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SOME GASTROPODS FROM MADAGASCAR AND WEST MEXICO [1]

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ABSTRACT

This paper deals with 43 species of marine gastropods, mostly opisthobranchs (but also 1 lamellariacean and 3 onchidiaceans) from Madagascar and from the Gulf of California. Anatomical descriptions are given for the various species. Three species were recognized to be common to both collections; these represent taxa occurring in circumtropical-warm seas. The following new species are described: *Smaragdinella kirsteueri, Stiliger (Stiliger) erbsus, Hypselodoris regina* and *Noumeaella isa* (from Madagascar), and *Elysia vreelandae* (from West Mexico). The new name *Stiliger (S.) raorum* substitutes *S. (S.) nigrovittatus* Rao & Rao, 1963. The opisthobranchs of Madagascar belong to the rather homogeneous Indo-Pacific reef fauna, while those from the Gulf of California live in areas largely devoid of coral reefs, but containing an admixture of Panamic and American temperate Pacific faunal elements.

INTRODUCTION

The present paper treats 30 species from Madagascar as Part XI of the Austrian Indo-west Pacific Expedition 1959/1960, and 13 species from the Gulf of California. Five new species are described, of which 4 are from Madagascar.

Benthonic animals of shallow water from these regions are separated by Ekman's East Pacific Barrier (Emerson, 1967). Only 3 species, which occur in all warm seas, are represented in both collections. Comparative morphological studies of opisthobranchs indicate that many species, especially nudibranchs, have extensive geographical ranges. Several species are known to occur in more than one zoogeographical province and some species of nudibranchs are apparently circumtropical in distribution. Therefore, a combined publication of zoologically allied, though geographically separate collections, facilitates faunal comparisons. The opisthobranchs of Madagascar belong to the rather homogeneous Indo-Pacific reef fauna, but those from the Gulf of California live in areas largely devoid of coral reefs. There, species of restricted or wide distribution in the Panamic faunal province meet with others of the American temperate Pacific fauna. The Panamic province is related to the Caribbean, and the American temperate Pacific fauna includes Japanese elements.

Although most of the species in the present collections are opisthobranchs, the first species treated belongs to the Lamellariacea. These are traditionally collected and studied together with opisthobranchs. Our 4 last species are Onchidiacea. Van Mol (1967) re-established the subclass Pulmonata in a recent study of the cerebral ganglion in Basommatophora, Stylommatophora, and

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Soleolifera, so the Onchidiacea are separated from the Opisthobranchia again, if one follows that author.

The types and some of the other material in this article are deposited in the Department of Living Invertebrates of The American Museum of Natural History.

MATERIALS

Collecting stations from Madagascar, 1959 (Ernst Kirsteuer)

viii Tanikely, *Porites* cf. *iwayamaensis*, 2.5 meters, June 25.
ix Tanikely, *Seriatopora angulata*, 2 meters, June 26.
x Tanikely, *Porites* cf. *iwayamaensis*, 2.5 meters, June 27.
xi Tanikely, *Seriatopora angulata*, 2.5 meters, June 29.
xiii Tanikely, *Seriatopora angulata*, 2.5 meters, July 1.
xiv Tanikely, *Seriatopora angulata*, 3 meters, July 2.
xvi Tanikely, *Seriatopora angulata*, 4 meters, July 4.
xviii Tanikely, tide pool, coarse sand and fragments of coral, under stones, 0.2 meter, June and July.
xix Tanikely, *Millepora tenella*, 4.5 meters, July 8.
xxi Tanikely, *Acropora corymbosa*, 2.5 meters, July 13.
xxii Tanikely, *Acropora corymbosa*, 2 meters, July 14.
xxiv Tanikely, *Acropora pharaonis*, 3 meters, July 16.
xxvi Nossi Iranja, southwest coast, under stones and dead coral, low intertidal zone, Nov. 24.
xxvii Tanikely, *Acropora pharaonis*, 2 meters, Dec. 3.
xxviii Tanikely, *Acropora corymbosa*, 3 meters, Dec. 4.
xxix Tanikely, *Acropora corymbosa*, 2.5 meters, Dec. 5.
xxx Tanikely, *Seriatopora angulata*, 2 meters, Dec. 6.
xxxi Tanikely, *Seriatopora angulata*, 2 meters, Dec. 7.
xxxii Tanikely, *Millepora tenella*, 2 meters, Dec. 8.
xxxiii Tanikely, *Porites* cf. *iwayamaensis*, 3.5 meters, Dec. 10.
xxxvi Tanikely, *Gracilaria* species, 3 meters, Dec. 13.
xxxvii Tanikely, *Millepora tenella*, 4 meters, Dec. 14.
xliii Nossi Be, Bay of Ambanoro, in front of the institute, sand under stones, low intertidal zone, Dec.
xlv Nossi Be, Bay of Ambanoro, mud with sand, 20 meters, Dec. 29.

Collecting stations from Mexico, Gulf of California

i Mexico, Sonora, Puerto Peñasco
ii Mexico, Sonora, San Agustin = El Sahuaral
iii Mexico, Sonora, Guaymas, latitude 27° 59' N, longitude 110° 58' W.
iv Mexico, Baja California, Cabo Pulmo, latitude 23° 22' N, longitude 109° 28' W.

SYSTEMATIC ACCOUNT

List of species

Prosobranchia, Monotocardia, Mesogastropoda, Lamellariacea, Lamellariidae
1. *Coriocella nigra* Blainville 1824

Euthyneura, Opisthobranchia, Cephalaspidea, Bullacea, Atyidae
Atys spec. juv.

Cephalaspidea, Philinacea, Smaraginellidae
2. *Lathophthalmus smaragdinus* Rüppell & F. S. Leuckart 1828
3. *Smaragdinella kirsteueri*, spec. nov.
Philine spec., juv.

Cephalaspidea, Philinacea, Aglajidae
4. *Chelidonura punctata* Eliot 1903
5. *Chelidonura inermis* (Cooper 1862)

Anaspidea, Aplysiidae
6. *Aplysia* (*Pruvotaplysia*) *parvula* Mörch 1863
7. *Dolabella auricularia* (Solander 1786)
8. *Dolabrifera dolabrifera* (Rang 1828)
9. *Stylocheilus longicauda* (Quoy & Gaimard 1824)

Ascoglossa, Elysiacea, Stiligeridae
10. *Stiliger* (*Stiliger*) *erbsus*, spec. nov.

Ascoglossa, Elysiacea, Elysiidae
11. *Elysia vreelandae*, spec. nov.

Notaspidea, Pleurobranchacea, Pleurobranchidae
12. *Berthellina cuvieri* (Bergh 1898)

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Conualevinae
13. *Conualevia marcusi* Collier & Farmer 1964

Doridoidea, Eudoridacea, Cryptobranchia,

Dorididae, Chromodoridinae
14. *Chromodoris quadricolor* (Ruppell & F. S. Leuckart 1828)
15. *Chromodoris norrisi* Farmer 1963
16. *Hypselodoris regina,* spec. nov.

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Aldisinae
17. *Rostanga pulchra* MacFarland 1905

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Archidoridinae
18. *Atagema osseosa* (Keelart 1859)
19. *Trippa intecta* (Keelart 1858)

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Discodoridinae
20. *Taringa aivica timia* Marcus 1967
21. *Tayuva ketos ketos* Marcus 1967

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Halgerdinae
22. *Asteronotus cespitosus* (van Hasselt 1824)

Doridoidea, Eudoridacea, Cryptobranchia, Dorididae, Platydoridinae (=Arginae)
23. *Platydoris scabra* (Cuvier 1804)

Doridoidea, Eudoridacea, Phanerobranchia, Nonsuctoria, Gymnodorididae
24. *Gymnodoris bicolor* (Alder & Hancock 1864)

Doridoidea, Porostomata, Dendrodorididae
25. *Dendrodoris nigra* (Stimpson 1855)
26. *Dendrodoris rubra* (Keelart 1858)
27. *Dendrodoris pudibunda* (Bergh 1879)

Doridoidea, Porostomata, Phyllidiidae
28. *Phyllidia (Phyllidia) varicosa* Lamarck 1801
29. *Dermatobranchus (Dermatobranchus) striatus* van Hasselt 1824

Eolidoidea, Pleuroprocta, Flabellinidae
30. *Coryphellina rubrolineata* O'Donoghue 1929

Eolidacea, Cleioprocta, Favorinidae
31. *Favorinus mirabilis* Baba 1955
32. *Pteraeolidia janthina* (Angas 1864)
3. *Noumeaella isa,* spec. nov.

Eolidacea, Cleioprocta, Aeolidiidae
34. *Aeolidiella indica,* Bergh 1888

Soleolifera, Onchidiacea, Onchidiidae
35. *Peronia peronii* (Cuvier 1804)
36. *Peronia verruculata* (Cuvier 1830)
37. *Hoffmannola hansi* Marcus 1967
38. *Onchidella hildae* (Hoffmann 1928)

Lamellariacea

Coriocella nigra Blainville 1824 (Figs. 1-9)

Coriocella nigra Blainville, 1824, p 259; 1825, p 466, pl. 42, fig. 1.

Range: Mauritius.

Collecting station: Madagascar; xxviii, 1 male.

Description: In life, the present specimen was 15 to 18 mm long, 8 to 10 mm broad, smooth, and uniformly black with whitish-yellow, granulated tentacles. In the preserved specimen a little pigment is present in the folds of the mantle, near the snout, and from the under side of the mantle onto the back of the foot. The surface of the mantle has about 5 bosses, evidently produced by contraction of the cutaneous muscles. One of the bosses lies over the apex of the shell (ax). The conchinous shell has about 3 whorls; the measurements are: length 10 mm, breadth 6.3 mm, length of aperture 8.5 mm. The blackish calcareous layer of the shell is shivered as generally in preserved *Coriocella.*

The inhalant siphon (er) lies in the middle. The triangular tentacles are smooth, not furrowed. They bear the brown eyes in a knob near the base. The anterior border of the foot is transversely grooved (vo). The mantle skirt is thin, its epidermis rich in gland cells. The osphradium (om) has at least 30 leaflets of equal length on either side of the broad rhachis. The food in the gut contains alcyonarian sclerites. The penis is rudimentary, only a hemispherical wart, 930 μ high and 200 μ in diameter at its base. The seminal duct (d), 35 μ in diameter, courses straight within the muscle layers of the body wall. In Bergh's much larger snails (1886, p 222, 225) it serpentines.

The jaws measure 1.4 by 1 mm. The radula has 48 rows. The left limb of the rhachidian tooth is 230 μ long, the right one 155 μ; the cusp is either median or inclined to the right or left. On either side it bears 4 to 6 denticles. The laterals are 380 μ high, their cusp has 3 to 6, generally 4, coarse teeth on the inner side, 6 to 12 (sometimes up to 17) finer teeth on the outer side.

Remarks: For synonomy and range we limit ourselves to Bergh (1886, p 176) who called the species *Chelyonotus tonganus* var. *mauritiana,* and synonomized *Marsenia berghi* from Mauritius and Rèunion with it. Later (1908b, p 107) he united the latter with *C. semperi*, considered an independent species in 1886 and 1905b. In 1908b Bergh questioned the specifity of *C. semperi.*

Vayssière's *Chelyonotus niger* (1912, p 118) possibly belongs to the present species in which case its distribution would extend to the Gulf of Aden. But the symmetrical rhachidian tooth of Vayssière's material differs from that in ours. Whether or not Adam & Leloup's "? *Lamellaria* (*Coriocella*) *mauritiana* Bergh" (1938, p 141) from the Aru Islands belongs to *C. nigra* cannot be judged.

Scaphandracea
Atys species, juvenile
(Figs. 10-15)

Collecting station: Madagascar; xxvii.

Description: The living snail was 1.5 to 2 mm long, 1 mm thick. Its narrow head shield was 0.8 mm long and slightly notched behind. The parapodia lay to the sides of the head shield and touch a little distance behind it, like in other species of *Atys* (Ostergaard, 1955, fig. 1; Macnae, 1962b, fig. 1). In the present juvenile only a small part of the shell, as well as the posterior mantle lobe, projected from the parapodia. The living specimen was bluish-white. On the head shield, parapodia and mantle lobe there were opaque snow-white spots, in the region of the shell brown dots. The light yellowish-brown Hancock's organs, the gizzard of the same color behind the head shield, and the dark eyes are recognizable in the drawing of the collector.

In the preserved snail the head shield and parapodia are contracted forward, and the shell stands out behind. In front the jaw plates project from the mouth. The notch of the head shield is deepened. Under the head shield lie the inconspicuous transverse folds of the Hancock's organs, whose hind ends are united by a fold over the back. On the right side runs the seminal groove; the penis is not developed yet. The sole is not set off from the parapodia; a transverse fold in its anterior $\frac{1}{3}$ is probably due to contraction. The general color of the preserved snail is brown, the digestive gland is green. The shell which lies on the mantle border is completely decalcified. The preserved conchinous layer, 1 mm long, shows a protruding sinistral larval shell of 1 whorl. The following dextral whorl is widened to the front and backward; the growth lines run parallel to the border, whose outer lip is slightly concave in the middle. The hind lobe beyond the larval shell is strong. The absence of spiral lines does not permit a judgment of the full grown shell, in, e.g., *Micromelo undata*, the structure of the shell changes rather late.

From the mantle border a lobe hangs over the mantle opening behind the gill. It corresponds to the "squamiform lamella" of *Acteon* and *Aplustrum* (Perrier & Fischer, 1911, p 26, 65), but is bigger. The inner side of the lobe bears cilia (zo), 40 μ long, which are the beginning of the dorsal ciliated ridge, the "raphé supérieur" of Perrier & Fischer. The lower mantle lobe is smaller than in *Acteon*. The gill (k) is small.

The jaw plates, about 100 μ by 50 μ, are composed of 8 to 10 rows of short pegs whose surfaces bear 3 to 6 short denticles at their broadest sides. The radula has 27 rows of teeth, and in the present young snail there are 4 lateral teeth on either side. The rhachidian tooth has a broad short cusp and a base widened toward the sides. The laterals are hooks without denticles; the innermost and outermost are shorter than the 2 middle ones. The 3 brown gizzard plates measure 300 μ by 140 μ; they bear at least 21 straight ribs, each with one row of pointed spines. The connectives of the nerve ring are short.

Remarks: Apart from the limitations of a decalcified shell, a snail so young cannot be classified beyond the genus. In *Atys obovatus* Bergh (1908a, p 156) the ribs of the gizzard plates bear similar spines as in the present animal, but the ribs form an angle on the crest of the plate. In *A. xarifae* Marcus (1960a, figs. 9, 10) the ribs are straight and spiny, but less numerous than in the present, smaller specimen. Also, the smooth elements of the jaw plates distinguish *A. xarifae*. The gizzard plates of *A. naucum* and *A. cylindricus*, both without spines, are very different from each other.

Philinacea

The genera of the Smaragdinellidae

The name Ophthalmidae Bergh (1905a, p 35) cannot be applied to this family because this name is not derived from one of the genera of the family. Thiele (1931, p 387) used Cryptophthalminae, but *Cryptophthalmus* Ehrenberg, 1831, has been replaced by *Lathophthalmus* (Pruvot-Fol, 1931, p 748). In a list, Thiele (1925, p 265) mentioned Smaragdinellinae, and this name appears in Pruvot-Fol (1934, p 29), Habe (1952, p 144), Zilch (1959) and Marcus & Burch (1965, p 236). Pruvot-Fol (1934, p 30) is inclined to unite the 2 genera with internal shell, *Lathophthalmus* and *Phanerophthalmus* Adams, 1850.

In *Smaragdinella* Adam & Reeve, 1848, the shell is mainly external (Fischer, 1887, p 557, 565; Pilsbry, 1893-1895, p 258; 1895-1896, p 36). The shell of *Nona algira* (Hanley) is similar to that of the type species of *Smaragdinella*, but as it is internal, *Nona* cannot be a subgenus of *Smaragdinella*.

An internal shell may appear to be external, when the mantle is very thin (Eales, 1938, p 82, 83). In *Phanerophthalmus* there is no mantle foramen; the mantle foramen of *Lathophthalmus* varies in diameter without relation to age; and that of *Aplysia* varies with age (Eales, 1960, p 280). When it is large (Baba, 1936, p 5), the exposed shell looks like an external shell, partly embedded in the mantle (Vayssière, 1912, p 8). In Ehrenberg's figure of *L. smaragdinus* (Pilsbry, 1895-1896, pl. 6, fig. 30) the mantle foramen shows when the parapodia are spread.

Bergh (1901, p 235) examined 2 specimens from Ehrenberg's collection without entering into the matter of the position of the shell. Previously (1900a, p 164) and later on (1901, p 301) he united 1 specimen from Mauritius and 1 from Fiji with Ehrenberg's species and described an external shell over the mantle. These animals do not belong to *Lathophthalmus*, but possibly to *Smaragdinella*. Some years later Bergh (1905a, p 36, 39) observed the internal shell and the mantle foramen of *Lathophthalmus*, but did not correct his earlier statement.

Evidently Thiele (1931, p 387) based his diagnosis of *Cryptophthalmus* upon Bergh's first characterization of the genus (1900a). Therefore he called the shell for the most part external, and Hoffmann (1934, p 363) and Zilch (1959, p 44) repeated this.

Lathophthalmus smaragdinus
(Rüppell & Leuckart 1828)
(Figs. 16-22)

Lathophthalmus smaragdinus, Marcus, 1960a, p 886-890, figs. 14-25.

