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Japanese Nudibranchs

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(With 2 plates).

The Nudibranchs described in this paper belong for the most part to the collection of the College of Science in the Imperial University of Tokyo, which consists of specimens of various ages and not all equally well preserved. In particular the colour of many has altogether disappeared. But for several species these museum specimens have been kindly supplemented by others obtained at the Biological Station of Misaki in 1907 and examined by me a few months after their capture. They were accompanied by coloured drawings made by a native artist, so that we have a good idea of their appearance in life. Thirteen of these drawings are reproduced in the plates which accompany the present paper. Unfortunately some interesting forms, such as *Melibe japonica* and *Sphaerodoris japonica*, are represented only by single specimens of some age without notes or figures.

It is noticeable that the collection contains several pelagic or swimming forms which are widely distributed, at least in the warmer waters of the globe. Such are *Phylliroë bucephala* and *Fiona marina*. It does not seem to me that *Euplocamus japonicus* (?) and *Glaucus lineatus* are clearly distinguished from the Atlantic forms *Eu. croceus* and *Gl. atlanticus*, and the two latter species should probably be considered as common to both oceans.

The bulk of the collection comes from about Lat. 35° N. and shows a mixture of tropical and temperate forms. Among the latter may be counted *Doris* (*Homoiodoris*) *japonica*, said to be

the commonest nudibranch in these waters, *Cadlina*, and *Rostanga;* but *Tritonia* is absent and so are the Pseudodorididæ (*Acanthodoris*, *Adalaria*, etc.) which are characteristic of the colder seas. On the other hand the tropical element is very large and it is remarkable to find equatorial forms such as *Sphaerodoris*, *Ceratosoma*, *Kalinga*, *Bornella* and *Pteraeolidia* occurring so far north. *Phyllidia* is represented in the collection but only by specimens from the Bonin and Loochoo archipelagoes, which though Japanese territory are considerably to the south of the larger islands.

Though the collection consists chiefly of forms which are found in the tropics, yet it is distinguished from the typical equatorial fauna by the absence of several large and conspicuous genera such as *Hexabranchus*, *Asteronotus*, *Kentrodoris*, *Orodoris*. Also the species of *Chromodoris* (3) and *Doridopsis* (1) are relatively neither numerous nor brilliantly coloured.[1)]

The Polyceridæ (especially *Plocamopherus*), *Melibe*, and Pleurophyllidiidæ are all remarkably numerous considering the size of the collection.

Though I have registered no less than nine new species, I confess that I feel doubtful if they will prove valid in the light of further research. In defence of them, it may be said that the specimens examined by me do not correspond with any published description. But these descriptions[2)] are to a large extent based on single preserved specimens and take no account of possible variations. Thus, the animal here named *Pleurophyllidia japonica* is decidedly not *Pl. compta* as defined by Bergh. It shows differences in the side lamellæ, head-shield and radula, all of which organs are supposed to offer good specific characters. But when one finds animals very like *Pl. compta*, coming from the same waters but differing in the organs mentioned, one must allow for the possibility that the species in this genus are more plastic and variable than was supposed. Again, the animals belonging

1) I should add that though *Doridopsis gemmacea* is not in the present collection I have found it in abundance at Misaki.

2) The most important account of Japanese nudibranchs is contained in Bergh's two papers, "Beiträge zur Kenntniss der japanischen Nudibranchien" in the "Verhandlungen der k. k. Zoologisch-botanischen Gesellschaft zu Wien," 1880 and 1881.

to the genus *Melibe* which are plentiful in Japanese waters are remarkable even among nudibranchs for their soft texture and I can affirm from personal observations that their shape sometimes changes remarkably when they are put into alcohol. Such change may be very deceptive because it is often not an obvious distortion but appears natural. I confess that I feel doubtful as to the specific distinctness of *M. papillosa*, *pilosa* and *vexillifera*.

The following is a list of the species noticed below.

Holohepatica.

Cladohepatica.

Doris (*Homoiodoris*) *japonica* Bergh.

Bergh, Verh. k. k. zool. bot. Ges. Wien, 1881, pp. 222-227.

Numerous specimens from Tsushima, Yokohama, Misaki and other places. This seems to be the commonest of Japanese nudibranchs but unfortunately there is no adequate description of its appearance when alive. Among the drawing sent to me are some coloured sketches representing Dorids from Misaki which may be of this species, but they bear no name nor numbers; and they cannot be safely identified with any of the specimens in the collection.

The preserved animals range from 10 mm. to 60 mm. in length. They are plump, not flat but with moderately arched backs and ample mantles which descend to the level of the sole

all round the body. The back is tuberculate and, as is usual when many specimens of one nudibranch are examined, there is great diversity in detail. As a rule the tubercles show remarkable differences of size in the same specimen. The commonest arrangement is that the whole back is covered with small tubercles (1 mm.—2 mm. broad), among which are scattered 20–30 much larger tubercles 4 mm. or even 5 mm. broad. These assume various shapes, being sometimes flat and sometimes, especially in the larger specimens, slightly constricted at the base and clavate. In the majority of specimens each rhinophore opening is protected by two or three large tubercles, but in some instances these are not noticeable. Similarly the branchial pocket is studded with tubercles which occasionally (though not very often) are sufficiently developed to merit the name of protective appendages. When the branchiæ are spread out they appear to be in all cases six, but very often two have a common base so that strictly speaking there are only five. As in *D. tuberculata* the tentacles are lumps at the side of the mouth. In many specimens they are clearly grooved on the under side and probably are so in all in life.

There is no trace of jaws or other armature on the labial cuticle. The teeth are simply hamate and the maximum formula of the radula is about $60 \times 70.\ 0.\ 70$.

The anatomy of this species has been described by Bergh (l.c.) who made it the type of a new genus *Homoiodoris* on account of some peculiarities in the genitalia. But as I have explained elsewhere[1] I think it should be regarded as belonging to *Doris* and as forming merely a subgenus.

Doris (***Ctenodoris***) ***aurantiaca*** sp. nov.

? = *Doris pecten* Collingwood.

For genus see Eliot: Nudibranchs of New Zealand, in Proc. Mal. Soc. 1907, p. 338.

(Plate I., fig. 1).

Two specimens from Misaki, accompanied by a coloured figure representing a yellowish brown Dorid with dots of a

1) Supplement to Alder and Hancock's British Nudibranchiate Mollusca. Ray Society 1910, p. 95.

brighter yellow scattered over the back. The rhinophores are long, with the lower part white and the upper part brown. The branchiæ are whitish and as described below.

The alcoholic specimens are about 18 mm. long and 14 mm. broad. The back is covered with warts of various sizes, containing spicules set in a stellate arrangement. The warts are quite separate from one another and not confluent. The general colour is semitransparent yellowish white, but the tips of the warts are often a bright opaque white and in one specimen the branchial pocket is edged with a border of the same colours. The mantle margin is ample and crinkled. The rhinophores are long; their pockets are not protected by special tubercles. The opening for the branchiæ appears externally not as a circle but as a crescent with the horns pointing anteriorly. The whole of the upper part acts as one valve and shuts down on the branchiæ. In one specimen however the branchiæ are protruded and very long, extending beyond the sides of the body. They are 13 in number and set in a single transverse line. Though apparently simply pinnate, most of the plumes prove on examination to be bipinnate and as those near the ends of the row have their bases united, they might be called tripinnate. The tentacles are represented by two ridges above the mouth. The foot is grooved in front and apparently notched but so contracted in both specimens that its structure is difficult to see.

There is no labial armature in the buccal parts. The radula has as a maximum formula about $50 \times 65.\ 0.\ 65$. It consists of rather stout hamate teeth often with a kink in the back and often with broken tips. The outermost teeth are shorter than the others and sometimes jagged but not regularly pectinate.

The stomach lies wholly outside the liver, which is brownish grey and coated with a thick yellow layer of hermaphrodite gland. The central nervous system is markedly granulate but the ganglia are distinct. The commissures are short and stout; the buccal ganglia are large and close together. The mucus gland is large and clear white in colour; the spherical spermatotheca and elongate spermatocyst are both grey and conspicuous

against this white. No armature was found in the genitalia.

This animal is possibly a colour variety of the *Doris pecten* of Collingwood which is blue. As the figure makes it certain that yellow is the natural colour of the present specimens, it seems better to register them provisionally under another name. But if the identity is established the specific designation *pecten* has priority and they should then be called *Ct. pecten* var. *aurantiaca*.

Ct. flabellifera Cheeseman seems to be a separate species having less conspicuous tubercles and smaller but more numerous (22) branchiæ.

Echinodoris armata sp. nov.

Cf. Quoy and Gaimard, Voyage de l'Astrolabe, Moll. ii. 1834, p. 263; and Bergh, Journal Musée Godeffroy, Heft 6, 1874, pp. 109–112, both referring to *E. eolida*.

One specimen. It is entirely white. Length 16 mm. maximum breadth 7 mm.: longest papillæ 2–5 mm. high. The back is covered with these papillæ, which are not constricted at the base but are roughly conical, though the outline is a little irregular. There are small papillæ round the mantle margin. The integuments are full of spicules which do not however project. No oral tentacles are visible and the under side of the mantle margin is as described by Bergh. The branchiæ as preserved stand in a thin, erect bundle; they are five in number, two small and three fairly large. They are tall, scanty, pinnate or bipinnate in different places.

On opening the buccal mass there is visible a labial armature consisting of a complete greyish ring composed of short rods bent at the tips. The radula is colourless, very fragile and easily thrown into confusion. The formula is at least $75 \times 70.\ 0.\ 70.$ There is no central tooth but a rhachidian fold. In essentials the teeth resemble those of *E. eolida* as drawn by Bergh. Those nearest to the rhachis bear four denticles spread out like a claw and are lower than the others. Those in the middle of the half rows are taller and bear from 4 to 6 denticles, but more than six were not seen. The outermost are longer still, thin and denticulate at the tips.

The central nervous system is as figured by Bergh and the three ganglia are unusually distinct. The penis is armed with very small transparent colourless spines.

This form agrees with Bergh's *E. eolida* in many respects but differs in the following points: 1) A circular labial armature is present. 2) The shape of the papillæ is somewhat different. 3) The radula is rather smaller and the teeth have fewer denticles, although the specimen is rather larger.

Provisionally this animal must, I think, be given specific rank, but it is not impossible that Bergh overlooked the presence of the labial armature and that this specimen and his *E. eolida* really belong to the same species.

Discodoris concinna A. and H.

Alder and Hancock, Notice of a Coll. of Nudib. Moll. made in India, Trans. Zool. Soc. 1864, p. 118.
= *Disc. concinniformis* Bergh, Malac. Ont. xvi, p. 807.

Three specimens from Kominato, Awa. The largest specimen is 41 mm. long, 26 mm. broad and 11 mm. high, flattish and not much arched. The texture is rather soft and the back is covered with minute tubercles or papillæ of various sizes though the largest do not exceed half a millimetre in length. The colour is greyish white bearing darker mottlings of various shades, greenish, bluish and blackish. All these markings have a curiously indistinct appearance as if they were under the skin. The papillæ are always whitish even in places where the ground colour is dark. On the under surface, especially on the sole of the foot, these are brown and grey spots.

