of the body-cavity by a muscular strap. The hermaphrodite gland does not differ from the liver conspicuously in colour. The heart is as usual in the genus. At the point where it is attached to the pericardium is the so-called pericardial gill—a line about 6 mm. long of yellowish lamellæ, each about 2 mm. wide.

The ampulla of the hermaphrodite gland is stout and brownish. After about 10 mm. comes the bifurcation. The male branch at first covers the spermatheca with thick soft coils; this part of it would probably be about 60 mm. long if stretched out. It then passes into a thinner portion with strong muscular walls, which enters the penis sac. The presence of an armature was not satisfactorily demonstrated. Some rather large transparent prominences were found on the lower vas deferens, but could not be isolated, nor is it certain that they were hard. In the female branch a thin tube runs from the bifurcation to the spermatheca, which is very large and almost sessile on the duct. It is full of spermatozoa and has very thin walls. The spermatocyst is small. It is in all probability naturally pear-shaped, but the contents are squeezed up into the top so as to make it appear globular. It has a very long duct. On the vagina is a vestibular gland.

DORIDOPSIS CITRINA, Cheeseman.

Doridopsis citrina, Cheeseman: Trans. New Zeal. Inst., vol. xiii, p. 223, 1880.

Seven specimens. The largest is 24 mm. long, 7.5 high, and 18 broad, but the real breadth is greater, the mantle-margin being folded. The animals are flattish in appearance, moderately soft, and of a uniform pale yellow.

The back is covered with numerous well-developed tubercles of rather irregular shape and size, and sometimes confluent; near the margin the tubercles are smaller and the intervals between them larger. The rims of the rhinophorial and branchial pockets are slightly raised, thin, and not tuberculate. The branchiæ are 5 and tripinnate. The mantle-margin is fairly ample, and in places shows spicules arranged in a reticulate pattern, but the integuments are thick and not very transparent. The spicules are of various sizes and shapes, such as straight and smooth; straight with a projection on one side, V-shaped and Y-shaped. The foot is fairly broad, not much pointed before or behind. In some specimens, but not in all, a groove can be seen on its anterior margin.

The central nervous system is as in *Doridopsis*, not as in *Doriopsilla*. The buccal ganglia are set at some distance behind the main mass of the nerve-collar. From the buccal cone issues a tube which describes a fairly large loop to the left and then contracts. At this point are the buccal ganglia united to the anterior nerve centres by fairly long connectives which run across the end of the loop. The tube does not

present the abrupt transitions seen in *Doridopsis mammosa*, and is of a more uniform breadth, but its essential structure seems to be the same. It shows one constriction at the point where the buccal ganglia are set and a second just before it enters the liver. After this second constriction comes a small globular dilatation.

The intestines are pale yellow. The liver is very large, cleft behind, and extending right into the anterior part of the body, where it lies under the buccal organs. It is somewhat lighter outside owing to the layer of the hermaphrodite gland which covers it. The genitalia are small. A prostate is present. The vas deferens and glands penis are very thickly covered with minute, slightly bent spines, resembling the hamate teeth of Dorids, but rather more elongate.

This form closely resembles *Doridopsis fulva* of MacFarland (Nudib. Moll. of Monterey Bay in Bull. of Bureau of Fisheries, Washington, vol. xxv, p. 130, 1905). If they are identical, Cheeseman's name (1880) has priority.

GONIODORIS PUNCTATA, B.

Goniodoris punctata, Bergh : Mal. Unt. in Semper's Reisen, vi, 2, p. 91, 1905.

Two specimens from Akaroa Harbour, near Lyttelton, in the South Island. They are about 6.5 mm. long and of a uniform yellowish-green without any trace of the red spots found in Bergh's specimens. The dorsal margin has a jagged appearance, as it is marked by a line of 7-10 simple lancet-shaped processes on each side. Similar processes are found on the frontal margin. On the dorsal surface are scattered tubercles, about 5 in front of the rhinophores and 20 between the rhinophores and branchiæ. The part behind the branchiæ is smooth. The tubercles form three extremely irregular rows, of which that in the middle is most definite. Bergh describes it as a *Kamm*, but it is evidently not so well developed in my specimens as in those which he examined. The head is produced into a blunt projection on either side. The foot is not grooved in front and not produced at the corners. The rhinophores are rather large; they bear about 10 perfoliations and show no trace of sheaths or pockets. The branchiæ are 5 or 6, scanty and bipinnate.

The internal organs are as described by Bergh. On the labial cuticle is a ring (apparently consisting of two semicircles which nearly meet) composed of small rods with tips sometimes entire and sometimes divided. The formula of the radula is $31 \times 2 . 0 . 2$. The teeth are transparent. The inner tooth is large and bears at least 20 denticles. The outer tooth is a small plate, bearing in most cases a single low but distinct cusp.

ACANTHODORIS MOLLICELLA, Abraham.

Acanthodoris mollicella, Abraham : Proc. Zool. Soc., p. 262, pl. xxx, figs. 1-4, 1877.

One of Abraham's specimens examined. The external characters are as described by him. The dorsal papillæ are somewhat longer than usual. Two of the denticulations on the rhinophore sheath are

long and flat. The colour is a uniform olive-brown. The lateral ends of the oral veil are large and free. The spines in the integuments are much bent and irregular, but not branched.

