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NUDIBRANCHIA FROM THE CLARENCE RIVER HEADS, NORTH COAST, NEW SOUTH WALES.

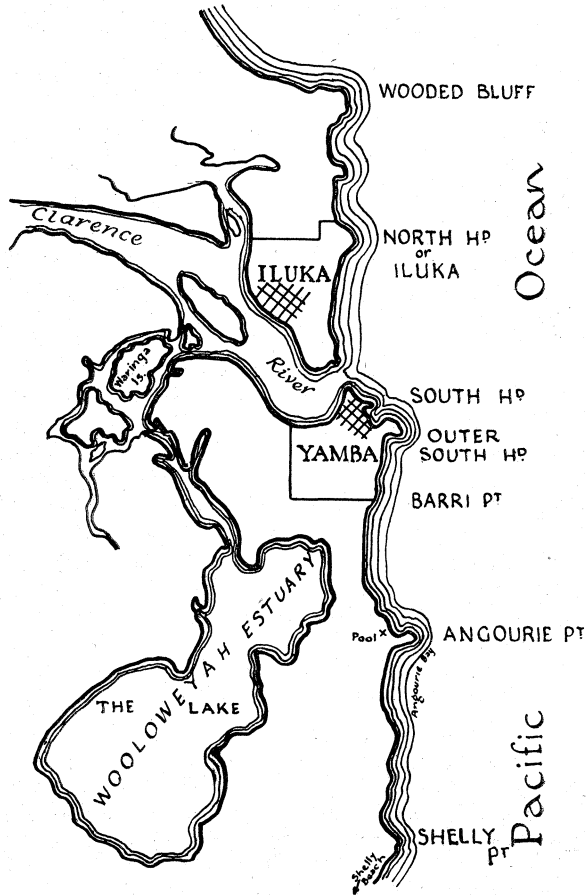
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(Plates xli-xliii and Map.)

Introduction.

In June, 1941, the Clarence River Heads, north coast of New South Wales, were visited for the purpose of collecting certain marine molluscan material, in particular, Nudibranchia. For some time Mr. A. A. Cameron, of Harwood Island, Clarence River, had forwarded to the Museum marine specimens from this locality, a considerable proportion of which had indicated the presence there of a strong, extra-Australian tropical influence of ecological and zoo-geographical importance. The nudibranch material was particularly interesting in this respect, since the majority of the rare species he had forwarded were collected in a restricted area, the Angourie Pool, a



small excavation in the rocky shore shelf at Angourie, a popular fishing spot. The trip was therefore undertaken to investigate the molluscan fauna in that locality, with special attention to the preparation of field notes and colour sketches of the Nudibranchia encountered.

A considerable variety of both tropical and temperate rocky shore shells was present in all areas visited—in one locality alone, Shelly Beach, no less than eleven species of cowries were noticed in an hour or so. Notes only were kept of the various species of molluscs seen, as the main concentration was to be on the Nudibranchia, which forms the basis of this paper. However, a collection was also made of several other very interesting Opisthobranchia, including species of Aplysiidae, and Lamellaridae, which it is intended to deal with at a later date.

Mr. Cameron not only gave every assistance by arranging transport at that end and acting as an enthusiastic guide to all the spots, but helped considerably with the actual collecting, and much of the success of the trip is due to his untiring efforts in this direction. My thanks are here tendered for his consideration and the interest he has always shown in this particular molluscan group. I should like to thank Mrs. D. Cameron also for the colour sketches she has prepared on occasions in the past, and Mrs. L. Woolacott and Miss G. Thornley for similar kindnesses while they have been holidaying at Angourie. My thanks are also due to Miss Betty McKinnon, of the Lands Department, Sydney, for preparation of the map.

Unfortunately, squally rain and very cold conditions, with heavier seas than had been experienced for many years along that part of the coast, continued during the two weeks of collecting and made the work most difficult and at times very unprofitable. Dredging was out of the question. The only attempt at this was abandoned early, owing to the adverse conditions. Fishing boats were often unable to operate, and the nets, when they were put out, brought in little material of personal interest, but fragments of coral, sponges, and other marine organisms clearly indicated the coral reef influence adjacent to the shore. Lobster pots were set down on several nights, but collected only common rock shells.

Collecting was confined generally to the Angourie Pool, with a few short trips to nearby grounds, Angourie Point, Green Point, Shelly Beach and Woody Head, all regarded as excellent collecting spots. Their principal features are detailed later.

Only one new species of Nudibranchia was found. But of far more importance than the establishment of new species was the predominance of tropical species (some of which are rare even in their type localities) which are now recorded from Australia for the first time, linking up a definite Africa-Indo-Pacific relationship of a significance not fully appreciated before amongst the nudibranchs. One family, Caliphyllidae, three genera, *Cyerce*, *Baeolidia*, and *Peronodoris*, and sixteen species have been added to our list as a result of this collecting. Amongst the species, six *Glossodoris*, out of a complement of nine *Glossodoris* collected, are new records. When the unfavourable conditions existent at the time—conditions which normally drive many nudibranchs out of collecting range—and the fact that the majority of rarer species came from a restricted pool not more than 60 feet long are taken into consideration, the result is somewhat amazing.

Throughout this paper the general classification is along the lines adopted by Thiele, and reference is made in the text to any doubtful points in this regard when necessary.

Character and Relationships.

Hedley, Iredale and others have indicated in various papers on zoo-geographical relationships of molluscan fauna the presence of an invading tropical fauna into Australian waters. Hedley (1893, p. 189) indicates that there appears no definite temperate and tropical division as a result of this invasion. This fauna gradually

dwindles southwards and the southern fauna moves northwards, but no definite line exists; the species along the coastline merely overlap, and in many places are found side by side. An excellent example of this may be found at Shellharbour, south coast of New South Wales, where living specimens of *Strombus luhuanus*, a typical coral reef shell, thrive in company with characteristic southern and mid-coastal species.*

A stream of tropical Papuan marine life (much of which is itself associated with other Indo-Pacific material) flows in fairly undiminished strength until it reaches the border of New South Wales, where, as Hedley points out (op. cit., p. 189) "the cooler climate diminishes its vigour, and at the Clarence River, N.S.W., with few exceptions, it finds its southernmost limit". From then on the tropical material becomes reduced in numbers, and in varieties of genera and species, until there are only tropical strays which have been able to survive the colder conditions of the south. As much as in any other marine group, the Nudibranchia on the eastern coast of Australia have demonstrated this invasion, a demonstration which has been considerably strengthened by examination of the collection made in 1941, at the Clarence River.

In recent years dredging in Sydney Harbour has revealed a prominent strong tropical element amongst the molluscan fauna (Iredale, 1929, p. 337). Material dredged by the *Triton* in particular has led to the supposition that there is a relict fauna there, apart from recent invaders, a reminder of the times when Sydney Harbour enjoyed a more tropical climate. Hedley has shown that tropical forms have incessantly attempted to colonize our coast. When the Notonectian current floods the harbour these gain a footing, though many perish when the stream swings off-shore. This probably explains, to some extent, the presence of many of Angas's species of Nudibranchia in Sydney Harbour, when in reality they are of more tropical nature, their range being Indo-Pacific, or even Africa-Indo-Pacific.

The present collection of Clarence River Nudibranchia lends further support to zoo-geographical relationships suggested in the past. As pointed out above, the relationship between them and those of the Africa-Indo-Pacific region is strikingly emphasized. Such species as *Elysia marginata*, *Peronodoris tuberculata* and *Glossodoris reticulata* are known to range through the Indo-Pacific to East Africa; *Glossodoris decora* and *G. inornata* to Japan and the China seas respectively; *Dendrodoris denisoni* to India and Japan, and *Baeolidia major* to Zanzibar and Japan. Strangely, *Dendrodoris guttata* has been recorded only from Western Australia and Japan previous to its Clarence River occurrence; no other record of it has appeared elsewhere from the Indo-Pacific. The presence of *Glossodoris geometrica* in the Clarence River collection is surprising since this species seems known only from New Caledonia, where it is apparently rare. Other instances of zoo-geographical relationships are indicated throughout the text.

In a close comparison of species, it is seen that this material and that of New Caledonia are very similar, the majority of the species having been recorded by Risbec and others from that island. A number of the Clarence River species have as their type locality the Sandwich Islands; it would be interesting to ascertain how far their eastern range extends and what relationship they bear to those from the west coast of America. Their relationship to the Lord Howe Nudibranchia is also interesting. The marine fauna, in general, of that small island has shown a close connection with that of New Caledonia and a slightly weaker one with the Australian fauna. Several

* Since writing the above I have received a copy of "Notes sur les peuplements littoraux d'Australie" (Soc. de Biogéographie, vii, 1940, pp. 289-313) by P. H. Fischer. In this study Fischer (p. 290) suggests that a distributional limit of true tropical and temperate molluscan littoral fauna on the east coast of Australia is reached at approximately Cape Sandy, Queensland. Prof. T. Harvey Johnston (Q'land Nat., Vol. ii, No. 2, 1917, p. 63) found a meeting ground of tropical and temperate fauna at Caloundra; in some groups the former predominated, in others it was the latter, but on the whole he found the southern element (temperate) was the stronger.

species of nudibranchs collected there have now appeared at the Clarence River, and rather notably, *Cyerce nigra*, var. *ocellata* Bergh, which also occurs at Samoa and in the Indian Ocean (Eliot).

This Lord Howe Island–New Caledonia relationship with Clarence River Nudibranchia is more clearly understood from the deductions of Iredale and Allan (1940, p. 45) in a study of the relationships of the mollusca of Lord Howe Island, in which the land connections between it and New Caledonia and the evidence of a land bridge or series of stepping stones connecting New Caledonia with southern Queensland by way of the Capricorn group are discussed. The influx into New South Wales would be consequential, as indicated earlier.

There is obviously a coral reef pocket off-shore from the Clarence River. Much of the marine life brought up in fishing nets, and frequenting the rocky shore at low-tide level, reveals this. This is apart from drifting objects from tropical islands of the Pacific carried along the route of the trade winds (Hedley, op. cit., p. 191). The nudibranchs collected in a restricted area during a few weeks, despite weather conditions which usually prove most unfavourable for their appearance, amply support this and lead one to suspect that there may exist there a far larger number of tropical species of this group than expected.

As further molluscan collections are made in Australia it should become apparent that many species previously regarded as more or less confined to these waters have, in reality, a wider range, and their zoo-geographical relationships will probably remove them from the ranks of separate species into the synonymy of older species. A perusal of even this small collection has demonstrated this possibility. This will be fortunate, since it will check much of the unnecessary splitting of species which in recent years has caused so much trouble to conchological workers.

Localities.

Yamba, about 40 miles by road from Grafton. No material of interest was found on its headlands and fine beaches.

Angourie Point.—A small headland a few miles south of Yamba. It consists of many fine rocky shelves, with numerous pools, weed-covered rocks, and narrow gutters, and is an excellent spot for general marine collecting. Owing to the heavy storms, masses of heavy kelp and bead weed (*Hormosira*) were piled over the rocks. The absence of nudibranchs here, in contrast to the abundance of other marine life, is consistent with their general behaviour under heavy storm conditions. It has been frequently noticed also, and was conspicuous during this trip, that nudibranchs do not favour association with the heavy growth of bead weed which is frequently found in certain exposed locations.

Angourie Pool.—The main purpose of the trip was to investigate the nudibranch fauna in this pool. It is undoubtedly a favourable collecting spot for this group. The pool is situated at Angourie, just immediately north of Angourie Point, and separated from it by a short, sandy beach. It is a pool in the rocky shore shelf jutting out between two beaches and is an old quarry in the shelf, from which rock was removed to make the breakwater at Yamba. It is somewhat below sea-level, and is dependent on the tides pouring in water through cuttings in the rocks at the south end and washing over the flatter, lower rocks at the north end. An ample supply of fresh salt-water is continually maintained in the pool, which is quite free of stagnation and contains abundance of healthy weed growth. Water seeps back into the sea through cracks in the rocky face of the pool. At the north end the heavy rains had caused a slight freshet from the land bank into the pool, and it was noticed that the water in that immediate vicinity was slightly clayey and the marine life had retreated more towards the centre of the pool.

The pool is about 60 feet long and about 15 feet wide, running parallel to the shore. The bottom stratum is sandy, almost devoid of mud, with masses of various sized rocks, profusely covered with short weed growth, an environment admirably suitable for many nudibranchs. The sheltered, calm position of the pool, and the almost complete absence of bead weed and giant kelps enable all types of Opisthobranchia to thrive, and they appear the dominant animal life in the pool. Although other marine types are present, their numbers are insufficient to affect this group. Common molluscs, typical of rocky shores, are also present, the principal ones being the loricates, periwinkles, limpets, and occasionally a cowry or two. The pool seems workable irrespective of tides and practically in all weathers. Only during the heavy seas ranging at that time had it been noticed covered completely with water. On very few occasions does it fail to produce an interesting species, since fresh Nudibranchia swept in by the strong seas breaking over the rocks at high tide are able to exist there in safety. At this particular time many of the marine organisms in the pool were breeding.

