# The Doridacea (Opisthobranchia; Mollusca) of the Hawaiian Islands[1]

E. ALISON KAY[2] and DAVID K. YOUNG[3]

THE DORIDACEA form a conspicuous element of the shallow-water molluscan fauna along both tropic and temperate shores. The 50 species described here from the Hawaiian Islands comprise approximately 5 per cent of the marine molluscan fauna of the Islands and 25 per cent of the opisthobranch fauna.

The hallmark of most dorids is a middorsal tuft of branchiae; the branchial tuft is lacking only in such minute (2 to 3 mm long) forms as *Okadaia elegans*. Dorids are recognized also by their dorsoventrally compressed, oval or elongate, soft bodies, although a few are limaciform (Goniodorididae, Polyceridae), and some have rather crisp mantles (*Platydoris*). In other respects the dorids exhibit a variety of features: they range in length from 2 or 3 mm to 200 mm (*Archidoris nubilosa*); they may be brightly colored (*Hexabranchus, Chromodoris, Hypselodoris*) or cryptic (*Archidoris nubilosa, Trippa scabriuscula*); and the mantle may be smooth (*Chromodoris, Hypselodoris, Hexabranchus*) or variously sculptured with tentacular processes (*Archidoris nubilosa*), pustules (*Asteronotus cespitosus*), spicules (*Trippa echinata, Jorunna tomentosa*), granules (*Doriopsis granulosa, Platydoris*), or ridges (*Halgerda*).

Dorids were among the first mollusks to be recognized in the Hawaiian Islands, with twenty-seven species described between 1852 and 1860. Two species were described by Eydoux and Souleyet (1852) from specimens collected during the voyage of the "Bonite," and three by Gould (1852) from the visit of the U. S. Exploring Expedition to the Islands; the remaining twenty-two species were recorded by William Harper Pease, a naturalist resident in the Hawaiian Islands (Pease, 1860). In recent years only Edmondson (1933, 1946) and Ostergaard (1950, 1955) have discussed Hawaiian dorids, the former quoting some of Pease's descriptions, the latter augmenting several of Pease's descriptions and describing three more species.

This study consists of a systematic account of the Hawaiian dorids and reports on their synonymy, anatomy, habits, and abundance. All of the previously recorded species are accounted for either as validly occurring species or as synonyms of validly occurring species, an additional fifteen are recorded, and eight are described as new.

## SYSTEMATIC TREATMENT

The Doridacea, like other nudibranchs, are notoriously difficult animals to deal with from the standpoint of systematics. Early workers (Pease, 1860; Kelaart, 1859; and others) described species on the basis of external characters only, and from these descriptions it is often impossible to identify the animals involved. Other workers, among them Bergh and Eliot, utilized various internal characters but were inconsistent in their use of these features both in describing species and in ascribing species to genera and higher taxonomic categories. The difficulties inherent in the early studies are compounded by the incomplete nature of collections of dorids in the Indo-West-Pacific.

With a collection of several hundred specimens at hand, representing 50 species of dorids from a single locality, we have found the customary taxonomic approach to the dorids both awkward and unsatisfactory. We have, therefore, diverged from the usual treatment of the group (Taylor and Sohl, 1962; Marcus and Burch, 1965; Marcus, 1965) and recognize the Doridacea as a superfamily divisible into families

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[2] Department of General Science, University of Hawaii, Honolulu, Hawaii 96822. This research was supported by National Science Foundation Grant GB 1346.

[3] Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543. This paper is part of a dissertation submitted to the Graduate Division of the University of Hawaii in partial fulfillment of the requirements for the Ph.D. degree in Zoology. The research was supported by a Bureau of Commercial Fisheries Marine Science Graduate Fellowship.

and subfamilies. Although familiar dorid groupings, such as the suborder Doridoidea and the infra-order Cryptobranchia, disappear in this treatment, our approach has the advantage not only of being an arrangement which incorporates both ecological and anatomical similarities, but of conforming to current practice wherein not only the Prosobranchia among the gastropods but the Bivalvia are treated as superfamilies and families.