The labial armature with its cuticular blades is as usual in the genus. It is composed of little columns split into three or four denticles at the top, and presents a very rough surface, almost like a radula. The formula of the radula is about $24 \times 6 + 1 . 0 . 1 + 6$. The first laterals are large with rather blunt tips and bear 4-5 denticles. The second, third, and fourth laterals are erect, and retain the hamate form. The fifth and sixth are plates. The vas deferens is long and bears a transparent armature which is difficult to see, but is apparently composed of disks bearing spines.

I think that this is probably the *A. pilosa*, var. *Novozealandia*, of Bergh (Mal. Unt. in Semper's Reisen, vi, 2, p. 94, 1905), but doubt if it is really the same species as *A. pilosa*, though undoubtedly nearly allied. The dorsal papillæ are longer, and there are differences in the rhinophore sheaths, labial armature, and radula.

ACANTHODORIS GLOBOSA, Abraham.

Acanthodoris globosa, Abraham: Proc. Zool. Soc., p. 262, pl. xxx, figs. 5-9, 1877.

One of Abraham's specimens examined. The external characters are as described by him, but it looks to me as if the animal had originally been black or bluish. The integuments are very thin, the dorsal tubercles sparsely scattered, and two of the processes on the rhinophore sheaths are larger than the others. The underside of the mantle is marked with reddish lines formed by spicules.

The internal organs are not well preserved, but the buccal parts are clear. Contrary to Abraham's statement, the labial armature with the two blades is quite distinct. It is formed of mace-like elements, swollen below the tip, but ending in a point and not denticulate or divided. They are set in unusually regular rows. The formula of the radula is about $34 \times 7 + 1 . 0 . 1 + 7$. The first lateral is of the usual shape and bears 3-4 denticles. The second to the sixth laterals are all erect, and, though much smaller than the first, retain something of the hamate shape. The seventh is a flat plate. No armature could be found in the genitalia. The vas deferens is long.

This is possibly identical with *A. metulifera*, Bergh (Mal. Unt. in Semper's Reisen, vi, 2, p. 98, 1905), described from a single specimen obtained in Tasmania, but there are differences of detail in the radula and labial armature.

NUDIBRANCHS FROM THE FALKLAND ISLANDS.

The small collection of Nudibranchs here described were all collected by Mr. Valentine, and, it would seem, all in Stanley Harbour, Falkland Islands. Two of them had been deposited in the Museum of Manchester University and were given me by Dr. Hoyle; for the rest I am indebted to Mr. Valentine himself.

The species are as follows:—

NAME.	DISTRIBUTION.
1. <i>Æolidia serotina</i> , Bergh (? = <i>Æ. papillosa</i>)...	An identical or closely allied species is recorded from the N. Atlantic, the N. Pacific, and Chile.
2. <i>Cratena Valentini</i> , n.sp.	Genus probably cosmopolitan: abundant in N. Atlantic and recorded from Chile.
3. <i>Galvina Falklandica</i> , n.sp.	Closely allied to <i>G. flava</i> from the N. Atlantic or identical.
4. <i>Coryphella Falklandica</i> , n.sp.	Closely allied to <i>C. lineata</i> from N. Atlantic or identical.
5. <i>Tritonia Challengeriana</i> , Bergh	Off the coast of Chile.
6. <i>Diaulula vestita</i> (Abraham)... ..	W. coast of Patagonia and Straits of Magellan, closely allied form from California.
7. <i>Staurodoris Falklandica</i> , n.sp.	The genera are well represented in the N. Atlantic.
8. <i>Acanthodoris Falklandica</i> , n.sp.	

The Falkland Islands are considerably farther south than New Zealand (Stanley is about 50° S.), and it is therefore natural that there should be no tropical element in the fauna. Two points are noticeable in the short list given above. Firstly, all the genera but one (and that a very doubtful identification) are characteristic of the North Atlantic, and three of the species are closely allied to and possibly identical with British forms. Secondly, two of the species are recorded from the coast of Chile, so that the east and west sides of the more southern portion of South America must have, to some extent at least, a common fauna.

ÆOLIDIA SEROTINA, Bergh.

Æolidia serotina, Bergh: Beitr. zur Kennt. der Æolidiaden, i, p. 619, 1874; id., "*Æolidia* (? var.) *pacifica*, n.sp.?" Nudib. of North Pacific, part i, p. 127, 1879; part ii, p. 131; id., *Æolidia papillosa* (= *Æ. serotina*), in Bull. of Mus. Comp. Zool. Harvard, p. 127, 1894; id., *Æolidia serotina*, Zool. Jahrb. Supp. IV, Fauna Chilensis, Bd. i, p. 541, pl. xxxi, figs. 26-31.

Three specimens, one marked Stanley Harbour.

The largest is grey and 30.5 mm. long, but is evidently much bent and contracted. It measures 30 mm. across the pericardium. The foot is strongly grooved in front, but not produced into projecting angles. In the middle of the back there are 15 distinct rows of cerata, set upon well-marked ridges. In all there seem to be about 40 rows, but they are much crowded near the rhinophores and tail. The bare space on the back is large and measures 12 × 5.5 mm. in the best preserved specimen, which is not the largest, and only 19 mm. long and 15 broad. The cerata are flat and not transparent. The anus is dextro-dorsal. The rhinophores are fairly long and stout in the best preserved specimens; wrinkled, but not perfoliate. The oral tentacles are also stout, and set far apart on the sides of the head.