Shelly Beach is situated about five miles south of Angourie and is reached by a strenuous walk along stretches of sand and very rugged coast or by a rough cart track through thick bottle-brush country. It is regarded as one of the best collecting grounds on that portion of the coast and usually repays the visitor who is prepared to make the journey. It is a favourite haunt of cowries, as will be seen from the fact that no less than eleven species were seen in an hour or so, some of them in large numbers. The rocky shelves exposed at low tide abound with pools, weed-covered rocks, and numerous gutters and cracks, in places teeming with many varieties of marine tidal life. Here again the seas had brought in masses of giant kelp weed and the rocks were covered with a profusion of bead weed, as noticed elsewhere.

Green Point is north of Angourie Pool and separated from it by a sandy beach. It did not yield any material of importance at this time, but appears a good collecting ground.

Woody Head (Wooded Bluff).—North side of the entrance to the Clarence River, about eleven miles from Yamba. It is an excellent collecting ground. The low rocky shelves exposed at low tide abound with marine life of considerable interest and variety, most of which displayed a strong Indo-Pacific influence. Some very interesting nudibranchs were found there and a record made of the value of this place as a collecting ground. The weather encountered on the two days spent at Woody Head was the worst experienced during the trip, and it speaks well for the marine life inhabiting this zone that such a profusion was noticeable in spite of heavy rain and biting, cold winds, which swept over the area. Bead weed was again much in evidence.

Summary.

The results gained from the study of this collection of nudibranchs may be summarized as follows:

Many interesting species have been added to the Australian list.

A much closer relationship between the Australian and the Africa-Indo-Pacific Nudibranchia, in particular those of New Caledonia, than previously estimated has been shown.

Several uncertain genera and species have been established and some species reduced to synonyms.

Some of Angas's species from Sydney Harbour have been shown to be tropical wanderers, whose more normal habitat is an Indo-Pacific range.

The coral reef influence off the Clarence River makes the locality an extremely important one for ecological and zoo-geographical study of its marine fauna.

The advantage and importance of studying nudibranchs and allied groups in the field, with preparation of colour notes and illustrations, have been further emphasized. More complete descriptions of several hitherto uncertain species, in particular those of Angas, Pease, Abraham and Kelaart, have been made possible.

Family CALIPHYLLIDAE.

Genus *Cyerce* Bergh, 1871.

Cyerce Bergh, 1871, p. 113. *C. elegans* Bergh, Philippines.

Tropical Opisthobranchia recognized by the numerous rows of large, flat, leaf-shaped cerata grouped along the sides of the body. The sole of the foot is divided. Rhinophores bifid. Teeth denticulate, forming an irregular heap in the radula sac. Vent dorsal.

A genus established by Bergh for drawings of species made by Semper in the Philippines. There are two principal species in the genus, *elegans* and *nigra*. This family, and the Elysiidae, though often grouped, in a general way, with the Nudibranchia in papers of this nature, belong to the order Sacoglossa, which is very close to the Nudibranchia.

Cyerce nigra var. *ocellata* Bergh, 1873.

(Plate xli, figs. 1-3.)

Cyerce nigra var. *ocellata* Bergh, 1873, pp. 83-86. Samoa.

Animal velvety-black, head and body lined and spotted with orange-yellow. Cerata black, with broad orange-yellow band of colour along the upper margin, and numerous orange-yellow pustular spots on both the upper and lower surfaces. The spots on one side of the cerata are confined to several irregular rows towards the edges, and on the reverse side are scattered completely over the surface and not wholly confined to the marginal areas. When alive, the animal is extremely beautiful, but in preservative most of its brilliancy has gone and many of the cerata have become detached from the body.

Measurements.—Approximately two inches in diameter when the cerata are fully expanded. Two specimens.

Locality.—Angourie Pool, crawling on the rocky side of the pool.

The typical *Cyerce nigra* has yellow or orange-red spots on one side of each cerna, but on the reverse side the spots are replaced by transverse lines of the same colour. Eliot (1903, p. 572) recorded the variety *ocellata*, which differs from the typical *nigra* in having spots on both sides of the cerata, from Minikoi (Indian Ocean). The Angourie specimens conform to the variety *ocellata*.

In a paper in the course of preparation this species is recorded from Lord Howe Island. This is, however, its first record from the Australian coast.

Family ELYSIIDAE.

Genus *Elysia* Risso, 1818.

Elysia Risso, 1818, p. 375.

Body very flat, sides winged, and a cardio-renal protuberance present. Surface smooth.

Elysia australis Quoy and Gaimard, 1832.

Actaeon australis Q. & G., 1832, p. 317. Sydney Harbour.

This tiny, olive-green species, delicately spotted with creamy yellow, and with violet-tipped rhinophores, and violet border to the mantle lobes, was found on numerous occasions in Angourie Pool. As a rule several specimens were found together, attached to fine weed. It had been noticed in the pool before and has since been found on several occasions. The species is very common round Sydney, but its small size and its habit

of associating with self-coloured weed render it most inconspicuous. This is the first record, as far as I am aware, of the species being found so far north.

Angas (1864, pp. 69–70) described this same species as *Elysia coogensis*.

***Elysia marginata* (Pease), 1870–1.**

(Plate xli, fig. 7.)

Pterogasteron marginatus Pease, 1870–1, p. 304. Sandwich Islands.

A single, beautiful specimen of this species was collected on a small rock at low tide in the Angourie Pool, 5th June, 1941. When alive it was extremely graceful and active, and the movements of its softly undulating mantle lobes were fascinating to watch.

The mantle is almost lettuce-green in colour towards the foot, but much darker, almost blackish-green, near the mantle edge. The slender neck and head are pale green. Along the edge of the mantle lobes is a rich, velvety-black band of colour, followed by a narrow white line, then a broad orange-red line. The whole body is covered with scattered black speckles, some larger than others, interspersed with white ones. The anterior end of the foot has a white edge and there are white splashes along the sides of the lobes, foot, and on the *rhinophores*. The stout rhinophores are ear-shaped and slightly involute, with narrow white edge, below which is a broad black band, followed by a narrow orange one.

This is the first record of the species from Australia, although previously I had recorded it from Middleton Reef, east of the New South Wales coast (Allan, 1937, p. 262).

Eliot (1904–5, p. 296–7) shows the variation in the colouring of specimens of this species from Zanzibar, and also draws attention to its close proximity to that of *E. nigrocincta* Bergh, 1873. I also feel that *E. grandifolia* Kelaart (1859, p. 493) is simply another variation in colouring of the species, and possibly also *E. punctata* Kel. which is described immediately below it and which seems merely a young form of *grandifolia*. Then again, a species described earlier by Pease from the Sandwich Islands, *Pterogasteron ornatum* (1860, p. 36), seems to be the same, and his lack of reference to it when describing *marginata* from the same region may lead one to think he had overlooked his earlier species. *P. ornatum* would have preference over *marginata*, but should *grandifolia* eventually prove synonymous, then it has preference over the other specific names.

Taking into consideration the degree of colour variation the Opisthobranchia appear to exhibit over a geographical range, the following species seem sufficiently close to consider their synonymy with *marginata*: *ornata* Pease, 1860, *grandifolia* Kelaart, 1859, *punctata* Kel., 1859, and *nigrocincta* Bergh, 1873.

Risbec (1928, p. 280–281) records a species as *E. ornatata* (Pease) from New Caledonia. This resembles our species which, however, appears to be the typical *marginata*.

Family POLYCERIDAE.

Subfamily POLYCERINAE.

Genus *Plocamophorus* Leuckart, 1828.

Plocamophorus Leuckart, 1828, p. 17.

Body limaciform. Head veil bearing tubercles or branched appendages to the margin, and two or three processes on each side of back. Gills few, non-retractile.

***Plocamophorus imperialis* Angas, 1864.**

Plocamophorus imperialis Angas, 1864, pp. 59–60. Sydney Harbour.

A typical example of this species was found in the Angourie Pool. The combination of its red and purple colouring, with dark spotting, and its elaborate structure, make it

one of the most beautiful of our nudibranchs. This is the first record of the species so far north along the New South Wales coast, although a specimen has since been collected at Angourie. The species occurs only rarely round Sydney, but when it does appear, several are usually found during the period of its occurrence, which is usually November to January.

Family DORIDIDAE.

Subfamily GLOSSODORIDINAE.

A subfamily composed of numerous species, abundant in the Indo-Pacific.

Genus *Glossodoris* Ehrenberg, 1831.

Glossodoris Ehrenberg, 1831, p. 92.

Elongate animals, with narrow mantle edge covering the head, but not the posterior part of the foot. Surface generally smooth and frequently ornamented with brilliant colours in the form of spots or lines. Gills many, simply pinnate.

Glossodoris bennetti (Angas), 1864.

(Plate xli, fig. 4.)

Goniodoris bennetti Angas, 1864, pp. 51-52. Port Jackson.

This brightly ornamented *Glossodoris* frequently appears round Sydney and north and south along the immediate coastline, where it is usually found at low tide crawling on weeds or under stones in rock pools. It is an extremely handsome species.

Our specimen was collected on the 6th June at Shelly Beach, just south of Angourie Point. Although only a small specimen, three-quarters of an inch in length, it agrees with those frequenting the type locality. It has the same azure-blue body-colour and magenta-red spots on the dorsal surface, round the margin of the mantle, and scattered along the sides of the foot. The rhinophores and the ten gills are red. The mantle has a vivid yellow border.

Although one of the commonest nudibranchs of the central New South Wales coastline, this species of *Glossodoris* does not appear to have been recorded from New Caledonia or other South Pacific localities, where an associated nudibranch fauna has been noticed. The species had not been noticed in the vicinity before.

Glossodoris daphne (Angas), 1864.

(Plate xli, figs. 11-13.)

Goniodoris daphne Angas, 1864, p. 54. Port Jackson, N.S.W.

This provides a northerly record for this species. It is rarely found, even in the type locality.

The white body, dotted dorsally with scarlet, has a double border (the outer scarlet, the inner orange) to the mantle, which immediately identifies it with *daphne*. As in the type, the gills and rhinophores are scarlet. The coloured border shows through to the under-surface of the mantle. The foot is white and a white tail protrudes well beyond the posterior portion of the mantle when the animal is crawling. The rhinophores are pedunculate, whitish along their stalks, finely lamellated, with about twenty-four lamellae. Gills (10) simply pinnate, linear, the posterior ones smaller. Orals linear. Mantle border and edge of foot wavy. The pink spotting on the dorsal surface and the coloured border show up vividly against the white background. The rhinophores are partly retractile in spirit, the gills not at all.

Measurements.— $1\frac{1}{2}$ inches long, $\frac{3}{4}$ inch broad (crawling).

Locality.—Angourie Pool, on weed. 12th June, 1941.

This beautiful *Glossodoris*, which is rarely found along the coast, provides another instance in support of the necessity of recording the colours of live nudibranchs.

Although the specimen has preserved well, every vestige of contrasting coloration has vanished and the animal is now a dingy cream. As it appears at present, it might be any one of several species.

The species approaches *Glossodoris marginata* (Pease) [1860, p. 30] from the Sandwich Islands, but the latter seems to lack the scarlet spotting on the dorsal surface. Risbec (1928, p. 133) and Baba (1938, pp. 11–12) record *marginata* from New Caledonia and Japan respectively, but neither of their descriptions refers to any coloured spotting on the dorsal surface. It may be considered, therefore, that these two species are distinct or, if related, the spotted southern form is a variety of *marginata*. Winckworth (1946, p. 157) points out, however, that *Glossodoris* (*Doris*) *marginata* Pease is preoccupied by *D. marginata* Montagu, 1804, and *D. marginata* Q. & G., 1832.

Incidentally, Winckworth (p. 156–7) describes a new species, *Glossodoris trimarginata*, from Bombay, which, except for the white edge to the mantle, closely resembles *G. daphne*. The species known as *marginata* Pease apparently requires a new specific name.

Glossodoris geometrica (Risbec), 1928.

(Plate xli, fig. 14.)

Chromodoris geometrica Risbec, 1928, pp. 148–151. New Caledonia.