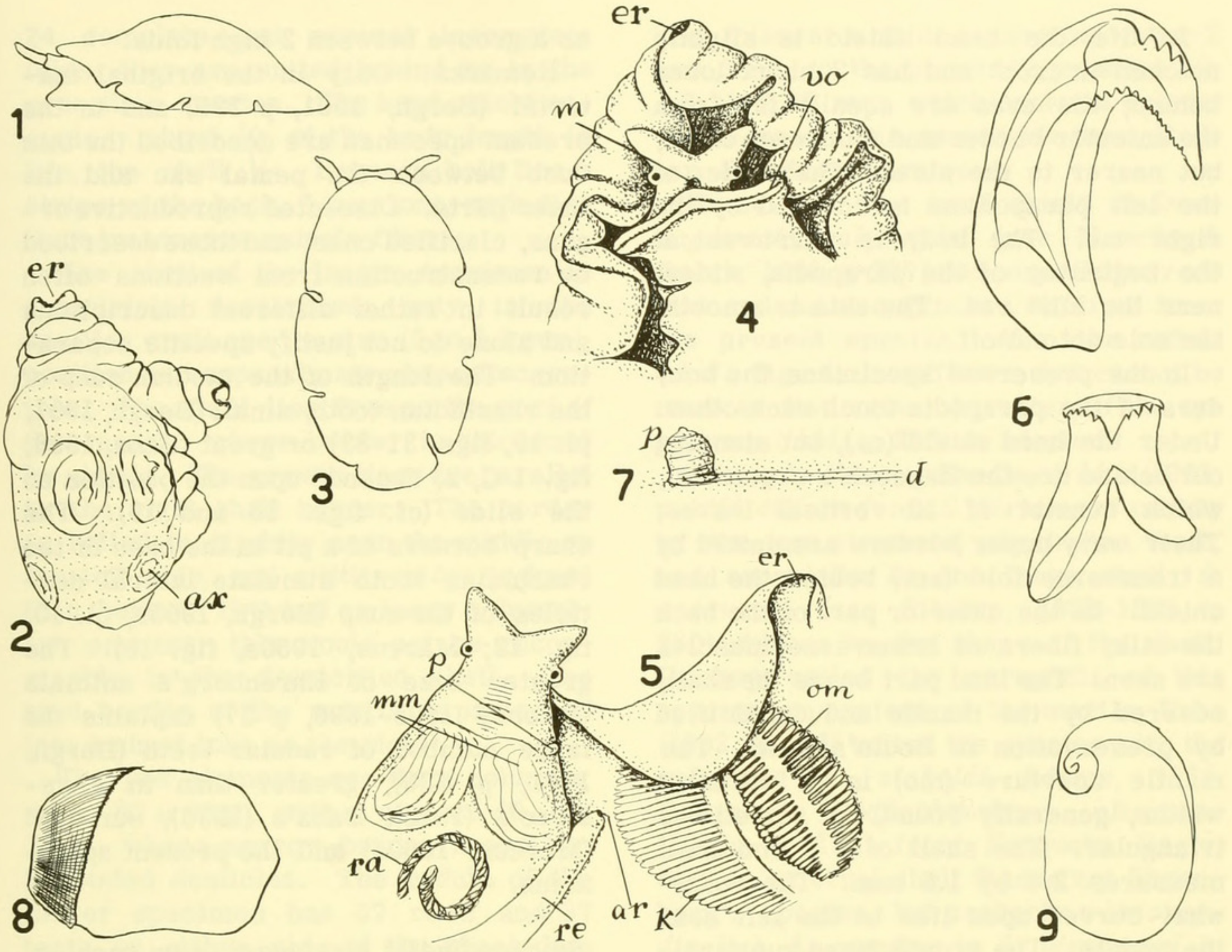
Range: From the Red Sea to the Ryukyu and Marshall Islands. (The "*Lathophthalmus*" specimens of Bergh (1901, p 301), cited by Marcus & Burch (1965, p 238), do not belong to this genus.) According to the aforesaid, not Fiji Islands (Marcus & Burch, 1965, p 238).

Collecting stations: Madagascar; xviii, xxvii, xxxiii, xliii, 25 snails.

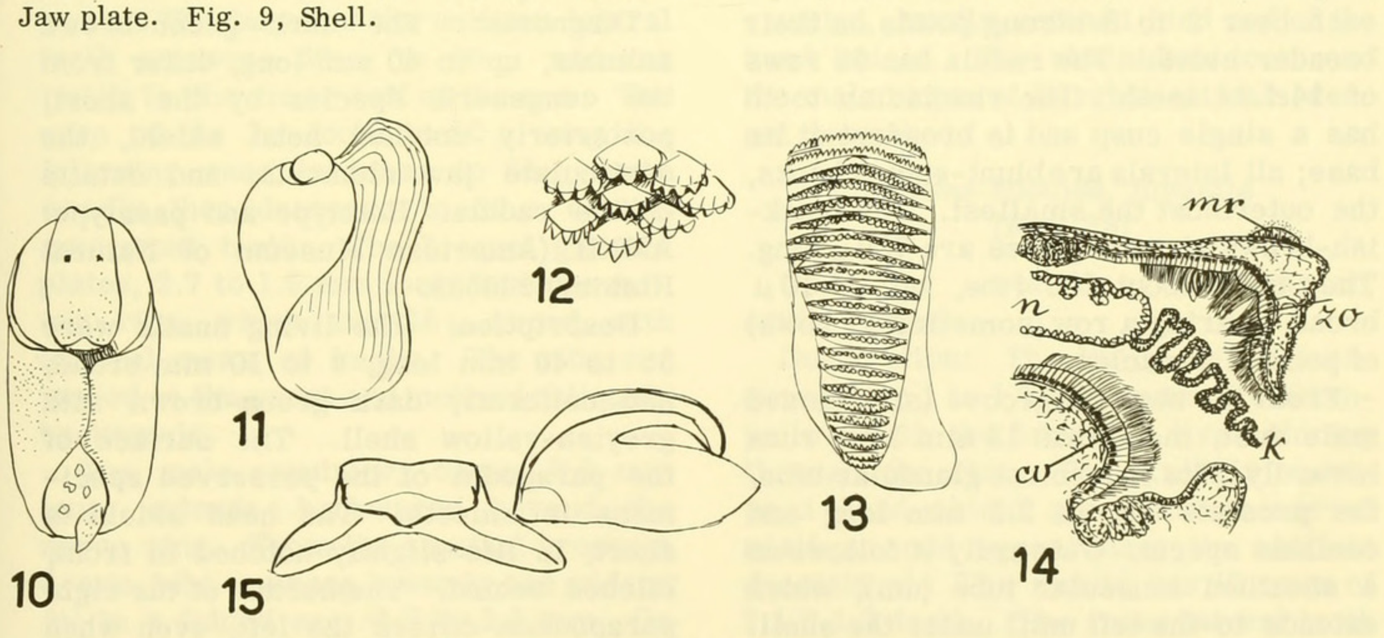
Description: The living snails were 20 to 22 mm long, 5 mm broad. The color is yellowish-green with fine dark spots. The rims of the head shield and parapodia are light bluish-green. In a photograph by Dr. Kirsteuer the black eyes and the yellow-brown pharynx are seen. The dark green digestive gland shines through the integument. .The preserved snails are light olive with a greenish liver.

KEY TO LETTERING IN FIGURES

a	ampulla
ag	albumen gland
am	male atrium
ao	aorta
ar	anus
as	ascus
au	allosperm duct
ax	apex
b	bursa copulatrix
cc	buccal ganglia
co	strand of connective tissue
cr	cerebral ganglion
cs	head shield
cv	ventral ciliated ridge
d	seminal duct
ea	pedal ganglion
er	inhalant siphon
eu	hermaphrodite duct
fa	female aperture
g	common genital opening
go	gastro-oesophageal ganglion
h	Hancock's organ
i	intestine
ia	digestive gland and its ducts
io	inner oviduct
k	gill
m	mouth
ma	male aperture
mm	foliate stomach
mo	mantle foramen
mr	gland of mantle border
mu	female gland mass
n	kidney
ne	nephroproct
ni	nidamental duct
no	notal gland
nx	pharynx
o	oesophagus
oc	oesophageal pouch
om	osphradium
on	opening of notal gland
oo	blood space
ov	ovotestis
p	penis
pg	penial appendage
q	prostate
r	retractormuscle
ra	radula
re	rectum
ri	rhinophore
ro	oral tube
sa	salivary gland
sc	spermatocyst
sd	gland of spine
so	stomach
sr	seminal groove
ss	spine sac with spine
t	spermatheca
uc	buccal gland
ui	thin part of male duct
um	sheathed part of male duct
us	blood gland
v	vagina
ve	vestibulum
vo	anterior border of foot
vs	seminal receptacle
xs	accessory prostate
xv	vestibular gland
y	eye
z	hyponotal glands
za	hyponotal pore
zi	perinotal glands
zm	transverse fold
zo	dorsal ciliated ridge
zu	ductule of hyponotal gland



FIGS. 1–9. *Coriocella nigra*. Fig. 1, Side view of living snail, from sketch by Dr. E. Kirsteuer. Fig. 2, Dorsal view of preserved snail. Fig. 3, Dorsal view of living snail, from sketch by Dr. E. Kirsteuer. Fig. 4, Ventral view of fore end. Fig. 5, Anterior part of body with opened mantle cavity. Fig. 6, Radular teeth. Fig. 7, Penis and seminal duct. Fig. 8, Jaw plate. Fig. 9, Shell.



FIGS. 10–15. *Atys* species, juvenile. Fig. 10, Living snail, from sketch by Dr. E. Kirsteuer. Fig. 11, Shell. Fig. 12, Jaw elements. Fig. 13, Gizzard plate. Fig. 14, Transverse section of opening of mantle cavity. Fig. 15, Radular teeth.

In life the head shield is slightly notched in front and has 2 short lobes behind; the eyes are equally far from the anterior border and from each other, but nearer to the sides. The border of the left parapodium is covered by the right one. The body is narrowest at the beginning of the parapodia, widest near the hind end. The skin is smooth, the sole not set off.

In the preserved specimens the borders of the parapodia touch each other. Under the head shield (cs), but standing out behind are the Hancock's organs (h), which consist of 18 vertical leaves. Their wavy upper borders are united by a transverse fold (zm) behind the head shield. In the anterior part of the back the silky fibers of transverse muscles are seen. The hind part bears the shell, covered by the mantle and decalcified by preservation in Bouin's fluid. The mantle aperture (mo) is of different widths, generally round, but sometimes triangular. The shell of a 6 mm snail measures 2.4 by 1.5 mm. The somewhat curved apex lies to the left near the middle. The growth lines run parallel to the right border, whose tip projects into the right mantle lobe.

The crescent-shaped jaw plates consist of short thick elements whose tips each bear 2 to 3 strong points on their broader sides. The radula has 38 rows of 14.1.14 teeth. The rhachidian tooth has a single cusp and is broadest at its base; all laterals are blunt-ending hooks, the outermost the smallest. The blackish-brown gizzard plates are 780 μ long. They have about 100 ribs, up to 10 μ broad, bearing a row (sometimes 2 rows) of pointed denticles.

From the seminal groove (sr) a closed male duct, more than 12 mm long, runs inwardly. Its innermost glandular tube, the prostate (q), is 2.5 mm long and contains sperm. Outwardly it follows as a sheathed muscular tube (um), which extends to the left until under the shell. A portion only 24 μ thick (ui) leads to the penial sac, which is 1.3 mm long and through which the male duct courses as a groove between 2 high folds.

Remarks: Only in the original material (Bergh, 1901, p 235) and in the present specimen are described the thin duct between the penial sac and the inner parts. Dissected reproductive organs, clarified ones, and those described by reconstruction from sections often result in rather different descriptions and alone do not justify specific separation. The length of the median cusp of the rhachidian tooth, small (Bergh, 1901, pl. 19, figs. 31-33) or great (Baba, 1936, fig. 1 C, a) depends upon the position on the slide (cf. figs. 18 and 19). The sharp borders of a pit in the base of the rhachidian tooth simulate lateral denticles of the cusp (Bergh, 1905a, pl. 10, fig. 12; Marcus, 1960a, fig. 19). The greater size of Ehrenberg's animals (Pilsbry 1895-1896, p 37) explains the large number of radular teeth (Bergh, 1901, p 236), greater than in Vayssiere's (1912), Baba's (1936), our first (Marcus, 1960a) and the present specimens.

Smaragdinella kirsteueri, new species
(Figs. 23-27)

Collecting stations: Madagascar; xxxi, xxxii, 2 specimens.

Diagnosis: The dark green-brown animals, up to 40 mm long, differ from the congeneric species by the short, posteriorly notched head shield, the denticulate jaw elements, and details of the radula. Holotype and paratype: AMNH (American Museum of Natural History) 140583.

Description: The living snails were 35 to 40 mm long, 9 to 10 mm broad, and uniformly dark green-brown with greyish-yellow shell. The surface of the parapodia of the perserved specimens is smooth. The head shield is short, in life slightly notched in front, bilobed behind. The border of the right parapodium covers the left, even when preserved. The large eyes are visible only after dissection; the sole is not set off. The Hancock's organs consist of

24 complete and several incomplete folds; they are united behind as in the preceding species. The head shield occupies about $1/4$ of the body length in life, the shell $1/7$. Between both lies a stripe of the back, 6 mm long, with distinct transverse muscle fibers.

The shell of the larger specimen is completely decalcified; only in the smaller snail are its size (5 to 3.1 mm), position and approximate shape discernible. The shell lies free on the roof of the mantle, whose border is thickened by glands. The growth lines are parallel to the right shell border. The border is rolled in slightly near the middle on the left side, and a little wider in front than behind. If it had an inner columellar process, this would not be recognizable in the decalcified shell. The hind border of the mantle is prolonged into a short lobe on the right.

The jaw elements are thick columns, up to 80 μ high, with a surface 40 μ by 25 μ, whose narrow border bears 1 to 3 pointed denticles. The radula of the larger specimen has 57 rows and 37 teeth on either side of the rhachidian tooth. The latter measures 30 μ by 30 μ, is a little narrower basally, and has a denticle on the sides of the cusp, at least simulated by the structure of the tooth. The bases of the uniform lateral teeth measure 50 μ to 60 μ and are rough in the inner half of the row. The cusp of the 1st tooth is 50 μ long, the following ones increase to 80 μ, outwardly they decrease to 30 μ on the outermost tooth. The 3 equal gizzard plates, 2.7 to 1.6 mm long, bear numerous ribs, which are 28 μ broad, with several rows of knobs. The ribs are angled at the crest and inclined obliquely backwards.

The male copulatory organ, 7.2 mm long, extends backwards beyond the nerve ring. From the seminal groove a 2 mm tube courses inwards and widens (p) to a folded sac, 1.5 by 1.0 mm. On the bottom of the sac inserts a thick retractor muscle (r); a thin one inserts at the entrance of the tube. Entally to the sac follows a thin connecting tube, 2 mm long, to the glandular prostate (q), 1.7 by 0.65 mm, which contains sperm.

The species is named for the collector, Dr. Ernst Kirsteuer.

Remarks: The head shield of *Smaragdinella calyculata* (see Marcus & Burch, 1965, p 237), its mandibular rodlets and male organ are different from the present species. Also the radula (*ibid.*, fig. 4) is different, but cannot be used as distinctive character, if the synonymy (*ibid.*, p 236) is adopted.

Risbec's *Smaragdinella viridis* (1951, p 139) differs from *S. kirsteueri* mainly by the jaw elements, rhachidian tooth, and especially by the large shell; *S. andersoni* (see Pilsbry, 1893-1895, p 260) differs by the shape of the shell. Pilsbry called the parapodia of this species expansions of the mantle; Habe (1952, p 146) united the species with the unfigured *S. sieboldi* Adams, 1864. Bergh's *Cryptophthalmus olivaceus* (1900a, p 164) from Fouquets Reefs, with an external shell (hence not Ehrenberg's species, but probably a *Smaragdinella*), is similar to *S. kirsteueri* in the body size, measurements of the shell, formula of the radula and perhaps jaw platelets. Differences are the indistinct Hancock's organ and the rounded, hardly notched hind end of the head shield. The rhachidian tooth and the male organ of Bergh's animals were not described.

Philine species, juvenile
(Fig. 28)

Collecting station: Madagascar; xxvii, 1 snail.

Description: The living animal measured 3 by 1 to 1.5 mm and was whitish-yellow with the brownish liver shining through the skin. The strongly shortened head shield gives the preserved snail an odd appearance; its shell is decalcified. The radula has 13 rows of 2.1.0.1.2 teeth. The inner lateral tooth has a strong outer process and about 18 pointed denticles on the inner side. The 2 marginals are smooth hooks whose cusp is larger than the base. The outer marginal is smaller than the inner one. There are no gizzard plates; the muscle layer of the gizzard is thickened. A penis is not yet developed.

Remarks: We only know *Philine caledonica* Risbec (1951, p 134) as an Indo-Pacific species of the genus without gizzard plates and with a radula of the same type as the present specimen. Its inner lateral tooth is, however, much broader (*loc. cit.*, fig. 8) than that shown in our Fig. 28. As our specimen has no shell remaining, we cannot compare it with the Atlantic *P.* (*Ossiania*) *quadrata*, also without gizzard plates and with the same radular formula.

Chelidonura
Adams 1850

The 2 genera of the Aglajidae with elongated head shield and long mantle lobes, *Chelidonura* and *Navanax* Pilsbry, 1895, should be united (Bergh, 1905a, p 42). As in *Aglaja*, the shell can be used only for the separation of the species.

The cephalic sense organs of *Chelidonura* and *Navanax* are of the same type. On either side of the mouth there is a protrusible thickening beset with many tufts of cilia. In most cases the thickening is vertically bipartite, so that an outer, sometimes larger knob and an inner one are formed (Marcus, 1955, fig. 8). In preserved slugs the thickening is often retracted and hidden under the head shield, so that the bipartition and the size of the knobs are difficult to judge. If they can be analyzed they are useful specific characters.

The long and smooth penis papilla, considered as a generic character of *Navanax* (Marcus, 1961a, p 8), occurs also in certain species of *Chelidonura*.

Chelidonura punctata
Eliot 1903
(Figs. 29-31)

Chelidonura hirundinina var. *punctata* Eliot, 1903c, p 336, pl. 13, fig. 2.

Range: Zanzibar.

Collecting station: Madagascar; xxxi, 1 specimen.

Description: The living snail was 40 to 45 mm long, 8 to 10 mm broad, bluish-black with scattered brown-orange spots of different size on the head shield, back, parapodia and under side. The head shield, parapodia and caudal lobes have a very narrow white rim. Also the seminal groove is white. The tail lobes are pointed. To the sides of the mouth the inner and outer knobs are beset with tufts of sensory cilia. The Hancock's organs are only a row of pits. The shell, 7 by 4 mm, is nearly as long as the mantle shield. Its front part is shivered; around the aperture it is solid and silvery. The right border of the outer lip penetrates into the right tail lobe. Between the outer lip and the apex there is a deep sinus. The columella has a thick callus which is obliquely furrowed.

When the animal is opened ventrally, the foremost organ is the white foot gland, 2 mm long. Its surface is rough, the hind border slightly notched. Dorsal to the foot gland lies the small pharynx, 2.5 by 1.5 mm, with the cerebral ganglia apposed to its hind end. To the right is situated the male organ, 2.2 mm long. The peritoneum is stippled with melanophores.

The penis corresponds to "type 2" of *Aglaja* (Marcus, 1966, p 165). The seminal groove enters the atrium. Two slightly lobed prostatic tubes of different length go out from the bottom of the atrium. Between them there is a small lobe of the large cells. The pointed penial papilla is broad at its base and projects into the atrium.

Remarks: Quoy & Gaimard's original material of *Chelidonura hirundinina* (1833) was not uniform in color and pattern (Pilsbry, 1895-1896, p 35; Pruvot-Fol, 1934, p 29). Therefore, striped and spotted snails were classified as *C. hirundinina* (Pilsbry, 1895-1896, pl. 2, figs. 31, 32) or called var. *elegans* and var. *punctata* (Bergh, 1900b, p 213). The penes of the species of *Chelidonura* should be better known before such combinations can be justified. The penis of *C. punctata* differs from that of *C. elegans*, and also from that of west Atlantic animals which we previously determined as *hirundinina* (due to their agreement with Baba's figures (1949, pl. 2, fig. 4; 1958, frontispiece)).