The jaws are strong and bear no denticles. The radula consists of a single row of 18 teeth of the usual pectinate shape; the largest is about 1.5 broad. The basal strip is narrow from top to bottom, and not strongly curved or arched. The smallest bear 24 denticles, the

largest 38-40. There is no trace of bilobation, except that the middle of the tooth is generally marked by two denticles set in a V shape. The denticles are often broken or blunted, and it would appear that even when perfect they do not slope symmetrically to a point. The teeth are much like those of the *Æolidia serotina* found by Plate in Chile, and figured by Bergh (Opisth. Plate, Taf. xxxi, 26-31).

With that animal the present specimens seem to be identical. The large bare space on the back, the absence of projecting corners to the foot, and the shape of the teeth are points of resemblance. The radula was much longer in Plate's specimen, but about the same (22) in the one from Valparaiso described by Bergh in 1874.

Is this species identical with *Æolidia papillosa*? Bergh (see the references above) seems to have held different opinions on this point, but in his latest notice of the form (1898) he registers it as a distinct species. In this, as in other cases, it is perhaps safest to separate specimens coming from such widely different localities and known only in their preserved condition.

On the other hand, the three known species of *Æolidia* (*Æ. papillosa*, *Æ. serotina*, Chile and Falkland Islands, *Æ. herculea*, California) show few decided differences, and Bergh considers that the true *Æolidia papillosa* is found on the west coast of North America. *Æ. serotina* is said to be reddish when alive, but this need not be a specific difference, for I have seen large specimens of *Æ. papillosa* at Plymouth of a fine rosy-gray with greenish cerata.

CRATENA VALENTINI, n.sp. Pl. XXVIII, Figs. 4, 5.

Several specimens. As preserved they are white or brownish. A coloured figure (Fig. 5) by Mr. Valentine represents a mottled *Æolid* of stiff and irregular appearance, characters also found in the preserved specimens.

The larger specimens are about 10 mm. long, 3 broad, including the cerata, and 2.5 high to the top of the pericardium. The body looks tuberculate, especially at the sides, but this is due merely to the hermaphrodite gland showing through. There is no tail to speak of distinct from the body. The foot is apparently without natural projections at the anterior corners, but as preserved it varies greatly. The rhinophores and tentacles are of moderate size, wrinkled, but not really perfoliate. The cerata are not set opposite one another, which gives the whole animal an irregular appearance. There are 5-6 large ovate cerata, and at the base of each, generally a little behind it, a very small one. The hepatic diverticula are yellowish, not much branched, but bearing knobs. The anus lies on the right side, just below the dorsal margin; a little in front of it is the renal pore.

Three radulæ examined consisted of a single row of 22, 24, and 25 colourless transparent teeth respectively (Fig. 4). They have a moderately large central cusp bearing 7-8 denticles in the front teeth and 9 in those behind. The edge bearing these denticles forms a shelf distinctly on a lower level than the median and hinder part of the teeth, and only the first denticles are set on the same level as the central cusp.

The yellow membranous jaws bear a row of large irregular denticles. The tips are generally square and blunt, but sometimes split or fringed.

From a series of sections made it appears that there is a chitinous armature on the penis, but whether it is a spine or a tube could not be determined.

This species seems intermediate between *Amphorina* and *Cratena*. It has ovate cerata and a style or tube on the penis, features which ally it to *Amphorina*, but on the other hand the radula is not, as usual in that genus, long and tapering. It may perhaps be referred to *Cratena*. It does not seem to be *Cr. Cavanee* or *Cr. pusilla* recorded from Chile.

GALVINA FALKLANDICA, n.sp. Pl. XXVIII, Fig. 6.

Three specimens and also some spawn consisting of small white coils attached to hydroids. The coils are short and stout, semicircular or imperfectly circular, but never more complicated.

The animals are elongate, the largest 8 mm. long and 2 broad. The height is 2.75 to the tip of the pericardium, and the foot extends 2 mm. behind the last cerata. The first is white and the integuments colourless, but the whole animal appears yellow or fawn-coloured, owing to the hepatic diverticula and hermaphrodite gland showing through.

The foot is rounded in front, without lateral projections, and apparently connected with the head. The rhinophores (3 mm.) are much longer than the oral tentacles (about 1 mm.), wrinkled, but not really perfoliate. Behind them are visible two black eyes. The cerata are long (2.75-3 mm.), and longer in the smaller than in the larger specimens. They are rather stout, but hardly ovate, very erect, and somewhat as in Trinchese's figure of *Galvina flava* (*Æolididæ* del Porto di Genova, vol. ii, pl. xxix, figs. 2-3). The plan of arrangement is not plain, but they are apparently set in about 6 groups, each containing 4 cerata as a maximum. The anus is lateral and rather far forward.