The seven families into which the Hawaiian dorids are subdivided are recognized primarily on the basis of feeding types (i.e., rasping sponge-feeders, sucking sponge-feeders, opisthobranch-feeders, polychaete-feeders) and by concomitant differences in the musculature of the buccal apparatus as well as differences in the genitalia. At a lower taxonomic level such features as the presence or absence of buccal armature, penial stylets, etc., are utilized to distinguish subfamilies, while genera are distinguished by combinations of characters such as mantle sculpture, type of branchiae, and radular differences. The theoretical basis and anatomical details of this approach, with special reference to the feeding types, will appear in a paper by Young (in press).

In assigning species, the following characters have been utilized: shape, skin texture, color, branchiae, rhinophores, oral tentacles, radula, jaws and buccal armature, genital mass, and egg masses and larvae. To eliminate some subjectivity from color descriptions the standard color guide issued by Stanley Gibbons, London, for stamp collectors was used; this guide has the advantage of being more accessible and less expensive than other standard color guides, such as those of Ridgeway. Patterns are described with the prevailing lightest color used as the background color on which darker pigment forms patterns. Radular tooth counts are based on that row which is maximally developed (which usually occurs about one-third of the distance proximally from the distal tip of the radular membrane); row counts are maximal, including all those radular rows which are distinguishable.

We have utilized as many of the species names attributed to the Hawaiian Islands as was feasible, avoiding in several instances names introduced for species in other Indo-West-Pacific localities, which may have priority, because of the vague descriptions which accompany them. Although the descriptions of Hawaiian dorids by Eydoux and Souleyet (1852), Gould (1852), and Pease (1860) are manifestly incomplete, it has been possible, with living animals available in the type locality, to determine all the species described by those authors from the Hawaiian Islands. Synonymies are limited to those pertinent to the Islands, and suggestions are made as to other names which may be appropriate in the sections termed "Remarks."

## HABITATS

The data were accumulated over a four-year period from monthly collections made in the littoral zone at four stations on the island of Oahu and collections every two months from three stations on the island of Kauai. The few records included of animals occurring at depths of more than 10 meters were obtained from SCUBA divers and from the dredging activities of a privately owned cabin cruiser, the "Pele."

In the littoral (= intertidal) zone, dorids are found most frequently under and in chunks of dead coral which occur in shallow water shoreward of fringing reefs, as at Kewalo and Nanakuli, Oahu, or on a reef platform such as the one at Ala Moana, Oahu. The coral, perforated with worm tubes and molluscan borers, is heavy with dense growths of marine invertebrates, presenting numerous niches occupied by the encrusting sponges upon which many of the Hawaiian dorids feed. The shallow water areas are protected from wave action and sediment deposition, but a fair amount of water exchange occurs at all tidal periods.

The majority of dorids for which we have records of only one or two specimens were encountered at the shoreward edges of fringing reefs, or high on a dead reef platform east of the reef at Ala Moana, Oahu, both areas which border considerable depths of water. It would appear that these animals are inhabitants of deep off-shore waters, and the collections of only one or two specimens may represent spawners.

Although represented by many species, the Hawaiian dorids with few exceptions are not numerous, and the numbers which we have collected are so small that they do not lend them-

selves to statistical treatment. In order to give some indication of numbers and seasonal occurrence, we have summarized the collection data in Table 1.

## DORIDACEA

The superfamily Doridacea is here recognized as encompassing that group of nudibranchs with a middorsal anus which is usually encircled entirely or partially by secondary branchiae. The group includes at least five feeding types in Hawaiian waters: rasping sponge-feeders, sucking sponge-feeders, opisthobranch-feeders, polychaete-feeders, and forms which are usually associated with ascidians. We have excluded from the Doridacea the genera *Marionia, Bornella,* and *Phyllidia,* all of which diverge so far from the characteristic dorid pattern in the anatomy of the digestive and reproductive systems and in ecology that they are best considered apart from the dorids.

## DORIDIDAE Alder and Hancock, 1855

The family Dorididae as recognized by Alder and Hancock (1855) included those dorids with the "Nothaeum [mantle] large, without marginal appendages; skin generally very spiculose; rhinophores laminate and retractile within cavities." We include within the family those rasping, sponge-feeding dorids with branchiae retractile into a common sheath, and with the digestive gland compact and unbranched.