This beautifully marked little *Glossodoris* is obviously Risbec's species. There is slight variation in colouring, which is not unusual when purples, reds and yellow predominate, as they do in this species. A short account of the Australian species, as in life, is as follows:

General colour light fawnish-yellow, with a dark purple-red line round the border of the upper surface of the mantle, continuing down each side, with off-shoots towards the mantle edge. These cross-lines enclose areas which have the appearance of pustules. On the main line are scattered creamy-white spots. Violet lines are on the upper surface of the tail. The rhinophores are set well back and are orange-yellow with a green tinge. There are seventeen long, slender, simply pinnate gills, cream at the base, and orange-yellow for their greater length. They are retractile into a circular cavity. The mantle is fairly wide. The dorsal surface is firm and rather flat, with a few large, indistinct pustular areas, with fawnish-yellow lines encircling them. A dark violet line runs round the upper end of the mantle, fading away just below the level of the rhinophores. The undersurface is creamy-white. The anterior end is broad and laminated, and the orals long and cream-coloured.

The rhinophore cavities in both preserved specimens are elevated. In one specimen the gills have completely retracted into a slightly tubular cavity, but in the other they are exerted. The gills diminish in size towards the posterior ones, which are very small.

Measurements.—Approximately 22 mm. long, 8 mm. broad. Two specimens.

Locality.—Angourie Pool, low tide under rock, amongst weeds.

Both specimens are now stained uniform deep reddish-purple. As far as I know they are the only specimens recorded, other than those forming Risbec's New Caledonian species. It is one of the most interesting species in the present collection.

Glossodoris decora (Pease), 1860.

(Plate xli, figs. 8–10.)

Doris decora Pease, 1860, p. 29. Sandwich Islands.

Glossodoris setoensis Baba, 1938, pp. 12–13. Japan.

Ten specimens of this very attractive species were collected at low tide in shallow water in the Angourie Pool on 4th June and following days. The species had not been

seen previously in the locality, and provides a new record for Australia. It is extraordinary that it should be so common at this particular time.

The striking colour pattern of the dorsal surface provides a strong distinguishing feature, as will be seen in the following brief description.

An elongated, smooth, gelatinous animal, with mantle rounded anteriorly. Gills fairly slender, simply pinnate, seven in number, the posterior ones in some specimens very small, giving the impression of only five gills. The gills decrease in size posteriorly. Rhinophores long, elongate-oval, their lamellated portion as long as their peduncles; retractile into simple cavities. Foot narrow, rounded anteriorly, extending to a tail point, well beyond the mantle margin, when crawling. Orals small, digitate.

The general body colour is cream to straw colour. The central dorsal surface of the mantle is conspicuously marked with three longitudinal, opaque, white stripes. The medial one runs down the centre from between the rhinophores and bifurcates about 3 mm. before the gills, the two branches running round and uniting behind the gill chamber. Similarly this line divides anteriorly, encircling the rhinophores connecting, sometimes disjointly, with a similar white line which runs down each side of the dorsal area, uniting posteriorly in some specimens. The mantle margin is creamy yellow-orange, interrupted by bluish-white patches of colour. Inside this, and between it and the lateral white lines, is an interrupted band of reddish-purple (puce), extending round the head and tail. The rhinophores and gills are dirty white. The foot is a gelatinous bluish-white, with a single row of small reddish spots which may show through from the dorsal surface.

The ten specimens showed slight variation in the depth of colouring round the mantle border, but the three white lines and the bifurcation of the medial one are constant. In preservative, the colouring has disappeared, but the white lines stand out against the now dusky body colour, and with the rhinophores and gills retracted, form a quaint pattern on the soft surface (fig. 10).

Measurements.—The largest specimens measured 25 mm. long and 5 mm. broad, when crawling, but some were slightly smaller.

This Australian *Glossodoris* certainly seems to be *Glossodoris setoensis* Baba, from Japan, but unfortunately Pease had earlier described *decora* from the Sandwich Islands, which, except for slight variation in the colouring of the mantle border, appears the same species. Though unaccompanied by an illustration, Pease's description permits the species to be identified without difficulty and leaves little doubt that *G. setoensis* Baba is a synonym of it. *Glossodoris lentiginosa* (Pease), 1872, pp. 18–19, seems to resemble this species also, but the medial line does not bifurcate, and the purple dots over the dorsal surface seem more profuse than on *decora*. It may be a colour variation of the latter.

Glossodoris inornata Pease, 1871.

(Plate xli, figs. 5–6.)

Chromodoris inornata Pease, 1871, p. 18. Huaheine Is. (Society Is.).

Chromodoris tenuis Collingwood, 1881, pp. 130–1. East China Seas.

The difference between *inornata* Pease and *tenuis* Collingwood is so slight that their separation seems quite unwarranted. Priority is given to *inornata* as the earlier name. Collingwood's colour illustration and that of Pease coincide, except that the latter shows fewer violet spots on the dorsal surface and does not indicate the orange-coloured line round the foot. Risbec (1928, pp. 129–131) describes and figures as *Chromodoris tenuis* a rare species from New Caledonia, which is certainly similar to our species. He may not have been aware of Pease's species, as he does not refer to it in relation to his species.

When crawling, the animal elongates considerably and is very beautiful. A bright orange-coloured line borders the pure white mantle and foot, and the dorsal surface

and sides of the foot are splashed with small violet spots. The rhinophores are orange and the gills are light coloured, tipped with violet and yellow. The gills are simply pinnate, and number seven, but some are slightly divided at the tips, which gives the impression of extra gills. Orals yellow.

Measurements.—Average length 35 mm., breadth 7 mm. Capable of considerable extension (50 mm.) when crawling.

Locality.—Angourie Pool, under a rock at low tide, 5th June. One specimen. This species had not been seen before in the locality, nor to my knowledge elsewhere along the coast. It is recorded from Australia for the first time.

In common with some other species of *Glossodoris*, the above animal had the ability to intensify or diminish its colouring at intervals, in particular the border and spots.

Eliot (1908, p. 111) considered *inornata* a closely allied form of *Glossodoris pallida* (Ruppell & Leuckart, 1828) from the Red Sea, of which he makes *G. marginata* (Pease, 1860) a synonym. However, I can see no resemblance between the two species to justify them being regarded as closely allied. I have seen several specimens which can be definitely determined as *inornata* as designated by Pease, and *tenuis* by Collingwood, and in none of these does the double-coloured border encircle the mantle. The other colouring is distinct also. The species regarded by Risbec as *tenuis* from New Caledonia is decidedly referable to these and not to *pallida*, or *marginata* as established by Pease. The brief description and figure of *pallida*, given by Ruppell and Leuckart, exhibit little to substantiate Eliot's decision to place *inornata* in its synonymy.

Glossodoris mariei (Crosse), 1872.

(Plate xli, fig. 15.)

Goniodoris mariei Crosse, 1872, p. 73. New Caledonia.

One very small specimen of this species was found under a stone at low tide at Woody Head on 10th June. It was between $\frac{1}{2}$ and $\frac{3}{4}$ inch long and $\frac{1}{4}$ inch broad.

The general colour of the animal is white, with an orange-coloured border, interrupted with white, round the mantle. Violet spots are scattered over the dorsal surface, principally towards the centre, and the rhinophores, ten gills, and oral tentacles are violet tinged. A violet line outlines the foot and tail.

Although Crosse draws attention to a slight resemblance between his species and some of the Australian forms described by Angas, but from which they differ specifically, there appears to be no species described from Australia with which *mariei* can be associated with certainty. *Goniodoris festiva* (Angas) is somewhat like it, but the yellow line in that species is entire and the spotting, rhinophores and gills are rose-carmine in colour, not the rich violet shade of the Woody Head species, or as described by Crosse for his species. *Glossodoris splendida* (Angas) also bears some resemblance to the species, but the colouring and the size of the spotting are different.

Glossodoris sannio (Bergh) (1888, p. 939), from Amboina, seems to me to be very close to *mariei* and may be synonymous. Eliot (1905, pp. 248-9) records *sannio* from Maskat. The only important difference between the two species appears to be the presence of some tubercles on *sannio*. In observing the living *Glossodoris*, however, the tendency of coloured spots on the body of the animal to rise like tubercles has frequently been noticed, and this may be the case in *sannio*.

Risbec (1928, p. 71) places *mariei* in the genus *Doridopsis* (= *Dendrodoris* Ehrenberg), as the specimens he collected in New Caledonia were without jaws or radula. Unfortunately our small specimen is very hard and brittle and I have been unable to discover whether there is a radula or not. However, in life it certainly was a typical *Glossodoris* in outward structure and colouring, and until further material comes to light it is left in this genus. It is certainly not a characteristic of *Dendrodoris* to have numerous simply pinnate gills.

Glossodoris reticulata (Pease), 1866.

(Plate xli, figs. 18–20.)

Goniobranchus reticulatus Pease, 1866, p. 205. Pacific Islands.*Chromodoris alderi* Collingwood, 1881, p. 132. North Formosa.

The above two species are undoubtedly synonymous. Specimens collected at Angourie Pool under stones at low tide on June 4th and 12th respectively showed variation in the intensity of the orange and red colouring, and slight difference in the colouring of the gills and rhinophores, that of the latter date resembling more Collingwood's illustration of *alderi*. In spite of these variations, it was difficult to separate the two forms.

The white body-colour, mantle with yellow to orange border, and fine orange to vermilion-red reticulations all over the central dorsal surface easily determine this attractive species. In the white space between the border and the reticulations are a number of orange-red spots. About 4–6 irregular spots are on each side of the specimen collected on the 12th June, and in the earlier specimen there are a few more. Also, the gills of the former are whitish slightly tinged with colour and the rhinophores are light coloured at their base, with red-brown tips, whilst those of the latter are quite reddish. Both specimens have a yellow border to the mantle undersurface, and a yellow-orange border round the foot and head, with yellow tips to the orals. The gills number eight to ten. At times, the white spaces enclosed by the fine reticulations on the dorsal surface have an almost pustulose appearance. The animal adopts a rounded-ovate shape at rest and elongates itself when crawling.

Measurements.—20 mm. long, 10 mm. broad (4th June); 25 mm. long, 6 mm. broad, crawling (12th June).

This is the first record of this species from Australia and it had not been noticed in the locality previously. Risbec (1928, pp. 135–7) records as *Chromodoris alderi* Coll., a similar species from New Caledonia. He makes no reference to *reticulata* Pease, and may have been unaware of that species, otherwise he must have noticed their similarities. Eliot (1904, p. 386) records specimens from the east and west coast of Zanzibar, and notes variation in colouring of the species. He appears to be the first author to note that *alderi* seems identical with *reticulata*. Baba (1933, p. 169) places *alderi* as a synonym of *reticulata* and reports that it is common in the spring at Tomioka, Japan.

Mrs. L. Woolacott collected a larger specimen of this species (1½ inches long, crawling) in the Angourie Pool, in November, 1945. This had the pale colouring noticeable in some of the specimens collected previously.

Glossodoris lineolata (Van Hassalt), 1824.

(Plate xli, figs. 16–17.)

Doris lineolata Van Hass., 1824, p. 258.

The specimen agrees with the type in general appearance and also with the various species regarded as synonyms of *lineolata*. The animal is typically Glossodorid in shape, attenuated when crawling, the tail protruding to some extent beyond the mantle.

The dorsal surface colouring is creamy-white with fine longitudinal chocolate-brown lines, ramifying in places. The upper surface of the tail is faintly marked in the same manner. The mantle is outlined with a bright orange border. The gills, which number seven, but branch somewhat towards the tips, are orange-coloured, dark-tipped. The rhinophores are brilliant orange-red, dark-tipped also. Both the gills and rhinophores stand out conspicuously against the dark background of the mantle. There are longitudinal lines, as on the dorsal surface, along the sides of the foot, which is outlined with orange. The orals are orange-coloured at their extremities. The colouring of the undersurface is pale bluish-white. On the dorsal surface the lines may appear as white

lines against a brown background or *vice versa*. The species is slight and rather delicate, but most attractive in appearance.

Measurements.—Approximately 1½ inches long, ½ inch broad (crawling).

Locality.—Angourie Pool. This specimen was collected by Miss G. Thornley, who kindly prepared a colour sketch of it in the field.

Glossodoris striatella (Bergh) and *Glossodoris funerea* (Coll.) are synonyms. I consider the New Caledonian species *Glossodoris clavata* (Risbec) [1928, p. 151] as a synonym also. Although there is apparently slight variation in the colouring of the Japanese species, *Glossodoris katoi* Baba (1938, pp. 131–132) it appears very close to *lineolata*.

Glossodoris sp.