The jaws bear a single row of coarse denticles. In two specimens dissected the radula was found to consist of forty rows, tapering considerably, and each containing three teeth. The median tooth (Fig. 6a) bears a central cusp with four denticles on either side. The central cusp is much depressed, so that its point lies below the level of the lateral denticles, with the result that from certain points of view the tooth appears to be bilobed with no central cusp at all. It can, however, be found by focussing in all the rows. The side teeth (Fig. 6b) are of the shape usual in the genus, but rather thin and tall. Their outline is curved, not rectangular.

The dentition of this species is not unlike that of *G. flava*, *G. viridula*, and *G. rupium*, and it is possible that it may be identical with the first of these, but until further information about the living animal is forthcoming I think it safer to register it as a separate species.

CORYPHELLA FALKLANDICA, n.sp. Pl. XXVIII, Fig. 7.

Cf. *C. lineata*, A. & H.: Monograph., Fam. 3, pl. xvi; Vayssière, Ann. du Mus. d'Hist. Nat. de Marseille, p. 73, 1886.

Three specimens seem referable to this form. The largest is 16 mm. long, 9 wide across the cerata and pericardium, with a bare space on the back measuring 9×4 mm. In colour they are uniformly yellowish or greenish white, with traces of white lines on the tail of one specimen.

As preserved, the animals are probably less elongate than in life. The head and foot are broad; the tail short, but distinct and without cerata; the margins of the foot and mantle well developed; the anterior margin of the foot slightly bilobed, and grooved with short but distinct projections at the corners. The rhinophores and tentacles are thick, the latter set rather far back, in many cases showing artificial wrinkles, but not really perfoliate. The largest cerata are inside, as much as 6 mm. long; the outermost are mere tubercles. No clear arrangement in transverse rows can be made out, but the cerata are set all along the side of the back in 4-6 irregular longitudinal lines. They vary greatly in transparency; the hepatic diverticula within them, when visible, are yellowish, smooth, and extend almost to the tip. The larger cerata are somewhat sunken in the middle and pointed at the tip, but not very symmetrical in shape. The genital orifice is just under the rhinophores; the anus lies about half-way between the head and tail, immediately under the mantle-margin. The eyes are minute and invisible externally.

The jaws have a bright metallic lustre, and bear at least 10 rows of small pyramidal denticles. The radula consists of 11-12 rows, each containing three teeth of the shape usual in the genus. The median tooth (Fig. 7a) has a horse-shoe base and a central cusp with 6-8 lateral denticles. The usual number is 7, but they vary both in number and shape. On some teeth they are much more curved than on others, and their edge is sometimes finely striated. In all cases there are two denticles rather high up, but sometimes the cusp rises smooth and clear-cut above them, in others it bears an extra pair of denticles. The lateral teeth (Fig. 7b) are thin and straight; the base is hollowed out, and the tip is sometimes bent a little back. They bear 14-16 (usually 14) saw-like denticles on the inside. This serrulation is often irregular and rudimentary, ill-formed denticles being found among more perfect ones.

This form is nearly allied to several species from the Northern Atlantic and Mediterranean, and may even be identical with *C. lineata*, but the colour and markings of the living animal are unknown, and I register it provisionally as a new species.

TRITONIA CHALLENGERIANA, Bergh.

Tritonia Challengeriana, Bergh: Challenger Reports, vol. x, pt. 26, Nudibranchiata, p. 45.

Eight specimens from the Falkland Islands. The notes allude to one being red and one white. Most of them are obviously bent and

distorted, but the real shape is probably linguiform with a tail, and the largest, if straightened out, would be about 45 mm. long and 17 wide. As preserved, some are white and some are green; the back is covered with low soft warts, which are clearest near the tail. The rhinophore sheaths are of moderate size, reflexed and not digitate. The frontal veil bears 10-15 processes. On either side of the body is a continuous row of 16-19 small branchial tufts, but the number is not always identical on the two sides. The tufts consist of 2-3 main stems bearing secondary branches, with small tertiary branches here and there. The jaws are olive-green, with 7-8 rows of very distinct denticles. The radula examined consisted of 42 rows with a maximum formula of $45 + 1 + 1 + 1 + 45$. The median teeth are tricuspid and hollowed out behind, the first lateral stout and rather clumsy, the rest rather elongate and curved near the tips.

DIAULULA VESTITA (Abraham).

Doris vestita, Abraham: Proc. Zool. Soc., p. 252, pl. xxviii, figs. 5, 6, 1877. = *Diaulula Sandiegensis*, var. *pallida*, Bergh: Bull. of Mus. of Comp. Zool. Haryard, p. 172, 1894.

I have examined two specimens of this form, one obtained by Mr. Valentine in the Falkland Islands and one from the Straits of Magellan, preserved in the British Museum and described by Abraham as *Doris vestita*. The specimens agree in both external and internal features, but the intestines are somewhat decayed in both.

The larger (Mr. Valentine's) is 45 mm. long, 22 broad, and 18 high, but the real breadth was probably much greater, as the ample mantle-edge (9 mm. broad in some places) is turned inwards. In both specimens there are rents in the mantle which make it probable that autotomy was commencing when the animals died. The texture is spiculous, much harder and rougher in one specimen than the other. The colour is whitish with here and there a yellowish tinge.