The foot is broad (7 mm.) and is grooved in front, the upper lamina being notched. The oral tentacles are digitate. The branchial plumes are six, tripinnate and connected at the bases. The branchial pocket is slightly raised and undulated or scalloped but not stellate. The plumes are white at the base, grey in the middle part and yellowish at the tips.

The blood gland is olive grey, large, thick and double, the portion in front of the central nervous system being the larger.

Neither portion is much lobed or branched. The central nervous system is much concentrated and is enclosed in a thick capsule which hides even the eyes.

The labial cuticle bears two yellowish plates composed of rods which are not distinctly bifid though the edges are sometimes jagged. The radula is deeply grooved in the middle, but when it is spread out, the rhachis is seen to be wide. The teeth are large, transparent, yellow and simply hamate, bearing a ridge on the inner side but no denticles. The innermost are small, the outermost small and slender. In two specimens examined the number of rows was only 20 and 24 respectively, and the number of teeth in a row was in both about 40. 0. 40. The shortness of the radula is characteristic of the species.

The hermaphrodite gland is distributed over the liver in the usual way. Both its duct and its ampulla are long. The spermatotheca is large. A large prostate is present but no trace of armature was found in the genitalia.

Halgerda japonica sp. nov.

See Bergh on *Aporodoris rubra* in *Siboga Expeditie*, Opisthobranchiata, p. 94.

(Plate I., fig. 2).

One specimen from Misaki, 44.5 mm. long and 27 mm. broad. It is accompanied by a coloured drawing which represents a flattish Dorid with a delicate and complicated colouration composed of various shades of grey. The ground colour is a yellowish grey which is lighter and brighter at the mantle edge where it forms a not very distinct border. Over the dorsal surface are distributed roundish areas of a darker grey, varying in intensity, and about 4 mm. in diameter. Small white dots are scattered over the whole dorsal surface regardless of these markings, and in one or two places are aggregated into white spots of a fair size. The six branchiæ are represented as large, whitish and very delicate. The underside, which is shown at one point, is of a drab colour, with minute black dots on the side of the foot.

The preserved specimen has not retained these colours. It is soft and presents various shades of light and dark brown

mostly with a reddish tinge. The white dots have disappeared. The foot is pinkish and the underside of the mantle is marked with lines inside, resembling fibres.

The dorsal surface is covered with a thick low indistinct reticulation, the meshes of which are pits. They are darker than the ridges which divide them and no doubt correspond to the dark areas in the figure.[1] Both the ridges and depressions bear minute prominences which perhaps were tipped with white in the living animal. They are sometimes confluent. The integuments contain spicules which sometimes project outside and are of two kinds: (1) white, transparent, either straight or curved but not granulate nor branched; and (2) darker, larger, granulate, branched and generally Y-shaped.

The rhinophore pockets have jagged edges which are not much raised. The rhinophores are strongly perfoliate and dark with light tips. The branchial pocket is irregularly 6–stellate; the branchiæ are six, tripinnate and tall but rather scanty. The labial tentacles are distinct and linear. The foot is broad and entirely covered by the mantle; the anterior margin is notched and grooved.

There is no labial armature. The radula consists of forty eight rows, each containing from 60 to 70 teeth on either side of the rhachis which is bare. The last four teeth at the outer ends of the rows are pectinate, the rest simply hamate.

The intestines have a pinkish tinge. The stomach lies wholly outside the liver, which is pinkish grey and covered in most parts, but not everywhere, by the white, dendritic, hermaphrodite gland. The spermatocyst and spermatotheca have long ducts and lie at some distance from one another. There is a prostate of roughly spherical form and the lower part of the vas deferens is armed with a few cones bearing hooked tips. They appear to be soft, not chitinous, and to be arranged in two rows.

After comparing this specimen with the original preserved in the Siboga collection, I am inclined to think that it is the

1) They do not look like depressions in the figure but there is no doubt of the existence of such depressions in the preserved specimen.

animal described by Bergh as *Aporodoris* ? *rubra*. This identity is hardly deducible from the description, in which Bergh has omitted to mention the peculiar low reticulation and depressions. They were however clearly visible in his specimen when I examined it, and it has the same red tint as the present Japanese specimen. This tint is apparently due to the intestines and is not shown in the figure of the living animal. The pectinate teeth and the hooked cones in the vas deferens are further points of agreement.

In view of the reticulation on the back I do not think either specimen should be referred to von Jhering's somewhat doubtful genus *Aporodoris*, of which the type is Alder and Hancock's *Doris millegrana*. They seem to me to be referable rather to *Halgerda*, from which they differ only in the cones on the vas deferens. But the name *H. rubra* is pre-occupied by another species created by Bergh (Siboga Exp. p. 126) and I therefore propose to call the present species *H. japonica*.

Halgerda graphica Basedow and Hedley.

See: Trans. Roy. Soc. South Australia, vol. 29. 1905, pp. 152–3. For *H. formosa* see Bergh in Verh. d. k. k. zool. botan. Ges. in Wien, xxx, 1880, pp. 190–195 and in Mal. Unters. 1888, Heft xvi, i. pp. 822–826.

Two specimens labelled Okinawa Islands and Otaba. The larger is about 55 mm. long and 35 broad. The smaller is about half this size, but both specimens are somewhat bent and were probably considerably larger when alive and fully extended. The integuments of the smaller specimen resemble a semitransparent stiff jelly, blue in the lower parts but more or less distinctly yellow on the ridges and tubercles.

The back bears a median ridge from which run side ridges at various angles, forming figures of different shapes but mostly quadrilateral, although those nearest to the mantle margin are incomplete. The ends and the junctions of these ridges are marked by tubercles of a considerable size. The space within the figures is marked with bold black lines and spots, and there

are similar but less conspicuous markings on the sides of the foot and upper surface of the tail. The anterior margin of the foot is grooved with a slight notch in the middle of the upper lamina. The rhinophores are rather long. The perfoliations are black : the lower part is striped with black but shows a good deal of yellow. As preserved the branchial pocket is elliptical and not at all stellate. The branchiæ may be reckoned as 4 or 6, the posterior pair being so deeply cleft that they may be counted as two pairs though superficially they appear as one. There is a series of black dots down the main rhachis and the finer ramifications are black, so that the whole appearance of the branchiæ is unusually dark.

The radula is large and strong, with a formula of 75 × about 65. 0. 65 in the larger specimen. In the front part of the radula the rows bend downwards towards the middle where the teeth are smaller and crowded, so that there sometimes seems to be a central tooth, though there is really none. The majority of the teeth are simply hamate and increase in size as they are further from the rhachis, but at the outer ends of the rows are 2–3 plate-like teeth, generally spatulate in shape but not pectinate or serrulate. The innermost teeth are often, but not invariably bifid.

The membranes surrounding the intestines are blackish, more so in one specimen than in the other. The stomach lies in a cleft of the liver but is not surrounded by it. The genitalia bear no armature.

I think this specimen is best referred to *H. graphica*, a species created but not very fully described by Basedow and Hedly. But it is possible that it may be at the same time a large and dark variety of *H. formosa* originally described from Japan. It is very like Bergh's figure of this species in Sempers Reisen pl. LXXXI, fig. 13 ; and in specimens of *H. formosa* which I have examined, I have found that the external teeth are not invariably pectinate. It has also many resemblances to *H. punctata* Farran.

Platydoris speciosa Abraham.

P. S. Abraham, Revision of the Anthobranchiate Nudibr. Mollusca. Proc. Zool. Soc. 1877, p. 250. See also Eliot, Trans. Linn. Soc. xiii, 2, 1910, pp. 425-6, and for *Pl. formosa* id. P. Z. S. 1906, p. 646.

(Plate I., figs. 3 & 4).

Three consignments of specimens. (1) Three young specimens from Kominato, 40 mm. to 45 mm. long. (2) Five specimens from Misaki ranging from 35 mm to 80 mm. (3) Seven specimens from Moroiso, Misaki, measuring as much as 90–100 mm.

A drawing of the living animal represents it as having very large branchiæ and a wrinkled mantle edge. The complicated coloration has for its basis a chocolate ground diversified with bold mottlings of a lighter brown. There are also markings of three other kinds: (1) blotches of opaque white, (2) small spots of dark brown, and (3) ocelli with a dark centre and a white or bluish circumference. These ocelli occur only on the light mottlings: the other kinds of markings are found in both the dark and light areas, though naturally the dark spots are much more conspicuous on a light background. The stems of the branchiæ are white, the perfoliations greenish but speckled with white. The lower part of the rhinophores is chocolate colour; the perfoliations are darker and marked with thin white lines. The under surface is of a fine clear yellow and bears on the mantle and sides of the foot (but not on the sole) bold and distinct spots, dark brown in colour and various in size.

The preserved specimens are mostly of a dirty white with slate coloured blotches and dots, as usual in *Platydoris;* the surface is finely granulated and the texture hard and stiff. The integuments contain numerous spicules. They are straight or slightly bent, not very large, not branched but covered with lumps and granulations. The oral tentacles are digitate and grooved. The foot is moderately broad (measuring 30 mm. across in a specimen which has a mantle 70 mm. wide), but it has a thin expanded margin and when this is turned inwards it appears narrow. It is grooved in front and the upper lamina of the groove is notched. The rhinophore openings are large slits but

the edges are not raised. The rhinophores are large and bear about 40 brown perfoliations. The branchiæ are six (rarely seven) and tripinnate. The pocket appears to be normally 6-stellate but is often distorted, and in one specimen is spread out like a cup.

When the body is opened, the large coal-black blood-gland is a conspicuous object. It is in two divisions. Uncertain traces of a labial armature were found. In young specimens the labial cuticle was found to bear a collection of minute rods, so small and transparent as to be visible only under the highest power. In larger specimens it bears scales and granules rather than rods and they are not combined into a plate such as is usually called a labial armature. In two specimens the radula consisted of 70 and 80 rows respectively with a formula of about 150. 0. 150. The teeth are white, simply hamate, rather elongate and graceful. They are not denticulate and maintain their shape throughout almost the whole of the row. But the last but one is thinner and lower than the others and the outermost of all is degraded, not regularly serrulate but sometimes bearing minute indentations on the top.

The genitalia show the peculiarities characteristic of the genus. Both the vas deferens and vagina are lined with a very thick muscular cuticle, thrown up into strong zigzag fords. The vas deferens is armed with numerous slightly curved spines each arising out of a circular disc. They are set not in rows but in rather irregular quincunces. In the vagina the folds do not bear true spines but knobs and prominences and in the lower part the portions between the folds are thickly studded with small tubercles. The spermatotheca is large and filled with greenish matter: the spermatocyst is elongate but crumpled and at the end of the vas deferens is an accessory gland.

After comparing these specimens with the *Doris speciosa* preserved in the British museum I have no hesitation in saying that the animal described by Abraham under that name is the young stage of this *Platydoris*. The species must therefore keep the name he gave it. He gives the number of branchiæ as seven.