A very small, rose-pink *Glossodoris*, with darker rose spots over the dorsal surface, seems unidentifiable at present. The gills and rhinophores are light pinky-yellow, and there is a deep orange-vermilion border to the mantle, which at times appears like a slight orange line inside a vermilion one. There is a suggestion of a white space immediately inside the coloured border. The gills number ten. The foot and tail are rose-pink, and the sides and undersurface of the foot dotted with dark red. In one specimen the spots were more orange than red.

Measurements.—Three specimens, 3 mm., 12 mm., and 15 mm. long, respectively.

Locality.—Angourie Pool, at low tide, on weeds, 5th June.

As this little species gave the impression that it was immature, it is possible its colouring might vary with full growth and, although no species could be found quite like it in the literature, it was considered wiser to refrain from regarding it as a new species at this stage. Further material will possibly clear its identification.

Subfamily THORUNNINAE.

Genus *Rostanga* Bergh, 1879.

Rostanga Bergh, 1879, p. 353.

Animal small, somewhat like *Glossodoris* in shape. Surface covered with papillose-like granulations. Labial armature and radula present. Colouring either drab or vivid, with dark mottling in the form of irregular spots, on the dorsal surface.

Rostanga arbutus (Angas), 1864.

Doris arbutus Angas, 1864, p. 47. Coogee, near Port Jackson, N.S.W.

This small, orange-scarlet and black-speckled species was noticed wherever collecting was being undertaken. Half a dozen or more could have been collected at any of the places, but a record of its presence was noted only. The species is one of the commonest nudibranchs along the New South Wales coast, where it is found at low tide, mostly amongst weeds. It stands out vividly against the green background of the weed, and is popularly known as the Strawberry Dorid.

It appears that *Doris muscula* Abraham (1877, p. 256) and *Doris rubicunda* Cheeseman (1881, p. 222), from New Zealand, may be more allied to *arbutus* than is believed. Should they prove synonymous, Angas' name would have priority. The papillae-like granulations packing the upper surface, the simply pinnate gills and other related characters help to support this synonymy. Abraham's colour description is from spirit material. In preservative *arbutus* becomes a drab yellow-grey.

Baba (1935, p. 343–5) records as *Rostanga muscula* Abraham a species from Japan. He groups the three species *muscula*, *rubicunda* and *Rostanga pulchra* McFarland under *muscula*, omitting any reference to *arbutus*, which he possibly overlooked. I am inclined to think that eventually these related species will all be referable to *arbutus*.

Subfamily MIAMIRINAE.

Genus *Casella* H. & A. Adams, 1858.*Casella*, H. & A. Adams, 1858, p. 57.

Animal compressed, elongated, with small mantle-margin forming undulated lobes along the sides of the back. Foot narrow, radula present, gills simply pinnate. Distribution, Indo-Pacific.

Casella atromarginata (Cuvier), 1804.

(Plate xli, fig. 21.)

Doris atromarginata, Cuv., 1804, p. 473. Sydney Harbour, N.S.W.

Although this species appears at intervals along other parts of the New South Wales coastline and at times quite commonly round Sydney, yet this was the first occasion on which Mr. Cameron had seen it in the vicinity of the Clarence River Heads. The body varied from light to dark cream and the border-line from reddish-brown to black while the specimen was being examined. The fourteen simply pinnate gills were creamy-brown, heavily tipped with purple. The rhinophores were very dark.

The species, which has a wide Indo-Pacific range, undergoes considerable colour variation.

Measurements.—Length, two inches.

Locality.—Collected in a shallow pool amongst weeds, at low tide, Woody Head, 9th June.

Subfamily DORIDINAE.

Genus *Doris* (*Staurodoris*) Linné, 1758.

Eliot (1906, p. 336) suggested it would be better to use the Linnean name *Doris*, rather than *Staurodoris* (established by Bergh, 1877, pp. 576–585), which could be maintained as a subgenus of *Doris*.

Later, Iredale and O'Donoghue (1923, pp. 197, 229) substituted *Doridigitata* Orbigny, 1839, for *Staurodoris* Bergh.

Thiele (1931, p. 434) adopts the generic name *Doris* Linné, 1758, for both *Staurodoris* Bergh and *Doridigitata* Ired. & O'Don., the type species being *D. verrucosa* Cuvier (*non* Linné). This classification is adopted here.

Doris (*Staurodoris*) *pustulata* Abraham, 1877.

(Plate xlii, figs. 1–2.)

Doris pustulata Abraham, 1877, pp. 256–7. Australian seas.

Several specimens of a *Doris* (*Staurodoris*) from Woody Head are referred to *Doris* (*Staurodoris*) *pustulata* Abraham, though they display some colour variation. The description and illustration of Abraham's species closely coincide with these specimens, and the establishment of a new species would be insecure, as Abraham was describing a preserved specimen, from which most of the colouring had departed.

For comparison with Abraham's species a description is given of the Woody Head specimens.

Body shape as in type. Dorsal surface covered with prominent rounded pustules, large in the centre, becoming smaller and more numerous towards the margins. Rhinophores fairly short, rounded, retractile into rounded openings, guarded by two large, lateral, almost cup-shaped tubercles, with smaller posterior and anterior ones, and a few even smaller ones, between them. These tubercles are capable of fitting completely over the rhinophore opening. The tubercular processes give a raised appearance to the opening. Gills eight, rather small in proportion to the size of the animal, bipinnate, arranged in approximately two groups, four on each side of the cavity, the last two being bifid. The long, tubular anus, with fluted edge to its opening, rises

between the posterior pair of gills. The gill cavity is guarded by a row of very large pustules with smaller ones between them.

Foot small, narrow, pointed posteriorly, about one-third the total width of the mantle. The anterior end is transversely slit, the anterior lamina notched. Orals in live specimens broad at base, fairly long and tapering (in preservative, as described by Abraham). Radula consists of a number of rows of crowded, simple, fairly long, smooth, hooked teeth on each side of the rachis. No medium tooth. Radula is broad. There is no labial armature, and the penis is unarmed. The whole surface, including the pustules, is spiculose and has a granulated appearance. The spicules stand out over the pustules like smaller pustules.

Colour.—The specimens showed considerable variation of colouring, ranging from dingy yellow-grey to rich orange-red, intermingled with yellow, and brown spotted. Some of them formed a perfect camouflage amongst the yellow-red spongy growth on which they were found. The ground colour varied from white to brilliant yellow, the dorsal centre being much darker, either brownish-green or brilliant orange-red. The dark area usually extends from between the rhinophores to the gills. Splashes of dark colour occur along the mantle; one large specimen had a row of dark orange blotches along the mantle edge and two rows of dark brown blotches between them and the rich orange-red centre. Gills vary from creamy-grey to orange, speckled inside with red and black. In some specimens the centre of the gills, in particular the three lower ones, is brilliant orange-red. Rhinophores may be reddish, yellow or grey tipped with orange. Pustules are yellow, with a white ring round the base of most of them. The undersurface is much paler, distinctly or indistinctly spotted with small reddish-brown speckling, principally on the mantle surface. Orals pale, dark speckled.

Measurements.— $1\frac{1}{2}$ – $2\frac{1}{2}$ inches long, $\frac{3}{4}$ – $1\frac{1}{4}$ inches wide. The larger specimen is the one referred to with the large dark brown blotches of colouring. Its colouring is so vivid that a single specimen might appear as a distinct species, but on comparison with a number of the less vividly coloured specimens it is found to dovetail into the others.

Locality.—Woody Head, 9th June. On weed-covered rocks and amongst spongy growth, at low tide. The larger specimen had been collected on one occasion previously at Angourie Pool by Mr. Cameron.

Hedley and Basedow (1905, p. 151) apply the name *pustulata* Abraham to a species dredged in 20 fathoms, Backstairs Passage. I have collected specimens similar to those from Woody Head round Sydney and further south, and have always regarded them as *pustulata*. The northern specimens seem to establish Abraham's species.

The animal becomes considerably flattened and rounded when at rest. In general appearance the species resembles *Homocodoris japonica* Bergh, but the presence of plate-like scales on the vagina of the latter disassociates them.

Doris (*Staurodoris*) sp.?

A very small, dark moss-green nudibranch was at first thought to be a green form of *Doriopsis viridis* Pease, but on a close examination it appears to be an immature *Doris* (*Staurodoris*). The animal is firm and the dorsal surface is thickly studded with creamy-yellow pustules, which look like sand adhering to the dark green background. The five bipinnate gills, and the rhinophores, are creamy-yellow. The undersurface is light orange.

Measurements.— $\frac{1}{2}$ inch long, $\frac{1}{4}$ inch broad. A single specimen.

Locality.—Woody Head, 10th June, on weed in a small pool.

The species is unlike any Dorid hitherto recorded, but as it appears immature, its specific identification is left until more specimens are available.

Genus *Doriopsis* Pease, 1860.

Doriopsis Pease, 1860, p. 32.

As pointed out by myself previously (1932, p. 96), the genus *Doriopsis* Pease, which has been regarded as a synonym of *Dendrodoris* Ehrenberg, 1831 (= *Doridopsis* Ald. & Hand.) refers to an entirely different genus, the main characteristic of which is a semicircular-shaped opening to the gill chamber, through which protrude a number of linear, simply pinnate gills. Eliot (1907, p. 338) made a new subgenus (*Ctenodoris*) of the genus *Doris*, to include species having simply pinnate gills arranged in a line or crescent and the upper lip of the cavity shutting down over them. In this genus, which has the same characteristic as *Doriopsis*, he places his species *Staurodoris pecten* and *Doris flabellifera* Cheeseman.

Later Risbec (1928, p. 102) made a new genus *Guyonia*, into which he placed *Doriopsis viridis* Pease, 1861, and his own species *flava*. In 1930, Mde. Pruvot-Fol (1930, p. 291) noted the distinctiveness of *Doriopsis* Pease. Thiele (1931, p. 291) lists *Ctenodoris* Eliot as a genus, queries *Guyonia* Risbec (p. 439), and follows earlier authors in erroneously placing *Doriopsis* as a synonym of *Dendrodoris*. From observations it is apparent that *Doriopsis* Pease, *Ctenodoris* Eliot, and *Guyonia* Risbec are genera established on the same character and are synonymous. The characters of *Doriopsis* are sufficiently explicit to establish the genus and it should therefore stand.

In respect of the species affected by this synonymy, *pecten* Eliot (1906, p. 557) appears similar to *flava* Risbec, but as Collingwood (1881, p. 126) had already described a *Doris pecten* from Formosa, obviously a *Doriopsis* like Eliot's species, Eliot's specific name is preoccupied by that of Collingwood. If his species is the same as *flava*, then a new specific name is not required for Eliot's species from the Maldives. If they are distinct, which seems doubtful, a new specific name must be given to Eliot's species, as *Doris (Doriopsis) pecten* Collingwood is specifically quite distinct from *Doriopsis pecten* (Eliot).

Pruvot-Fol (1930, p. 295) places *Doriopsis* in the family Archidorididae.

Doriopsis flava (Risbec), 1928.

(Plate xlii, figs. 3-4.)

Guyonia flava Risbec, 1928, pp. 103-4. New Caledonia.

Several specimens of an orange-yellow Dorid seem indistinguishable from *Guyonia flava* Risbec, in particular the black-spotted form (Risbec, Pl. i, fig. 9). Its characters are as follows:

Animal oblong-oval, slightly depressed, firm, mantle thickly studded with small, rounded, rather flattened pustules. Rhinophores rather small, retractile, and coarsely lamellated. Gills sixteen to twenty-six, simply pinnate, middle ones the largest, decreasing in size towards the sides of the gill cavity. They are retractile into a fairly large semicircular opening, the upper lamina of which can fold down over the lower lamina, which flanges out slightly, permitting the edge of the former to rest upon it. When extended the gills protrude through the slit between the two laminae, but when withdrawn only the tips of the middle gills may be seen. Rhinophores set fairly well back. Spicules in the mantle are long and solid. Undersurface smooth. Buccal area prominent, especially in spirit specimens. There is no buccal armature. The radula has about 45-50 rows of numerous, similar-shaped, simple teeth. The penis is unarmed.

Colour.—General colour bright orange-yellow, rhinophores yellow to burnt orange. Gills yellow. Pustules have fine black speckling over them, the speckles also forming a ring at the base of each pustule. In this respect the species resembles Risbec's variety rather than the true *flava*, which is uniform yellow. However, young specimens of this display much variation of the dark speckling, and they may possibly be regarded merely as variation and not varieties. Undersurface yellow.

Measurements.—One specimen, $1\frac{1}{2}$ inches long, $\frac{3}{4}$ inch broad. Other specimens measure $1\frac{1}{4}$ inches, $\frac{3}{4}$ inch, and $\frac{1}{2}$ inch long respectively. Under rocks at low tide in the Angourie Pool, 5th and 12th–13th June. A specimen was also collected in November, 1945, by Mrs. L. Woolacott in the same locality.