There is no trace of a dorsal ridge or keel, but the back is covered with small, flat-topped tubercles of various sizes, the largest not more than .75 mm. high and .5 mm. broad. They are full of spicules, about seven of which project from the top of each and form a sort of crown. These spicules, which are also found in great quantities in the rest of the integuments, are long, colourless, slender, and fairly straight, not branched or swollen. The rhinophorial pockets are closed, but appear to have been protected by rather high sheaths with denticulate edges. The margin of the branchial pocket shows indistinct undulations or jags, five in one specimen, nine in the other. The branchiæ are much contracted, short, stout, and bi- or tripinnate. They may be counted as either nine or five, according as the smaller plumes are reckoned as independent or as subdivisions. The foot is grooved and notched in front. The tentacles are small and digitate.

The intestines are yellowish. On the labial cuticle is a collection of granules forming a grey strip, which has not, however, in either specimen the usual appearance of a labial armature, and does not contain rods or hooks. The radula is small, consisting of 20 and 22 rows, which contain respectively 31 and 26 yellowish teeth on

either side of the rhachis, as a maximum. The innermost are low with blunt tips. The teeth increase in size outwards: the first 5-6 are small, the rest rather large; about the middle of the half row are generally one or two teeth markedly taller than the rest. The one or two outermost are thin and erect, but not tall.

The stomach is not enclosed in the liver, and is laminated internally. The central nervous system is as in *Archidoris*. The pedal ganglia are round; the cerebral and pleural divisions are not very distinctly separated; the buccal ganglia are elliptical, strongly granulated, and united by a short commissure; the gastro-oesophageal ganglia are united to them by short connectives and irregularly globular. The genitalia also seemed much as in *Archidoris*, and entirely without armature. The upper part of the vas deferens is soft and much coiled; the lower part is straighter and muscular. The spermatheca is large and round; the spermatocyst elongate. A distinct prostate was not found, but its absence cannot be considered certain.

I consider the type-specimen of Abraham's *Doris vestita* as undoubtedly the same species as the animal found by Mr. Valentine in the Falkland Islands, and both of them as probably identical with the *Diaulula Sandiegensis*, var. *pallida* of Bergh from Cape Delgada on the east coast of Patagonia (Argentine Republic), 42° 24' S., 61° 38' W. It seems to me, however, safer to treat the form provisionally as a new species, and not as a mere variety. *D. Sandiegensis* is marked with dark rings which are totally absent in the specimens from the Atlantic side and the Straits of Magellan, and there may be other differences of detail. The resemblance in the radulæ is striking, but I could not demonstrate the existence of a large prostate,¹ although the vas deferens has a thick prostatic portion. But one specimen was old and the other much hardened.

The animals also agree in many details with *Trippa* (?) *hispida*, Bergh, from the coast of Chile (Bergh, *Opisthobranchier der Sammlung* Plate, 1898, p. 52). In fact, they differ in hardly any point except that they have no trace of a dorsal ridge. They even seem to have glandular masses attached to the outer surface of the tube leading into the buccal cavity, as figured by Bergh for *T. hispida* (i.e., pl. xxxi, fig. 1), but the state of preservation makes it impossible to be sure of the character of these organs. The animal, which is referred by Bergh to *Trippa* with a query, seems to me to be practically a *Diaulula* with a median dorsal ridge. Much the same may be said of *Atagema* (Gray, 1850). Bergh describes the back of *A. carinata* as "ganz fein chagriniert," but Quoy & Gaimard say that it was covered with "petits poils rudes," which they represent in their figure.

Diaulula Capensis, Bergh, also seems in many ways an allied species.

STAURODORIS FALKLANDICA, n.sp.

One specimen obtained by Mr. Valentine and given me by the Manchester University Museum. It is soft, almost globular, and as

¹ Also in these specimens the stomach seems to be external to the liver, whereas in the typical *D. Sandiegensis* it is included in it.

preserved about 19 mm. long, 18 high, and 16 broad, but is bent and was probably considerably longer in life.

The dome of the back is purplish grey with traces of yellow on the tubercles. There are also traces of bright yellow near the rhinophores, on the branchiæ, and on the foot. The back is covered with round, flattish tubercles, the largest 3 mm. wide, but most not more than a third of that size. About 12 of the largest are disposed in an irregular series so as to form three not very clear lines. In the intervals between them are smaller tubercles which become still smaller and more crowded near the edges of the mantle.

The tentacles are flat. The margin of the foot is grooved, but not notched. Round each of the rhinophorial openings are set about seven tubercles, but they are not differentiated from the others on the dorsal surface. The rhinophores are yellow and bear about 15 perfoliations. The margin of the branchial pocket is marked by a line of inconspicuous tubercles. They resemble those of the rhinophores and dorsal surface generally, and do not look as if they could in any circumstances close over the pocket, which is of an unusual construction. It is very shallow, especially behind and at the sides; a little, but not much deeper in front. It can hardly be doubted that the animal is a crypto-branchiate Dorid, but the pocket, as preserved, is merely a special area a little lower than the dorsal surface. A somewhat similar phenomenon is seen in several species of *Doridopsis*. The branchiæ consist of 12-13 small bright-yellow plumes, mostly bipinnate, but some simply pinnate.

The main colour of the intestines is a bright deep purple. The central nervous system lies far forward, but the position is perhaps not natural. The three pairs of ganglia are distinct; the pleural portion of the cerebro-pleural ganglia rather large; the eyes sessile.