It is usually six but occasionally a side branch divides from the main stem so low down as to constitute a separate plume. He also says "Foot . . . . with an anterior transverse groove, the upper lamina of which is deeply notched, a little enlarged, and bearing one or two terminal papillæ at each side of the notch." I could not detect this peculiarity in the British Museum specimen, in which I merely observed that the two ends of the divided upper lamina on either side of the notch are rather long and pointed, so that they might possibly be described as papillæ.

Pl. speciosa belongs to the same group of species as *Pl. formosa* (A. & H.) *Pl. inframaculata* (Abr.) and *Pl. ellioti* (A. & H.) which are distinguished by a rather conspicuous mottled coloration, especially on the lower side. So far as is known, none of them have denticulate teeth. It is possible that *Pl. formosa* is a lighter variety of *Pl. speciosa*, having orange spots on a white ground instead of black spots on a yellow ground. If the two forms are regarded as mere varieties the name *formosa* (1864) has priority.

Platydoris tabulata Abraham.

P. S. Abraham, Revision of the Anthobranchiate Nudibr. Mollusca, Proc. Zool. Soc. 1877, p. 248. Eliot, Nudibranchs of Percy Sladen Trust Exped., T. Linn. Soc. xiii, 2, 1910, pp. 427–8.

(Plate I., fig. 5).

Nine specimens from Misaki. The dimensions of the largest (to which the present notes refer, though they have been confirmed by an examination of others) are: length 64 mm, breadth 35.5. Foot small. Mantle-margin very ample. The whole animal is very flat and hard, and the back is covered with numerous minute papillæ. The ground-colour of both the upper and lower surface is yellowish white, diversified on the back by darker areas of yellowish green. Much of the dorsal area is also covered with fine purple dots, but there are considerable bare spaces in the middle and elsewhere. The absence of dots on them may, however, be due to abrasion. On the underside of the mantle is a band of purple dots round the foot. The rhinophores are dark

violet-grey. The branchiæ are six and tripinnate: their main axes are reddish below; the perfoliations are violet-grey; in all parts there are numerous dark dots. The pocket is indistinctly six-toothed. The oral tentacles are large and grooved.

A drawing of the living animal represents it as brownish yellow, the medio-dorsal area being darker than the marginal region which is bounded by a still lighter border.[1] There are five irregular whitish spots on various parts of the back. The whole of the dorsal surface, whatever its colour, is thickly spotted with minute dark purplish dots. The branchiæ are greyish white; the rhinophores have yellowish stems and violet-grey perfoliations. The mantle edge is much undulated and wrinkled.

The labial cuticle bears an armature of rods, which though of a faint grey and not conspicuous is yet distinct. It consists of two longish plates, which are thicker and darker at the ends where they are nearest each other. The radula varies from $35 \times 80.0.80$ to $57 \times 135.0.135$. The outermost tooth has no hook, but bears irregular denticles on the apex and also occasionally on the side. The outermost tooth but one bears a hook which is reduced, but still clear, and below it a few irregular denticles. The remaining teeth are hamate and rather slender.

The oesophagus is rather large. The stomach lies in a cleft of the liver, but is not enclosed by it. Its walls are thin, not muscular, and slightly laminated internally. The liver is brown and traversed internally by unusually large tubes and passages. It is covered by a thick yellowish layer composed of the hermaphrodite gland. The general colour of the intestines is pinkish.

The blood gland is purplish grey and composed of two parts, of which the anterior is larger. The ganglia of the central nervous system are yellowish and fairly distinct. The common commissure is very thick. The eyes are set on short stalks.

The ampulla of the hermaphrodite gland forms two or three thick convolutions. The albumen and mucus glands are of mode-

1) But though the ground colour of the border is lighter, it is sometimes so thickly studded with purplish dots that its general effect is darker.

rate size. The spermatotheca is round, brown, and full of spermatozoa. The spermatocyst is elongate and stalked; it rises close to the spermatotheca and is bent on itself, so as to appear double, The prostate is large and globular. Attached to the bag which contains the penis is a pear-shaped flocculent gland with a longish duct. The lower part of the vas deferens (and it would appear the glans penis too) bears strong, jagged, pinkish folds, which rise into bent spines of a pinkish colour set in six rows. Higher up there are no spines, but only jagged colourless folds. The vagina is lined with a thick red cuticle bearing folds on which are knobs and prominences. Though the whole armature is very similar to that of the male branch, there are no true spines in it.

This form is nearly allied to Bergh's *Pl. variegata*, which also possesses the anomalous character of a labial armature. The two may be varieties of a single species (in which case the name *tabulata* of 1877 has priority over *variegata* of 1880), but there are many differences of detail. The coloration of the dorsal surface is not strikingly similar; *Pl. tabulata* has no lines on the foot; its oral tentacles are large and grooved, whereas those of *Pl. variegata* are small and digitate.

Platydoris cruenta Q. and G.

(=*P. arrogans* Bergh).—Q. & G. Voyage de l'Astrolabe, ii, 1832, p. 260, Bergh Mal. Untersuch. Heft xii, p. 513 ff. and Supp. Heft i, p. 58 ff.

Two specimens from Yaeyama Is. appear to belong to this species, of which they possess all the internal and external characters except the presence of scarlet blotches. It is known that these blotches totally disappear in alcohol.[1] As preserved the specimens have a yellowish ground colour but the greater part of the dorsal surface is thickly marked with fine lines, which are of olive colour and impart the same colour to the spaces between them. In many places the lines are so numerous that they coalesce and form blotches, but there are also

1) This has happened to all the specimens in my own collection.

blank areas which bear no lines and are distributed quite irregularly here and there on the back.

Internally there is no trace of a labial armature and the formula of the radula is about $50 \times 110.0.110$ In the genitalia the vas deferens is armed with large hooked spines set on disks, but in the vagina, though the cuticle is very strong and thrown up into many folds, neither spines nor disks occur. I am somewhat doubtful as to the specific distinctness of this and the next species. See my remarks at the end of the description of the latter.

Platydoris striata Kelaart.

Alder and Hancock on Indian Nudibranchiate Mollusca, 1864, p. 117–118. Eliot, P.Z.S. 1960 p. 647 and p. 1003.

One specimen from Kataura, Kagoshima Province. The integuments are tinged with faint pink and are marked with bold black lines which do not coalesce so as to form blotches. Here and there however are clear spaces without any lines.

The specimen is bent and the margin is much undulated but the dorsal surface is about 95 mm. long and 65 mm. broad. The foot is short, being only about 35 mm in length, but its ample thin margins, which are now turned inwards, must have been of a considerable breadth when the animal was adhering to a flat surface. The mantle margin is also very ample, in some places as much as 25 mm.

The lines on the back are rarely straight, but usually those in a particular region lie on the whole in the same direction. They are densist in the lateral parts of the dorsal surface and over the head. There are some clear spaces in the medio-dorsal area and here and there on the mantle margin, but as a rule the lines run to the edge. On the under surface of the mantle margin and the sides of the foot there are also black lines, straighter and not so numerous as those on the back. There are also black lines on the branchiæ and on the oral tentacles and there is black pigment in the grooves of the latter.

The rhinophores as preserved are violet grey. The openings

are entirely closed but appear to have been stellate and perhaps somewhat raised. The branchial pocket is raised, distinctly six-stellate, and closed, The posterior lobe is considerably larger than the others and covers some part of all of them. The branchiæ are pinkish, but bear very numerous fine black lines, which produce a general effect of grey. It is difficult to see the parts near the mouth, as the naturally hard integuments are much contracted but the anterior margin of the foot seems to be grooved and notched and the oral tentacles are large and furrowed.

There is no labial armature. The radula consists of 50 rows, rather crowded and containing as many as 150 teeth. The teeth have rather long bases and slender erect shafts, the tips of which are often blunt. The two outermost are rather degraded in shape and not hamate. They are not regularly serrulate but they often bear (especially the last one) a few irregular denticles.

The intestines, as so often happens in specimens of this genus,[1] were dry and hardened but by a careful examination of the genitalia it seemed possible to identify both the vagina and vas deferens. They are thick tough tubes conspicuous on account of the thick yellow cuticle with which they are lined. In this specimen both bear strong zig-zag folds and lumps, but no hooks or spines whatever were found.

It is with some hesitation that I refer this specimen to *Pl. striata*, characterized by having no red blotches on the back but numerous dark lines and by having no disks or spines on the male genitalia. The buccal parts are practically as in *Pl. cruenta*. My examination of the much damaged specimen labelled *D. striata* by Alder and Hancock which is preserved in the Newcastle Museum (P. Z. S. 1906 p. 647) supports this diagnosis and I have found the same absence of spines and disks in a specimen kindly lent me by the British Museum. But it must be remembered that in dealing with old, dried, specimens it is difficult to demonstrate conclusively the absence of a spiny armature in the genitalia. If this is consistently absent, the present form will be a valid species. If it proves to be present, *Pl. striata*

1) Probably the hard thick integuments do not allow the preserving fluid to pass.

can hardly rank higher than a variety of *Pl. cruenta*. At present we seem to have three possibly valid species, all of which have practically the same radula.

1. *Pl. cruenta* (Q. & G.). admitted by Bergh. (Siboga p. 136) to be the same as his *Pl. arrogans*. Whitish, with dark lines and scarlet blotches. Male genitalia armed with hooks and disks.

2. *Pl. flammulata* Bergh. Brownish with white mottlings and scarlet blotches, the whole plentifully besprinkled with dots or very short lines. Genital ducts with thick, winkled cuticle but no hooks or disks.

3. *Pl. striata* (Kelaart). No red blotches (this is proved by A. & H's drawing) but bold dark lines. Genital ducts as in *Pl. flammulata*.

Rostanga muscula Abraham.

See Eliot in Proc. Malac. Soc. Vol. vii, 1907, p. 339, also Mac Farland on *R. pulchra* U. S. Bull. of Bureau of Fisheries, 1905, Vol. xxv. p. 119, and Cheeseman on *Doris rubicunda* in Trans. Inst. New Zeal. Vol. xiii, 1880, p. 222.

One specimen from Misaki 16 mm long and 3 mm broad. It is pure white and soft in texture. The back is covered with elongate tubercles from which spicules project. The branchiæ are seven and simply pinnate. The edge of the pocket is quite smooth.

The buccal parts show hardly anything which can be called a labial armature but the labial cuticle bears granules and a few fibrous rods. The teeth are of much the same shape as in *R. muscula* but the radula is considerably smaller, the formula not exceeding $33 \times 51.0.51$. The first lateral next to the rhachis is hamate and bears 20–30 denticles. Then follow about 30 teeth without denticles, hamate but gradually becoming more erect. The last 15 or 20 teeth towards the end of the row are long, erect, thin, and split at the tip into 2–4 long brushlike denticles.

This specimen seems allied to *R. muscula*, *R. pulchra* and *R. rubicunda* and perhaps should be identified with the first as the absence of a labial armature and the shape of the teeth are common characters. But an examination of more specimens and of the living animal is desirable.

Cadlina (or *Tyrina*) sp.