Baba & Abe (1959, p 280) stress the similarity of their *Chelidonura tsurugensis* with *C. punctata*, but the sole of the Japanese species has no spots, and the parapodia are not rimmed. The short right tail lobe is rounded in all specimens of *C. tsurugensis*. The head shield bears a triangular white area on either side of the midline (Abe, 1964, pl. 2, fig. 7).

Chelidonura inermis
(Cooper 1862)

Navanax inermis, Marcus, 1967, p 149, fig. 11.

Range: From Monterey Bay to the Gulf of California.

Collecting station: Mexico; iv, Dec. 26, 1966 (Paula Vreeland), 1 specimen.

Remarks: Alive the animal was 30 mm long. The bluish-grey under side of the photograph shows golden yellow dots. In part these are still recognizable in the preserved specimen, whose back has dark streaks.

Anaspidea

Aplysia (*Pruvotaplysia*) *parvula*
Mörch 1863

Aplysia (*Pruvotaplysia*) *parvula*, Eales, 1960, p 287-291, figs. 10-11.

Range: In all warm and warm-temperate seas, from about latitude 40° N to 40° S; not in the Mediterranean.

Collecting stations: Madagascar; xxix, 1 specimen.

Mexico: ii, Nov. 12, 1966 (Paula Vreeland), algae on rocks in the intertidal zone, 1 specimen.

Remarks: The living animal from Madagascar was 8 to 10 mm long and 3 to 4 mm broad. It was dark green with whitish-yellow spots and yellow tips of the tentacles and rhinophores, and dark brown rings around the eyes. The parapodia are rimmed with dark brown and joined high up.

The specimen from the Gulf was 18 mm long when living, colored reddish-brown with whitish blotches. The parapodia were rimmed with dark blue. The tips of the light outer parts of the tentacles and rhinophores were blue.

Dolabella auricularia
(Solander 1786)
(Fig. 35)

Dolabella scapula, Engel, 1942, p 199, 207-234, figs. 6-16.

Dolabella auricularia, Marcus, 1965, p 266.

Dolabella californica, MacFarland, 1966, p 32-37, pl. 6, fig. 14, pl. 8, figs. 26-32, pl. 9, figs. 13, 14.

Range: Indo-Pacific, from the Red Sea to Japan, Easter Island, Ecuador and the Gulf of California.

Collecting stations: Madagascar; xxvi, 1 specimen.

Mexico: iv, Dec. 26, 1966 (Paula Vreeland), 1 specimen.

Remarks: The snail from Madagascar was 100 mm long alive and 50 to 60 mm broad. It was green-brown with lighter and darker spots and whitish grey, mottled borders of the parapodia. The parapodia are beset with short, pointed papillae.

The Californian specimen was 95 mm long and had green spots similar to MacFarland's specimen 26.

Dolabrifera dolabrifera
(Rang 1828)

Dolabrifera dolabrifera, Engel, 1936, p 29-43, fig. 16; Kay, 1964, p 184, 185.

Range: Circumtropical and circum-subtropical, but not recorded yet from the American Pacific coast.

Collecting station: Madagascar; xviii, 3 specimens.

Remarks: The largest specimen was 40 mm long alive, 12 to 15 mm broad.

The ground color was a light green-brown, the border of the foot whitish-grey. On the back there were whitish-grey papillae and dark brown spots.

Stylocheilus longicauda
(Quoy & Gaimard 1824)

Stylocheilus longicauda, Engel, 1936, p 57-72, figs. 24-43; Kay, 1964, p 182-184, pl. 8, fig. 4; Marcus, 1967, p 159, figs. 16, 17.

Range: Circumtropical.

Collecting stations: Madagascar; xxxvi, 5 specimens.

Mexico: iv, Dec. 26, 1966 (Paula Vreeland), rocks, intertidal zone, 1 specimen.

Remarks: The preserved slugs from Madagascar are up to 22 mm long. They have wart-shaped and ramified papillae, black streaks and the ocellar spots visible as white dots, as in Engel's material from Barbados Reef (1936, p 61). In the hind gizzard we found only 3 cuticularized warts.

The Mexican specimen was 14 mm long, 10 mm high and 9 mm broad when alive. It has the longitudinal streaks and ocellar spots which distinguish the species from *Stylocheilus citrinus* (Rang, 1828, p 71; Marcus, 1962b, p 16, 1967, p 40). Radula, gizzard plates and penial spines do not furnish clear-cut diagnostic characters.

Ascoglossa
Stiliger (*Stiliger*) *erbsus*, new species
(Figs. 32-34)

Collecting station: Madagascar; xxii, 1 specimen.

Diagnosis: Small, whitish-yellow, with green granules in the liver branches, the hind ends of which anastomose. In the cerata the hepatic diverticula are unbranched. Holotype: AMNH 140585.

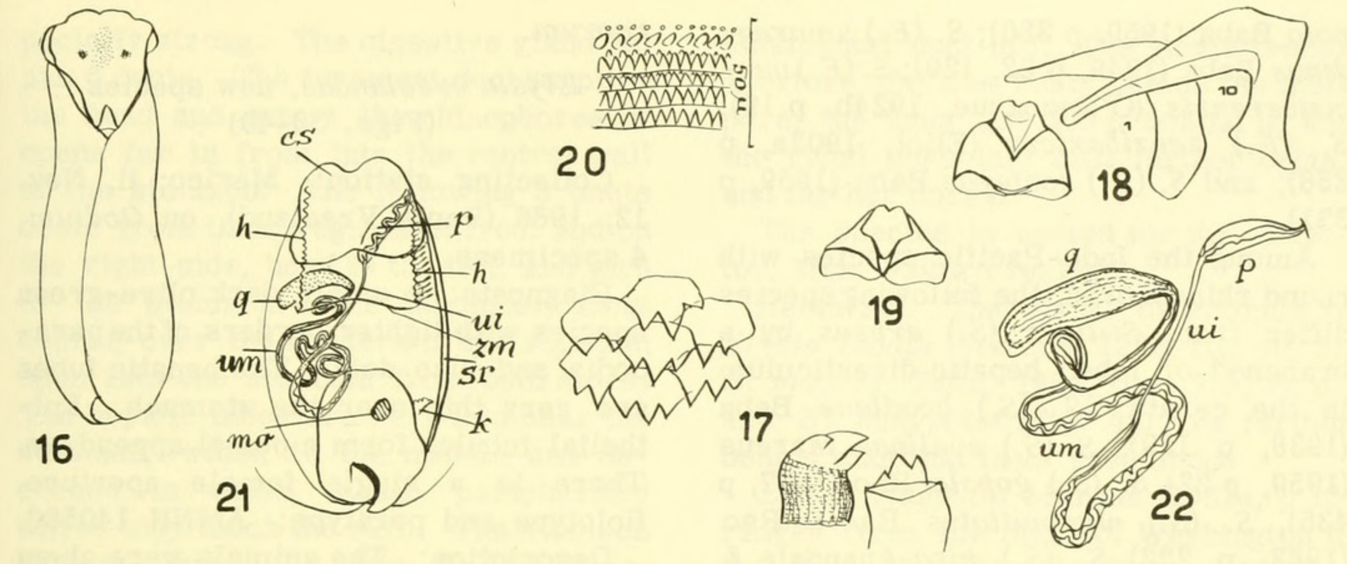
Description: The slug was 3 mm long and 1 mm broad when alive. The main liver stems are slightly ramified. The anterior foot border, lips and rhinophores are whitish and transparent; on the rhinophores there is a dorsal stripe of graphite-black. Further skin pigments are a dark brown irregular middorsal area, and melanophores between the cerata and the foot border.

The preserved animal measures in mm: length 2.5, breadth 0.55, tail 0.4, rhinophores 0.5, longest cerata 0.5, distance between the eyes 0.25; diameter of eyes 0.05. The cerata stand in a row on either side, about 12 large and many small ones. The head stands out over the thick lips. The rhinophores are blunt, round in transverse section, and narrowed at the base. The anterior foot border is notched, with short and round lateral angles. Two transverse folds of the sole are probably produced by contraction. The border of the sole is distinctly set off from the sides. The tail is limited by an anastomosis of the liver branches between the hindmost cerata.

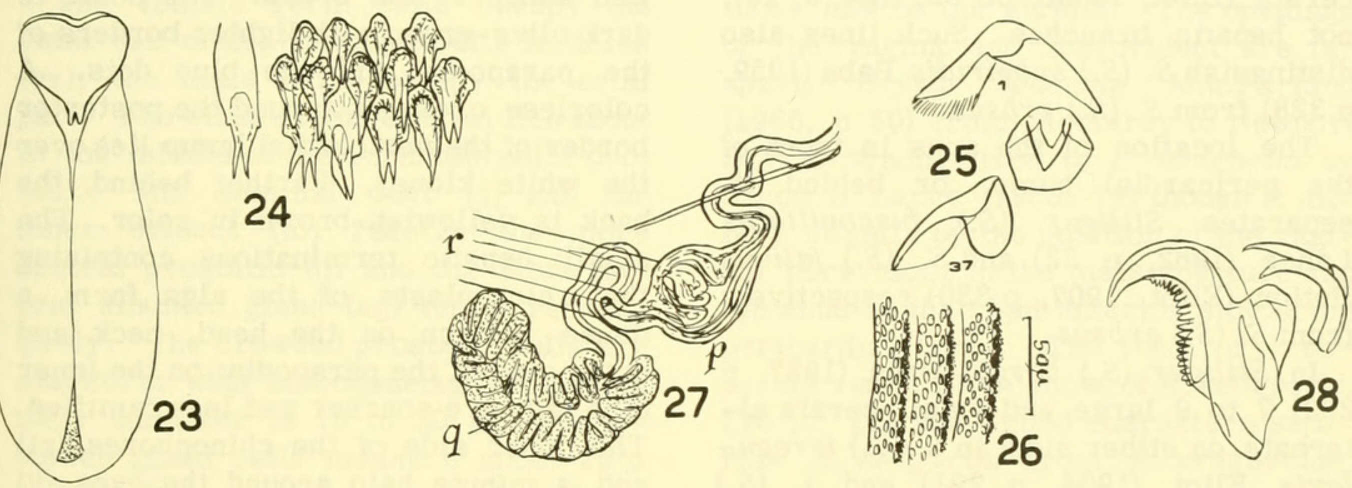
The blunt cerata contain an unbranched hepatic diverticulum, but no tube of the albumen gland. Large subepidermal gland cells, especially near the tip of the cerata, are irregular, not arranged in stripes. The short pharynx lies between the eyes. The anus is situated in the midline in the anterior part of the pericardial eminence, which extends to the middle of the body. The short penial stylet is curved.

The radula has about 6 teeth in the ascending limb, 6 in the descending limb, and 4 smaller ones heaped in the ascus. The teeth are 104 μ long, the base 39 μ; the tip is broad and round. The upper side of the tooth is bipartite by a pit, the borders of the hollow underside are smooth, even when viewed with high power.

Remarks: *Stiliger erbsus* differs from all other species of the genus. Avoiding a discussion of the synonymy of the European species, we mention only the Indo-Pacific ones. Those of the subgenus *Ercolania* Trinchese, 1872, differ from the new species by their rhinophores flattened or grooved on the outer side. These species are: *S.* (*E.*) *akkeshiensis* Baba (1935a, p 116); *S.* (*E.*) *illus* Marcus (1965, p 267); *S.* (*E.*)

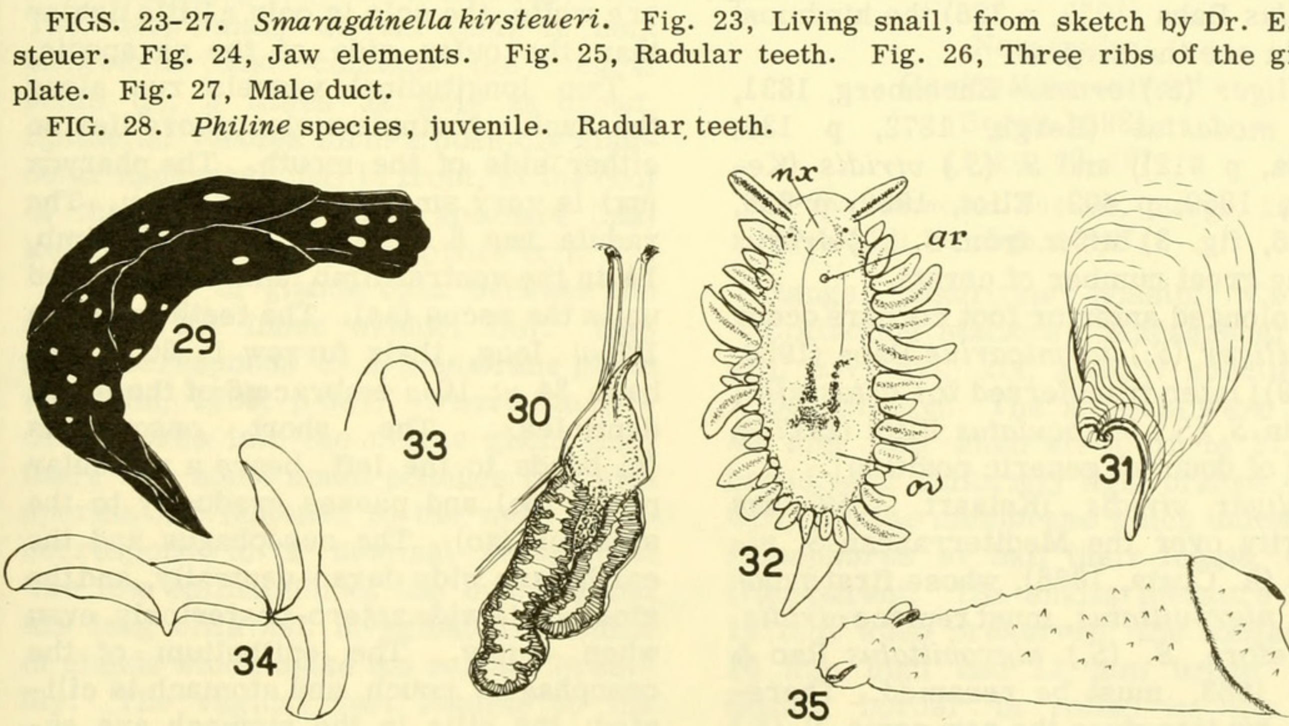


FIGS. 16-22. *Lathophthalmus smaragdinus*. Fig. 16, Living snail, from color photo. Fig. 17, Jaw elements. Fig. 18, Radular teeth. Fig. 19, Rhachidian tooth of other specimen. Fig. 20, Ribs of gizzard plate. Fig. 21, Male duct *in situ*. Fig. 22, Male duct.



FIGS. 23-27. *Smaragdinella kirsteueri*. Fig. 23, Living snail, from sketch by Dr. E. Kirsteuer. Fig. 24, Jaw elements. Fig. 25, Radular teeth. Fig. 26, Three ribs of the gizzard plate. Fig. 27, Male duct.

FIG. 28. *Philine* species, juvenile. Radular teeth.



FIGS. 29-31. *Chelidonura punctata*. Fig. 29, Living snail, from color photo. Fig. 30, Male duct. Fig. 31, Shell.

FIGS. 32-34. *Stiliger erbsus*. Fig. 32, Preserved slug. Fig. 33, Penial stylet. Fig. 34, Radular teeth.

FIG. 35. *Dolabella auricularia*. Living snail, from sketch by Dr. E. Kirsteuer.

noto Baba (1959, p 330); *S.* (*E.*) *smaragdinus* Baba (1949, p 32, 129); *S.* (*E.*) *vancouverensis* (O'Donoghue, 1924b, p 19); *S.* (*E.*) *zanzibaricus* (Eliot, 1903a, p 256); and *S.* (*E.*) *zosterae* Baba (1959, p 331).

Among the Indo-Pacific species with round rhinophores, the following species differ from *Stiliger* (*S.*) *erbsus* by a branched or lobed hepatic diverticulum in the cerata: *S.* (*S.*) *boodleae* Baba (1938, p 129), *S.* (*S.*) *evelinae* Marcus (1959, p 22), *S.* (*S.*) *gopalai* Rao (1937, p 435), *S.* (*S.*) *nigrovittatus* Rao & Rao (1963, p 232), *S.* (*S.*) *pica* Anandale & Prashad (1922, p 700) and *S.* (*S.*) *varians* Eliot (1904, p 290). *Stiliger varians*, it is true, has longitudinal lines on the cerata (Eliot, 1903b, pl. 32, figs. 9, 10), not hepatic branches. Such lines also distinguish *S.* (*S.*) *subviridis* Baba (1959, p 328) from *S.* (*S.*) *erbsus*.

The location of the anus in front of the pericardial hump, or behind it, separates *Stiliger* (*S.*) *fuscovittatus* Lance (1962, p 32) and *S.* (*S.*) *felinus* Hutton (Eliot, 1907, p 330) respectively from *S.* (*S.*) *erbsus*.

In *Stiliger* (*S.*) *berghi* Baba (1937, p 222) 7 to 9 large and small cerata alternate on either side; in *S.* (*S.*) *irregularis* Eliot (1904, p 291) and *S.* (*S.*) *pusillus* Baba (1959, p 328) the hindmost cerata are the largest.

Stiliger (*S.*) *ornatus* Ehrenberg, 1831, (not *modestus* (Bergh, 1872, p 139; 1878a, p 812)) and *S.* (*S.*) *viridis* (Kelaart, 1859, p 492; Eliot, 1906, p 686, pl. 46, fig. 3) differ from *S.* (*S.*) *erbsus* by the great number of cerata.

Prolonged anterior foot corners occur in *Stiliger* (*S.*) *formicarius* Baba (1959, p 329) [later transferred to *Costasiella*] and in *S.* (*S.*) *tentaculatus* Eliot (1917, p 179) [of doubtful generic position].

Stiliger viridis (Kelaart, 1859) has priority over the Mediterranean *S. viridis* (A. Costa, 1866), whose first synonym, *nigrovittatus*, must replace *viridis*. Therefore, *S.* (*S.*) *nigrovittatus* Rao & Rao, 1963, must be renamed. Therefore, we introduce the new name, *S.* (*S.*) *raorum*.

Elysia vreelandae, new species
(Figs. 36-40)

Collecting station: Mexico; ii, Nov. 12, 1966 (Paula Vreeland), on *Codium*, 4 specimens.

Diagnosis: A small, dark olive-green species with lighter borders of the parapodia and blue dots. The hepatic tubes are very thin near the stomach. Epithelial tubules form a penial appendage. There is a single female aperture. Holotype and paratype: AMNH 140586.