This species is occasionally found round Sydney and at scattered localities along the coast of New South Wales. It approaches very closely *Doriopsis flabellifera* (Cheeseman) [1880, p. 222] from New Zealand, from which I can see little difference, both in colouring and general structure. However, as the tendency of the northern New South Wales molluscan fauna is to bear relationship to tropical species, in particular those from New Caledonia, rather than to those from the colder New Zealand waters, I am accepting the Australian species as *flava* Risbec, with the anticipation that eventually *flabellifera* and *flava* may prove synonymous. In this event the species would possess a wide range, the New Zealand form being one of the representatives of warmer seas met occasionally amongst New Zealand mollusca. Should they prove the same species, *flabellifera* would have priority.

In the New South Wales species the zig-zag folds described on the vagina of *flabellifera* are not apparent. The number of gills does not seem a permanent or reliable character, as they vary considerably.

Doriopsis flava, in particular the New Caledonian forms, may bear relationship to *Doriopsis granulosa* Pease (1860, pp. 32–3) from the Sandwich Islands, but Pease's description is too brief to substantiate this. It has already been pointed out that *Doriopsis pecten* (Eliot)—not *pecten* (Coll.)—seems identical with *flava*.

Doriopsis viridis Pease, 1861.

(Plate xlii, fig. 5.)

Doriopsis viridis Pease, 1861, p. 244.

Doris pecten Collingwood, 1881, p. 126. North Formosa. (Not *pecten* Eliot, 1906.)

An inky blue, very small, firm animal, with its mantle studded with small pustules of a darker colour. Rhinophores strong, lamellated, light at base, dark blue club. Gills 9–11, simply pinnate, set in a semicircular-shaped pocket, situated well down towards the posterior end of the mantle; smaller at the sides, darker blue than the body colour. Undersurface paler blue. When the posterior portion of the mantle shrinks, the gills stand out as though they are on the edge of the mantle. When the animal is alive it has the habit of pulling in the posterior portion of the body in this manner. Head and oral folds are a dingy yellow-blue. Foot bluish-yellow.

Measurements.—Two specimens, 10 mm. long, 5 mm. broad.

Locality.—Under stones, on weed, low tide, Angourie Pool, 5th–13th June. Two more specimens were collected a few weeks later by Mr. Cameron, and in November, 1945, Miss G. Thornley collected another blue specimen in the pool. Until the specimens were found in 1941 it had not been seen in the locality. This provides its first record for the species in Australia.

Risbec (1928, p. 105) considers *pecten* Collingwood a synonym of *Doriopsis* (*Guyonia*) *viridis* Pease. Under the latter name he places two varieties of these quaint little Dorids from New Caledonia—variety (a) is blue and typical of *pecten* Collingwood, whilst variety (b) is dark green, which may be the true *viridis* Pease. Our specimens so far conform to the blue form, but it is a matter of conjecture whether *pecten*, typifying the blue form, stands as a distinct species, or variety of species, or whether it becomes synonymous, as being a colour variation only, of *viridis*.

Subfamily ARCHIDORIDINAE.

Genus *Archidoris* Bergh, 1878.

Archidoris Bergh, 1878, p. 616. Type, *Doris tuberculata*, Ald. & Han.

Archidoris cameroni, n. sp.

(Plate xlii, figs. 6-7.)

A very pretty, bright orange-yellow animal, with white gills and rhinophores, contrasting with the yellow colouring of the mantle. The upper surface of the animal is strongly ornamented with large, elevated, rounded pustules, with smaller ones between them, the top of each pustule being tipped with small blackish-brown spots, which give a dark speckled look to the whole surface. The rhinophores are conspicuous, lamellated, and in preservative are slightly retracted into their cavities which are guarded by four small pustules. The six gills are very bushy, tripinnate, and preservation has retracted them almost to the edge of the gill cavity. The foot is broad, the orals conspicuous, cylindrical and folded. The radula consists of about thirty or more rows of crowded, simply hamate teeth on each side of the rachis, the inner ones being smaller and more crowded. No labial armature could be found.

Colour.—As stated above. There is a large brown-black patch of colour along the central dorsal surface and a small patch immediately in front of the gills, which are slightly tipped with black. The undersurface is orange-yellow, the foot being slightly speckled with dark colour on the sides but not on the sole.

Measurements.—One specimen, 1 inch long, $\frac{1}{2}$ inch broad (crawling). When crawling, the tail extends beyond the posterior end of the mantle.

Locality.—Angourie Pool, 5th June. Under a weed-covered rock.

This species is referable to the genus *Archidoris*, but its specific status has been more difficult to determine. The only illustration it seems to approach is *Archidoris montereyensis* (Cooper) from Monterey, which appears too removed geographically to be applied to it with certainty. It does not agree with *Doris chrysoderma* or *Doris carneola* of Angas, although it is admitted the descriptions of both these species are brief, nor can it be identified with *Archidoris staminea* Basedow & Hedley, which was dredged in 20 fathoms, Backstairs Passage, South Australia. Bergh (1884, pp. 89-96) describes *Archidoris australis* from 95 fathoms, Kerguelen Is., but the Angourie species cannot be distinguished as that species.

As there appears to be no species with which this beautiful little nudibranch can be allied with certainty, I have given it the specific name *cameroni*, after the finder, Mr. A. A. Cameron.

Genus *Trippla* Bergh, 1877.

Trippla Bergh, 1877, p. 63; 1877, pp. 543-546; 1890, pp. 904-908; 1902, pp. 1098-9.

Trippla erinaceus (Angas), 1864.

(Plate xlii, figs. 8-10.)

Goniodoris erinaceus Angas, 1864, pp. 57-58. Port Jackson, N.S.W.

I can find no previous record of this species being placed in, apparently, its correct genus. It certainly is not a *Goniodoris*, and observations on the living animal, together with the description given by Angas, indicate its relationship to *Trippla*.

A single specimen collected at Angourie Pool, on the 4th June, is very like the illustration of the type. The whole upper surface consists of soft rounded pustules, heavily spiculose, giving the animal a hairy appearance. The rhinophores rise out of elevated spiculose sheaths, which resemble the pustules in shape. The six gills are very bushy, tripinnate, and partly retracted in preservation. The gill cavity is elevated almost to a point, its margins thin and slightly lobed. Foot is very broad, laminated at the anterior end.

Colour.—General body colour dark chocolate-brown with a reddish-purple tinge. A narrow, dull, orange-coloured streak runs down the dorsal centre of the mantle from between the rhinophores to the gills. Rhinophores are dark chocolate, white-

tipped. Gills very dark with a yellow line in the centre of each. Foot liver coloured with a reddish-tinge. Undersurface speckled between the mantle and foot, round the head and along the sole with tiny bluish-white speckles, which are also noticeable on the rhinophores.

Preservation has caused the specimen to become very soft, with smooth areas between the rounded pustules. The spicules on the pustules have shrunk to small protuberances. The colouring has changed to a dingy black-brown.

Measurements.—45 mm. long, 20 mm. broad (crawling).

Locality.—Angourie Pool.

Although collecting has been undertaken at different times in the type locality of this species, i.e., Garden Island, Port Jackson, the species seems very rare, and I have seen it only on one other occasion, alive. It has not been seen by Mr. Cameron previously. This is the most northerly record of the species to date.

I can see little difference, however, between this species and *Trippa ornata* Bergh (1877), recorded from Malay Archipelago, Philippines, Laccadives, and more recently from New Caledonia (Risbec). Beyond a more brownish tinge in *ornata*, the species seem close enough to suspect their synonymy, in which event *erinaceus* would take priority over Bergh's name. The fact that authors, in referring to *ornata*, omit reference to *erinaceus* leads one to suspect that they have overlooked the similarity of the two species. The apparent rarity of *erinaceus* along the New South Wales coast supports the view that this species, like several others of Angas, is a tropical form which has wandered into this State but is more environmentally suited to the Indo-Pacific. *T. ornata* seems, however, very close to *T. intecta* Kelaart (1859, p. 302). The three species may prove synonymous, in which event *intecta* appears to have slight priority.

Genus *Peronodoris* Bergh, 1904.

Peronodoris Bergh, 1904, pp. 44–45. Type, *P. cancellata* Bergh. Pacific.

Sclerodoris Eliot, 1904, p. 361.

Peronodoris Bergh apparently has priority over *Sclerodoris*, as recorded by Thiele (1931, p. 435). The animal has a hard texture, like *Platydoris*, but the dorsal surface is marked with various ridges and depressions, with pustule-like processes at their junctions or at intervals along the ridges. The surface has a granulose appearance, due to small bunches of tiny spicules over the entire area. There are no labial or genital armatures.

The genus *Sclerodoris* was established by Eliot for certain species, including *Doris apiculata* Ald. & Han., noting at the same time its resemblance to *Dictydoris* Bergh. Various workers find the diagnostic characters of *Dictydoris* and a near genus, *Halgerda* Bergh, so similar that they present no definite point by which they can be differentiated, although Thiele (1931, p. 436) lists them as separate genera. Eliot (1906, pp. 639, 645, 1000, 1002) later placed *apiculata* in *Halgerda* without reference to his own genus, a classification recorded later by O'Donoghue (1932, pp. 155–156).

In studying Alder and Hancock's original description and illustration of *apiculata* (1866, p. 122) and the excellent descriptions of several species of *Sclerodoris* by Eliot (1904, pp. 380–383), it appears that there are distinctive characters, in particular the fine but closely spiculose-granular surface of the species and the filaments of *apiculata*, which justified Eliot considering them different from *Dictydoris* generically and caused him to establish *Sclerodoris* which, unfortunately, is apparently preoccupied by *Peronodoris*. In neither *Halgerda* nor *Dictydoris*, in their true sense, is the granulated surface present, both of these genera being characterized by a smooth surface, although ridged; whereas in *Sclerodoris* the fine spiculose structure is apparent over the entire surface in all the species placed by Eliot in the genus and in the two species from New South Wales to be described below. If not a distinct genus, they at least form

a definite section in the *Halgerda-Dictydoris* group. More clarification of the group seems necessary.

In the meantime our two species are regarded as of the *Sclerodoris* type, as originally described by Eliot, but as pointed out above, this genus has become a synonym of *Peronodoris* Bergh.

Peronodoris apiculata (Alder and Hancock), 1866.

(Plate xli, figs. 22-23.)

Doris apiculata Ald. & Han., 1866, p. 122. East coast, India.

The likeness between the colour sketch of *apiculata* as supplied by Alder and Hancock (Pl. xxx, fig. 8) and the sketch of the live animal from Angourie is remarkable and leaves little doubt that they are the same species. Both they and *Peronodoris tuberculata* (Eliot) come close to *Doris incii* Gray, 1850, from Torres Strait, but their relationship cannot be established from the figure alone, as given by Gray (Vol. iii, Tab. 226). This latter species has not been recognized definitely from Australia since Gray recorded it.

A short description of our species is supplied for future reference.

The animal is elongate, leathery and hard to touch, rather elevated in the centre, flattened round the margin. The dorsal surface consists of a network of ridges, the more prominent ones intercrossed with shorter ones, giving a reticulate pattern to the surface. The ridges connect up prominent pustules, three conspicuous rows being on the central dorsal area. Smaller pustules are interspersed amongst them, but are always on ridges or, actually, at the junctions of ridges. About twelve pustules comprise each row on the central area. From the tops of some of these pustules the points of filaments, as indicated by Alder and Hancock, can be seen protruding in the preserved specimen, although these were not noticeable in the live specimens, as far as can be recollected. Over the whole surface is a dense granulation composed of minute bunches of tiny spicules.

The rhinophores are fairly large, but slender, and the six bushy, tripinnate gills are in a simple rounded gill cavity, the margin of which is slightly crenulated, due to the surface structure. The undersurface exhibits prominently the sponge-like reticulations described by Alder and Hancock. On breaking a piece of the mantle its undersurface is seen to be composed of masses of long, slender spicules. The medium-sized foot is laminated at the anterior end, with a grooved upper lamina. The orals are small and slender.

Colour.—General appearance is light creamy-brown. The actual body-colour, however, is lemon-yellow, with most of the smaller pustules tipped with rust colour and the larger ones white-tipped. The latter are most conspicuous against the darker background. The sunken spaces between the ridges on the dorsal surface are rich brown. The whole surface, in addition, is finely sprinkled with brown, and there are some small brown patches of colour round the mantle border. Rhinophores have cream stalks and rich brown clubs. Gills are creamy-yellow tipped with brown. The undersurface is lemon-yellow with some small brown spots round the mantle and foot edges and on the sole. The animal quickly loses its contrasting coloration in preservation, two small specimens becoming uniform lemon-yellow and the larger specimen a dingy yellow.