One specimen from Ago Bay, Shima. It is 28 mm. in length, 18 mm. in breadth and of a uniform greenish brown, which however may not be the original colour. The dorsal surface is covered with warts and prominences of various sizes which are not confluent and are generally separated by an appreciable interval. The margin of the rhinophore pockets is not at all raised: that of the branchial pocket, though only slightly raised, forms a remarkably distinct circle. The branchiæ are simply pinnate, very small and difficult to count but apparently 9 in number. On either side of the head is a large puffy lobe. These lobes seem to be swollen and distorted but in their natural condition they may have borne indentations as do those of *Tyrinna*. The whole animal is very flat.

There is a labial armature of brownish rods, curved and bifid at the tips. The radula is large and the teeth fit closely into one another. The formula is at least $80 \times 100 + 1 + 100$, and some rows are a little wider. The median tooth is narrow and bears four claw-like denticles. The first lateral is denticulate on both sides: the rest bear on the outside only 7–9 distinct denticles, of which the uppermost in longest. Some scales were found in the vas deferens and on the verge, but no spines were visible, though their absence cannot be considered certain.

Three species of *Cadlina* are known from the American side of the northern Pacific, namely *C. pacifica* Bergh, *C. marginata* MacFarland *C. flavomaculata* MacFarland, but this specimen cannot be referred to any of them. But owing to its distorted condition it is impossible to say whether it is a *Cadlina* or a *Tyrinna* and it therefore seems better to leave it unnamed.

Genus *Sphaerodoris* Bgh.

(See especially Bergh: *Kritische Untersuchung der Ehrenberg'schen Doriden* in *Jahrbuch d. deutschen malakozool. Ges.* 1877, pp. 65–67).

It is not easy to decide whether this genus should be called *Actinocyclus* or *Sphaerodoris*. The former name (Ehrenberg 1831)

has priority over the latter (Bergh 1877) but whereas Bergh's definition is clear and his type specimen well preserved, the same cannot be said of Ehrenberg's. His definition of the generic characters (Apertura analis non tubulosa: pone branchiarum discum et ab eo plane discreta) does not apply to the specimen now in the Zoological Museum at Berlin nor, it may be added, to any known genus of Nudibranchs. Bergh (l. c.) came to the conclusion that this specimen labelled *Actinocyclus verrucosus* was probably of the same genus as his *Sphaerodoris punctata* but could not establish the fact, as he was not allowed to dissect the animal. I however was more fortunate and received permission to extract the mouth parts and found that they have the typical characters of *Sphaerodoris.* The labial armature is a thin band (? circular) composed of small hooks. The radula is at least $56 \times 25 + 1.0.1 + 25$ and perhaps much larger for the tissues are old and decayed and it is possible that only the anterior half was extracted. The first teeth of each row are as in Bergh's plate of *Sph. laevis*: one half is smooth with a rudimentary hook, the other half bears about 8 denticles. The other teeth are erect and bear 15 or more denticles. But though the generic characters are certain the specimens (two in number) are in such indifferent condition that it is impossible to formulate their specific characters or to identify them with any species of *Sphaerodoris* already described. Also there is some doubt as to the specific name: in the printed edition of the *Symbolae Physicae* it is *verrucosus*: the jar in the Berlin Museum is labelled *Actinocyclus ocellatus*, and Ehrenberg seems to have also used the name *papillosus.*

No specimens have been preserved of the two animals called by Ehrenberg *Actinocyclus velutinus* and *A. fragilis.* They probably did not really belong to the same genus as his *A. verrucosus.*

In favour of calling the genus *Actinocyclus* may be adduced the weighty fact that the specimen so named by Ehrenberg in 1831 undoubtedly belongs to the same genus as the *Spaerodoris* created by Bergh in 1877. Against this may be set the following considerations. (1) The specimen does not agree with Ehrenberg's description and definition of the genus. It is possible that

he accidently mixed up the notes which he had made on two different animals. (2) There is some uncertainly as to the specific name of the type specimen and its specific characters cannot be formulated. I therefore think that it is better to neglect entirely Ehrenberg's genus *Actinocyclus* and his species *ocellatus* or *verrucosus* and to treat the genus as *Sphaerodoris Bergh 1877*. There are two certain species *Sph. punctata* and *Sph. laevis*, both created by Bergh. As he himself observed, his *Sph. papillata* may be merely a variety of *Sph. punctata*. The type specimen which is preserved in the Copenhagen Museum is a remarkable looking animal with the dorsal ridges and tubercles highly developed but the differences from *Sph. punctata* seem to be of degree rather than kind.

Sphaerodoris japonica sp. nov.

(Cf. for *Sph. punctata* and *Sph. papillata* Bergh, Mal. Unters. Heft xiii, 1878, p. 587 ff. For *Sph. laevis* Bergh, Mal. Unters. Heft xvii, 1890, p. 924, and Eliot in Proc. Zool. Soc. 1904, p. 403.)

One specimen labelled Ago Bay, Shima. It is 61 mm. long, 32 broad and 14 high. The foot, which has expanded margins, is almost exactly as wide as the back. The colour is yellowish brown, spinkled here and there (especially on the tips of the tubercles) with black or bluish spots. The smaller tubercles bear a single bluish spot on the tip but the larger ones bear many such spots united into dark blotches.

The dorsal surface is hard and leathery. It bears about 30 tubercles arranged in four fairly regular rows, with a smaller ones placed round the mantle margin, and also here and there among the large ones. They vary from 1.5 mm. to 7 mm. in breadth and from 1.5 mm. to 2 mm. in height as preserved but were perhaps more prominent in life. The mantle edge is not very wide and is smooth beneath. No oral tentacles of any kind are visible. The mouth is a round opening immediately above the anterior margin of the foot which is deflected downwards in the middle so as to form a semicircular groove round the lower half of the mouth. The area round the branchial pocket is smoother than the rest

of the back. The rim of the pocket is thin, slightly raised and not at all tuberculate. The branchiæ are brown, 18, strong in texture and, though only simply pinnate, form a large bunch. There are no traces of ridges on the dorsal surface, between the tubercles or elsewhere.

The most remarkable feature of this ani malis the rhinophorial pocket which has only a single small aperture about 2 mm. wide. This leads into a relatively large chamber, the floor of which measures about 5 mm. × 3.5 mm. and is brownish, like the dorsal surface. From this aperture rise two stout rhinop hores with bases some distance apart and tips inclined towards one another. The tips are light yellow, the lower part brown. It is not easy to see how such large rhinophores can emerge together out of so small on opening.

The labial armature consists of a yellowish ring of rods which, though sometimes bent or wavy, are not definitely hooked at the tip. The radula is dark brown and of a somewhat unusual appearance. The rhachis is very wide and all the rows curve considerably downwards so that the anterior rows, which are very long, almost surround the posterior rows which are very short.

The radula is hard to count on account of this unusual curvature and the occasional confusion of two or three rows with one another but the formula is about $110 \times 50 + 1.0.1 + 50$ in the longest rows. But many rows are quite short. The shape of the teeth somewhat resembles that shown in Bergh's figures for *Sphaerodoris laevis*.[1] The first laterals are divided into two parts. The outer or upper part is spatulate but jagged at the top. On the inner side it bears about 5 inconspicuous denticles. The other part of the teeth is split into at least 9 long transparent denticles. The other teeth are tall and erect, bearing 20–30 denticles which decrease in number on the teeth near the end of the rows. In a few rows the outermost teeth are quite smooth.

There is no trace of a stomach outside the the liver. The

1) See Malac. Unters. Heft. xvii pl. 88, fig. 3.

liver is large and externally yellowish, owing to the follicles of the hermaphrodite gland which form a rather irregularly distributed layer on the upper surface but are present on the lower surface only here and there and only in small quantities. The texture of the liver is loose and spongy and the colour inside is mixed, being yellow, brown and black in different parts. It contains several cavities and tubes in which digestion probably tabes place but owing to the imperfect preservation of the organ it is not easy to distinguish between the substance of the liver and the alimentary matter enclosed in it.

Neither the central nervous system nor the genitalia are very well preserved and the details of their structure are not clear in all points. The ganglia are contained in a stiff capsule which has become fused with the grey and moderately large blood gland. So far as can be jndged, they are much as represented by Bergh for *Sphaer. lacvis*,[1] that is to say fairly distinct from one another and united by short thick connectives.

Near the point where the hermapherodite duct passes from the surface of the liver to the anterior genital mass is a large curved dilatation but owing to the imperfect preservation of the adjoining parts it is not clear whether it is the ampulla of the hermaphrodite duct or, at least in part, a prostate. The vas deferens is thin and the glans penis very small. The vaginal duct is long and twisted. The spermatotheca is relatively enormous and spherical measuring about 10 mm. in diameter. The spermatocyst is elongate (about 8 mm. long and 2.5 mm. broad) and constricted at several points. The albumen-mucus gland-complex is large and shows on its underside the coil of a much convoluted tube.

This specimen raises some difficulties. Firstly the arrangement of the rhinophores is unique: they are retractile not into separate pockets but into a single common pocket. If this structure is regarded as normal, the animal must be made the type of a new genus, if not of a new family. But its other characteristics are those of *Sphaerodoris*, an exceptionally well marked genus, and it

1) Mal. Unters. Heft. xvii, pl. LXXXVIII, fig. 3.

seems probable that the disposition of the rhinophores is a monstrosity.[1] The change by which the septum dividing two neighbouring pockets atrophies and leaves a single chamber is not great. On the other hand it is unusual both in the Dorids as a class and in *Sphaerodoris* in particular to find the rhinophore pockets so close together that they can be described as being divided by a partition. They are rather separate cavities excavated in the right and left sides of the dorsal surface and the space between them is often filled by a crest or tubercles. It would therefore seem that, even if the present specimen is a monstrosity, it presupposes an unusual arrangement of the rhinophore pockets. But it is useless to speculate on a question which can be decided only by the examination of further specimens.

If the animal is regarded as a *Sphaerodoris* with teratological features, there still remains the question whether it is a new species or not. It can hardly be *Sph. punctata* or *Sph. papillata* but it may possibly be a large specimen of *Sph. lævis* or of Ehrenberg's *Actinocyclus verrucosus*. The specimens of *Sph. lævis* which have been described are all about 30 mm. in length, with 14 branchiæ and a radula having a formula of about $80 \times 25.0.25$. The back is on the whole smooth but shows in some specimens shallow pits and irregular low excrescences. This specimen being twice the size of the others may possibly represent the mature stage of the animal in which the dorsal tubercles are more developed, the branchiæ more numerous, the radula larger and the individual teeth more copiously serrulated. At the some time the external appearance is quite unlike *Sph. lævis* and the radula is sufficiently distinctive and so, while not denying that *Sph. lævis* may the young of the present form, I think that the phases of the transformation require demonstration and therefore name the present specimen *Sph. japonica*.

1) Compare the animal described by me in Proc. Malac. Soc. 1905 p. 233 as *Chromodoridella mirabilis* with a warning that it might prove to be a monstrosity. I am now still more inclined to regard it as one, since no similar specimens have been observed.