Description: The animals were about 10 mm long when living; preserved they are up to 8 mm. A preserved animal with almost fully spread parapodia is 7 mm long, 5 mm broad. The color is dark olive-green with lighter borders of the parapodia and the blue dots. A colorless crescent around the posterior border of the pericardial hump lies over the white kidney. Farther behind, the back is yellowish-brown in color. The small hepatic terminations containing the chloroplasts of the alga form a dense pattern on the head, neck and outer side of the parapodia; on the inner side they are coarser and less ramified. The inner side of the rhinophores (ri) and a minute halo around the eyes (y) are white, the sole is only a little lighter than the outer side of the parapodia.

Two longitudinal vessels run along the back. A single melanophore lies on either side of the mouth. The pharynx (nx) is very small, 400 μ by 400 μ. The radula has 8 teeth in the dorsal limb, 14 in the ventral limb, and many heaped up in the ascus (as). The teeth are up to 120 μ long, their furrow is 80 μ, the base 34 μ; 10 μ embrace 6 of the small denticles. The short oesophagus (o) bends to the left, bears a muscular pouch (oc) and passes gradually to the stomach (so). The oesophagus and the cardia are wide dorso-ventrally, and the stomach is wide antero-posteriorly, even when empty. The epithelium of the oesophagus, pouch, and stomach is ciliated; the cilia in the stomach are especially strong. The digestive gland (ia) has 6 ducts. The foremost duct supplies the head and enters the rhinophores; it opens far in front into the ventral wall of the stomach. The following 3 ducts come from their regions in front and on the right side, bend to the left, and turn to the stomach. The hindmost ducts course over the borders of the sole and open into the stomach from both sides. The hepatic tubes are very thin near the stomach, widen in the middle and decrease in width, again peripherally where they touch the skin. The stomach narrows gradually into the intestine, which is 100 μ long. The anus (ar) lies between the right parapodium and the pericardium.

The female germ cells occupy the ental half of the hermaphrodite follicles (ov); the male cells occupy the ectal part. The ciliated ampulla (a) lies about in the middle of the hermaphrodite duct (eu). The seminal duct (d) and the inner oviduct (io) receive the more central prostatic (q) and the more lateral albumen gland (ag) tubes, respectively. The crowded prostatic cells are claviform with homogeneous secretion; their diameter is 15 to 20 μ. The albumen gland cells measure about 25 μ and contain granules measuring 6 μ. The deep male atrium (am) is bent backwards and contains the conical penis (p), 3 times as long as broad. Epithelial tubules form a possibly glandular appendage (pg) in front, at the root of the penis. The male aperture (ma) lies under the right rhinophore (ri).

Clusters of glands open between the cells of the inner oviduct (io). This part corresponds to a membrane gland (Ghiselin, 1965, p 337). Where the oviduct passes into the mucus gland (mu) there are some small pouches (vs) with sperms not fastened to the wall. They correspond to a seminal receptacle. The low epithelium of the mucus gland has long cilia and invaginated saccules of glands which make the surface brambly. The vaginal duct leading to the bursa copulatrix (b) goes out from the nidamental duct (ni). The single female aperture (fa) lies 1 mm behind the male pore, the anus (ar) 100 μ behind it, and the renal pore (ne) still farther behind and farther dorsal.

The species is named for the collector, Mrs. Paula Vreeland.

Remarks: The atrial diverticula of *Elysia lobata* (Marcus, 1958, fig. 40, 3), *E. maoria* (Reid, 1964, figs. 7 A, B, d), and *E. hedgpethi* (Fig. 41) are farther behind than that in *E. vreelandae*.

Elysia hedgpethi Marcus (1961a, p 13) ranges from the State of Washington to the Gulf of California (Lance, 1966, p 71). It is up to 29 mm long when preserved. Its penis is twice as long as broad, with a diverticulum near the inner end of the atrium. The openings of the vagina and the oviduct are far apart. *Elysia bedeckta* MacFarland (1966, p 50) from Monterey to Newport Bay is synonymized to *E. hedgpethi* by Sphon & Lance (1968: 79) though it differs slightly by the position of the vaginal pore close to the male aperture and the anus on the right anterior side of the pericardial hump. The teeth of *E. bedeckta* reach 330 μ, those of *E. hedgpethi*, 170 μ. The mentioned characters separate *E. hedgpethi* from *E. vreelandae*.

Notaspidea

Berthellina cuvieri (Bergh 1898) (Figs. 42-48)

Pleurobranchus cuvieri, Bergh, 1898, p 129-131, pl. 11, figs. 19-27.

Range: Mauritius; possibly Ceram.

Collecting stations: Madagascar; xi, xiii, xiv, xvi, xix, xliii, 7 specimens.

Description: The animals were 35 to 40 mm long when alive, 15 to 17 mm broad, and uniformly light orange. The veil, and the membrane which unites the rhinophores at half their length, were transparent. The snails measure 13 to 19 mm when preserved; the longest is 14 mm high and 13 mm broad. The mantle border is rolled in, the foot border wavy. In the smooth, gelatinous notum lie opaque, invaginated epidermal glands (up to 0.5 mm long) in different stages, as in *Berthellina granulata* (Hill, 1963, fig. 1). We found neither spicules nor organic traces of such; some sponge spicules stuck in the skin.

The shell measurements in mm are: 9 by 5.5 (body 13 mm); 5.5 by 2 (body 14 mm); 8.5 by 5 (body 15 mm); 6 by 2.5 (body 16 mm); 6.5 by 2.4 (body 19 mm). The growth lines are distinct. The spiral sculpture consists of rows of dots which do not reach the anterior border; on the shell of snails 13 to 16 mm long, it extends over $\frac{1}{3}$ of the shell, in the 19 mm specimen over $\frac{2}{3}$. The fact that a small snail had the biggest shell is fortuitous. The periostracum is colorless.

The furrowed anterior foot border, the veil and the rhinophores show no peculiarities. The last quarter of the gill is free. Animals of 15, 14 and 19 mm have 20, 24 and 26 branchial leaves, respectively.

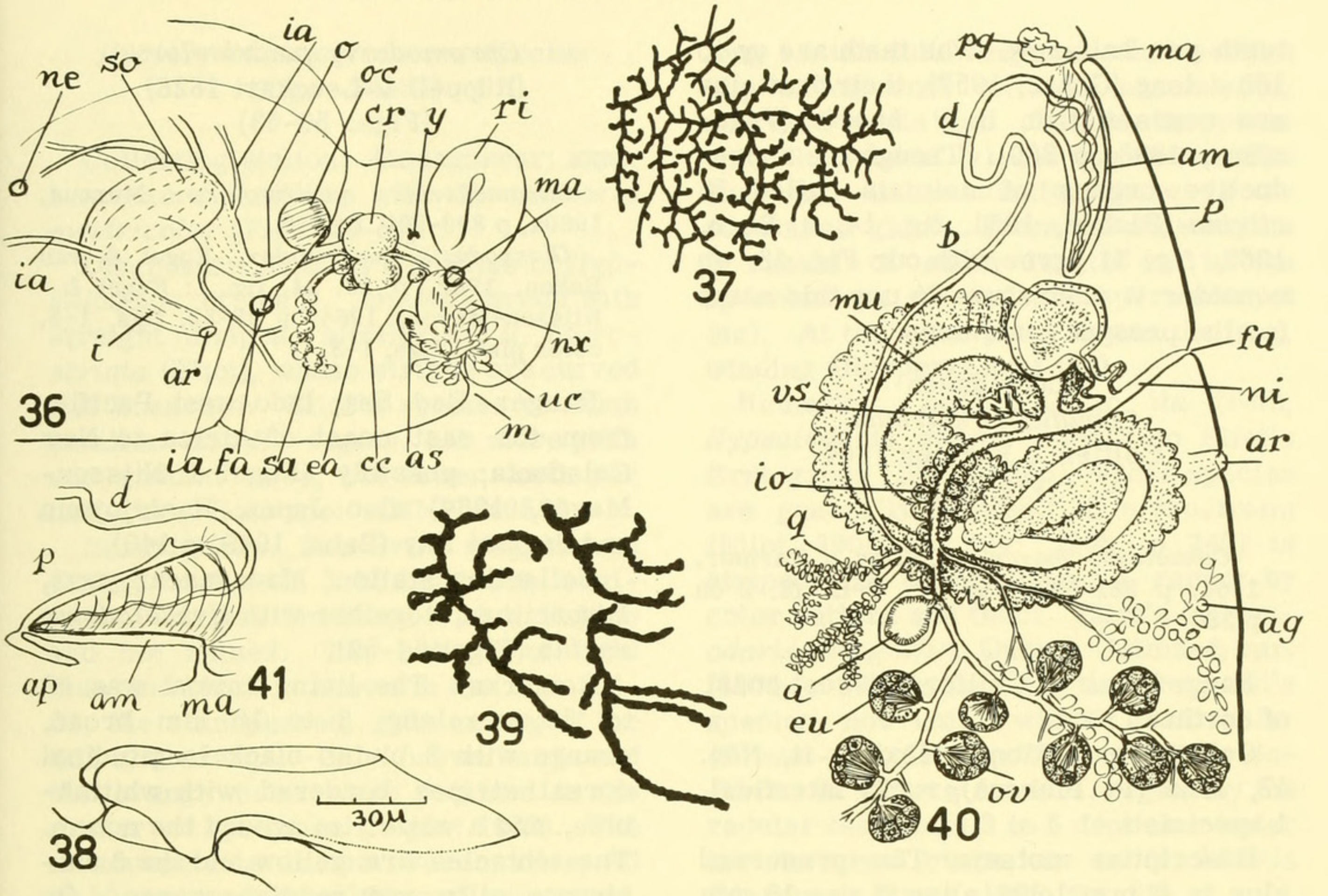
The jaw plates are 3.5 by 1.5 mm (14 mm snail) and 4.5 by 2 mm (15 mm snail). The elements (80 μ by 22 μ) are generally unicuspidate, but sometimes they have a secondary point on one or both sides of the cusp. The radulae of a 14 mm and a 15 mm snail measure 3.5 by 3.2 mm and 3.33 by 3.33 mm, respectively. They have 80 and 90 rows, 150 and 200 teeth per half-row, respectively. The largest teeth are 180 μ and 170 μ long, respectively. The teeth of both specimens have 12 to 19 denticles; the innermost teeth have the fewest denticles, those in the middle the greatest number of denticles. On the outer teeth the denticles are longest.

At the outlet of the long and narrow ampulla (a), filled with sperm, the spermoviduct divides into an inner oviduct (io) and a seminal duct, which is glandular at its beginning (q). The acinous prostate is apposed to the spermatheca (t). Into the succeeding part of the male duct there opens a coiled, glandular tube, the accessory prostate (xs). The heavily muscular seminal duct (d) enters the male atrium (am), dilated by a strong penial papilla (p). A retractor muscle (r) inserts at the bottom of the atrium.

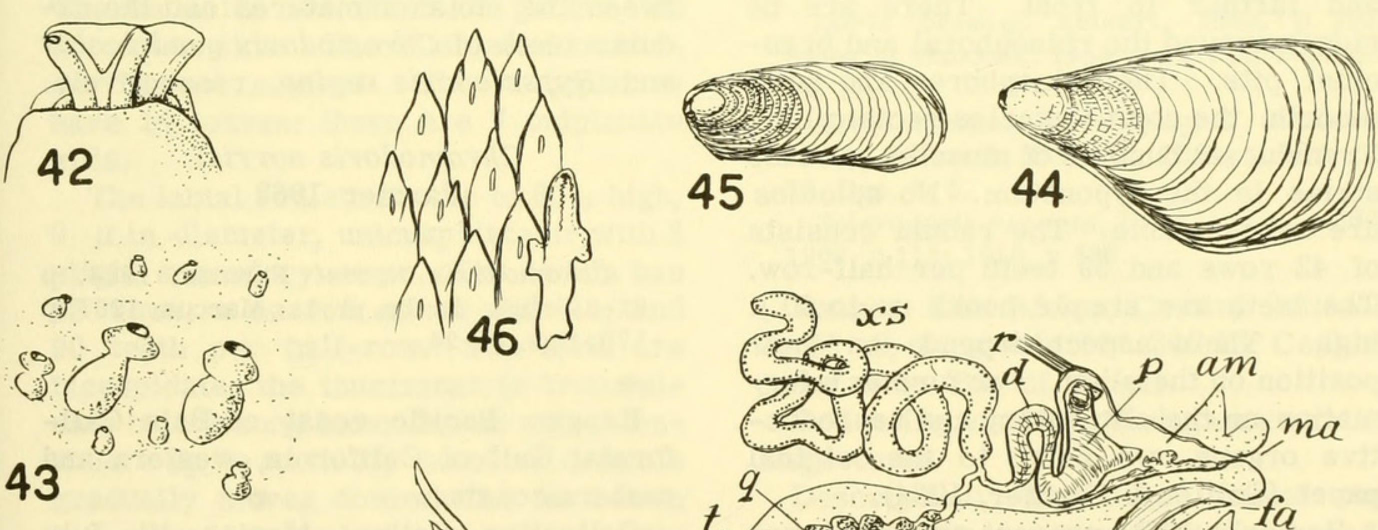
Beside the male aperture (ma) lies the wide opening (fa) in common for vagina (v) and nidamental duct (ni). The vagina leads into the soft spermatheca (t) containing black residues of sperm and prostatic secretion. From the vagina a thin duct courses to the spermatocyst (sc) full of orientated sperm. The wall of the spermatocyst is connected with the mucus gland by a strand of connective tissue, whose position corresponds to an allosperm duct (perhaps it is a rudimentary duct).

Remarks: Vayssière's *Berthellina brocki* (1896, p 120; 1898, p 256) and Bergh's *B. cuvieri* are from the same locality and collection, but Vayssière's name and description refer also to specimens from Amboina, Java, and New South Wales, Jervis Bay. Later, its range was extended to Easter Island (Odhner, 1921, p 248). The reproductive organs of *B. brocki* agree with those of our animals, while they are incompletely known for *B. cuvieri*. The spiral shell sculpture reaches the anterior border in *brocki*, but not in the present material. Possibly Vayssière's specimens from Jervis Bay are identical with *Pleurobranchus punctatus* Quoy & Gaimard, 1832, (Pruvot-Fol, 1934, p 34, 35). Therefore, Macnae (1962a, p 172) called his snails from Madagascar and southern Mozanbique *Berthellina punctata*. The position of the prostate and the allosperm duct in Macnae's figure differ from our Fig. 48.

Burn (1962, p 138) united *Berthellina brocki*, *B. punctata* and other species with *B. citrina* (Rüppell & Leuckart, 1828). In living animals of this species the cutaneous glands produce a reticulation of the notum, but not always, see Gohar & Abul-Ela, 1957, pl. 1. The spiral sculpture reaches the anterior border of the shell. The jaw elements are short and have 1 or several secondary cusps (Vayssière, 1906). The radula comprises 60 rows and up to 140



FIGS. 36-40. *Elysia vreelandae*. Fig. 36, Diagram of digestive tract. Fig. 37, Ramification of liver on back of animal. Fig. 38, Radular tooth. Fig. 39, Ramification of liver on inner side of parapodia. Fig. 40, Diagram of reproductive organs.
FIG. 41. *Elysia hedgpethi*. Penis.



FIGS. 42-48. *Berthellina curieri*. Fig. 42, Head of living snail, from color photo. Fig. 43, Notal skin, preserved. Fig. 44, Shell of 13 mm animal. Fig. 45, Shell of 16 mm animal. Fig. 47, Tips of radular teeth. Fig. 48, Diagram of reproductive organs.

teeth per half-row. The teeth are up to 160 μ long (Gohar, 1957); their denticles are coarser than in *B. brocki* (Vayssière, 1898, p 260). Though the reproductive organs of animals called *B. citrina* (Risbec, 1951, fig. 14, 2; Burn, 1962, fig. 3) agree with our Fig. 48, we consider it premature to use this name for the present specimens.

Eudoridacea

Conualevia marcusi
Collier & Farmer 1964
(Fig. 49)

Conualevia marcusi Collier & Farmer, 1964, p 381-383, figs. 1, C-H, pl. 2 on p 386.

Range: Gulf of California, west coast of northern part.

Collecting station: Mexico; ii, Nov. 12, 1966 (P. Pickens), rocky intertidal, 1 specimen.

Descriptive notes: The preserved slug is 8 mm long; alive it was 16 mm long. The body and the rhinophores are white, the 16 unipinnate gills retracted. The notum is finely papillose with opaque glands to the sides of the gills and farther in front. There are no ridges around the rhinophoral and branchial pits. The rhinophores are quite smooth, the stout tentacles rectangular. Translucent bundles of muscles produce striae in the hyponotum. No spicules are recognizable. The radula consists of 42 rows and 59 teeth per half-row. The teeth are simple hooks up to 60 μ high. Their aspect depends on their position on the slide. For further information on the alimentary and reproductive organs, we refer to the original paper (Collier & Farmer, 1964).

Remarks: The present slug has fewer rows and teeth in the radula than the original diagnosis. But as Collier and Farmer counted only 1 of their specimens, the taxonomic value of this difference cannot be judged.

Chromodoris quadricolor
(Rüppell & Leuckart 1828)
(Figs. 50-53)

Chromodoris quadricolor, Marcus, 1960a, p 899-901, fig. 42.
Glossodoris quadricolor, Engel & van Eeken, 1962, p 23, 24, fig. 1; Engel & Nijssen-Meyer, 1964, p 27-32, figs. 1-5, color plate, figs. 1-3.

Range: Red Sea; Indo-west Pacific, from the east coast of Africa to New Caledonia; possibly (Engel & Nijssen-Meyer, 1964) also Japan, Hachijojima and Sagami Bay (Baba, 1949, p 140).

Collecting station: Madagascar; xxxi, 1 specimen, together with *Hypselodoris regina* (Figs. 54-59).

Remarks: The living animal was 40 to 50 mm long, 8 to 10 mm broad, orange with 3 bluish-black longitudinal dorsal stripes bordered with whitish-blue, and a white rim around the notum. The tentacles are yellow and the 8 unipinnate gills are reddish-orange. On the sides of the foot there are 2 black lines. The salivary glands are long tubes with pointed ends. Our Figs. 52, 53 and 57, 58 show the differences between the labial armatures and the radular teeth of *Chromodoris quadricolor* and *Hypselodoris regina*, respectively.

Chromodoris norrisi
Farmer 1963

Chromodoris norrisi Farmer, 1963, p 81-84, figs. 1a-1e, pl. 1a; Marcus, 1967, p 170, figs. 21-24.

Range: Pacific coast of Baja California; Gulf of California, western and eastern coasts.

Collecting station: Mexico; iii, July 30, 1966 (A. Kerstitch), rocky intertidal, 3 specimens.

Remark: The present slugs have the same color pattern as the type specimens.

Hypselodoris regina, new species
(Figs. 54-59)

Collecting station: Madagascar; xxxi, 1 specimen together with *Chromodoris quadricolor* (Figs. 50-53).