The labial cuticle is strong and brown, but without armature. The radula is rather small, consisting of 25 rows with a formula of 24. 0. 24. The teeth are colourless, simply hamate, small inside, and increasing up to the middle of the row. The outermost shorter, but not much degraded, and not denticulate. The œsophagus is long and describes a complete circle behind the buccal mass. The stomach lies in the anterior cleft of the liver. Its upper wall is much laminated internally; the intestine is long. The gall-bladder is purple, and so is the liver both within and without, but in places the colour is somewhat dimmed by the sparse, greenish hermaphrodite gland.

The genitalia are also purplish. The duct of the hermaphrodite gland is rather long. The mucus and albumen glands are not large. The spermatheca is purple, large, and globular, but the spermatocyst rises so close to it as almost to form a swelling on its side. The duct dilates, and the two receptacles rise together. Something similar is seen in Bergh's figures of *St. Januarii* (in Semper's Reisen, Supp. ii, pl. c, fig. 23). The vas deferens is tough and strong. No prostate was found and no armature.

This form also resembles *St. Januarii* (which is probably a variety of *St. verrucosa*) in its yellowish colour and red intestines, but the arrangement of tubercles round the branchiæ and rhinophores is

different, the radula is much smaller, and the structure of the branchial pocket is very peculiar. It is hard to say if the appearance of this organ as preserved is natural. It seems best to register the form provisionally as a new species, which may be intermediate between *Staurodoris* and *Ctenodoris*.

ACANTHODORIS FALKLANDICA, n.sp. Pl. XXVIII, Fig. 8.

One specimen from Manchester Museum. No notes, except a label saying that it forms part of Mr. Valentine's collection from the Falkland Islands.

The shape is somewhat triangular or linguiform. The length 25 mm., the maximum breadth 18, the height 13. The animal seems well preserved, except for a rent in the right side which has carried away some of the genitalia. It is plump and soft, yellowish brown in colour, with a pinkish or purplish tint in places owing to the intestines showing through the semi-transparent integuments. The rhinophores and branchiæ are lighter and more distinctly yellow than the rest of the dorsal surface, the foot yellow, the orifice of the genitalia bright yellow.

The back is covered with papillæ of various sizes, not set very closely. They are hyaline, but appear white in some lights. On the under-side of the mantle are vein-like lines produced by spicules seen through the integuments. These spicules are abundant everywhere on the dorsal surface and mantle-margin. They are brownish, irregular and undulated in outline, but always in one piece and never branched. Their surface is often granulate, and they are sometimes jointed. Among them are found numerous roundish granules.

The rhinophore pockets are bounded by a raised hyaline edge bearing two processes in front and three behind. These processes are not conspicuous as preserved, but are perhaps contracted. The rhinophores have a long stalk and about 25 perfoliations. The branchial area is not a pocket, and bears papillæ like the rest of the back, from which it is hardly differentiated. The plumes are 7 or 8, two being close together and bipinnate, but as the main axis lies flat and is attached to the back for most of its length they appear simply pinnate in many places. The foot is triangular, pointed behind, and with a rather long tail (8 mm.). The anterior margin is slightly grooved, but not notched. Over the mouth are two flaps which can be described either as an oral veil deeply bilobed or as unusually large strap-like tentacles. But perhaps the bilobation is not natural. The mantle-edge is ample, and bears above the mouth and also above the tail hard brownish accretions, somewhat resembling those of *Archidoris fulva* except in colour.

On opening the body the genitalia are seen to be highly developed. The whole of the right side is filled by the large white mucus gland, and the light-yellow follicles of the hermaphrodite gland are plentifully spread over the top and side of the liver, but do not extend far on the under-side. The liver itself is greenish, not bifid behind, and hollowed out on the right-hand side to receive the genitalia. The intestine issues near its anterior end and turns backwards at once.

In the central nervous system the pleural ganglia form a very distinct round swelling at the base of the cerebral. The pleural lie below. The buccal ganglia were not found. The blood-gland is small. The salivary glands of moderate size and band-like.

The buccal mass is surmounted by the sessile *ingluvies buccalis*, which is divided into two longitudinal halves striped transversely. The labial armature consists of two small yellowish plates, perhaps really united into a ring, formed of short rods or columns with a point at the top, so that when seen from above they appear as disks with a dot in the centre. The radula consists of 33 rows with a maximum formula of 7 . 1 . 0 . 1 . 7. The first lateral (Fig. 8*a*) is large, of the shape usual in the genus, with a varying number of denticles at the side. Sometimes there are none; usually 4-5 distinct, with 2-3 others less distinct below, occasionally as many as 12. The second lateral (Fig. 8*b*) has a distinct cusp, and traces of it remain even in the last tooth (Fig. 8*e*). Not more than seven teeth were seen with certainty in any row.

The male genitalia appear to be armed, not with hooks, but with elongate granulate scales, but the rent in the side has injured these organs so much that it is impossible to say if these scales are really on the vas deferens. The vagina is long and thin, and has an accessory floeculent gland. The spermatheca and spermatocyst are large, but flattened and empty.