Ceratosoma cornigerum Adams.

(Plate II., fig. 6).

Two specimens, one from Ago Bay and one from Misaki. The latter is accompanied by a coloured drawing which shows that it had the coloration of *C. cornigerum*, though as preserved it has a pale waxy pink appearance. The radula has a formula of about $80 \times 230.0.230$ and most of the teeth bear a single denticle on the outside only. The innermost teeth have one denticle outside, and one or two inside. The outermost teeth are low and often bifid but not serrulated. The labial armature is a greyish yellow ring of bent rods. The buccal mass is elongate and a long tube leads from the mouth to the labial armature.

The other specimen shows a curious malformation. The margin of the foot is interrupted on the left side (probably as the result of an accident) and has grown out into a horn about 10 mm. long.

Chromodoris sibogae Bergh.

Bergh, Siboga Expeditie, Opisthobranchiata, p. 157.

(Plate II., fig. 7).

Five specimens from Moroiso, Misaki, 14–16 mm. long. A coloured drawing represents the living animal as pellucid with an opaque white border round the mantle and also round the foot. The pellucid flesh is faintly tinged with green near the margins, with violet on the top of the tail and with pale brown in the middle of the back. This last colour is doubtless due to the intestines shining through. The rhinophores are tipped with black and each of the branchiæ bears two fine longitudinal lines of the same colour. The preserved specimens are greyish but the white borders and black lines are still distinct.

The shape is high and somewhat rectangular. The branchiæ are 16. The labial armature is formed of bent rods, some of which are bifid but most have the tips entire. The radula is yellow and very transparent. It contains 150–170 rows, in each

of which there are 50–55 teeth or either side of the rhachis. There is no central tooth but the rhachis bears triangular thickenings in which the apex is plain but the base very indistinct. The first four or five laterals are broad and low in shape. The one nearest the rhachis is denticulate on both sides. The following teeth bear about ten denticles on the outer side only. These gradually become fainter and fainter, and the last ten teeth or so are quite smooth and triangular in shape. The outermost teeth are not denticulate on the apex, as is usual in this genus.

This specimen appears to be the *Chr. Sibogae* of Bergh which, so far as it is known at present, is characterized by (a) its coloration (b) a long narrow radula composed of hamate teeth bearing about 10 small denticles.

Chromodoris pallescens Bergh.

Bergh, Journ. Mus. Goxleffroy 1874, pp. 81–82 = *Chr. tumulifera* Collingwood.

(Plate II., fig. 8).

Sixteen specimens from Misaki and Tsushima, accompanied by a coloured drawing. They vary greatly in size, the smallest being only 10 mm. long, whereas the larger are 54 mm.–50 mm. long and 15 mm.–18 mm. broad. They undoubtedly belong to the species described by Bergh from a single specimen 15 mm. long and present only such differences as can be explained by size and age.

The drawing represents an elongate *Chromodoris* with a narrow mantle margin and a longish tail. The dorsal surface is of a greyish lemon colour and is surrounded by a double border, the inner line of which is bright yellowish white and the outer line orange. The tips of the rhinophores are orange and the stalks white. The gills are represented as mainly white but bordered with fine lines of brown or orange. In many of the preserved specimens the gills are spotted. The dorsal surface and the sides of the body bear a moderate number (25–30 on the back) of black spots or blotches, disposed in irregular lines, and sometimes but not always forming a border to the foot or part of the

mantle edge. The branchiæ are 18 in the larger specimens, 10 in those of moderate size and only 8 in the two smallest. They evidently increase in number with age.

The labial armature is composed of distinctly bifid rods. In the larger specimens the formula of the radula is about 75×70. 0.70. The teeth bear 5–7 denticles, which become much more distinct near the end of the rows, but the outermost teeth of all are merely plates with jagged edges.

Chromodoris marenzelleri Bergh.

Bergh: Beiträge zur Kenntniss der japanischen Nudibranchien, ii, Verh. k. k. Zool. Bot. Ges. Wien, 1881, pp. 219–221.

(Plate II., fig. 9).

Two specimens from Misaki about two centimetres long and also two coloured drawings made in 1895 and 1907 respectively, the latter representing the present specimens when alive. It depicts a flattish and moderately broad *Chromodoris* of a slate-blue colour. The margin of the mantle is marked by a lemon-coloured border and a continuous line of the same hue runs down the centre of the back from the rhinophores to the branchiæ. On either side of this continuous line is a similar but broken line. On the sides of the body are lemon-coloured spots. There are also a few scattered black spots on the back. The rhinophores are blue in the lower and bright red in the upper part. The branchiæ are eleven, bright red outside and white inside. The earlier drawing is similar in essentials but the ground colour is greenish rather than blue and there are numerous dark spots on the back and sides.

The preserved specimens agree, so far as their present condition admits of a comparison, with the drawing of 1907 and also with Bergh's description. The radula is as described by him except that I found no thickenings on the rhachis and that the teeth next to the rhachis often bear 4 and not merely 3 denticles.

Plocamopherus tilesii Bergh.

Bergh, Malac. Unters. Heft xi, 1877, pp. 433–439, and id. Beiträge zu einer Monogr. der Polyceraden in Verh. der k. k. Zool.-Bot. Ges. in Wien, 1880, pp. 45–51.

Eleven specimens from Misaki and elsewhere, yellowish white in colour with more or less distinct markings of greenish brown. The largest is about 82 mm. long. The specimens are not well preserved but the external characters seem to have been as described by Bergh.

The jaws are small triangular plates. The radula is large and strong, The inner teeth are chestnut brown, the outer lighter. The rhachis is wide and marked by transverse lines. The teeth are arranged in about 50 rows containing 34 teeth on either side of the rhachis. The first 24 of these are large bifid hooks: the outer 10 are flat plates.

Plocamopherus imperialis Angas.

See Angas, Journ. de Conchyl. 1864, p. 59; Bergh, Beiträge zu einer Monographie der Polyceraden, iii, pp. 144–149, Verhand. k. k. Zool.-Bot. Gesells. Wien, 1883.

One specimen whitish in colour and 25 mm. long. Locality not marked. The specimen is not well preserved but coresponds with previous descriptions fairly well, both in anatomy and external character. The radula is as in Bergh's plate (l.c, pl. × fig, 2). On either side of the broad rhachis are twenty one rows, each of which contains five or six hamate teeth followed by 12–14 plates without a hook.

Euplocamus japonicus (*?*) Bergh.

Bergh, Beiträge zu einer Monog. der Polyceraden in Verhand. Zool.-Bot. Gesellsch. Wien, 1880, p. 636. See also Bergh on *E. croceus* var. *capensis* in Trans. S. Afric. Philos. Soc. Vol. xvii, 1907, p. 71; and Mazzarelli, Intorno ali *Euplocamus croceus*, in Annuario del Mus. Zool. Università di Napoli, 1905, p. 1.

Two specimens from Moroiso, whitish in colour with traces of yellow, 17 mm. and 21 mm. in length respectively. The oral veil bears 8 bipinnate processes. The dorsal margin is clearly

marked and bears 4 or 5 bipinnate processes on either side, 3 in front of the branchiæ and one or two behind them. The fifth process is rudimentary and in one specimen hardly visible. The branchiæ are rather scanty, in one specimen five, in the other four. But in this latter one plume is bifid and apparently represents two which have grown together.

The labial armature consists of two yellow, separate, triangular plates composed of rather fibrous rods which are not very distinct individually, although the plates are distinct enough. The formula of the radula is in one specimen $23 \times 18 + 3.0.3 + 18$ and in the other $18 \times 14 + 3.0.3 + 14$. The teeth are yellowish brown and shaped as described by Bergh for *E. croceus*. The vas deferens and glans are armed with spines of varying shape but mostly hamate.

It is hard to believe that this is not the *E. japonicus* of Bergh described from Japanese specimens, but at the same time I do not see that it possesses any characters which decisively separate it from *E. croceus*, especially from the variety *capensis*. The coloration is possibly different and notes on the living animal would be valuable. The radula of *E. croceus* is very variable and ranges from $18 + 3.0.3 + 18$ to $35 + 3.0.3 + 35$. *E. japonicus* has 36 or $37 + 3.0.3 + 36$ or 37.

Kalinga ornata A. and H.

See Eliot, P. Z. S. 1906, p. 670–673 and authorities there quoted; Bergh on Opisthobranchiata of S. Africa in T. South Afr. Philos. Soc. Vol. xvii, 1907, p. 75.

One specimen from Moroiso, accompanied by a rough drawing according to which it was, when alive, about 60 mm. long and 35 mm. broad, yellowish white in colour and bearing on the back about 40 projections or papillæ of a light red colour. The teeth are extremely small and cannot be seen separately even under a hand lens. Under a high power they prove to agree with previous descriptions. The other external and internal features are as usual. As often happens in this species the buccal parts are completely everted.

Japan is a new locality for this species which has hitherto been recorded from India, Ceylon and South Africa.

Genus *Phyllidia* Cuv.

This genus is represented by three specimens, which call for no comment except a record of their distribution. *Phyllidia nobilis* is represented by two individuals from the Bonin Islands and *Ph. pustulosa* by one from Okinawa Island.

Doridopsis rubra Kelaart.

var. *nigromaculata.*

See Bergh, Danish Exped. to Siam. Opisthobranchia, pp. 1901. Eliot in Proc. Zool. Soc. 1904,Vol. 2, p. 279. Eliot in Linn. Soc. Journ. Zoology xxxi, 1908, pp. 118–9.

(Plate II., fig. 10).

Six specimens labelled Ariake Bay, Hiuga, and three labelled Misaki. The largest is 69 mm. long and 45 mm. broad. The texture is soft and flably. A coloured drawing represents the colour in life as transparent red of a brownish tinge and not rosy. The branchiæ and tips of the rhinophores are of a deeper and brighter red but still not rosy. The stalks of the rhinophores are white. In the preserved specimens the edges of the mantle, which are extremely thin, show a pale border which is not distinctly marked in the drawing. On the dorsal surface are bold black blotches, which vary in number in different specimens but never leave the impression that the colour is proponderatingly dark. Often there are also a few faint dark lines forming an imperfact reticulation.

The dorsal surface is quite smooth and the chief structural characters both external and internal agree with previous descriptions of *D. rubra.* The rhinophores are set far forward, the branchiæ far behind. The branchiæ are 6, stout and voluminous. They are completely everted in all the specimens but the pocket though very shallow has not entirely atrophied. In one specimen however the hinder part of its edge has disappeared and the ordinary dorsal surface runs up to the roots of the branchiæ with-

out interruption. The foot is broad. Its anterior margin is thickened and more or less grooved, the depth of the groove varying greatly. In no specimen however is the margin split into two distinct laminæ. The mouth is a slit in this margin and above it are two ridge-like tentacles.

Internally the buccal parts are as usual in the genus. There is a large bilobed yellow gland beneath the buccal cone. The central nervous system is orange-coloured and the alimentary tube describes a complete circle behind it.