Diagnosis: This is a species of *Hypselodoris* of the *H. semperi* group with straight stripes, similar to *H. nigrostriata* (Eliot), whose stripes are curved and branched. Eliot's species is much smaller than *H. regina*, has more gills and radular rows, but fewer teeth per half-row. Holotype: AMNH 140582.

Description: The living slug had an orange back with 3 bluish-black longitudinal stripes bordered with light blue and not raised. The pattern of light blue and black is shown in the Figs. 54-56; the rhinophores, gills and tip of the tail are orange. Only brown bands and the orange color were retained in the preserved specimen (August 1967). The measurements in mm were: alive, 40 to 50 mm long, 8 to 10 broad, preserved, 22 long, 7 broad, 9 high. The notal border is broad in front, narrow on the sides and behind, and has many globular glands, increasing in size backwards. The tentacles are short and grooved on the outer side. The bilabiate foot border is not notched. The rhinophores have 14 leaves; there are 7 unipinnate gills.

The labial rodlets are up to 60 μ high, 9 μ in diameter, unicuspidate or with 2 slight secondary cusps. The radula has 62 rows, a narrow naked rhachis, and 90 teeth per half-row. The teeth are bicuspidate, the innermost is tricuspidate by a strong inner and an outer denticle. Up to tooth 75, the outer denticle gradually moves downwards; farther to the side the teeth decrease in length, the cusps become blunt and the ventral border nodular. The salivary glands are flat with a broad middle portion and a pointed end.

The ampulla (a) is spherical, the spermoviduct is long; the seminal duct begins tubular, then forms a broad, flat, coiled prostate (q), more than twice as long as the following muscular section (d), which ends with an acrembolic, unarmed penis (p). Beside the penis open the vagina (v) and the nidamental duct (ni) independently; there is no vestibular gland. From the wide vagina 2 canals of equal length go to the spermatheca (t) and the spermatocyst (sc). At the same point begins the long, winding allosperm duct (au).

Remarks: According to its teeth, *Hypselodoris regina* belongs to Eliot's first group (1904, p 385), whose species are generally spotted. *H. nigrostriata* (Eliot 1904, p 394; 1905, p 247) is striped, but differs from *H. regina* by color pattern and teeth. Eliot's *Chromodoris ?magnifica* Quoy & Gaimard, var. (1904, p 397) is not Quoy and Gaimard's species, now united with *C. quadricolor* (Pruvot-Fol, 1934, p 72), but a *Hypselodoris*. It differs from *H. regina* by the radular teeth with 3 to 5 denticles under the terminal cusps, as in *H. hilaris* (Marcus & Burch, 1965, fig. 26).

Atagema osseosa
(Kelaart 1859)
(Figs. 60-64)

Doris osseosa Kelaart, 1859, p 298; Alder & Hancock, 1864, p 121, pl. 28, figs. 10, 11.

Doris carinata (non Quoy & Gaimard, 1832); Alder & Hancock, 1864, p 122, pl. 29, figs. 5, 6.

Sclerodoris osseosa, Eliot, 1903a, p 380; 1908, p 114; 1910, p 420.

Range: East Africa; Coetivy (latitude 7° 15' S, longitude 56° 24' E); Ceylon; coast of the Bay of Bengal.

Collecting station: Madagascar; xviii, 1 specimen.

Description: The living animal was hard, 40 mm long and 30 mm broad, with a folded notal border. The rough surface bears dorsal papillae which stand on a net of ridges. The meshes in between are flat. The papillae are small on the margins of the notum, the rhinophoral sheaths, and on a median ridge. This ridge begins behind the rhinophores and ends in front of the gills. The ground color is ocher, the papillae are white. The meshes are light brown on the sides, dark brown or blackish-green in the region over the viscera; their pigment is traversed by lines of the ground color. The rhinophores are ocher; their high sheaths have finely scalloped borders.

The preserved animal is 30 mm long (35 mm when measured over the back) and has a 7 mm broad notum. The tentacles are pointed triangles; the rhinophores have 20 leaves. A hump in the cardiac region was not salient in the living slug. The branchial pit has 3 large anterior and 2 smaller posterior lobes; between these the 5 multipinnate gills and the anal papilla project backward. The notum covers the foot, which is 20 mm long. In front, the foot is deeply bilabiate; it is pointed behind.

The papillae contain projecting spicules and are connected by tracts of spicules. Further tracts run from the dorsal to the ventral side, where they form a coarse net. The spicules are smooth, blunt on both ends, and generally straight. The biggest were 700 μ long, 35 μ thick. Globular melanophores, 200 μ to 30 μ in diameter, lie in the connective tissue. The eyes are small; the central nervous system is similar to that of *Austrodoris* (Odhner, 1934, fig. 27). The blood glands are whitish-yellow.

The labial cuticle has no rods or platelets, but bears some colorless soft points. The salivary glands are ribbon-like. The radula, 4.8 by 3 mm, has 17 rows with 30 teeth per half-row. The 6 inner teeth are simple spines, whose size increases from 46 μ to 210 μ. The succeeding teeth are hooks. Their length increases from 300 μ to 500 μ. From the 24th outwards the size decreases; the 2 outermost teeth are 95 μ and 60 μ long. The stomach lies free over the liver, the caecum on the left.

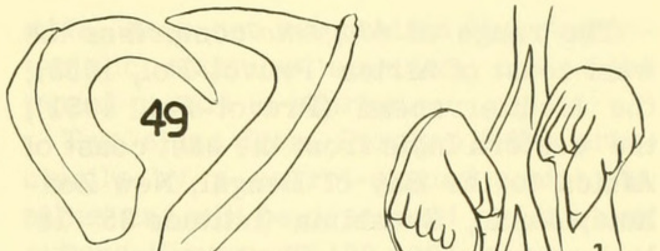
The autosperms in the ampulla and the allosperms in the seminal reservoirs show that the specimen is mature. The inner oviduct (io) and the seminal duct separate at the exit of the longish ampulla (a). The prostatic part (q) is the dilated inner section of the male duct; the outer one (d) is narrower. It opens without a papilla into a strongly muscular male atrium and functions as an acrembolic penis (p).

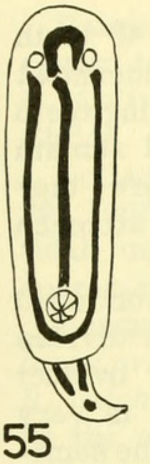
Between the nidamental duct (ni) and the penis, a short vagina (v) runs to the seminal reservoirs, the large spermatheca (t) and the small spermatocyst (sc). The spermatheca contains irregularly heaped sperms, the spermatocyst parallelly arranged ones. The topography of the reservoirs and their ducts corresponds to the vaginal type. The allosperm duct (au) leads from the the spermatocyst to the inner region of the female gland mass (mu), where the rising allosperms meet the eggs descended through the inner oviduct (io).

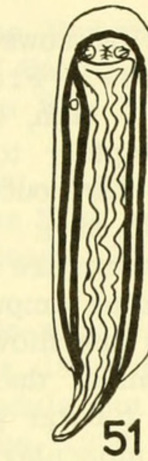
On the genus *Atagema* Gray 1850

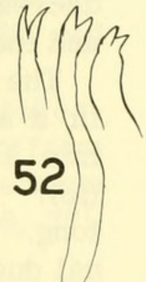
The holotype of *Doris carinata* Quoy & Gaimard 1832, from New Zealand has dried (Pruvot-Fol, 1934, p 64). Therefore Bergh's description of a similar specimen from New Zealand (1904, p 39-41), which he called *Atagema carinata* (Quoy & Gaimard, 1832), is acceptable to settle the type. *Petelodoris* Bergh (1882, p 227) and *Sclerodoris* Eliot (1903a, p 361) cannot be separated from *Atagema*. The 2 known species of *Peronodoris* Bergh, 1904, however, have a penial stylet. This genus cannot be united with *Sclerodoris*, as did Thiele (1931, p 435), Allan (1947, p 451) and Iredale & McMichael (1962, p 93), but should be maintained separate (Eliot, 1908, p 113, 114; Odhner, 1926, p 54).

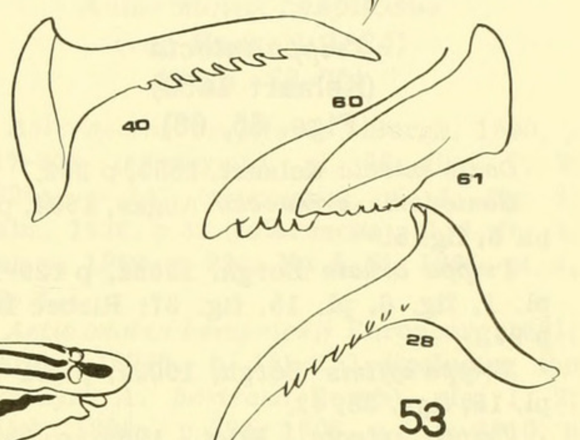
The species of *Atagema* have a hard and rough notum; those of *Halgerda* Bergh, 1881, a leathery or stiff, jelly-like one. Due to the texture of the notum, *Doris apiculata* Alder & Hancock (1864, p 122) was removed from *Sclerodoris* Eliot (1903a, p 361), i.e., *Atagema*, to *Halgerda* (id., 1906, p 645, 1002; 1908, p 113). The strong prostate, an internal character of *Halgerda*, was found in *H. apiculata* by Eales (1938, p 404).

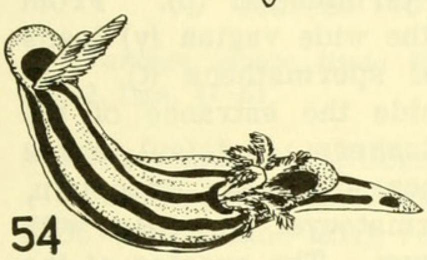












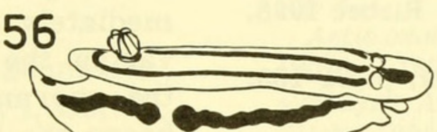
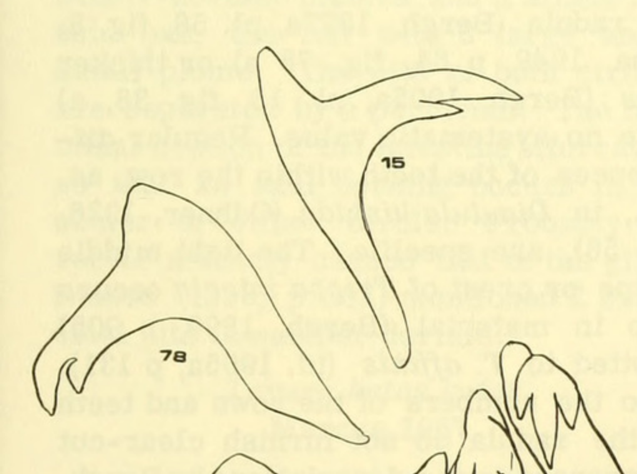
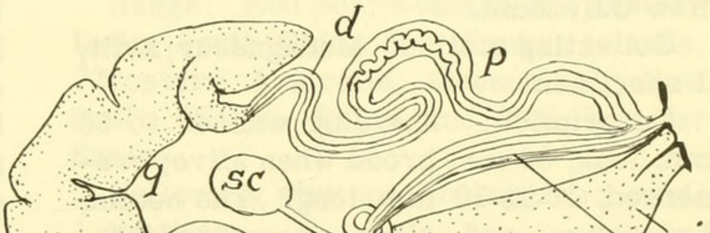


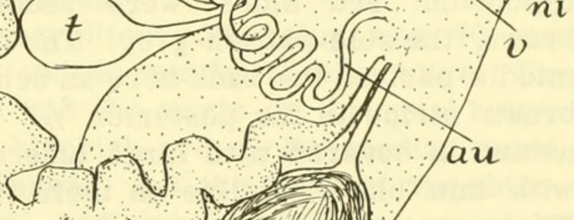
FIG. 49. *Conualevia marcusi*. Radular teeth.

FIGS. 50-53. *Chromodoris quadricolor*. Fig. 50, Dorsal view of preserved slug. Fig. 51, Ventral view of same. Fig. 52, Labial rodlets. Fig. 53, Radular teeth.

FIGS. 54-56. *Hypselodoris regina*. Fig. 54, Living slug, from color photo. Fig. 55, Preserved slug, dorsal view. Fig. 56, Side view of same.







FIGS. 57-59. *Hypselodoris regina*. Fig. 57, Labial rodlets. . Fig. 58, Radular teeth. Fig. 59, Diagram of reproductive organs; prostate laid apart.

The range of *Atagema* comprises the west coast of Africa (Pruvot–Fol, 1953); the Mediterranean (Pruvot-Fol, 1951); the western Indic from the east coast of Africa to the Bay of Bengal; New Zealand; Japan, Enoshima (latitude 35° 18' N, longitude 139° 22' E); California, San Diego (Collier, 1963).

Trippa intecta
(Kelaart 1859)
(Figs. 65, 66)

Doris intecta Kelaart, 1859, p 302.

Goniodoris erinaceus Angas, 1864, p 57, pl. 5, fig. 5.

Trippa ornata Bergh, 1905a, p 129-131, pl. 1, fig. 6, pl. 15, fig. 37; Risbec 1928, p 97.

Trippa affinis Bergh, 1905a, p 131-133, pl. 15, figs. 38, 42.

Trippa intecta, Eliot, 1909, p 83-85; Baba, 1949, pl. 24, fig. 89. Yu & Si, 1965, pl. 3, fig. 2.

Trippa erinaceus, Allan, 1947, p 450, pl. 42, fig. 8.

Range: Ceylon; Malaysia; South China Sea; middle Japan; New South Wales; New Caledonia.

Collecting station: Madagascar; xviii, 1 specimen.

Description: The slug was 40 to 50 mm long, 30 mm broad when alive; preserved, it is 30 mm long. The notum, hyponotum and sides were reddish-brown, the sole whitish-grey. The dark middle part of the back bore an ocher-brown stripe in the posterior ⅔. The notum is covered with large tubercles with thin black papillae on their tops. These contain sparse spicules, some of which stand out. On the sides of the foot are small tubercles; larger ones are on its wavy black border. The connection from head to foot (Bergh, 1877a, pl. 58, fig. 3) was not seen, as part of the mantle border had been autotomized. The rhinophores are black with white tips and have about 25 leaves. The 5 tripinnate gills are black. The high rhinophoral sheaths and the borders of the branchial pit bear tubercles and papillae. The anterior foot border is bilabiate and notched.

The labial cuticle is smooth. The radula has 24 rows and 40 to 43 teeth per half-row. From the innermost tooth, 100 μ high, the succeeding teeth increase rapidly to 280 μ and remain large till far outwards, where they decrease to 85 μ. The large stomach and the caecum are free.

The winding ampulla (a) is continued in a short spermoviduct which divides into a seminal duct and inner oviduct (io). The tubular prostate (q) is very long. The muscular portion of the seminal duct winds in a sheath and is widened in its penial termination (p). From the vestibule the wide vagina (v) leads to a spherical spermatheca (t). Immediately beside the entrance of the vagina the allosperm duct (au) leaves the spermatheca and, near its origin, bears the spermatocyst (sc) filled with orientated sperm. The opening of the allosperm duct into the gland mass (mu) is near the entrance of the inner oviduct. The nidamental duct (ni) opens behind the vestibule (ve).

Remarks: Narrower inner teeth of the radula (Bergh, 1877a, pl. 58, fig. 5; Baba, 1949, p 64, fig. 78 a) or thicker ones (Bergh, 1905a, pl. 15, fig. 38, a) have no systematic value. Regular differences of the teeth within the row, as, e.g., in *Diaulula hispida* (Odhner, 1926, fig. 56), are specific. The light middle stripe or crest of *Trippa intecta* occurs also in material (Bergh, 1890, p 905) allotted to *T. affinis* (id. 1905a, p 131). Also the numbers of the rows and teeth of the radula do not furnish clear-cut differences in the descriptions by Bergh, Eliot and Risbec, so that *T. affinis* cannot be maintained.

Trippa monsoni Eliot (1903a, p 371) from the east coast of Zanzibar, probably identical with the Ceylonese *T. leoparda* (Kelaart, 1859, p 294), differs from *T. intecta* by characters of color and radula.

Rostanga pulchra
MacFarland 1905

Rostanga pulchra, MacFarland, 1966, p 165-169, pl. 25, fig. 7, pl. 29, figs. 7-10, pl. 35, figs. 1-16.

Range: From the Vancouver Island region to the Gulf of California (Farmer & Collier, 1963, p 62); South Chile, Chiloé.

Collecting station: Mexico; i, Oct. 29, 1966 (Mary Anne Hill), rocky intertidal on a red sponge, 2 bright red specimens.

Remark: The Indo-west Pacific *Rostanga arbutus* (Angas, 1864) differs from *R. pulchra* by the radula, but not always by the color (Marcus, 1959, p 36, 37).

Taringa aivica timia
Marcus 1967

Taringa aivica timia Marcus, 1967, p 189, figs. 47-51.

Range: Gulf of California, Sonora.

Collecting station: Mexico; i, Oct. 15, 1966 (Mary Anne Hill), rocky intertidal, 1 specimen.

Remarks: The specimen was transparent light brown with darker rhinophores and spots on the notum and gills. The latter form 2 circles, the right one with 7 normal plumes and a single minute one, the left with 3 large and 1 small plume. The pits of both circles are separated by a perineum. The terminal section of the intestine bifurcates, so that an anal opening occurs in the center of either circle. Probably the rectal anomaly caused that of the gills. Risbec (1928, p 108) mentioned 2 branchial pits in another doridid.

Tayuva ketos ketos
Marcus 1967

Tayuva ketos Marcus, 1967, p 192, figs. 52-56.

Range: Gulf of California, Sonora.

Collecting station: Mexico; i, July 18, 1966 (Mary Anne Hill), rocky intertidal, 1 specimen.

Remarks: The present animal, about 25 mm long when alive, is young and less intensely colored than the original material. The radula has 21 rows and 25 teeth per half-row. The 2 hindmost plumes of the 6 tripinnate gills are largest. The vestibule, though already wide, does not yet contain the characteristic cuticular spicules. Also, the penial papilla is shorter.

Two slugs from Curaçao differ principally by a carrot-shaped penial papilla, and will be described under a new subspecific name.

Asteronotus cespitosus
(van Hasselt 1824)
(Figs. 68-70)

Asteronotus cespitosus, Bergh, 1890, p 917-921 (synonymy), pl. 86, figs. 7, 8; 1905a, p 141 (synonyms), pl. 1, fig. 5; Baba, 1936, p 32 (references), pl. 1, fig. 2; Kenny, 1960, p 224; Yu & Si, 1965, pl. 3, fig. 9.

Asteronotus hemprichii Ehrenberg, 1831; Bergh, 1877b, p 161-173 (including the synonym *A. bertrana* Bergh), pls. 1, 2; Eliot, 1903a, p 384; 1908, p 116; 1910, p 428; Pruvot-Fol, 1933, p 120, 121, pl. 1, fig. 1; 1934, pl. 1, fig. 19.