This specimen does not seem referable to any of the species already described. The structure of the branchiæ is not very plain, but they are smaller and simpler than is usual in the genus. The *Acanthodoris Vatheleti* of Rochebrune & Mabile (Mission Scientifique du Cap Horn, 1882-3, p. 11) may perhaps be this animal, but the description is so slight that it is not even certain that it represents an *Acanthodoris*.

CALYCIDORIS, Abraham.

I examined the type-specimens of this genus preserved in the British Museum, under the impression that they probably came from New Zealand or Chile. The habitat is unknown, but the collector had also been in Bering Straits, and the affinities of the form make it possible that it was collected there. I append some notes on it, as Abraham's description is not correct in all respects.

CALYCIDORIS GÜNTHERI, Abraham. Pl. XXVIII, Fig. 9.

Calycidoris Güntheri, Abraham: Ann. Mag. Nat. Hist., vol. xviii, p. 132, pl. vi, figs. 1-1*c*, 1876.

Through the kindness of Mr. E. A. Smith I have been allowed to examine the type-specimens of this interesting form. They are three in number, and in spite of their age, which must be considerable, well preserved externally. The external features are correctly described by Abraham. The foot is triangular, with a fairly broad margin all round. Anteriorly the sole is terminated by a shallow furrow; beyond this is another furrow, and beyond that a fleshy ridge of the same breadth as the foot, with a cleft for the mouth, which is ventral,

in the middle, and slightly developed tentacular projections at the end. The whole organ has the appearance of being part of the foot rather than an oral veil.

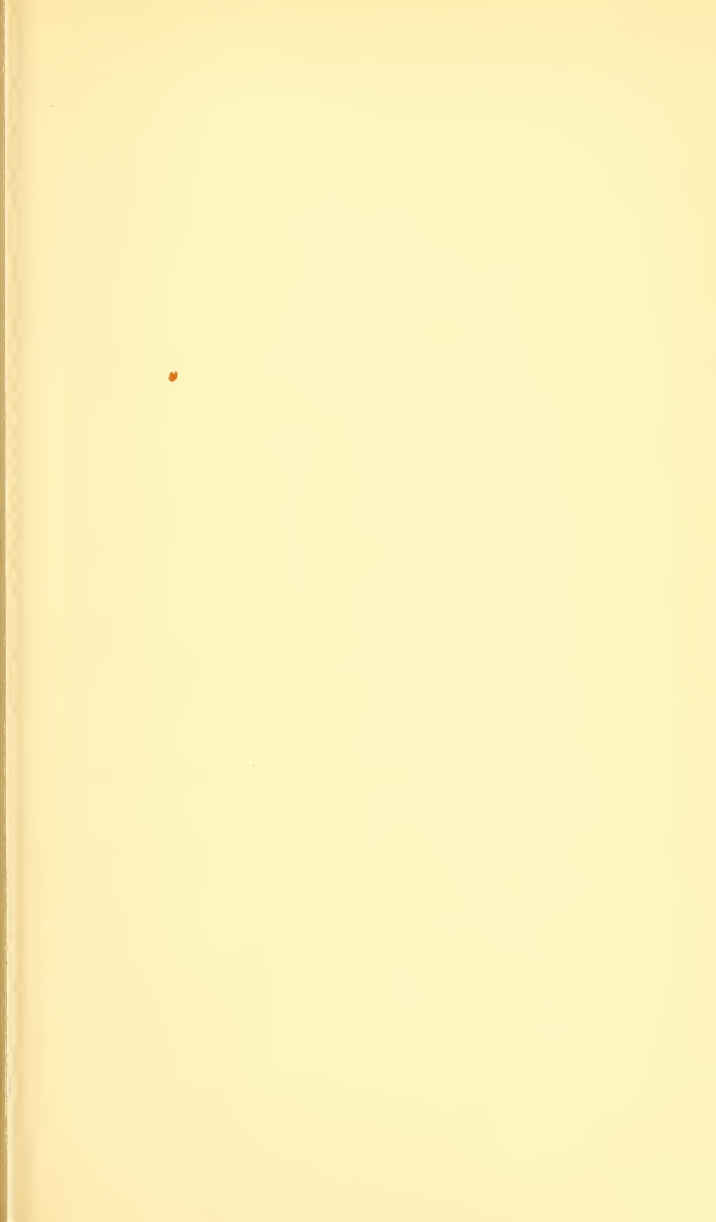
The branchiæ are as described by Abraham. In the specimen which I dissected they consist of 22 simply pinnate laminae, set in a cavity 1.5 mm. deep. It does not seem probable that this pocket can ever close over the branchiæ, but still it is a distinct cavity and not merely a differentiated part of the dorsal surface.