Measurements.—Two specimens, approximately the same size, 30 mm. long, 10 mm. broad (crawling). A larger specimen was found by Cameron in the Angourie Pool on 28th February, 1943. This measures, in spirit, 50 mm. long and 25 mm. broad.

Locality.—Angourie Pool, 6th June; Woody Head, 9th June. The specimen from the latter locality was slightly paler than the other.

The species seems very close to a species from Japan, described by Baba (1933, pp. 171-2) as *Halgerda japonica* Eliot.

Peronodoris tuberculata (Eliot), 1903.

(Plate xlii, figs. 11-14.)

Sclerodoris tuberculata Eliot, 1903, pp. 381-2. Zanzibar Harbour.

Somewhat similar in structure to *apiculata*, but tubercles are not so pronounced on the ridging, and the colouring is different entirely. In the spirit specimens the ridging appears the most conspicuous part of the dorsal surface of *tuberculata*, although pustules are present, but in *apiculata* both ridges and pustules are almost equally predominant.

The animal has the same hard, leathery texture as *apiculata*, the surface profusely granulated with minute bunches of tiny spicules. The dorsal surface is very elevated in the centre, with mantle margins somewhat flattened. Over the entire surface are small and large tubercles connected by ridges which, in the central area, are very strong, but become lower towards the margins. Between the ridges, in particular those on the central area, are deep depressions. One large depression is situated on the central dorsal line, a little more than midway between the rhinophores and gills, five along each side and one behind the gill. Smaller depressions occur between the ridges on other parts of the dorsal surface. The rhinophores are strong and there are eight bipinnate gills. The foot is fairly broad, but in preservation appears narrower in comparison with that on *apiculata*. Anterior end of foot laminated, grooved. Orals distinct, digitate. Radula has approximately 40 rows of about 50 simple teeth on each side of the rachis. There appears to be no labial or genital armature.

Colour.—The animal resembles a piece of greenish-brown sponge, similar to that among which it is found. A fine yellow dusting, like pollen, and dark brown patches of colour are scattered over the dorsal surface. Pustules and ridges are yellow, and the depressions between them are dark purplish-brown, with a conspicuous, almost black, spot in the centre of the floor of each large depression and in some of the smaller ones. The rhinophores and gills are orange-brown to tan-coloured and stand out conspicuously against the dark greenish-brown background. The undersurface is uniform deep orange, the mantle and sides of the foot being profusely speckled with brown. When alive and removed from its surroundings it is a very beautiful nudibranch.

Measurements.— $2\frac{1}{4}$ inches long, $1\frac{1}{4}$ inches broad (crawling). A single specimen.

Locality.—Angourie Pool, amongst self-coloured sponge, 13th June, 1941.

There seems to be no distinctive feature to separate this species from *tuberculata* Eliot. His species is not figured, but the colouring, size, eight gills, and general description conform to our specimen. Eliot (1906, p. 667) regarded it as possible that his species might be the same animal as that described by Kelaart (1859, pp. 303-4) as *Doris castanea*, from Ceylon. He formed this opinion after examining Kelaart's type and a coloured illustration of the species, which Eliot reproduces in his paper (Pl. xlii, figs. 6-7), but admitted the identity could not be proved at that time from the scanty material supplied. There seems little in Kelaart's description to establish this relationship definitely. However, although the colour sketch of the upper surface of Kelaart's species resembles that of our specimen to a very slight degree, the undersurface (fig. 7) is exactly like the colour sketch made of the Angourie species. Whether *tuberculata* Eliot is eventually to become a synonym of *castanea* Kelaart remains to be seen, as fresh material from the two type localities needs to be examined before this can be determined. In the meantime our species compares favourably with *tuberculata* and is identified as such.

In spirit the animal has become a greenish-slate colour, with the tips of the pustules and ridges much lighter in tone. The rhinophore openings are slightly

elevated and crenulated round the edges, but not adorned with the nine valve-like structures, as in Eliot's species. The gills have retracted completely, the edges of the cavity being slightly raised and crenulated, forming a small opening.

The above two species, *apiculata* and *tuberculata*, are recorded here for the first time from Australia.

Subfamily DISCODORINAE.

Genus *Kentrodoris* Bergh, 1876.

Kentrodoris Bergh, 1876, p. 413. *K. rubescens*, Philippines.

Animal soft, dorsal surface minutely pilose, mantle broad. Tripinnate gills. Upper lamina of anterior end of foot deeply cleft. No labial armature. Penis armed with a style.

Thiele (1931, p. 436) uses *Centrodoris*. Pruvot-Fol (1934, p. 220) uses the family Discodorididae and not family Dorididae, subfamily Discodorinae.

Kentrodoris funebris (Kelaart), 1859, p. 293.

(Plate xliii, figs. 10-12.)

Doris funebris Kelaart, 1859, p. 293. Ceylon.

Kentrodoris annuligera Bergh, 1876, pp. 423-427. Philippines.

Animal with wide, wavy mantle, very soft. Dorsal surface covered with deep, heavy, pilose growth, which breaks away easily. Foot wide anteriorly, deeply grooved, with upper lamina cleft, tapering to a much narrower tail. Orals slender, jaws absent, teeth simple, curved, fairly large. Gills large, tripinnate to quadripinnate, six in number. Structure otherwise as indicated by Kelaart and Bergh.

Colour.—Creamy-white ground-colour, ornamented with scattered, rounded patches of dark reddish-brown on the mantle and over the central dorsal surface, as figured by Bergh. The dark markings consist of heavy speckling on the pilose surface, ringed with dark colour. On the undersurface there is a regular row of separated spots along the sides and outer margin of the foot. Spots on the dorsal central area are larger than those elsewhere. In preservative the spots are black and the ground colour a dingy white.

Measurements.—Approximately $1\frac{1}{2}$ inches long, $\frac{3}{8}$ inch broad (crawling) but becomes almost circular in repose.

Locality.—Angourie Pool, June, 1941. In November, 1945, a very handsome specimen of this species was collected in the pool by Mrs. L. Woolacott, who prepared a colour sketch of it in the field. The ground-colour is white, and the spotting, rhinophores and gills a beautiful maroon-brown. According to various authors, the species varies from black to red-brown markings and a light fawn to white ground-colour. In preservative the spots on this specimen are now black.

In the study of this species a very interesting point has arisen. Bergh (p. 922) placed his species *annuligera* in with Cuvier's *Doris maculosa*, 1804, and Eliot (1906, pp. 649-650) follows this by listing it and *funebris* Kelaart (1859, p. 293) as synonyms of *maculosa* Cuv. He points out, and appears correct in this, that the species from Vanikoro, which Quoy and Gaimard identified as *maculosa* Cuv., does not look like it at all. Kelaart provides an interesting account of the egg-laying habits of his species. However, Pruvot-Fol (1934, pp. 220-223), in studying the Dorididae of Cuvier, has placed *maculosa* in the genus *Discodoris*, on the grounds that the granulations, typical jaws and teeth are those of that genus and not *Kentrodoris*. She reached this conclusion after a thorough anatomical study of Cuvier's type.

In identifying our species, however, which is undoubtedly the same as that named *annuligera* by Bergh and *funebris* by Kelaart, examination of the specimen has shown that it is definitely not a *Discodoris*, but is a *Kentrodoris*. The teeth are unlike those

of the former genus, but are similar to those of the latter; there are no jaws (a *Kentrodoris* characteristic); the anterior end of the foot is more deeply laminated than in *Discodoris*, the upper lamina is deeply cleft, and the structure of the dorsal surface is heavily pile-like, not granular, and remains that way to a considerable extent even in preservation. I had been doubtful of its synonymy with *maculosa*, in particular Quoy and Gaimard's specimen, although conscious that *funebria* and *annuligera* were undoubtedly the one species. Unfortunately our specimen is too soft and breakable to probe internally to any extent and, therefore, I was unable to locate a style to the penis, but the other characters show its affinity to *Kentrodoris* and conform to those given by Kelaart and Bergh. Alder and Hancock (1866, pp. 122-3) elaborate somewhat on Kelaart's description, pointing out that there is no jaw and the radula teeth are large and occasionally a bright grass green (teeth in our specimen are also large and are stained an orange tinge).

The species evidently cannot be allied to *maculosa*, but remains in *Kentrodoris*. The only species it is allied with is *annuligera*, over which it takes priority as the earlier name. As soon as possible it is hoped that a specimen of our species can be sent to Paris for comparison with the type of *Discodoris maculosa* (Cuvier).

This has proved one of the most interesting species in the collection. It is, in addition, one of the most handsome of the nudibranchs. Although it has been recorded as collected in Shark's Bay, Western Australia, by Péron, its appearance in the Angourie Pool provides the first record of the species from eastern Australia.

Genus *Discodoris* Bergh, 1877.

Discodoris Bergh, 1877, p. 61. Type, *D. boholiensis*. Bohol, Philippines.

Body subdepressed, rounded or oval, minutely granulated above, fairly soft. Margin of branchial aperture crenulated, bilabiated or stellate. Anterior margin of foot grooved, upper lamina divided. Labial armature present. Rachis bare, many simple teeth. Penis unarmed. Warm seas.

Discodoris nubilosa (Pease), 1871.

(Plate xlii, figs. 17-21.)

Doris nubilosa Pease, 1871, pp. 13-14. Society Islands. $6\frac{1}{2}$ inches.

Animal very large and handsome. Elongate-oval, subdepressed, fairly firm. When alive, the entire dorsal surface is closely covered with simple and branched papillae of various lengths, but after preservation these become more granular in appearance. Rhinophores fairly prominent, with a slight backward bend, and set in slightly raised cavities, papillose to the margin. Gills bushy, rather small in comparison with the size of the animal, retractile, tripinnate, six in number. The margin of the gill cavity is divided into six shallow papillose crenulations, not strong lobes as in *Platydoris*. Anal tube with star-shaped orifice.

The foot is medium-sized, approximately one-third the width of the whole under-surface. The anterior end is grooved rather deeply, the groove extending well down the side of the foot, but gradually dwindling in depth. Upper lamina extends slightly beyond lower lamina and is rather deeply cleft. The labial armature consists of a pair of narrow, elongated, horny-yellow jaws, composed of minute rods. The radula is wide and has about 30 rows of numerous simple teeth on each side of the bare rachis.

Colour.—In life the ground-colour is creamy-fawn, with splashes of mottled grey-brown over the dorsal surface. Some markings form large dark spots, outlined with a rather broad, darker ring. Down the dorsal central area in particular there are a number of these large, black, irregular spots. This marking should not be confused with that of *Kentrodoris maculosa*, however, as the two species are quite unlike. The gills have blackish-brown stems, with yellow branches, tipped here and there with

brown. Rhinophores are dark brown. The undersurface of the mantle is bluish-white, heavily blotched with large, very conspicuous, chocolate-brown spots, situated close together towards the foot, but becoming smaller and more separated towards the mantle edge, with a few very small spots between them. Each large spot has a dark ring and a small dark spot in the centre. The papillae on the dorsal surface are yellow. The entire sole and sides of the foot are heavily mottled with dark brown. The markings on the undersurface form a strong distinguishing feature.

Measurements.—One specimen, $4\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches broad (crawling). An immature specimen, one inch long, shows the heavy blotches on the sole of the foot, but the spots have not developed to the same degree on the undersurface of the mantle.

Locality.—Angourie Pool, under a large rock, 5th June. This species has not been seen in the district previously.

There are several named species, the characteristics of which are not clearly defined, but which come under consideration in the identification of this species. *Doris* (*Platydoris*) *infrapicta* Smith (1884, p. 91) from four fathoms, Queensland, superficially agrees with the Angourie species, and its locality might lend some support to this affinity. Several of Abraham's species, most notably *Doris inframaculata* (1877, p. 248) from Amboina, also approach our species, but again insufficient descriptions prevent their application with safety.

However, Pease (1871, pp. 13-14, Pl. 6) gives a full-size illustration of *Doris nubilosa* which, together with his clear description, leaves little doubt that the Angourie species is the same as that described by him from the Society Islands, although his species is slightly larger than ours. The two species have the same branched papillae, with simple ones between them, on the dorsal surface, the star-shaped anal orifice, and a very close similarity in their colour marking.

Some years ago I saw a specimen of this same species from the Great Barrier Reef and on that occasion, although only a brief consideration was given to its specific status, came to the conclusion that it most closely approached *nubilosa*. Although the species shows some variation from the characters as set out for the genus *Discodoris*, it has been so placed generically, since it has the labial armature, radula and unarmed penis of that genus. On the other hand, the branching papillose granulations seem more like the sculpture of *Thordisa* Bergh, 1877, whilst the rather deep slit in the upper lamina of the foot approaches *Kentrodoris* Bergh, 1876, but neither of these two genera possesses a labial armature.