? *Asteronotus fuscus* O'Donoghue, 1924a, p 551, 552, pl. 28, figs. 12, 13.

Asteronotus brassica Allan, 1932, p 93-95, Figs. 1, 2 (on p 104), pl. 5, figs. 12-14.

Range: Red Sea; western and eastern Indic; South China Sea; Ryukyu Islands; ?Western Australia; Queensland; New South Wales; Palau and Fiji Islands; Samoa.

Collecting station: Madagascar; xxvi, 1 specimen.

Description: The slug was 70 mm long and 40 mm broad when alive. The back and the warts on the notal bulges are blackish-green, the median crest, the bulges, and the rims of the rhinophoral and branchial pits greenish-brown, the margins of the notum ocher to reddish-brown. Preserved, the dark pigment is visible through the notal border on the under side. Inwards to this dark zone follows a dense light stripe and one with epidermal pigment. Also, the sole is pigmented. The peritoneum and the vestibule are grey. The rhinophoral sheaths have a median spur. The branchial pit is surrounded by 2 anterior and 3 posterior lobes. The smooth labial cuticle is folded. The radula has 38 rows with 45 smooth, hooked teeth per half-row. The stomach has thick walls.

The hermaphrodite duct forms a tubular ampulla (a) at the exit of which the oviduct and the seminal duct separate. The latter begins with a clustered prostatic part (q), followed by a smooth, massive one. The winding sperm duct (d) ends with a coil in the muscular penial pouch (p), which opens into the deep, folded vestibule (ve). Opposite to the penial pouch there is a voluminous vestibular gland (sd), the follicles of which have a common muscular duct. This ends with a spine (ss) lodged in a muscular sac. The vagina (v) courses from the vestibule to the spermatheca (t) containing residues of sperm and prostatic secretion. Beside the entrance of the vagina the allosperm duct (au) leaves the spermatheca. The duct communicates with the broad lobed spermatocyst (sc) filled with sperm, and joins the inner oviduct at its entrance into the gland mass. The nidamental duct (ni) opens behind the aperture of the vestibule.

Remarks: The reproductive organs of our specimen agree with Bergh's descriptions (1878b, p 641-644; 1890, p 920, 921), which refer to animals from Malaysia and the Palau Islands. These organs are somewhat different in Eales' specimen (1938, p 104, fig. 120) from the Gulf of Aden, which measured 32 mm long preserved and was possibly immature.

Asteronotus fuscus, listed above, is probably a young *A. cespitosus*. Mrs. Joyce Allan related *A. brassica* to *A. mabilla* (Abraham, 1877, p 249) a synonym of *cespitosus*, by a handwritten note in her reprint of 1932, sent in 1954.

Asteronotus madrasensis O'Donoghue (1932, p 158) has considerably more radular teeth than *A. cespitosus*. *Asteronotus* sp. (Eales, 1938, p 105-107) is similar to *A. madrasensis*, but immature. *A. wardianus* Allan (1932, p 95) does not belong to *A. cespitosus*. *A.* (*Tumbia*) *trenberthi* Burn (1962, p 161) is not an *Asteronotus*. Risbec (1928 and later) called *Discodoris boholiensis* Bergh (1877a, p 519) *Asteronotus b.*, but it is the type species of *Discodoris*, whose species have labial rodlets.

Platydoris scabra (Cuvier 1804)

Platydoris scabra, Marcus, 1960a, p 907-911 (synonymy), figs. 55-57; 1965, p 277.

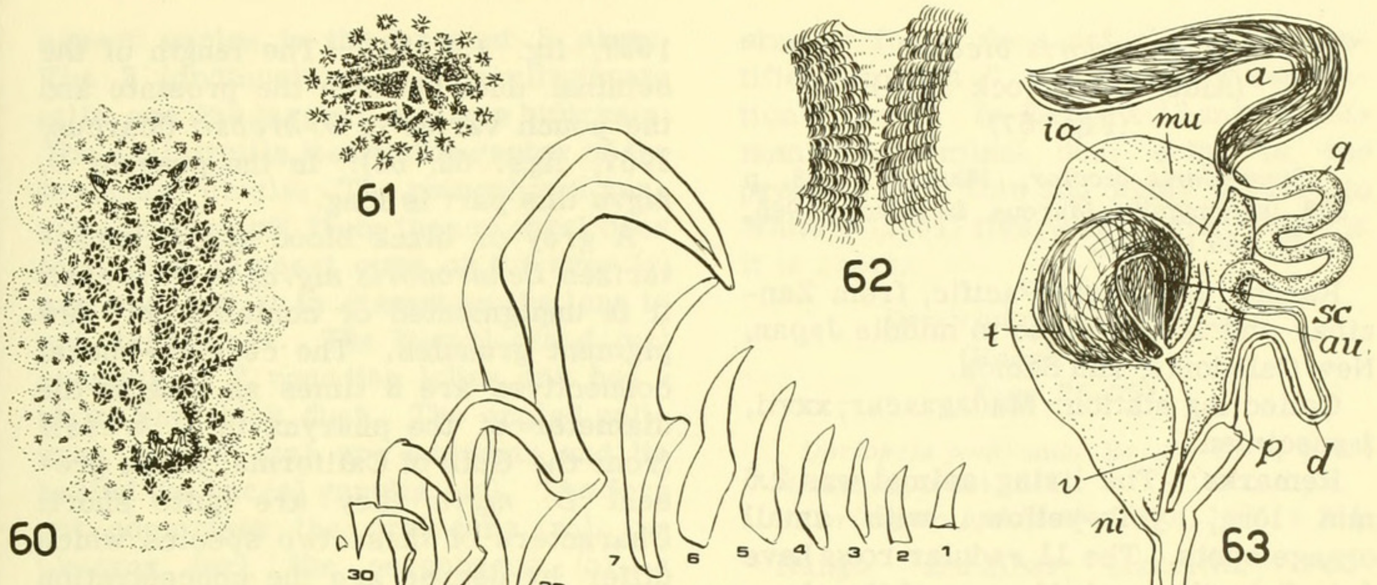
Range: Red Sea; Indo-west Pacific, from the east African coast to the Carolines, Marshall and Tonga Islands; Samoa.

Collecting station: Madagascar; xxvi, 2 specimens.

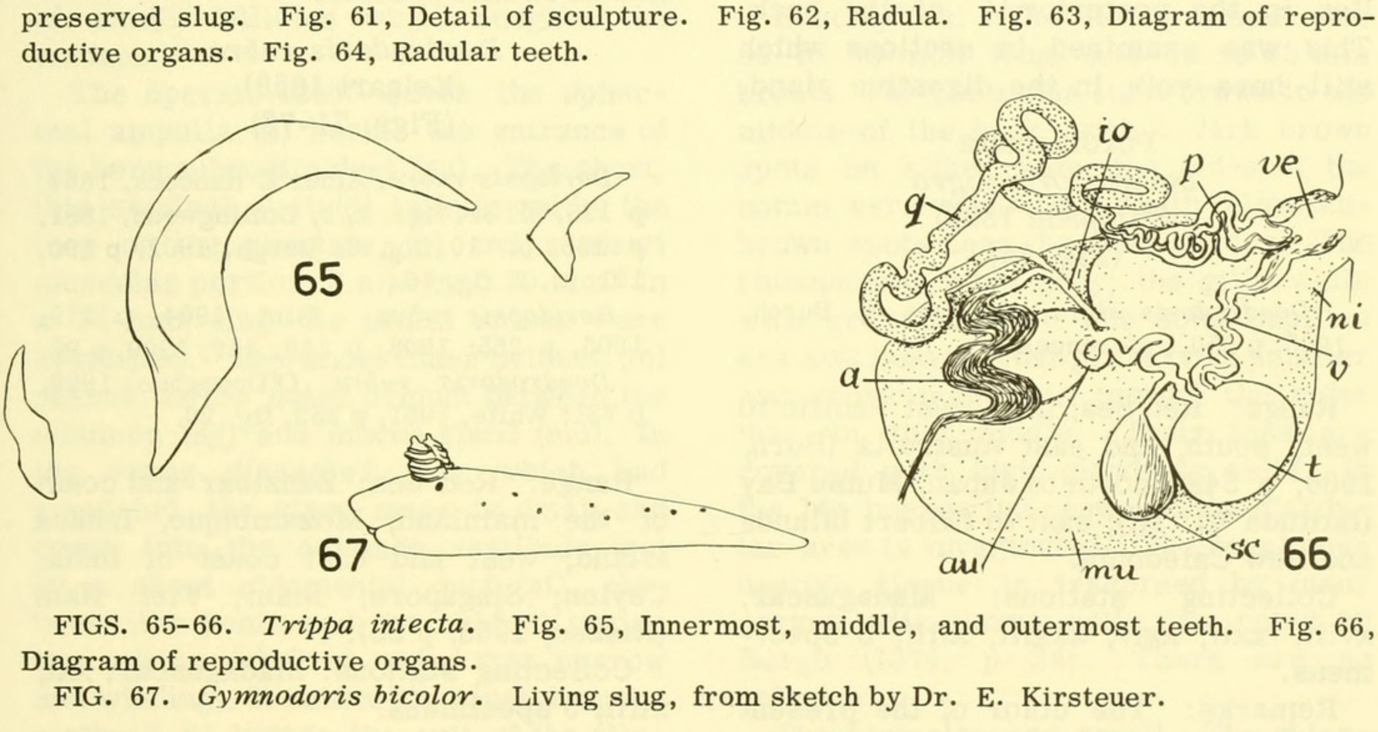
Descriptive notes: The living animal was 100 mm long, 50 mm broad. The notum is light brown with a broad marginal region of white blotches in its 3 posterior fourths. The rhinophores and the gills are grey; the former have orange-yellow terminal knobs, the latter have dark vessels. The digitiform tentacles are flecked with black and tipped with yellow. Also, the rim of the branchial pit and the border of the sole are yellow. The sole itself is white; the sides of the foot are rusty brown.

The radula has 50 rows of teeth with 98 to 100 teeth per half-row. In some of the innermost teeth the cusp arises from a shoulder-like angle of the base, as in Bergh's fig. 18 (1884, pl. 2). The salivary glands have narrow fundi, with an inner wide and an outer thin portion of the ducts.

Remarks: The salivary glands in the present specimen are as in the animal from the Red Sea (Marcus, 1960a); in other descriptions the terminal narrow part is much longer (Bergh, 1884, pl. 3, fig. 11, a) or the wide middle portion is absent (White, 1950, p 98). As in other species of the genus the ejaculatory duct and the vagina have different cuticular structures. The latter bears thick folds as in most descriptions; only once are prominent rounded bosses mentioned (Bergh, 1905a, p 138). The male duct contains spiny discs.

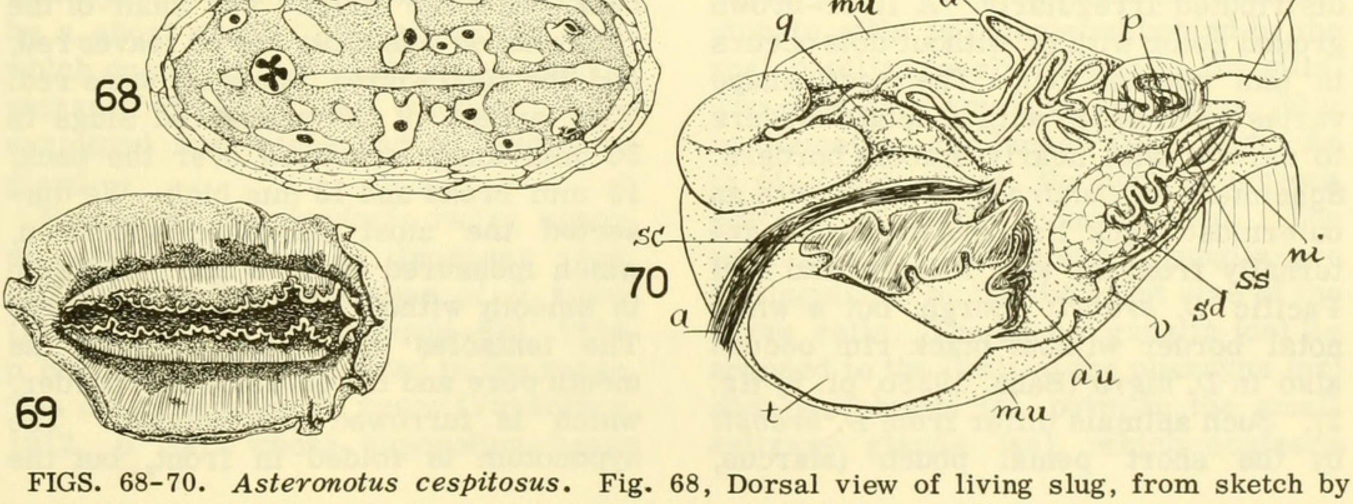


FIGS. 60-64. *Ategema osseosa*. Fig. 60, Dorsal aspect, combined from color photo and preserved slug. Fig. 61, Detail of sculpture. Fig. 62, Radula. Fig. 63, Diagram of reproductive organs. Fig. 64, Radular teeth.



FIGS. 65-66. *Trippa intecta*. Fig. 65, Innermost, middle, and outermost teeth. Fig. 66, Diagram of reproductive organs.

FIG. 67. *Gymnodoris bicolor*. Living slug, from sketch by Dr. E. Kirsteuer.



FIGS. 68-70. *Asteronotus cespitosus*. Fig. 68, Dorsal view of living slug, from sketch by Dr. E. Kirsteuer. Fig. 69, Ventral view of preserved slug. Fig. 70, Diagram of reproductive organs.

Gymnodoris bicolor
(Alder & Hancock 1864)
(Fig. 67)

Gymnodoris bicolor, Macnae, 1958, p 358 (synonymy); Marcus & Burch, 1965, p 249, 250 (range).

Range: Indo-west Pacific, from Zanzibar and Mozambique to middle Japan, New Caledonia, and Samoa.

Collecting station: Madagascar; xxvii, 1 specimen.

Remarks: The living animal was 2.5 mm long, yolk-yellow, with small orange spots. The 11 radular rows have 4 to 7 teeth per half-row, of the shape characteristic for the species. The slug has no gills yet around the anus that lies in the posterior 1/3 of the back. This was examined in sections which still have yolk in the digestive gland.

Porostomata
Dendrodoris nigra
(Stimpson 1855)
(Fig. 74)

Dendrodoris nigra, Marcus & Burch, 1965, p 250 (references).

Range: Red Sea; Indo-west Pacific to west, south, and east Australia (Burn, 1966, p 349); north to Japan, Mutsu Bay (latitude 41° N.); east to Gilbert Islands and New Caledonia.

Collecting stations: Madagascar; xviii, xxii, xxiv, xxxiii, xliii, 5 specimens.

Remarks: The color of the present specimens is black with small whitish-yellow dots in 2 longitudinal rows or distributed irregularly. A liver-brown ground color with or without dots occurs in this species too. The body shape varies from broad with undulate borders to narrow with nearly smooth borders. Specimens of *Dendrodoris nigra* with an outermost black line are separated externally from the west Atlantic and east Pacific *D. krebsii* Bergh, but a white notal border without black rim occurs also in *D. nigra* (Baba, 1935b, pl. 6, fig. 2). Such animals differ from *D. krebsii* by the short penial pouch (Marcus, 1957, fig. 152, ei). The length of the seminal duct between the prostate and the pouch varies in *D. krebsii* (Marcus, 1967, figs. 62, 63). In the present *D. nigra* this part is long.

A grey or black blood gland characterizes *Dendrodoris nigra;* in *D. krebsii* it is unpigmented or contains only few pigment granules. The cerebro-buccal connectives are 3 times as long as the diameter of the pharynx in *D. krebsii* from the Gulf of California; in the present *D. nigra* they are quite short. Characters of these two species which differ by degree are the concentration of the central nervous system, higher in *D. krebsii,* and the more coalesced oral glands in that species.

Dendrodoris rubra
(Kelaart 1858)
(Figs. 71-73)

Doriopsis rubra, Alder & Hancock, 1864, p 126, pl. 31, figs. 1, 2; Collingwood, 1881, p 135, pl. 10, fig. 8; Bergh, 1902, p 190, 191, pl. 2, fig. 16.
Doridopsis rubra, Eliot, 1904, p 279; 1905, p 255; 1908, p 118, 119; 1909, p 95.
Dendrodoris rubra, O'Donoghue, 1929, p 731; White, 1951, p 250, fig. 20.

Range: Red Sea; Zanzibar and coast of the mainland; Mozambique, Inhaca Island; west and east coast of India; Ceylon; Singapore; Siam; Viet Nam (Risbec, 1956, p 26).

Collecting stations: Madagascar; xxi, xliii, 5 specimens.

Description: The living slugs were pink, a little darker in the middle of the back, with red spots. The shaft of the rhinophores was pink, the 16 leaves red, and the knob white. The gills were red. The largest of the preserved slugs is 30 mm long, measured over the back, 15 mm broad and 13 mm high. We dissected the most stretched specimen, which measured 12 by 8 mm. The skin is smooth without papillae or spicules. The tentacles are folds between the mouth pore and the anterior foot border, which is furrowed and notched. The hyponotum is folded in front, but the aspect varies in the present 5 slugs. The 2 hindmost of the 6 multipinnate gills are the largest, and are bifurcate. The anal papilla lies in the center of the branchial circle. The rhinophoral ganglia are set off from the cerebral ones (cr). The pigment cups of the eyes (y) are big, 140 μ in diameter; the lens is not very large. The buccal gland (uc) consists of 2 roundish lobes and has a short and thick duct. The angled salivary glands (sa) are separate and lie behind the buccal ganglia (cc). The fore gut comprises the oral tube (ro), the pharynx (nx), the oesophagus (o), a spherical dilatation, and the digestive gland with a wide lumen, the stomach. The roundish blood gland is composed of small follicles which roughen the surface.

The spermoviduct leaves the spherical ampulla (a) beside the entrance of the hermaphrodite duct (eu). The short, thin seminal duct (d) is followed by the loop of the prostate (q) and a short muscular portion, 3 mm by 0.19 mm. In a 15-mm slug the penial spines were developed. The short inner oviduct (io) passes to the outer oviduct between the albumen (ag) and mucus gland (mu). In the young dissected slug which had copulated, the gland mass is small and opens into the common vestibule (ve) by a short nidamental duct (ni). Between the penis and the oviduct begins the vagina (v) first wide, then narrow and winding. It enters the longish spermatheca (t) beside the exit of the allosperm duct (au). The globular spermatocyst (sc) filled with sperm is joined by a short canal to the allosperm duct, which opens into the gland mass near the entrance of the inner oviduct. The 3 examined specimens had no vestibular gland.