The pericardial gill is not much developed. The hermaphrodite gland is yellowish and is concentrated more than usual on three or four points of the anterior liver, though it cannot be detached. Both the spermatotheca and spermatocyst are spherical and grey, but the former is considerably the larger. The prostatic portion of the vas deferens is long, reddish and bent several times on itself. The lower portion of the vas deferens and the glans are thickly armed with minute spines. These have a fairly broad basis from which rises a hook or spine of rather irregular and varying shape.

These specimens are larger than those of *D. rubra* which I have examined from other localities and they have not either as preserved or in the drawing the rosy tint which usually marks the species. But Alder and Hancock say that it sometimes attains a length of 3 inches and variations of colour are also recorded. Therefore although these Japanese specimens look to me unlike those which are commonly found on the coasts of East Africa and South Asia I do not think there is sufficient ground for considering them a new species. But they certainly constitute a well marked variety, characterized by its large size, large black blotches, and probably by the ground colour being brownish brick-red rather than rosy.

Doridopis nigra (Stimpson).

(Plate II., fig. 13).

This species is common in Japan and is represented in a

drawing made at Misaki and here reproduced. I did not however find any specimens in the collection sent to me.

Scyllæa bicolor Bergh.

Bergh, Verh. k. k. Zool.-Bot. Ges. Wien 1880, pp. 167–172.

Three specimens from Misaki. They agree with Bergh's description of one caught at the neighbouring locality of Enosima, except that they are much larger, being 30 mm.–35 mm. long. The characteristics of this species are as follows. (1) The body is dark olive green but the sole and the mouth are pinkish yellow. There is a distinct border of yellow round the top of the rhinophore sheaths and a less distinct one round the cerata. The contrast of colours is rather striking. (2) It is probable that the cerata in their natural condition have rounded edges with no jags. They each bear on the inner side four branchial tufts and such tufts do not occur elsewhere on the back or tail. (3) As in *Sc. elegantula* the radula is relatively small ($24 \times 17.1.17$) whereas in *Sc. pelagica* there are more than 50 laterals. (4) The teeth in the second stomach are all of one size and the liver consists of 3 separate lobes. (5) The hermaphrodite gland consists of only two lobes, which are quite distinct from one another.

This form is allied to *Sc. elegantula* (described by Bergh from one small specimen obtained in the Philippines) and differs from it chiefly in colour and the structure of the liver. An examination of further specimens of *Sc. elegantula* is desirable.

Bonella arborescens Pease.

Two specimens of this common tropical form from Niijima Island Izu.

Phylliroe bucephala Per. and Les.

One specimen from the Bonin Islands.

Melibe japonica sp. nov.

Label. "Bashford Dean collection. Loc. near Numazu, 12 hiro. 24 May 1905."

One large specimen, much flattened and twisted but perhaps 150 mm. long with cerata about 70 mm. high. Hood very large, measuring about 75 mm. across. Colour transparent yellowish white, with a strong reddish linge in parts.

On the sides of the hood are scattered small papillæ either simple or combined in tufts. On the back these papillæ are larger and form arborescent appendages consisting of a stalk and tripinnate branches. These appendages are as much as 10 mm. long but hardly foliaceous. All the cerata have become detached and only eight are preserved, but the marks on the back indicate that there were ten pairs. They are much flattened and distorted but as preserved consist of a smooth, thick basal portion with an ample membranous expansion at the top bearing minute tufts. This configuration however may not be natural. A stout diverticulum of the liver, of a deep red brown colour, penetrates into the basal portion but does not extend to the membranous expansion. The diverticulum bears a knob at the top and on its surface smaller knobs which hardly amount to branches.

The edge of the hood is thickly fringed with cirrhi, set in 9–10 rows at the sides, although above the mouth the number sinks to two or three rows. Below the mouth the edge of the hood is indented. The rhinophore sheaths are small (5 mm. high) with a tuberculate process (4 mm.) behind. The foot is a broad groove, measuring about 25 mm. across in front.

Inside the hood are scattered small tubercles and tufts. The lips are raised into a large fleshy prominence. The mouth is a simple slit, leading into a tube studded with papillæ near the orifice and with lumps lower down. About 22 mm. below the lips are a pair of small yellow jaws. They are almost membranous but thicker at the point of junction. The edge is hardly denticulate but exhibits faint undulations and striations. The first stomach is fairly large and bears a girdle of 24 black triangular plates, of various sizes but not alternating regularly. The largest are 5 mm. long. Then comes a constriction marked outside by a very distinct row of pouchlike puckers, which is interrupted in one place. After this comes a second stomach with no plates

but bearing laminæ and on one side a strong thick ridge. The liver is brownish and consists of seven masses, each composed of several irregularly shaped balls. Two of these masses are completely enclosed by the hermaphrodite gland and two project from it. The hermaphrodite gland is composed of 14 packets, 12 on the left side of the liver and two on the right. These packets are made up of smaller globules. The vas deferens is very strong and muscular. It issues from a roundish yellow mass consisting of many lobes. The penis is broad (10 mm.) and sharply bent at the end into an acute point, which is almost at right angles with the base. The female branch is little developed. The spermatotheca was found empty; the mucus and albumen glands are small. The fan-shaped organ described by Bergh for some species of *Melibe* was not found. The vagina dilates into a large pouch before entering the vestibulum genitale. The yellowish central nervous system lies in a semitransparent capsule from which it was with difficulty separated. It is markedly granular but consists of six clearly distinguishable masses, representing three pairs of ganglia. The buccal ganglia were not found. The salivary glands are represented by small, flocculent bands.

I register this form as a new species characterized by the following features: (a) a broad foot, (b) the presence of large arborescent appendages on the back, (c) a rather compact brown liver, (d) a broad penis, (e) black stomach plates, (f) the two divisions of the stomach are remarkably distinct. But in view of its great size (15 centimetres or more) it is possible that it may only be an unusually developed individual of some species known by smaller specimens.

Characteristics (a) and (b) approximate it to *Tethys*, but the creeping surface, though very broad, is a groove, not a flat sole, and the arborescent appendages are scattered over the back, not arranged symmetrically as branchiæ.

Melibe papillosa de Filippi.

See Bergh, Beitrag zur Kenntnis der Gattung *Melibe* in Ztsch. Wiss. Zool. Bd. XLI, 1885, pp. 145–152.

Two specimens from Ariake Bay, Hiuga and Kominato, Awa, together with smaller ones which are less certainly referable to the same species. The colour is greyish opaque white, mottled here and there (especially on the tubercles and processes) wtih olive, inclining to black in places. There is a conspicuous broad band of this colour round the hood and there is scattered dark pigment in the œsophagus. There are five pairs of cerata not deciduous and not set opposite each other. The jaws are small and yellow: the stomach plates 21 in number and also yellow. A "fan-shaped" organ is present in the genitalia.

Melibe vexillifera (*?*) Bgh.

See Bergh in Verh. k.k. Zool.-Bot. Gesell. Wien, 1880, p. 162.

(Plate II., fig. 11).

Two small specimens for which no locality is given seem referable to this species, though the shape of the cerata is not as described by Bergh. That shape however was probably due to distortion. The colour is yellowish white, with traces of brown and the upper surface and sides are covered with small knobs and tubercles. The œsophagus is white; the jaws small with indistinct denticles: the stomach plates large, greyish yellow and only 14 in number. The liver is flocculent and extends into the cerata.

Pleurophyllidia japonica sp. nov.

= *P. compta* var?

For *P. compta* see Bergh *Beiträge zur Kenntniss japanischen Nudibranchien* in *Verh. d. k. k. Zool.-Bot. Ges. in Wien*, 1880. pp. 173–176,

(Plate II., fig. 12).

Several specimens were found Aug. 7. 1904 on a muddy bottom near Misaki and are accompanied by some notes as well as by a coloured drawing. The notes state that in life the mantle

was black with pale yellowish longitudinal lines: the head shield and foot were dark and purplish, margined with yellow. The coloured drawing corresponds with this description but the preserved specimens have become much paler. They are flattish and of an elegant shape, a large one being 50 mm. long and 22 mm. broad.

The caruncle is not much developed. At most it can be said that there are two small knobs under the rhinophores but even these are not clear in all specimens, nor are any papillæ visible. The anterior margin of the foot is produced into sharp angulate processes on either side. The transverse branchiæ are thin and as preserved white; they are about 40 in number but between the principal leaflets are other small ones. The side lamellæ consist of 4–5 thick longitudinal strips; those in the middle run continuously from the branchiæ to the tail, but the innermost and outermost lamellæ are often broken up into disconnected projections. All the side lamellæ contain thick and conspicuous hepatic diverticula and the cnidopores along the mantle edge are also distinct. On the posterior half of the sole is an inconspicuous furrow.

The jaws bear about 15 rows of denticles. In two specimens which were dissected the radula consists of 46 and 48 rows respectively and in both these were about 50 laterals on either side of the central tooth. This tooth is fairly broad and bears 7–8 denticles on either side of the median cusp, besides one or two on the sides of the cusp itself. The first lateral is rather clumsy in shape: it bears a ridge and 3–5 denticles. The second lateral bears 3–4 denticles, and the next thirty five bear 1–2 denticles, rarely 3. The 10–15 outermost are quite smooth.

The naturalist who wrote the notes on the living animals regarded them as *P. compta* Bergh, described from a single specimen captured at Nagasaki in 1876. This habitat makes the identity extremely probable but the present specimens do not agree in all respects with Bergh's description, (1) *P. compta* has only a single side lamella, whereas all the present specimens have 4–5. (2) It has 15 papillæ of various shapes on the head

shield which are clearly figured by Bergh. (3) Its radula has a formula of $44 \times 36.1.36$ and only six or eight of the inner teeth are denticulate, the rest being smooth. If an examination of further material shows that these features are subject to variation, the specimens now under examination might be referred to *P. compta* but they all[1] differ from Bergh's description in the same points and must, I think, be regarded provisionally as a new species. *P. stenidia* Bergh (Siboga Exp. pp. 214–215) is also nearly allied.

Pleurophyllidia similis sp. nov.

For *P. cygnea* see Bergh in Malak. Blätter 1879, p. 9, and Basedow and Hedley, Trans. Roy. Soc. S. Australia 1905, p. 149. *P. euchroa*, Bergh, Trans. of S. African Philos. Soc. Vol. xvii, 1907, p. 102. *P. formosa*, Bergh in Verhandl. der k. k. Zool.-Bot. Ges. in Wien, 1869, p. 225 ff., and Farran in Ceylon Pearl Oyster Report, Opisthobr. Mollusca 1905, p. 333.

Three large specimens from Misaki, about 60 mm. long and 30 mm. broad. There are no notes on the appearance of the living animal. As preserved the under and anterior parts are of a pale faded brown, perhaps representing an original pink. The dorsal surface has much the same ground colour but bears about thirty dark brown double stripes. Sometimes the double stripe consists of two perfectly distinct lines with a clear pale stripe between them but sometimes the two dark lines unite here and there across the pale interval.