The species known as *infrapicta*, which Smith put into *Platydoris*, may be the same, in which event *nubilosa* should have priority.

Discodoris palma Allan, 1933, pp. 448-9.

Discodoris palma Allan, 1933, pp. 448-9. Pussycat Bay, near La Perouse, Sydney, N.S.W.

Specimens of this species, collected at Shelly Beach, 6th June, and at Woody Head, 9th June, varied from dark rock colour to very pale grey or creamy-white, like sandstone. They were found at low tide amongst short weeds, on spongy growths, or flattened to the undersurface of rocks. In the latter position their colouring rendered them almost indistinguishable from the rocks. Those found on spongy growth were of a more pale yellow colour, resembling that growth.

The body is soft to feel, covered with small, elevated papillae, the upper surface mottled with darker, rounded patches of colour. In some specimens these formed a few rather irregular but inconspicuous rows down the central dorsal surface. The rhinophores are long and retractile, with pale bases, speckled white, and yellow, dark-speckled tips. Gills six, tripinnate, greyish, speckled with yellow. Foot broad, grooved anteriorly, orals linear. Sole and undersurface of mantle profusely speckled with a brown shade.

Measurements.—When crawling the average length is 2 inches, breadth 1 inch, but the animal becomes somewhat circular in shape when resting.

Although the animal is soft to feel, it is fairly firm, and when clinging to rocks is difficult to dislodge. Most of the specimens throw off portion of their mantle, as characteristic of the genus.

Subfamily DENDRODORIDINAE.

Genus *Dendrodoris* Ehrenberg, 1831.

Dendrodoris Ehrenberg, 1831, p. 94.

Soft animals, smooth or pustulose, with a suctorial buccal apparatus, and lacking jaws and radula. The mouth is a fine pore. Gills large, usually very bushy, and rarely number more than eight. Very abundant in the Indo-Pacific.

Dendrodoris denisoni (Angas), 1864.

(Plate xlii, fig. 16.)

Doris denisoni Angas, 1864, p. 45. Port Jackson.

Doridopsis gemmacea Ald. & Han., 1864, p. 126-7. India.

This species has been collected on several occasions previously by Mr. Cameron in the vicinity of the Clarence River Heads and has been found to undergo some variation in colouring. Our specimen was collected on the 12th June amongst short weed in the Angourie Pool. Preservation has robbed it of most of its colouring.

In the vicinity of the type locality, where it occurs at intervals, only small specimens—an inch or less in length—are usually found. As a general rule the Clarence River specimens are more than two inches long. The specimen from Angourie was one and a half inches long in a normal attitude. However, this may be purely coincidental, depending on the time of the year when the specimens are collected. The type locality is probably approaching the southernmost limits of the species' distribution, as it is obviously a tropical wanderer reaching colder waters.

The colour varies to some extent, so that the border of the mantle may be cream to bluish-grey, and the blue spots in the brown, lozenge-shaped areas on the dorsal surface may vary from brilliant peacock-blue to pale blue, and number from one to several in each area. The colouring of the gills and rhinophores may be light or dark yellow-brown. The typical soft pustules are present over the dorsal surface.

Bergh (1884, p. 694) was the first to recognize that *denisoni* Angas and *gemmaea* Ald. & Han. were synonymous, but placed them in the genus *Doriopsis* Pease, which has now been recognized as an entirely different genus from that first supposed. The acceptance of *Dendrodoris* to include many species hitherto placed in the genera *Doriopsis* and *Doridopsis* is now in general use.

Eliot (1907, pp. 91-92) doubtfully allies *Doridopsis gemmacea* Ald. & Han. with *denisoni* when recording the former species from Japan. Baba (1933, pp. 172-3) refers to a *Dendrodoris gemmacea* from Japan, about 70 mm. long. It is apparent that the two species are synonymous, with a wide Indo-Pacific range. *D. denisoni* has a few months' priority.

There are points of similarity, however, between the New Zealand species *Dendrodoris mammosa* (Abraham), 1877, and *denisoni* which suggest the possibility of a closer relationship than at present accepted. *Dendrodoris gunnamatta* Allan (1932, pp. 97-8), an inhabitant of the more muddy tidal flats round Sydney, is a species close to *denisoni*. The latter species is found along the rocky shore zone of our coast and does not frequent the muddy tidal flat.

Dendrodoris guttata (Odhner), 1917.

(Plate xlii, fig. 15.)

Doridopsis guttata Odhner, 1917, p. 62. North Western Australia.

A single specimen of a handsome little *Dendrodoris* can be identified as *Dendrodoris guttata* (Odhner), although its type locality is north Western Australia, and specimens have not been recorded previously from any intervening localities between there and the eastern coast of Australia. This is the first occasion on which *guttata* has been recorded from Australia since Odhner established his species. Baba (1933, p. 173) reports the species from Japan, where he says it is common in spring at Eisubana, Tomioka. It certainly has not proved to be common in Australia to date.

The Clarence River specimen appears to have only five gills, compared with six in Odhner's and Baba's species, but the number of gills in the Dorids does appear subject to variation. The animal is small, elongate, rounded at the ends. Surface smooth, yellow-red, with numerous, distinct black spots scattered over the upper surface, those at the sides of the mantle being slightly smaller than the centre spots. The rhinophores are rather stout, conspicuous, almost brick-red colour at their bases, with white tips. Between the white tip on each rhinophore and its stalk is a ring-like band of black. This colouring of the rhinophore forms a distinguishing characteristic. The five bushy tripinnate gills are yellow-red, slightly paler than the body colour, and are tipped with black. The undersurface is paler than the upper surface and is slightly more yellow round the head. The foot is broad.

Measurements.—Approximately 15 mm. long, 8 mm. broad (type specimen measured 8 mm. long, 3 mm. broad; Japanese specimen 20–30 mm. long).

Locality.—Shelly Beach, south of Angourie Point. Low tide, on a weed-covered rock, 6th June, 1941.

Dendrodoris nigra (Stimpson), 1855.*Doris nigra* Stimpson, 1855, p. 330.

This very soft, smooth-surfaced nudibranch is widespread in its distribution throughout the Indo-Pacific, but is subject to the same amount of colour variation that is noticeable in some other Indo-Pacific species, such as *Casella atromarginata*. Several colour varieties of *nigra*, previously regarded as distinct species, are now accepted as synonyms.

The usual colour is a rich velvety-black, with or without white or yellow speckling over the surface, and a white, yellow, blue or other coloured band running round the edge of the mantle. Similarly, the rhinophores and gills may be tipped with white, yellow or other colours. A bluish bloom is often observed over the animal. The mantle is usually wavy and graceful, and the gills large and bushy. It is a most beautiful animal when seen in its natural habitat.

In 1932 I named a variety of this species, *Dendrodoris melaena* (1932, pp. 98–99). Since then many colour variations of the species have appeared along the New South Wales coast and I have come to the conclusion that these merge into one another and am of the opinion now that *melaena*, whilst it has definite colouring, is only one of the shades found in the species *nigra* and is not a separate species or variety. That these colour variations can cause complications is demonstrated with the material collected at Angourie alone. The species was very common in the pool, where it was found breeding on several occasions and, whilst the majority of the specimens ranged from a smoky black to deep black, with the usual amount of variation in spotting and coloured border, some lacked the latter and others had the mantle much reduced in width. A few specimens were almost liver coloured.

There was one colour variation, however, which resembled Bergh's colour sketch of *Dendrodoris nigra* var. *luteo-punctata* (1905, pp. 170–172), and as the distinguishing

features of this seem constant at present, the species has been named as such. The mantle was not so wide as in typical forms of *nigra*. The colouring was liver-brown and small yellow dots were scattered over the dorsal surface, many of them clustered into rosette-like bunches down each dorsal side. A blue border outlined the dorsal surface of the mantle. The gills and rhinophores were dark blackish-brown, tipped with yellow, and the foot a dingy pale orange with a few black spots. This particular specimen measured $1\frac{1}{4}$ inches long and $\frac{3}{4}$ inch broad, but the typical *nigra* may be two inches or more in length. As the colouring of Bergh's species, which is an East Indian form, and this variety from Angourie seem identical, the latter may be regarded as *nigra* var. *luteo-punctata* Bergh.

Family TETHYIDAE.

Genus *Melibe* Rang, 1829.

Melibe Rang, 1829, p. 129.

Animal with large head expanded into a veil, fringed round the margin. Rhinophores retractile into large sheaths. Back with leaf-like or other shaped papillae down the side, no distinct gills. Jaws, but no radula.

Melibe australis (Angas), 1864.

(Plate xliii, figs. 8-9.)

Melibaea australis Angas, 1864, pp. 62-63. Port Jackson, N.S.W.

A single specimen of this species was found in the Angourie Pool on the 4th June. Only once previously have I seen this species alive, and that was procured in the type locality. This is the first occasion on which Mr. Cameron had seen it, and apparently Angourie may be regarded as its most northerly record to date.

The species differs in no way from the Sydney one. The body is fleshy-white in life, elongate, with head expanded into a large cup-like veil, and tapering to a pointed tail posteriorly. Mouth is large, rounded. Rhinophores stand out from the veil and are retractile into long, trumpet-shaped sheaths. Margin of mantle veil is serrated. Body is marked down the dorsal centre with reddish-brown patches, principally between the protuberances and along their stalks.

There are no distinct gills, but there are a row of about four large, orange-yellow, puff-like protuberances along each side of the dorsal surface. These are the most conspicuous part of the animal. They are pitted with small holes and when on the rock the species looks very like a piece of yellow sponge. A few indistinct protuberances are situated between the principal ones, and it is obvious that the species has the ability to replace lost protuberances with new growths. While examining the live animal one of the protuberances fell off but showed considerable movement after it had become detached.

The small holes in the protuberances are arranged in about 3-4 rows. One hole in the centre is larger than the others. In preservative the protuberances appear pustulose and the sides of the body and the veil are definitely pustulose, although the pustules were not conspicuous when the animal was alive. The mouth is wide and, when opened out, is laminated longitudinally for some length. There appear to be no jaws and a radula is absent.

The animal measured 26 mm. in length.

In their enumeration of the known Australian species of nudibranchs, Basedow and Hedley (1905, p. 137) have placed *Melibe australis* Angas in the genus *Doto* Oken, 1812 (fam. Dotonidae). Thiele (1931, p. 449), on the other hand, records *Doto* as a synonym of *Idulia* Leach, 1852 (fam. Idulidae). Alder and Hancock (1846, pt. 2, fam. 3) point out that *Melibe* differs from *Doto* in having the large funnel-shaped veil fringed inside, and a proboscis-like mouth (which *australis* has). Thiele mentions a

jaw plate being present in *Melibe* but absent in *Tethys* Linné (1758), 1767, the other genus of the family, but our species seems more allied to *Melibe* than to *Tethys*. Its proboscis-like, laminated mouth and other characters definitely remove it from *Idulia* (= *Doto*), which has jaws and radula, and may require it to be removed later altogether from either *Melibe* or *Tethys*. The genus *Melibe* is the one into which it most conveniently falls at present, and the species is therefore being left as Angas placed it. In any event the species should not be placed in the family Dotonidae and is removed to its more correct family, Tethyidae.

No other species of the Cladohepatica nudibranchs exhibits the peculiar puff-like type of protuberances characteristic of *australis*.

Family AEOLIDIIDAE.

Subfamily AEOLIDIINAE.

Genus *Baeolidia* Bergh, 1888.

Baeolidia Bergh, 1888, pp. 777-8. *B. moebii*. Mauritius.

A genus characterized by the peculiar structure of the rhinophores. These are conspicuously ornamented with crowded knobs, arranged, more or less, in rings round the rhinophores. The cerata are flat and leaf-shaped. Only a few species known.

Baeolidia major Eliot, 1903.

(Plate xliii, figs. 1-7.)

Baeolidia major Eliot, 1903, pp. 252-3. Zanzibar.

This species was collected on a previous occasion in the Angourie Pool by Mr. Cameron and sent to the Museum. The notes and illustrations prepared by myself at that time are therefore included in this paper. The species was not seen during the June, 1941, collecting trip. The type locality of the species being Zanzibar, it is interesting to note that Baba (1933, p. 178) has found it in Japan. This first record of *major* from South-western Pacific waters not only widens its distribution, but adds a very interesting genus and species to the Australian list.