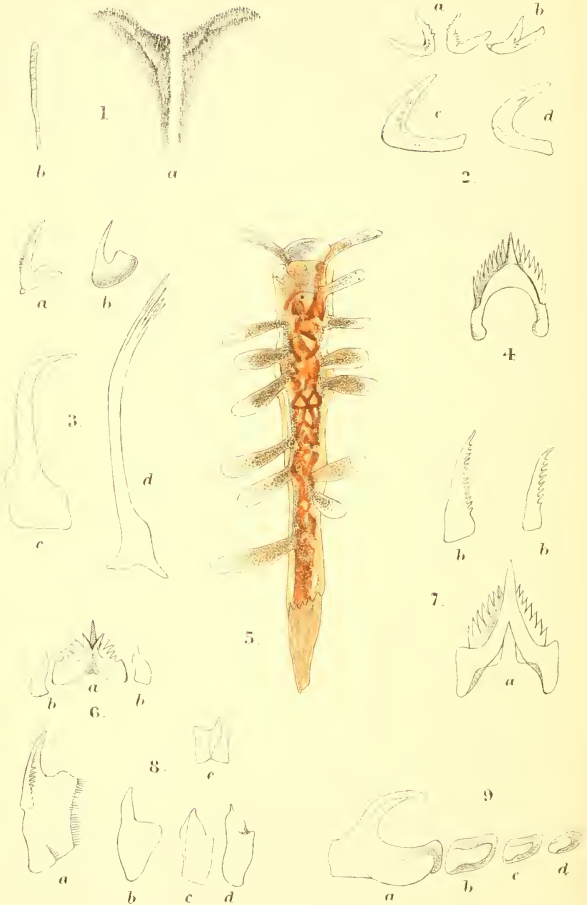
The intestines are of a uniform yellow colour. On the top of them lies a dendritic organ, probably the kidney. The blood-gland is single. In the central nervous system (which is somewhat decayed) the pedal ganglia seem to be large and round, and the cerebro-pleural ganglia divided into two fairly distinct parts, both of them triangular and elongate. The eyes are set on short stalks.

The buccal mass is fairly large. The top part of it is formed by a sessile crop, divided into two halves longitudinally. No striation is visible, but it may have disappeared. The labial armature is distinct, and composed of bent rods with rather wavy outlines and swollen ends. Two blade-like thickenings or projections are developed on the cuticle. Abraham's description of the radula is not correct. The formula is $26 \times 3 + 1 . 0 . 1 + 3$. The first lateral (Fig. 9a) is dark-brown and large, much as in *Adalaria proxima*, simply hamate, not denticulate; the base is very large in proportion to the shaft. The three outer teeth (Figs. 9b-d) are roughly oval plates, decreasing in size outwards, and each bearing a ridge. The liver cavity seems to act as the stomach. The intestine describes a very short coil in front and then runs backwards.

The genitalia are somewhat decayed, but some features are still plain, particularly the extraordinary length of both the male and female ducts. The vas deferens, which is rather thick, seems to wind under the buccal mass. It is armed with minute transparent scales, which under the highest power are seen to bear a small prominence. The spermatheca is large, the spermatocyst smaller and round. They arise from an elaborately coiled duct, which surrounds them with ample convolutions and apparently passes into the vagina. The hermaphrodite gland seems to be spread over the liver in the usual way.

I think it possible that this species is identical with the animal subsequently described by Aurivillius (Vega Expedition, vol. iv, pp. 372 and 380) as *Doris (Adalaria) Siberica*, and by Krause (Mollusken von Ostspitzbergen, in Zool. Jahrb., 1892, p. 364) as *Doris (Acanthodoris) Siberica*. The agreement in the buccal parts is remarkable, and Krause says "die Vagina war sehr lang, 40 mm. bei dem grössern Stück." But neither observer notices the gill-cavity, though they mention that the gills are more numerous than is usual in *Acanthodoris*. Yet the said cavity is perfectly plain in all three specimens of *Calycidoris*, and looks like a natural and conspicuous feature. The habitat of *Calycidoris* is unknown, but according to the records of the British Museum it was obtained by J. O. Goodridge, a surgeon in the Royal Navy, who is known from other entries to have collected in Bering Straits and on the west coast of South America.





J.Green lith. et imp.

NUDIBRANCHS FROM NEW ZEALAND & THE FALKLAND IS.

I think the genus *Calycidoris* had better be maintained, unless it can be shown that the peculiar branchial cavity is not a natural and permanent arrangement. It differs from *Acanthodoris* in the presence of this cavity, in having numerous simply pinnate branchiæ, and no denticles on the first lateral tooth. It is thus in some ways intermediate between *Acanthodoris* and *Adalaria*.

EXPLANATION OF PLATE XXVIII.

- FIG. 1.—*Alloiodoris lanuginata*: *a*, labial armature; *b*, a single rod from the same.
 ,, 2.—*Alloiodoris lanuginata*: radula: *a*, two first laterals; *b*, second lateral; *c*, a tooth from the inner part (3-15) of the half row; *d*, a tooth nearer the end of the row.
 ,, 3.—*Rostanga muscula*: radula: *a*, first lateral; *b*, second to eighth laterals; *c*, ninth to thirty-sixth laterals; *d*, thirty-seventh to eighty-second laterals.
 ,, 4.—*Cratena Valentini*: a tooth.
 ,, 5.—*Cratena Valentini*: living animal.
 ,, 6.—*Galvina Falklandica*: a row of the radula: *a*, median; *b*, lateral teeth.
 ,, 7.—*Coryphella Falklandica*: a row of the radula: *a*, median; *b*, lateral teeth.
 ,, 8.—*Acanthodoris Falklandica*: *a*, first lateral; *b*, second lateral; *c*, third lateral; *d*, fourth and fifth laterals; *e*, sixth and seventh laterals.
 ,, 9.—*Calycidoris Güntheri*: *a*, first lateral; *b*, second; *c*, third; *d*, fourth.