Remarks: *Dendrodoris rubra nigromaculata*, frequent in Japanese seas, and the possible synonyms of *D. rubra* (Eliot, 1905, p 254; Pruvot-Fol, 1934, p 62), were not considered in the range. The description of *D. rosea* (Vayssière, 1912, p 82), whose hyponotum bears similar folds, does not allow for identification with *D. rubra* nor for separation from it. In Bergh's 18 mm specimen the seminal duct ectal to the prostate was "thin and highly wound"; in White's (1951) figure of a 36-mm animal it is short.

Dendrodoris pudibunda (Bergh 1879) (Figs. 75-79)

Doriopsis pudibunda Bergh, 1879, p 33, 34; 1889a, p 844, 845.

Doridopsis pudibunda, Eliot, 1904, p 274.

Range: Zanzibar; Mauritius, Fouquets Reefs; Philippines Sea.

Collecting station: Madagascar; xxvi, 1 specimen.

Description: The living animal was 80 to 90 mm long, and 30 to 35 mm broad. The color was light brown in the middle of the back, with 6 dark brown spots on either side; the sides of the notum were whitish-grey with yellowish-brown spots near the wavy border. The rhinophores were grey; the gills white with grey plumes. The notal papillae are soft bosses when preserved, smaller and more numerous toward the sides than in the middle. Their tops are covered with high glandular cells. In the big bosses the center of the glandular area is invaginated. The noval connective tissue is traversed by many nerves with nerve cells, as noted by Bergh (1879, p 34). There are no spicules.

The tentacles are small. The rhinophores have 25 leaves and smooth bordered pits. The circle of the 8 multipinnate gills is completed behind by the anal papilla, nearly as high as the gills. The eyes have small pigment cups, 80 μ in diameter, and lenses 120 μ high. As in all *Dendrodoris*, the central nervous system is highly concentrated. The cerebral (cr) and pleural ganglia are distinguished by the different size of the nerve cells. The buccal ganglia (cc) lie apposed to the limit of the pharnynx (nx) and oesophagus (o), between the small salivary glands (sa), which coalesce behind them. The mouth tube (ro) projects into the buccal cavity and receives the thin, winding duct of the buccal gland (uc). The 2 lobes of the latter are fused. The mouth tube bends to the left before passing through the nerve ring. Behind this follows the long, muscular pharynx (nx) looping first to the left, then to the middle. Its lumen is triangular. The glandular oesophagus (o) forms a globular dilation before entering the stomach. At the beginning of the intestine there is a small caecum. The aorta (ao) courses through the bipartite, coarsely lobed blood gland (us). There is no pigment in the mouth tube, the inner organs, or the peritoneum.

The spermoviduct leaves the pear-shaped ampulla (a) some distance from the entrance of the hermaphrodite duct (eu). The seminal duct (d) widens suddenly to form the prostatic portion (q) and passes abruptly to the following narrow part (ui), 100 μ in diameter. This section uncoiled would be at least 10 mm long. The short muscular tube, the acrembolic penis (p), is wide and bears a few cuticular spines. Where it opens into the folded common vestibule (ve) inserts a retractor muscle (r), which lodges a small gland among its fibers. There is a long, clustered vestibular gland (xv). The inner oviduct (io) enters the gland mass between the albumen gland (ag) and the mucus gland (mu). The short nidamental duct (ni) opens into the vestibule (ve) beside the wide beginning of the vagina (v), and continues as a winding duct to the spherical spermatheca (t). Close to its entrance leaves the long, winding allosperm duct (au), to which the spermatocyst (sc) is connected by a long, straight duct. The spermatocyst contains oriented sperms.

Remarks: When the species was first mentioned (Bergh, 1876, p 387), it was neither described nor figured. The penial spines are scarse in specimens from the western Indic; in the original animal from the Philippines they were called "as usual." The thick-walled seminal duct of that slug, 2.5 mm long, does not agree with our specimen. The above mentioned different length of the seminal duct in *Dendrodoris rubra* shows that this character is systematically useless.

Dendrodoris clavulata (Alder & Hancock, 1864, p 127), not the *D. clavicu-lata* (Eliot, 1904, p 278) that is widely distributed in the Indo-west Pacific (Risbec, 1953, p 24), has spots on the border of the notum as *D. pudibunda*, but its colors are brighter and the bosses stronger.

Phyllidia (*Phyllidia*) *varicosa* Lamarck 1801

Phyllidia (*Phyllidia*) *varicosa*, Marcus, 1960a, p 911-913 (references, range), fig. 58; 1965, p 277, 278.

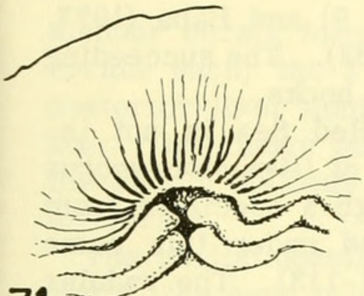
Range: Red Sea; tropical Indo-west Pacific, from the east coast of Africa to the Ryukyu Islands and east to Micronesia, Gilbert Islands.

Collecting station: Madagascar; viii, 4 specimens.

Descriptive notes: The living animals are up to 70 mm long and 40 mm broad, black with bluish-grey ridges, yellow papillae, and graphite-grey sides and sole. The connections of the tentacles with the foot (Bergh, 1869, pl. 14, fig. 6; Pruvot-Fol, 1952, fig. 3) are distinct. There are 150 branchial leaves; the genital aperture lies at the level of the 13th gill. The folds of the pericardium, an important feature of the Porostomata (Bergh, 1892b), were drawn in their natural position by Risbec (1956, fig. 85).

Remarks: The gastro-oesophageal ganglia (Bergh, 1869, p 380, 401, pl. 16, fig. 4) were confounded with salivary glands in early publications (Bergh, 1889a, p 857; 1892a, p 1126; 1897, pl. 12, fig. 13). This was repeated in Hoffmann's treatise (1938, p 947). Risbec (1956, p 23) described the 2 pairs of ganglia correctly.

Risbec's *Fryeria pustulosa* from Madagascar (1929) is *Phyllidia varicosa;* in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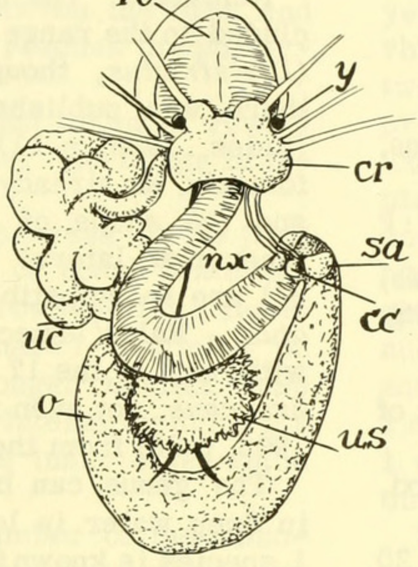

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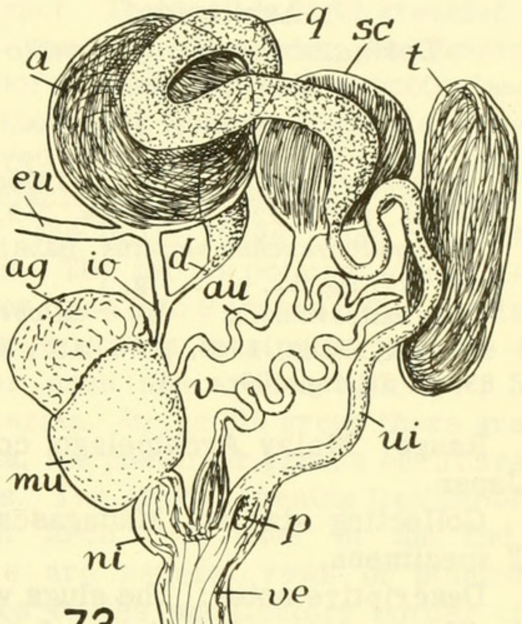

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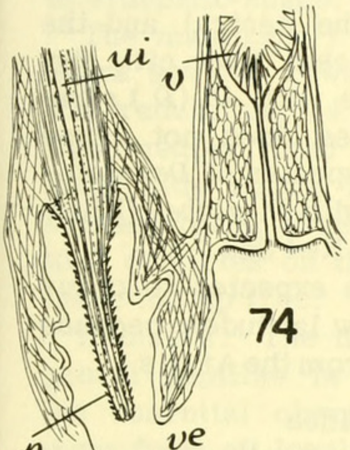
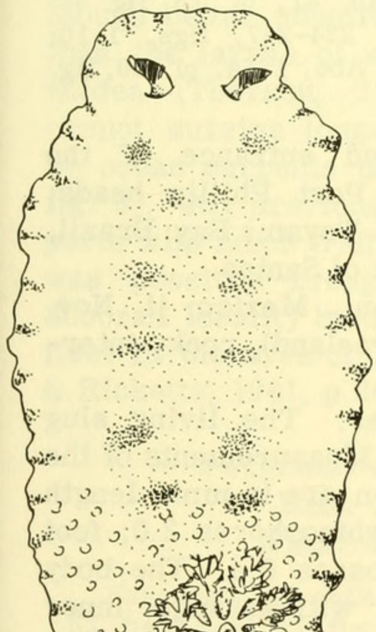


FIGS. 71-73. *Dendrodoris rubra*. Fig. 71, Head of preserved slug. Fig. 72, Anterior part of gut. Fig. 73, Diagram of reproductive organs.

FIG. 74. *Dendrodoris nigra*. Section of penis and vagina.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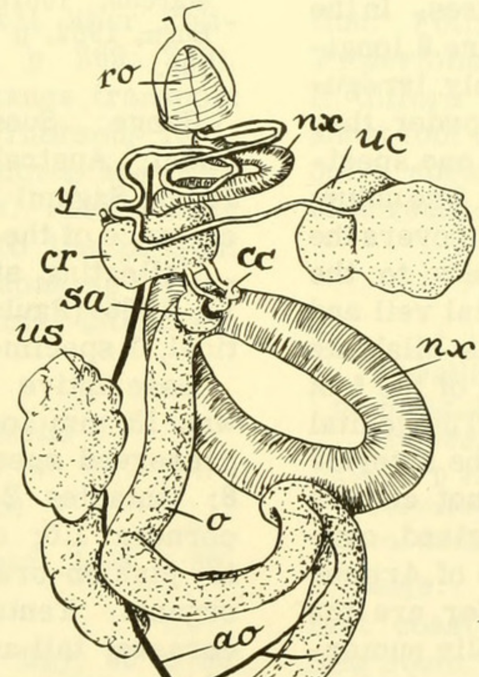

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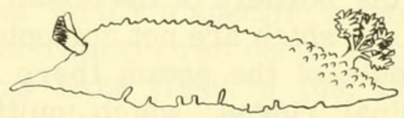
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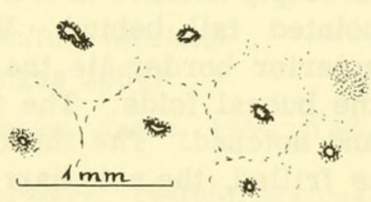

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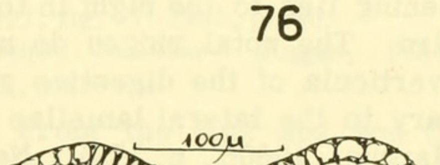

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FIGS. 75-79. *Dendrodoris pudibunda*. Fig. 75, Side view of living slug, from sketch by Dr. E. Kirsteuer. Fig. 76, Skin. Fig. 77, Section of skin. Fig. 78, Dorsal view of living slug, from sketch by Dr. E. Kirsteuer. Fig. 79, Anterior part of gut.

his fig. 1 the dorsal anus is seen at the end of the dorsal crest.

Arminoidea
Dermatobranchus (*Dermatobranchus*) *striatus*
van Hasselt 1824

Pleuroleura striata, Bergh, 1905a, p 209, 210, pl. 4, fig. 22, pl. 19, figs. 7-9.
Dermatobranchus striatus, Baba, 1937, p 316, 317, fig. 12, pl. 2, fig. 1.
Dermatobranchus (*Dermatobranchus*) *striatus*, Baba, 1949, p 73, 157, 158, fig. 83, pl. 29, fig. 109.

Range: Malay Archipelago, coasts of Japan.

Collecting station: Madagascar; xxi, 2 specimens.

Descriptive notes: The slugs were 20 to 25 mm long when living, 5 to 7 mm broad. The ground color was yellow-ocher with whitish-grey ridges and dark brown blotches near the wavy borders. The rhinophores are furrowed longitudinally, whitish-grey peppered with black, and have a greenish-yellow top. In the borders of the notum lie the saccules, which are not cnidophores. In the middle of the notum there are 3 longitudinal ridges, which multiply irregularly backwards. On the border they run parallel to the contour in one specimen and fan out in the other. The notum is deeply notched in front and covers the pointed tail behind. Ventrally to the anterior border lie the frontal veil and the buccal folds. The foot is bilabiate and notched. The thick edge of the foot is frilled, the sole narrow. The genital opening lies to the right in the anterior third. The notal ridges do not contain diverticula of the digestive gland, contrary to the lateral lamellae of *Armina* (Marcus, 1960b, p 172). Nor are the ridges provided with especially numerous blood lacunae, so that a respiratory function is not evident.

The thin, light brown jaws have denticulate masticatory borders. The radula has 32 rows with 16 teeth on either side of the rhachidian. The innermost lateral is much broader than the succeeding ones, as shown in the figures of Bergh (pl. 19, fig. 9) and Baba (1937, fig. 12; 1949, fig. 83). The succeeding laterals are smooth hooks.

Remarks: The Red Sea is not included in the range of *Dermatobranchus* (*D.*) *striatus*, though a specimen from there was published under this name (Eales, 1938, p 111-113). The radular formula, as already noted by the author, and the shape of the central and the innermost lateral teeth (loc. cit., fig. 24) are incompatible with *D.* (*D.*) *striatus*. Eales' species does not agree with any of the 17 species of *Dermatobranchus*, not even with *D. glaber* (Eliot, 1908, p 88) from the Red Sea.

The genus can be expected to occur in deep water in low latitudes, because 1 species is known from the Arctis.

Eolidoidea
Coryphellina rubrolineata
O'Donoghue 1929
(Fig. 81)

Coryphellina rubrolineata O'Donoghue, 1929, p 798-802, fig. 219; Baba, 1955, p 26, 27, 51, figs. 40, 41, pl. 13, fig. 37; Marcus, 1961b, p 224-227, figs. 1-10; Burn, 1962, p 107; Abe, 1964, pl. 30, fig. 107.

Range: Suez and entrance of the Canal; Australia, Port Phillip heads; Japan, Sagami Bay, Toyama Bay; Brazil, entrance of the Bay of Santos.

Collecting station: Mexico; ii, Nov. 12, 1966 (Paula Vreeland), rocky intertidal, 1 specimen.

Descriptive notes: The living slug was 13 mm long. Measurements of the preserved specimen are in mm: length 8; tentacles 2.5; rhinophores 2.0; foot corners 1.0; cnidosacs 0.4. The body is pinkish-orange with orange inner organs. Tentacles, rhinophores, foot corners, tail and cerata bear red rings, which were violet in life. The long white tips of the cerata were powdered with yellow. A median line on the pointed tail was silvery white.

The shaft of the rhinophores is short. The back of the long club is beset with 12 oblique rows of about 15 high and blunt papillae each. The consistent, slender cerata form 11 groups of 3 to 4 cerata each; the 3 first groups of the posterior liver contain 7, 6 and 5 cerata. The flange between the back and the side of the body reaches the posterior cerata.

The genital openings lie under rows 3 and 4, the anus under the flange in the interhepatic space.

The masticatory process of the jaws bears several rows of rough denticles. The radula has 34 rows of 1.1.1 teeth. The median tooth has 7 denticles on each side and a longer median cusp beneath them. The lateral teeth have 5 to 7 denticles on the inner side, which leave the tip free.

Remarks: The number of the rhinophoral papillae is highly variable, but the essential characters of the specimens from all localities do not evidence clear-cut differences. The zoogeographic aspect of *Coryphellina rubrolineata* is that of a species recently distributed on ships' bottoms. The larva of the neighboring *Coryphella rufibranchialis*, though better adapted for a pelagic life than the larvae of several other Eolidoidea (Thorson, 1946, p 269, 270), cannot survive long-distance transport by ocean currents (see Thorson, 1961, fig. 3). All previous records are from ports with much traffic. *C. rubrolineata* was possibly brought to the present Sonoran locality by the Japanese fishing fleet in the area of Guyamas (Steinbeck & Ricketts, 1941, p 247).

Favorinus mirabilis Baba 1955 (Figs. 83-85)

Favorinus mirabilis Baba, 1955, p 30, 53, fig. 50, pl. 17, fig. 46.

Range: Japan, Sagami Bay, 50 to 60 meters.

Collecting station: Madagascar; xxix, 1 specimen.

Description: The living slug was 5 mm long and 1.2 mm broad. The ground color is transparent light grey with white flecks over the whole body, especially on the pericardial hump. The claviform grey cerata have a subapical brown spot. The head is light greenish-yellow, the tentacles grey; the brown rhinophores bear few yellow spots, between them lies a brown triangle. The preserved specimen is 3.5 mm long. The tentacles are longer than the rhinophores, the latter longer than the foot corners. The tail is pointed. The rhinophores have 8 to 9 leaves. The cerata stand in 8 groups in single rows, the 4 anterior ones are arches with 7, 7, 5 and 4 cerata. In the 5th group there are 2 cerata, the posterior groups each have 1 ceras. The genital opening lies under the 1st arch, the anus in the 2nd.

There are several rows of pointed denticles on the masticatory border of the jaws. The 15 radular teeth have strong cusps and no denticles.

Remarks: The type specimen was larger, 15 mm, and had correspondingly more (12) groups of cerata and 21 teeth. Only the 1st 3 groups are arches, the rest slanting rows, but our single specimen does not justify a specific separation. Foliate rhinophores occur also in *F. perfoliatus* Baba (1949, p 109, 177). It differs from the present species by short foot corners, slender cerata without a subapical spot, and only 2 groups of horseshoe-shaped cerata.

Pteraeolidia ianthina (Angas 1864)

Flabellina ianthina Angas, 1864, p 65, pl. 6, fig. 6.

Pteraeolidia semperi (Bergh), Marcus, 1960a, p 921, fig. 77; 1965, p 280.

Pteraeolidia ianthina (Angas, 1864), Burn, 1965, p 89, 90.

Range: From the Red Sea and the east coast of Africa to middle Japan; New South Wales; east to New Caledonia and Micronesia, Carolines.

Collecting station: Madagascar; Tanikely, 1 specimen.

Remarks: The preserved animal is 40 mm long and has 18 pairs of tufts of cerata. Living slugs up to 75 mm long have been recorded.

Noumeaella isa, new species
(Figs. 86-89)

Collecting station: Madagascar; xxx, 1 specimen.