The caruncle is not distinct but appears to be bifid. The foot is large and is traversed throughout its entire length by a conspicuous furrow. The numerous branchiæ are arranged in an even and distinct row but are small, not exceeding 4 mm. in length. The side lamellæ are 8 in number. Five of them are relatively smooth and straight, but interrupted and sometimes only a centimetre or so long. The remaining three are thicker and much crinkled. They run among the smaller lamellæ continuously from the branchiæ to the extreme end of the body. Cnidopores are not conspicuous.

The jaws are large, elongate and transversely striated. The

1) Only two radulæ were examined.

masticatory process bears many rows of scale-like denticles. The formula of the radula is about $50 \times 230+1+1+1+230$. The median tooth bears six or eight lateral denticles on either side but is not broad. The central cusp is fine and easily broken off. It bears 2–3 additional denticles on its sides. The first lateral bears 7–8 denticles but all the other teeth are smooth. They are somewhat clumsy in shape and a few are bifid at the tip.

This species presents many resemblances to *P. cygnea* Bgh. and *P. euchroa Bgh.* but it differs from them in having only a few side lamellæ and a very broad radula. In the breadth of the radula and in many external features it resembles *P. formosa* but in that species the teeth are regularly bifid (not as here exceptionally and sporadically) and the side lamellæ are very numerous. Provisionally I think the animal must be described as a new species, *P. similis.*

Linguella variolosa Bgh.

See Bergh. Malac. Unters. in Semper's Reisen, Theil vi, Lieferung 1, 1904, pp. 21–24, and Eliot in P. Z. S. 1903, pp. 681–2. For *Linguella fallax* see Bergh, Beitr. zur Kenntniss der japanischen Nudibranchien, Verh. k. k. Zool. Bot. Ges. in Wien, xxx, 1880 pp. 177–180, and Eliot in P. Z. S. 1906, 1906. p. 684.

Two specimens from Minatomura, Izumi, 65 mm. and 30 mm. long respectively. Both are now of a sandy yellow but both show traces of a rosy coloration on the under side. In one the back is covered with very distinct round tubercles of various sizes, which tend to become arranged in straight lines in the anterior portion. In the smaller specimens the tubercles are much less conspicuous and though they are clearly present in some parts, other parts are almost smooth. The head shield bears some wrinkles but no caruncle or papillæ. The branchiæ form a numerous and compact series between the body and the mantle edge, but there is no special cavity or cleft to contain them. The side lamellæ are numerous, extending from the branchiæ almost to the tail and mostly set transversely. The first lamella (immediately behind the branchiæ) is rather larger than the others and longitudinal. A distinct median furrow extends along the whole length of the foot.

The smaller specimen is contracted so as to make the sides of the body seem unusually high and the side lamellæ relatively small. But this conformation appears not to be natural.

The edges of the jaws bear 5–6 rows of lumps. The radulæ of the two specimens are almost exactly the same. They contain 52 and 53 rows respectively and in both the formula for the longest rows is 28+1+1+1+28. The median tooth bears 8–11 denticulation on either side of the central cusp, The first lateral bears 6–8 denticles and from 8 to 11 of the following teeth are denticulate, the rest being smooth.

These specimens agree with *L. fallax* Bgh. (known by a single example from Enosima, Japan) in the radula and several other points, but can hardly be identified with it, because it is expressly said to have a smooth dorsal surface, Even in the smaller specimen the back, though less markedly tuberculate than in the large one, cannot be called smooth. They also show many resemblances to *L. variolosa* Bgh. (although in all the specimens of this animal hitherto described only 3–4 of the lateral teeth were denticulate) and I think they should bear that name. *L. variolosa*, as described by me in previous papers (l. c.), shows considerable variation in external appearance and some in the radula. I am inclined to believe that it is really the same species as *L. fallax* and that in the specimen to which Bergh gave that name the dorsal tubercles had become obliterated. Unfortunately the appearance of the living *L. fallax* is unknown.

Pleuroleura striata van Hass.

See Bergh, Notes from the Leyden Museum, ix, 1887, pp. 303-322; id. Die Pleuroleuriden in Zool. Jahrb. Abth. für Systematik, 3. Band, Heft 3, Jena, 1888, p. 362; id. Siboga, Opisthob. pp. 209, 210. Eliot in Stanley Gardiner's Fauna of the Maldives and Laccadives, 1904, p. 26 ff.

Two specimens from Misaki, much bent but 25–30 mm. long, if straightened out. The dorsal stripes and other external characters agree with previous descriptions. The colour is yellowish brown with darker spots such as are shown in van Hasselt's figure. The formula of the radula is about 42×13+1+1+1+13,

which is somewhat larger than any hitherto recorded. The central tooth is wide with 12–17 denticles on either side of the median cusp: the first central is like half the central cusp, bearing 12–17 denticles: the remaining laterals are simply hamate not denticulate.

Hervia ceylonica (*?*) Farran.

Farran on Opisthobranchiate Mollusca in Ceylon Oyster Report 1905, p. 331.

Two specimens from Enoura, Suruga. They are colourless and somewhat distorted, but the larger would apparently be about 20 mm. long, if straightened.

The external characters are on the whole those of *Hervia*. The angles of the foot are moderately produced. The cerata are thin and rather long, arranged in six irregular transverse rows, with a gap behind the first row. The oral tentacles are large and strong. No armature could be found on the genitalia. The jaws bear a single row of well developed denticles. The radula consists of twenty five teeth which bear 6 denticles on either side of the central cusp.

I think these specimens are probably the *Hervia ceylonica* of Farran but in the absence of notes on the colour and shape of the living animal it is impossible to express a positive opinion. Against the identification may be set the denticles of the teeth, which are six and not five in number, and the denticles of the jaw which are strong, fairly regular and blunt at the tips, whereas the jaws of *H. ceylonica* are irregularly denticulate.

Hervia rosea (*?*) Bergh.

Bergh, Malac. Unters. in Semper's Reisen, Heft. xvii, and Beitr. zur Kennt. der Aeolidiaden, ix, pp. 677–680, 1888.

Two specimens from Misaki about 15 mm. long, colourless except for a faint rosy tinge. The radula consists of 19 teeth bearing 3–4 denticles on either side of the central cusp. The other characters are much as in the specimens described as *H. ceylonica* (?)

These are perhaps young examples of *H. rosea*, known only by one larger (55 mm.) specimen from Amboina.

Amphorina (*?*) sp.

See Eliot in Journal M. B. Assoc. 1906, vii, pp. 363–366 for some remarks on this and allied genera.

Three specimens from Misaki, the largest about 15 mm. long. The colour is greyish green, which however may be due to the preserving fluid and not natural. The cerata and other external characters seem to be as in *Amphorina*. No tentacular angles can be seen on the foot. The anus is latero-dorsal.

The jaws bear a single row of denticles. The radula is distinctly tapering. It consists of 70 teeth. They bear a central cusp rising far back and from 2 to 6 lateral denticles. The variation in number is due to the fact that these denticles are often badly formed or split. No stylet nor any trace of armature was found on the verge.

I do not think it is worth while to create a species for these specimens, for they present few characteristic features. The radula is that of *Amphorina* but absence of a stylet makes the reference to this genus disputable.

Aeolidiella japonica sp. nov.

Five specimens. They are considerably bent but the largest is as much as 50 mm. long and 15 mm. broad. All are now of a uniform alcoholic yellow but the colour must evidently have been very transparent in life, for the follicles of the hermaphrodite gland and the hepatic diverticula in the cerata are distinctly visible through the integuments.

The lateral margins of the foot are somewhat expanded: the anterior margin in thickened and grooved but, though it projects slightly at the corners, it is not produced into tentacular prolongations.

The rhinophores bear 3–4 strong rings, not perfoliations. It is hard to say whether they are natural or the result of contrac-

tion due to the preserving fluid, but since they occur in all the specimens and in the same positions perhaps they are natural. When the cerata are *in situ*, no division into groups is discernible: there is merely a thick line of cerata along either side of the back. But in a stripped small specimen eighteen cushions are visible on either side and behind them a group of cerata on the tail. The larger cushions bear 10 cerata each.

The jaws have smooth undenticulate edges. The radula consists of 18 pectinate teeth. They are bilobed but the curve is unusually broad and undulating. The central cusp of each tooth is large and there are as many as 65 long and very transparent denticles on either side of it. In the smaller tooth the number of lateral denticles is somewhat less.

The external characters of this animal are rather doubtful but the shape of the teeth is characteristic and different from that of the other species described under the names of *Aeolidiella* or *Spurilla*, two genera which is my opinion should be united.

Pteraeolidia semperi Bergh.

Three specimens labelled Bonin Is. and Misaki, Sagami. They are long aeolids, 50–60 mm. in length and only 6–7 mm. broad, of a uniform yellow as preserved and much bent. The oral tentacles are large, the rhinophores perfoliate. The cerata are set on 10–15 pairs of distinct fleshy flaps each of which bear 20–25 longish fusiform cerata. The jaws bear many rows of knobs on the masticatory edge. The radula is a single row of fairly broad horse-shoe teeth. The central cusp is strong and is flanked by 11 denticles of which two or three arise from the sides of the cusp not from the base of the tooth. No armature was found on the genitalia.

Fiona marina Forskol.

See especially Bergh in Scientific Results of the Exploration of Alaska, I, 1879, pp. 142–144.

Many specimens varying from 20 mm. to 25 mm. in length. The details given below are taken from an average specimen

which was 23 mm. in length, 9 mm. broad across the cerata and 4 mm. broad across the bare part of the back behind the rhinophores. This bare portion extends backwards for about 15 mm.

The specimens are now of a dull yellow colour but the cerata are darker than the body and may have been bluish in life. The sides of the body are semitransparent. The cerata are fusiform and thickly set but are not arranged in definite groups or regular lines. They are inserted simply on the surface of the back and not on ridges. All the cerata, even the smallest, bear a distinct crinkled membrane. The anal papilla is dorsal, about 12 mm. behind the rhinophores and slightly to the right of the median line, just where the cerata begin. The genital orifices are distinct and double, situated as usual in the genus. The rhinophores are not perfoliate: the corners of the foot are rounded.

The jaws are large: the cutting edge is not smooth but bears a series of distinct but very irregular and often bifid projections. The radula consists of a single row of 40–50 teeth. The central cusp of each tooth is long and strong and near the base broadens out into winglike lateral expansions. Beyond these expansions the lower part of the tooth bears 5–9 denticles on either side. In the anterior teeth both the central cusp and the lateral denticles are much worn and broken.

I can see no reason for separating this animal specifically from *Fiona marina* (=*atlantica*). It is probably the var. *pacifica* described by Bergh l.c. but unfortunately he does not state clearly what are the characters which distinguish this variety from the atlantic form. The most important of them appears to be the colour which, according to Dall, was "blue purple like *Ianthina communis*." As indicated above, the present specimens though now yellowish retain traces of a darker colour which may have been bluish in life.

Glaucus lineatus Reinhardt.

(Bergh, Anatomiske Bidrag til Kundskab om Aeolidierne, 1864, pp. 149–153 and plate viii).