The animal has an elongated, narrow body with rows of leaf-like cerata down each side and extending inwards over the dorsal surface. These are easily dislodged and are replaced with new growths. The conspicuous rhinophores are covered throughout their length with pronounced knobs. The radula consists of about 32 pectinate teeth, the unusual shape of which is typical of the genus, and can be understood by reference to the illustration (fig. 5). The jaws are large, thin, and simple. The reproductive orifice is below the first row of cerata on the right side of the body, and the lateral vent below the second row, from the anterior end of the animal (fig. 3).

Colour.—General colour rather indefinite, light greyish-brown with some mottling. Cerata with bluish tinge, merge into pinkish-purple towards the points of attachment. Rhinophores showed signs of mottling and the foot was white. In its colouring the species seems to approach variety *ornata* Eliot (p. 254), but is probably only a slight colour variation of the typical *major*.

Measurements.—Three specimens, two of approximately 1½ inches in length and the third specimen slightly smaller.

Locality.—Angourie Pool, crawling on sand and stone in the bottom of the pool at low tide, 4th January, 1939.

References.

- Abraham, P. S., 1877.—*Proc. Zool. Soc. Lond.*
 Adams, A., 1861.—*Ann. Mag. Nat. Hist.*, Ser. 3, Vol. viii.
 Alder and Hancock, 1846.—*Monograph of British Nudibranchiate Mollusca*, part II, fam. 3, Gen. 12.
 ———, 1864.—*Trans. Zool. Soc. Lond.*, Vol. v.

- Allan, J., 1932.—*Austr. Zool.*, Vol. vii, pt. 6.
 ———, 1933.—RECORDS AUSTRALIAN MUSEUM, Vol. xviii, No. 9.
 ———, 1937.—In Whitley, *Austr. Zool.*, Vol. viii, pt. 4.
 ———, 1940.—See Iredale, T., and J. Allan.
 Angas, G. F., 1864.—*Journ. de Conchyl.*, 3rd Ser., Vol. xii.
 Baba, K., 1933.—*Annot. Zool. Japon.*, Vol. xiv, No. 1.
 ———, 1935.—*Sci. Rep. Tohoku Imp. Univ.*, 4th Ser., Biol., Vol. x.
 ———, 1938.—*Kyusyu Imper. Univ., Journ. Dept. Agric.*, Vol. vi, No. 1.
 Basedow, H., 1905.—*Trans. Roy. Soc. S. Austr.*, Vol. xxix
 Bergh, R., 1871-1904.—*Malacologische Untersuchungen in Semper Reisen im Archipel der Philippinen*.
 ———, 1873-4.—*Journ. des Museum Godeffroy*, Bd. 1, Heft 2, Hamburg.
 ———, 1884.—*Report Sci. Res. "Challenger"*, Zool., Vol. x.
 ———, 1887.—*Jahrb. d.d. Malakol. Ges.*, iv.
 ———, 1905.—"Siboga" *Expeditie*, mon. L.
 Cheeseman, T. F., 1880.—*Trans. N.Z. Institute*, Vol. xiii.
 Collingwood, C., 1881.—*Trans. Linn. Soc. Lond.*, Zool., Ser. 2, Vol. ii, No. 2.
 Crosse, J., 1872.—*Journ. de Conchyl.*, 3rd Ser., Vol. xx.
 Cuvier, G., 1804.—*Ann. du Mus. nat. de Histoire naturelle*, iv.
 Ehrenberg, C. G., 1831.—*Symbolae physicae*. Mollusca.
 Eliot, C., 1903-6.—*Proc. Zool. Soc. Lond.*
 ———, 1905.—*Journal of Conchology*, Vol. xi, Nos. 8-9.
 ———, 1906.—*Fauna and Geography of the Maldive and Laccadive Archipelagoes*, Vol. ii, No. 1.
 ———, 1906.—*Journ. Mar. Biol. Assn.*, Vol. vii, No. 3.
 ———, 1907.—*Journal of Conchology*, Vol. xii, No. 3.
 ———, 1907.—*Proc. Malac. Soc.*, Vol. vii, No. 6.
 ———, 1908.—*Journ. Linn. Soc. Lond.*, Zool., xxxi, No. 204.
 Hedley, C., 1893.—*Natural Science*, Vol. iii.
 ———, 1905.—See Basedow.
 Iredale, T., 1929.—*Austr. Zool.*, Vol. v, pt. 4.
 Iredale, T., and Allan, J., 1940.—*Austr. Zool.*, ix, pt. 4.
 Iredale, T., and O'Donoghue, C., 1923.—*Proc. Malac. Soc.*, Vol. xv, pt. 4.
 Kelaart, E. F., 1859.—*Ann. Mag. Nat. Hist.*, 3rd Ser., Vol. iii.
 Odhner, N., 1917.—*Kungl. Svensk. Vetensk. Handl.*, Bd. 52, No. 16.
 O'Donoghue, C., 1923.—See Iredale, T., and C. O'Donoghue.
 ———, 1932.—*Proc. Malac. Soc.*, Vol. xx.
 Orbigny, A. D. d., 1839.—In *Webb et Berthelot, Histoire naturelle des Iles Canaries*, Vol. ii, Pt. 2, Moll.
 Pease, W. H., 1860.—*Proc. Zool. Soc. Lond.*
 ———, 1861.—*Proc. Zool. Soc. Lond.*
 ———, 1866.—*Amer. Journ. Conch.*, Vol. ii, No. 3.
 ———, 1870-1.—*Amer. Journ. Conch.*, Vol. vi, pt. 4.
 ———, 1871-2.—*Amer. Journ. Conch.*, Vol. vii, pt. 1.
 Pruvot-Fol, A., 1930.—*Bull. Mus. Hist. Nat.*, Ser. 2, Tom. ii, No. 3.
 ———, 1934.—*Journ. de Conchyl.*, Vol. lxxviii, No. 4.
 Quoy and Gaimard, 1832.—*Voyage de "l'Astrolabe"*, Zool., ii.
 Rang, P. K. S. L., 1829.—*Manuel de l'Histoire naturelle des Mollusques*.
 Risso, 1818.—*Journ. de Phys.*
 Risbec, J., 1928.—*Contribution a l'Étude des Nudibranches Néo-Caledoniens*, Paris.
 Rüppell, E., and Leuckart, F., 1828.—*Neue wirbellose Thiere des Rothen Meeres*, in *Rüppell, Atlas zu der Reise im nördlichen Afrika*.
 Smith, E. A., 1884.—In report on *Zoological Collections, "Albert"*.
 Stimpson, 1855.—*Proc. Acad. Philad.*, vii.
 Thiele, J., 1929-35.—*Handbuch der syst. Weichtierkunde*, Teil ii.
 Van Hasselt, J. C., 1824.—*Bull. Sci. Nat.*, iii.
 Winckworth, H. C., 1946.—*Proc. Malac. Soc.*, Vol. xxvi, pt. 6, p. 155-160.

EXPLANATION OF PLATES.

Plate xli.

- Fig. 1.—*Cyerce nigra* var. *ocellata* Bergh. Complete animal.
 Fig. 2.—*Cyerce nigra* var. *ocellata* Bergh. Ventral surface of head region.
 Fig. 3.—*Cyerce nigra* var. *ocellata* Bergh. Both sides of a single cera to show position of coloured spots.
 Fig. 4.—*Glossodoris bennetti* (Angas).
 Fig. 5.—*Glossodoris inornata* (Pease). Dorsal view.
 Fig. 6.—*Glossodoris inornata* (Pease). Side view.
 Fig. 7.—*Elysia marginata* (Pease). Side view.
 Fig. 8.—*Glossodoris decora* (Pease). Dorsal view of complete animal.
 Fig. 9.—*Glossodoris decora* (Pease). Ventral view of anterior end of animal.
 Fig. 10.—*Glossodoris decora* (Pease). Outline of white markings on the dorsal surface, as seen in preserved specimen.
 Fig. 11.—*Glossodoris daphne* (Angas). Dorsal view.
 Fig. 12.—*Glossodoris daphne* (Angas). Ventral view of portion of animal showing head region and coloured border on undersurface of mantle.
 Fig. 13.—*Glossodoris daphne* (Angas). A single gill.
 Fig. 14.—*Glossodoris geometrica* (Risbec). Dorsal view.
 Fig. 15.—*Glossodoris mariei* (Crosse). Dorsal view.
 Fig. 16.—*Glossodoris lineolata* (Van Hasselt). Side view of animal crawling.
 Fig. 17.—*Glossodoris lineolata* (Van Hasselt). Ventral view of portion of animal.
 Fig. 18.—Rhinophore of *Glossodoris reticulata* (Pease).
 Fig. 19.—*Glossodoris reticulata* (Pease). Dorsal view.
 Fig. 20.—*Glossodoris reticulata* (Pease). Ventral view to show head and coloured borders to foot and mantle.
 Fig. 21.—*Casella atromarginata* (Cuvier). Side view.
 Fig. 22.—*Peronodoris apiculata* (Ald. & Han.). Side view.
 Fig. 23.—*Peronodoris apiculata* (Ald. & Han.). Ventral surface to show position of coloured spots and sponge-like reticulation.

Plate xlii.

- Fig. 1.—*Doris (Staurodoris) pustulata* Abraham. Dorsal view.
 Fig. 2.—*Doris (Staurodoris) pustulata* Abraham. Ventral view of portion of animal.
 Fig. 3.—*Doriopsis flava* (Risbec). Dorsal view.
 Fig. 4.—*Doriopsis flava* (Risbec). Few pustules from the dorsal surface to show shape and position of colour markings.
 Fig. 5.—*Doriopsis viridis* Pease. Dorsal view.
 Fig. 6.—*Archidoris cameroni*, sp. nov. Side view.
 Fig. 7.—*Archidoris cameroni*, sp. nov. Few enlarged pustules from dorsal surface to show shape and spotting.
 Fig. 8.—*Trippa erinaceus* (Angas). Dorsal view.
 Fig. 9.—*Trippa erinaceus* (Angas). Ventral surface of head region.
 Fig. 10.—*Trippa erinaceus* (Angas). A single spiculose tubercle from the dorsal surface.
 Fig. 11.—*Peronodoris tuberculata* (Eliot). Dorsal surface.
 Fig. 12.—*Peronodoris tuberculata* (Eliot). Ventral surface of portion of animal.
 Fig. 13.—*Peronodoris tuberculata* (Eliot). Bunches of spicules which closely cover the dorsal surface of the animal. In preservation these have become granular in appearance.
 Fig. 14.—*Peronodoris tuberculata* (Eliot). Side view to show elevated dorsal area and arrangement of ridges.
 Fig. 15.—*Dendrodoris guttata* (Odhner). Dorsal view.
 Fig. 16.—*Dendrodoris denisoni* (Angas). Side view.
 Fig. 17.—*Discodoris nubilosa* (Pease). Dorsal view.
 Fig. 18.—*Discodoris nubilosa* (Pease). Portion of ventral surface to show position and nature of coloured spotting.
 Fig. 19.—*Discodoris nubilosa* (Pease). A single coloured area to show broad banded outline and dark spot in centre.
 Fig. 20.—*Discodoris nubilosa* (Pease). A few simple and compound filaments from the dorsal surface.
 Fig. 21.—*Discodoris nubilosa* (Pease). Teeth from the radula.

Plate xliii.

- Fig. 1.—*Baeolidia major* Eliot. Dorsal view of preserved animal. The cerata have fallen off, but their points of attachment may be seen along the sides of the body.
 Fig. 2.—*Baeolidia major* Eliot. Typical cerata from the animal.

Fig. 3.—*Baeolidia major* Eliot. Portion of the dorsal right side to show position of reproductive organs (below the first row of cerata) and the lateral vent below the second row from the anterior end of the animal.

Fig. 4.—*Baeolidia major* Eliot. Ventral surface of anterior end of animal, showing head tentacles, knobbed rhinophores, buccal area, and grooved, winged anterior end of foot.

Fig. 5.—*Baeolidia major* Eliot. Serrated tooth from the radula.

Fig. 6.—*Baeolidia major* Eliot. Side view of radula, as in position.

Fig. 7.—*Baeolidia major* Eliot. The inner and outer view of the jaw.

Fig. 8.—*Melibe australis* Angas. Dorsal view of complete animal.

Fig. 9.—*Melibe australis* Angas. Portion of the buccal area showing elongated laminations on the inside of the proboscis-like structure extending from the mouth.

Fig. 10.—*Kentrodoris funebris* (Kelaart). Side view.

Fig. 11.—*Kentrodoris funebris* (Kelaart). Portion of ventral surface to show nature of spotting and pile-like granulation.

Fig. 12.—*Kentrodoris funebris* (Kelaart). Teeth from radula.

Note.—With the exception of *Baeolidia major* Eliot, the illustrations, other than anatomical, were prepared from the living animals and were originally in colour.

Joyce Allan, *del.*