Diagnosis: This first *Noumeaella* from the western Indic is characterized by an opaque white net all over the body, and the radular tooth whose cusp is flanked by 2 small inner and 4 larger outer denticles. Holotype: AMNH 140854.

Description: The living animal was 5 mm long, 2.5 mm broad, semitransparent white, with an opaque white network over the whole body. Also, the yellowish-white cerata have this net, as well as brownish-yellow granules at their base. The pointed foot corners are about as long as the tentacles. The pointed rhinophores stand far behind the latter; on their posterior side they have a brush of papillae standing in rows. The small black eyes show at the base of the rhinophores. The slender cerata stand in 5 uniseriate arches. The 1st has 8 cerata. The groups following contain 8, 6, 4 and 2 cerata. In the interhepatic space lies the strong genital papilla; the anus lies in the first arch of the right posterior liver. The furrow of the anterior foot border is continued onto the angles.

The shape of the jaws is similar to that in *Noumeaella curiosa* Risbec and *N. rehderi* Marcus. No denticles were seen on the masticatory border. The radula has 16 horseshoe-shaped teeth with long limbs. The cusp is flanked by 2 small inner and 4 larger outer denticles on either side.

The male organs are a thin seminal duct which arises at the exit of the ampulla (a), a thick prostatic part (q) curving to the left and connected with the muscular terminal part (p) by a thin duct (d). The thick and long penis bears a cuticular stylet. The bursa (b) contains orientated sperm. A vaginal canal (v) isolated from the oviduct lies far inwards, but folds separate the path of the allosperms from the path of the eggs farther outwards. Insemination may be presumed near the opening of the vaginal canal.

Remarks: The 2 other species of the genus (Risbec, 1937, p 163; Risbec, 1953, p 158; Marcus, 1965, p 282) have a single strong median cusp flanked by 6 to 8 smaller denticles. The denticulate masticatory border of these species contrasts with the probably smooth one of the present species.

Aeolidiella indica
Bergh 1888
(Figs. 90, 91)

Aeolidiella indica Bergh, 1888, p 781-783, pl. 78, figs. 1, 2.

Range: Mauritius.

Collecting station: Madagascar; xlv, 1 specimen.

Description: The slug was 5 mm long, 1.5 mm broad, both when alive and preserved. Its buccal mass was pressed out. The longest cerata are 0.8 mm with 0.2-mm cnidosacs. The color was whitish-yellow with dark brown spots on the rhinophores, the middle of the back, and the anterior face of the cerata. The eyes are largest in the antero-posterior direction (140 μ). The tentacles are longer than the smooth rhinophores. The foot is narrower than the body, its furrowed anterior border has short angles. The tail is short.

The claviform cerata are cylindrical and pointed. The liver diverticula are smooth tubes in the present juvenile specimen. The cerata stand in 12 slanting rows. The 4 anterior ones bear 7 cerata each, followed with 2 with 5, 3 with 4, 1 with 3, and 2 with 2 cerata. Through the opaque skin the ramifications of the liver are not visible. The anus lies between the 4th and 5th rows.

The brownish jaws have growth lines parallel to the border. The radula has 13 light brown teeth. The strong median cusp is sometimes oblique. On either side of it stand 19 to 21 denticles; in the oldest teeth there are 10 to 14 denticles. The breadth of the teeth in micra is as follows: 80 in front, 146 behind; the height of the teeth in micra is 52 and 110, respectively, including the denticles, which are 20 μ and 26 μ long.

There is only a primordium of the male reproductive organ.

Remarks: *Aeolidiella faustina* Bergh (1900b, p 235; 1904, pl. 1: *A. pacifica*) has a minute central cusp on the tooth; *A. orientalis* Bergh (1889b, p 673) has rounded anterior foot corners (Eliot, 1908, p 96). The adult specimen of *A. drusilla* Bergh (1900b, p 33) has especially short anterior rows of cerata, and its anus lies between the 5th and 6th row. Also the young specimens allotted to *A. drusilla* with reservation (Bergh, 1905a, p 222) have 3 to 4 cerata in the anterior rows; the tooth has 15 lateral denticles. Our young slug, not completely concordant with the preserved 8 mm long original animals of *A. indica*, agrees with them regarding the teeth and the numerous cerata in the anterior rows.

Onchidiacea

Peronia peronii
(Cuvier 1804)

Peronia (*Peronia*) *peronii,* Marcus, 1960a, p 877-881 (references), figs. 1-5.

Range: Red Sea (Labbé, 1934, p 190); Indo-west Pacific, from southern Mozambique and Madagascar (Odhner, 1919, p 42) to the west Pacific: Fiji, Tonga Islands, Samoa.

Collecting station: Madagascar; xxvi, 1 specimen.

Remarks: We consider the genera *Peronia* Blainville, 1824, and *Paraperonia* Labbé, 1934, at most as subgenera, because the definable character (Marcus, 1960a, p 876) of *Paraperonia* suffers exceptions (Labbé, 1934, p 202), while the other characters (ibid., p 196) are rather vague.

The examined slug was 90 by 80 mm when living. Arborescent tubercles occur over the whole notum, and more than 30 of them bear eyes. In life the ground color was a dark green, the tubercles were slightly lighter, brownish-green. The copulatory organs are very small, evidently malformed, as reported for other Onchidiacea (Plate, 1893, p 180; Labbé, 1934, p 195). The retractor of the penis originates beside the nerve ring, corresponding to Plate's 1st type (1893, p 148, 170, note 1), occurred generally in *Peronia peronii* (ibid., p 173). Hoffmann (1928, p 105) indicated the 2nd type for *P. peronii*, an origin beside the pericardium. We found the latter condition in a specimen from the Maldive Islands (Marcus, 1960a, p 480), but in a 2nd animal from there we now noted the 1st type.

Peronia verruculata
(Cuvier 1830)

Onchidium verruculatum, Hoffmann, 1928, p 44, 72, 106 (references, range); Awati & Karandikar, 1948, p 1-53 (anatomy, embryology, bionomics); Baba, 1948, p 20, 144.

Range: From Suez through the Indic and western Pacific to Hawaii and Japan, Shimoda (latitude 34° 40' N, longitude 138° 55' E).

Collecting station: Madagascar; xliii, 1 specimen.

Remarks: The living animal was 45 mm long, 20 mm broad, greyish-green above, with a hue of yellow towards the borders, and densely set tubercles of the same color as the back. The hyponotum is yellow with a slight green tint, the sole yellow-green. About 25 branched tubercles occur in the posterior 6th of the strongly contracted preserved animal. The peritoneum is slightly pigmented, the penial gland large, the penial retractor originates in the posterior angle of the body cavity (i.e., as in Plate's 3rd type (1893, p 170, note 1)). The intestinal loops are as in Plate's 2nd type (1893, p 119), uncommon in *Peronia verruculata*, but not unprecedented (Labbé, 1934, p 193). *Peronia anomala* Labbé (1934, p 195) has the same type of intestine; his species is probably a synonym of *P. verruculata*. A further species quite close to *P. veruculata* is *P. branchifera*

(Plate, 1893, p 183). The papilla of the penial gland of *Peronia gaimardi* Labbé (1934, p 194, fig. 8) is evidently not a specific character, but an evaginated muscular sac (Marcus, 1960a, fig. 1, es). Therefore, *P. gaimardi* also might be a synonym of *P. verruculata*.

Hoffmannola hansi Marcus 1967 (Figs. 92, 93)

Hoffmannola hansi Marcus, 1967, p 232, figs. 87-95.

Range: Gulf of California, San Agustin, probably also Angel de la Guarda Island.

Collecting station: Mexico; ii, Nov. 12, 1966 (P. Pickens), on rocks, 7 specimens.

Remarks: The Onchidiacea can be separated into the Onchidiidae with the male pore situated to the left of the right tentacle, and the Onchidellidae with the male pore or pores (*Peronina* Plate, 1893) to the right of the right tentacle. *Watsoniella* Hoffmann, 1928, replaced by *Hoffmannola* Strand, 1932, belongs to the Onchidiidae, contrary to Labbé's indication (1934, p 238).

Hoffmann's material of *Hoffmannola lesliei* (Stearns, 1892) had been collected in 1852 and was histologically defective (Hoffmann, 1928, p 57). Therefore he could not understand an "organ of unknown function" (p 64) which lies between the big notal glands (no) and the body cavity. He observed the blood spaces (oo) and the hyponotal pores (za) connected with the organ in *H. lesliei*, and pondered a respiratory function. Thanks to Professor Pickens, who preserved material of *H. hansi* for histological purposes, the organ can be defined as composed of parcels of glands (z) embedded in diagonal fibers of the body musculature. The secretion is led out by ductules (zu) which unite to wider ducts. These also receive canals from the perinotum which drain clusters of small gland cells (zi).

In the outer part of the hyponotum the epidermal cells bear cuticular cones (Fig. 92), and some sensorial knobs, whose aspect and location suggest reception of mechanical stimuli.

Onchidella hildae (Hoffmann 1928)

Onchidella hildae, Marcus, 1967, p 230-231, figs. 84-86.

Range: Ecuador, Puna Island; Panama, Pacific coast; Mexico, Sonora, Puerto Peñasco.

Collecting stations: Mexico; ii, Nov. 12, 1966 (P. Pickens), rocky intertidal, 6 specimens; iv, Dec. 26, 1966 (Paula Vreeland), rocks, 1 specimen.

Remarks: Measured over the back, the preserved animals are 8 to 25 mm long. Two specimens have 18 marginal papillae, 4 have 19, and 1 has 20 papillae. The slugs of the original material, up to 25 mm long, had 16 papillae. The radula of the smallest specimen has 48 rows of 52 teeth without denticles per half-row. The muscular wall of the efferent duct in its free part equals the diameter of its lumen. The hyponotal line near the foot distinguishes *Onchidella hildae* from *O. binneyi* Stearns, 1893, which occurs also at Puerto Peñasco (Marcus, 1967, p 227).

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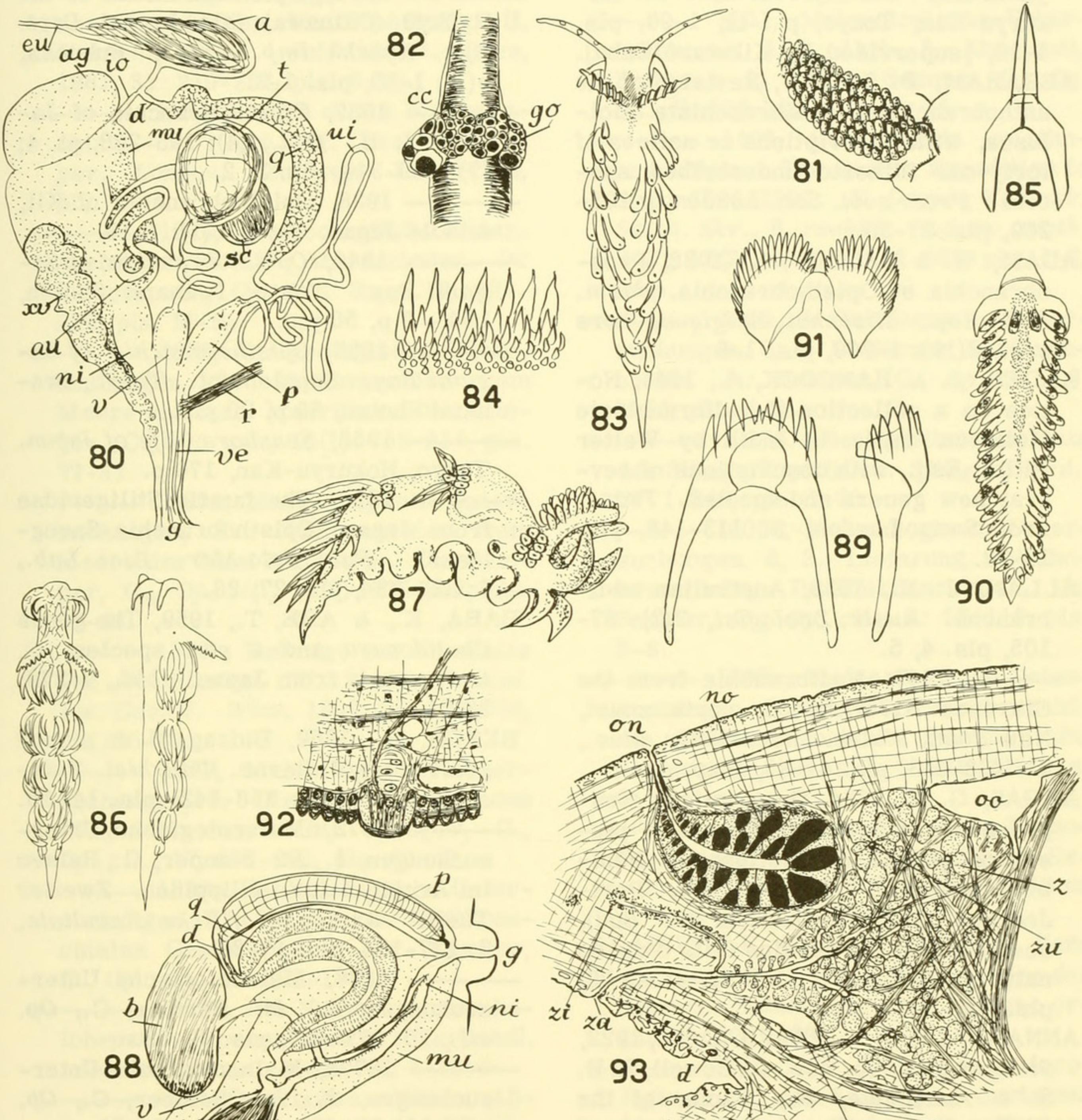

FIG. 80. *Dendrodoris pudibunda*. Diagram of reproductive organs.

FIG. 81. *Coryphellina rubrolineata*. Rhinophore of preserved slug.

FIG. 82. *Phyllidia varicosa*. Oesophagus with buccal and gastro-oesophageal ganglia.

FIGS. 83-85. *Favorinus mirabilis*. Fig. 83, Living slug, from sketch by Dr. E. Kirsteuer. Fig. 84, Denticles of masticatory border. Fig. 85, Radular tooth.

FIGS. 86-89. *Noumeaella isa*. Fig. 86. Dorsal and left side view of living slug, from sketches by Dr. E. Kirsteuer. Fig. 87, Preserved slug with partly plucked cerata. Fig. 88, Diagram of reproductive organs. Fig. 89, Radular tooth frcm above and from the side.

FIGS. 90-91. *Aeolidiella indica*. Fig. 90, Living slug, from sketch by Dr. E. Kirsteuer. Fig. 91, Radular tooth.

FIGS. 92-93. *Hoffmannola hansi*. Fig. 92, Section of outer part of hyponotum. Fig. 93, Section of notal and hyponotal glands.

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ADDENDUM

Since the present paper was completed in 1967, I received some opisthobranchs from Komodo by the kindness of Dr. Brian K. McNab-Gainesville. These were one specimen of *Trippa intecta*, two of *Atagema osseosa*, and one of a *Gymnodoris* with the innermost radular tooth twice the length of the second tooth, hence corresponding to the descriptions of the well-classified *G. citrina* (Bergh, 1877). The brown color of the innermost tooth agrees with that in the material from Eniwetok (Marcus and Burch, 1965: 249), at that time classified as *G. bicolor* (Alder and Hancock, 1864), later transferred to *citrina* (Marcus, 1970, Opisthobranchs from the Southern Tropical Pacific. Pacific Science 24: 155-179, on p 169).

RÉSUMÉ

QUELQUES GASTROPODES DE MADAGASCAR ET DE L'OUEST DU MEXIQUE

E. du Bois-Reymond et E. Marcus

Cet article traite de 43 espèces de gastropodes marins, surtout Opisthobranches (mais aussi 1 Lamellariacea et 3 Onchidiacea) de Madagascar et du golfe de Californie. Des descriptions anatomiques sont données pour les diverses espèces. Trois espèces ont été reconnues comme communes dans l'une et l'autre série; elles représentent des taxa qui se rencontrent dans les mers chaudes circumtropicales. Les nouvelles espèces suivantes ont été décrites: *Smaragdinella kirsteneri*, *Stiliger* (*Stiliger*) *erbsus*, *Hypselodoris regina* et *Noumeaella isa* (de Madagascar), et *Elysia vreelandae* (de l'Ouest du Mexique). Les Opisthobranches de Madagascar appartiennent à la faune récifale indo-pacifique, qui est assez homogène; au contraire, ceux du golfe de Californie vivent dans des zones largement dépourvues de récifs coralliens, mais contenant un apport d'éléments faunistiques du Pacifique tempéré américain et panaméen.

A. L.

RESUMEN

ALGUNOS GASTROPODOS DE MADAGASCAR Y MEXICO OCCIDENTAL

Marcus y Marcus

Se tratan 43 especies de gastropodos marinos, la mayoría opistobranquios (pero también 1 lamelariáceo y 3 onquidiacéos) de Madagascar y del Golfo de California. Se da la descripción anatómica para varias de las especies. Se reconocieron 3 especies comunes en ambas colecciones que representan taxa de mares circumtropicales. Se describen las siguientes especies nuevas: *Smaragdinella kirsteureri*, *Stiliger* (*Stilliger*) *erbsus*, *Hypselodoris regina*, y *Noumeaella isa* (de madagascar), *Elysia vreelandae* (del oeste de Mexico). Los opistobranquios de Madagascar pertenecen a una fauna Indo-Pacífica más bien homogenea, de los arrecifes, mientras que los del Golfo de California viven en areas donde no existen arrecifes de coral, pero que contienen una mezcla de elementos faunisticos de la zonas de Panamá y templadas del Pacífico.

J. J. P.

АБСТРАКТ

О НЕКОТОРЫХ БРЮХОНОГИХ С МАДАГАСКАРА И ЗАПАДНОЙ МЕКСИКИ

Э. ДЮБУА-РАЙМОН-МАРКУС И Э. МАРКУС

В работе рассматривается 43 вида морских брюхоногих моллюсков, главным образом заднежаберных (но также 1 представитель Lamellariacea и 3 представителя Onchidiacea) с Мадагаскара и из Калифорнийского залива. Приведены анатомические описания различных видов. Три вида оказались общими для обоих мест сборов; они представляют собой таксоны, встречающиеся в циркумтропическо-теплых морях. Описаны следующие новые виды: *Smaragdinalla kirsteueri, Stiliger* (*Stiliger*) *erbsus, Hypselodoris regina* и *Noumeaella isa* (с Мадагаскара) и *Elysia vreelandae* (из Западной Мексики). Заднежаберники с Мадагаскара принадлежат к более или менее однородной Индо-пацифической рифовой фауне, в то время как моллюски из Калифорнийского залива живут в областях, в значительной степени лишенных коралловых рифов, но содержащих примесь панамских и американских умеренных пацифических элементов фауны.

Z. A. F.