Several specimens labelled "Sagami Sea from the surface." Average length about 20 mm. but often bent and twisted. The

colour is of various dark shades (no doubt originally blue) on the dorsal surface. The pedal surface is either silvery white or bears a more or less interrupted streak of this colour on a dark ground. The cerata are set in two groups on either side, about 16 in the anterior and 14 in the posterior group. If there were originally smaller groups further behind, they have been pulled up into the second group by contraction. The tail is rather long. The oral tentacles and rhinophores are small but distinct. In most specimens the verge is exserted and very large. It is coiled in a corkscrew shape but if straightened out would be 15–20 mm. long. In two specimens it bears a very distinct chitinous hook or spine, much more curved in the one than in the other. In the remaing specimens no such armature can be found and it is probable that it has been rubbed off. This suggests that it is very unsafe to make the presence or absence of such a spine in preserved specimens a generic[1] or even specific character.

The jaws are as in *G. atlanticus* with a single row of pointed denticles. The radula consists of rather more than 20 teeth (21, 22 and 24 in the specimens examined), which generally bear 4 (more rarely 3, 5 or 6) rather irregularly shaped denticles on either side of a central cusp.

In colour and dentition these specimens agree with the descriptions and figures of *G. lineatus* recorded from the Southern Pacific but it may be doubted if this species is more than a variety of *G. atlanticus*.

Elysia japonica sp. nov.

18 specimens. Locality? (No label found). The largest is about 20 mm. long and the wings are moderately ample. In two specimens which were dissected, the radula was found to contain 5 teeth in the ascending row, 15 in the descending and about 20 more of various sizes lying in a heap. The structure of the radula and shape of the teeth is as usual in the genus. No

1) As is done by Bergh in defining the genera *Glaucus* and *Glaucilla*.

denticles are to be seen. I think that this form is probably a new species distinguished by the following characters :

(1) Colour. In all the specimens the rhinophores and the tip of the tail are conspicuously black or very dark brown. Otherwise the colour is uniform and in the best preserved specimens is yellowish brown. The wings have no coloured borders and the head and pericardium are of the same colour as the dorsal surface.

(2) The arrangement of the dorsal surface. This is similar in all the specimens and I have not seen it in any other species. The pericardium is not ovate but is constricted in the middle. Its length is greater than its breadth but it is short in comparison with the length of the whole animal. The dorsal ridges which run into it are very distinct and the two hindmost, which run backwards towards the tail, are parallel to one another and enclose an area which is differentiated from the back and forms a smooth trench.

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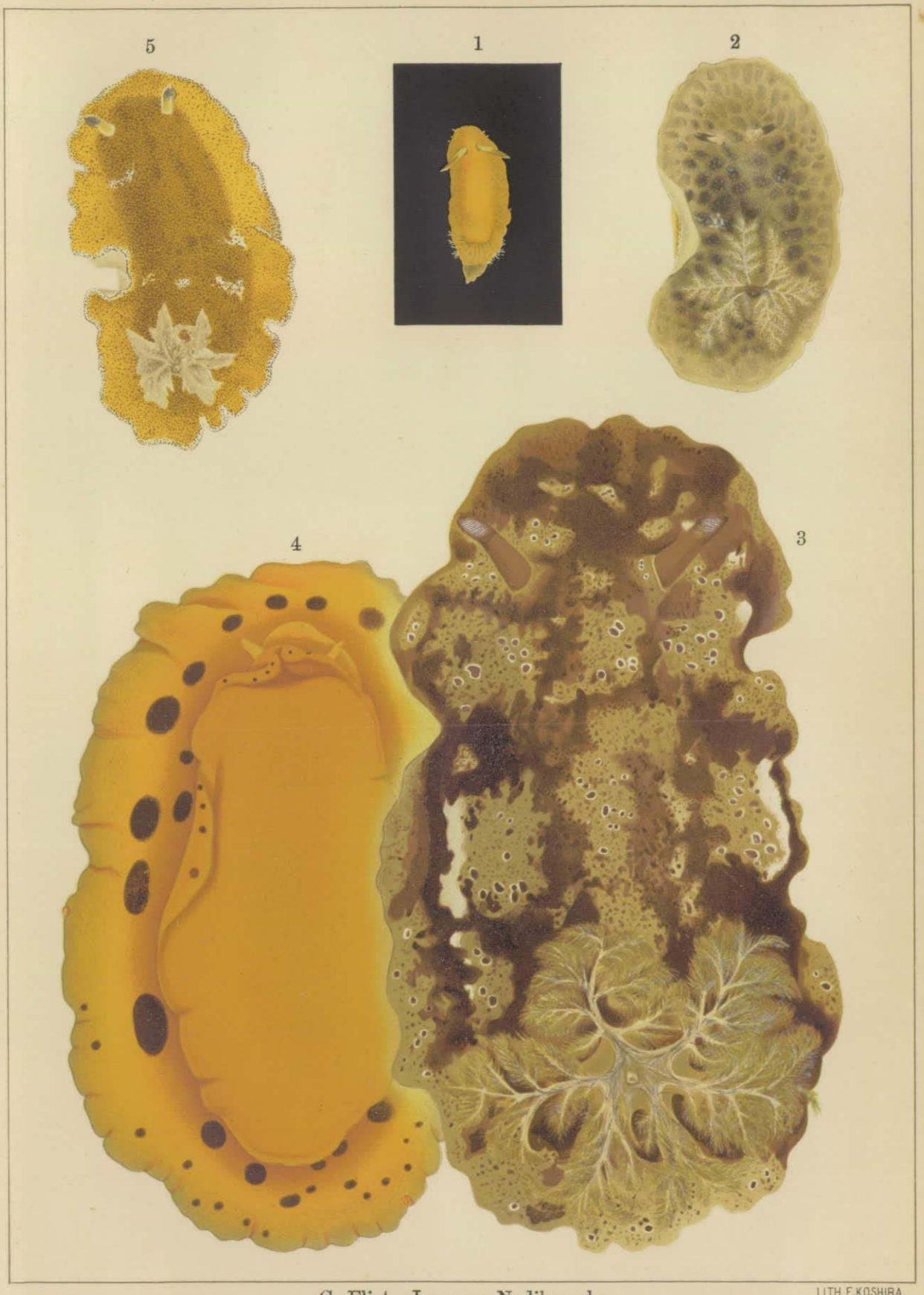
PLATE I.

Explanation of Pl. I.

All figures in natural size.

Fig. 1. *Doris* (*Ctenodoris*) *aurantiaca* sp. nov.
„ 2. *Halgerda japonica* sp. nov.
„ 3. *Platydoris speciosa* Abraham. Upper surface.
„ 4. „ „ „ Under „
„ 5. *Platydoris tabulata* Abraham.



C. Eliot: Japanese Nudibranchs.

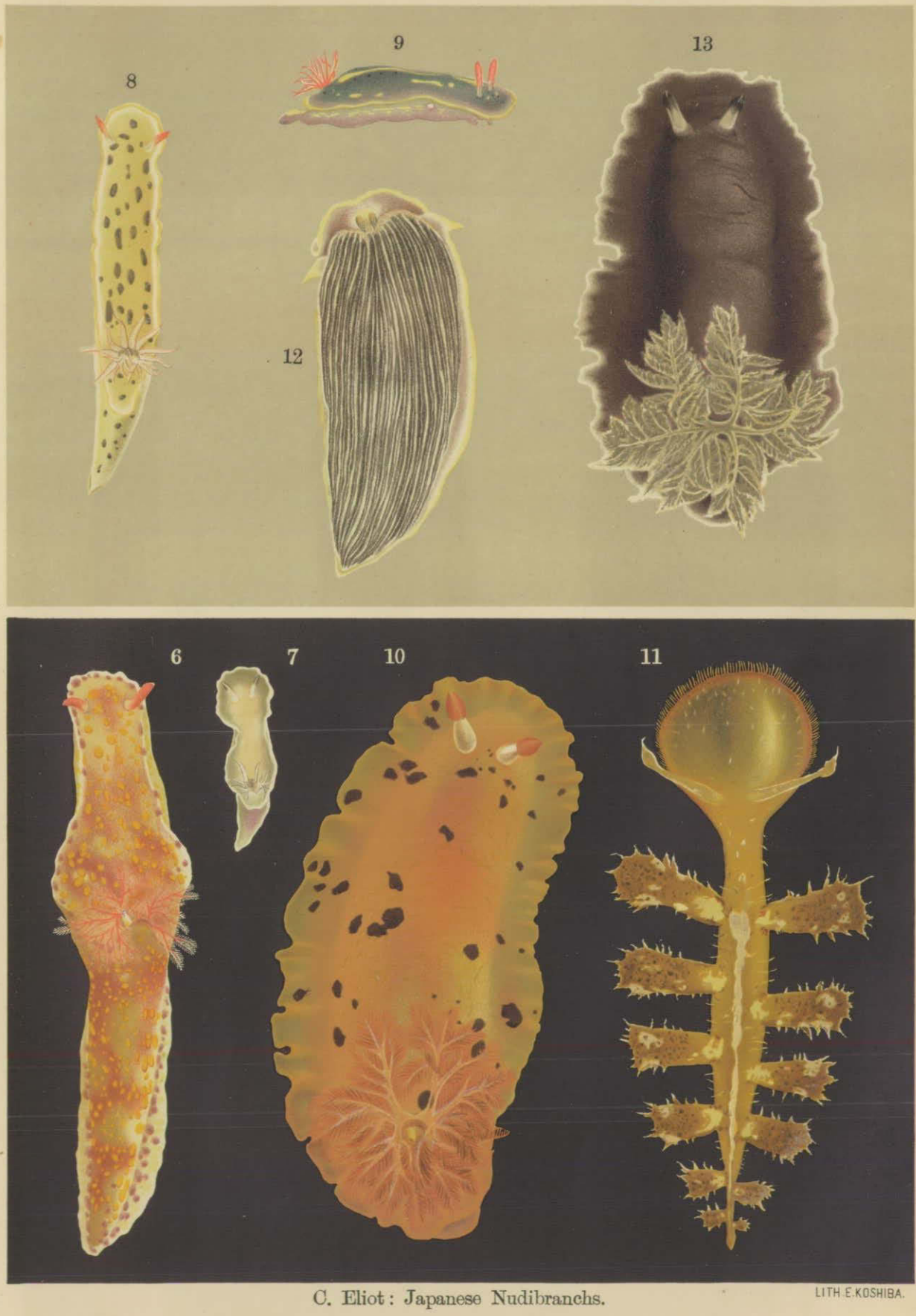
LITH E.KOSHIBA.

PLATE II.

Explanation of Pl. II.

All figures in natural size.

Fig. 6. *Ceratosoma cornigerum* Adams.
„ 7. *Chromodoris sibogae* Bergh.
„ 8. „ *pallescens* Bergh.
„ 9. „ *marenzelleri* Bergh.
„ 10. *Doridopsis rubra* Kelaart.
„ 11. *Melibe vexillifera?* Bergh.
„ 12. *Pleurophyllidia japonica* sp. nov.
„ 13. *Doridopsis nigra* (Stimpson).



C. Eliot: Japanese Nudibranchs.

LITH. E. KOSHIBA.