Nine subfamilies are recognized as having representatives in Hawaiian waters.

### Subfamily DORIDINAE

This group of dorids seems sufficiently distinct to warrant its consideration as a subfamily. It includes dorids without jaws, with hamate radular teeth, without a conspicuous prostate, and with a cirrus rather than a penis in the male reproductive tract. At the present time the subfamily comprises two genera, Pease's (1860) genus *Doriopsis* distinguished externally by a semicircular row of gills, and the new genus *Doriorbis* described below.

*Doriopsis granulosa* Pease, 1860
Fig. 1

*Doriopsis granulosa* Pease, 1860:32–33. Sandwich Islands [Hawaiian Islands]; Pruvot-Fol, 1947:109.

*Doriopsilla granulosa* (Pease) Bergh, 1905:147.

DESCRIPTION: Length, 4 to 11 mm; width, 1 to 4 mm. The animal is oblong-ovate, rather rigid, convex above, and the margins of the mantle are thin and discrete. The mantle is pale yellow to buff, occasionally with green spots and/or a blue tinge middorsally; it is ornamented with minute, irregular spicular granules. The rhinophores are short, widely spaced, with 8 to 10 pale yellow lamellae. There are 8 or 9 simply pinnate branchiae arranged in a semicircle; the branchiae, like the rhinophores, are pale yellow. The foot is pale yellow and nonbilabiate.

The radular formula for two specimens 8 and 10 mm long is 30–38 × 40–48.0.40–48. The

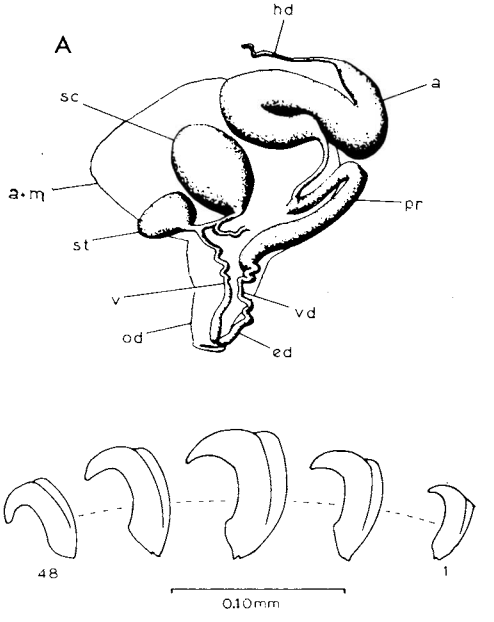



FIG. 1. *Doriopsis granulosa* Pease. *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. *a,* Ampulla; *a* + *m,* albumin and mucous gland; *ed,* ejaculatory duct; *hd,* hermaphroditic duct; *od,* oviduct; *pr,* prostate gland; *sc,* spermatocyst; *st,* spermatheca; *v,* vagina; *vd,* vas deferens.

radular teeth are hamate and without denticles. The teeth increase in size centrally within each row, ranging in length from 40 to 83 μ in an 8-mm specimen. No jaws are present in the buccal apparatus.

The ejaculatory duct and vaginal ducts have separate external orifices; both are narrow and convolute. The prostate gland has a wider diameter than the convolute vas deferens; it forms a single smooth loop and enters the albumin and mucous gland at the junction with the ampullary duct. The vaginal duct leads to a common duct connecting the spermathecal-spermatocystic duct with the spermatheca and is paralleled by the uterine duct which unites with the common duct nearest the spermatocyst. The spermatocyst is always larger than the spermatheca; both are ovate in shape. The short, straight uterine duct enters the albumin and mucous gland separately from the prostatic and ampullary ducts.

HABITS: This is a commonly occurring species of which there are records for practically every month in the year; spawn were noted in July 1962. The animals have been collected under rocks on the reef platform at Ala Moana, Oahu, and in the shallow waters shoreward of fringing reefs at Kewalo and Diamond Head, Oahu, and near Koloa, Kauai.

REMARKS: This species apparently has been recognized several times under different names. *D. scabra* Pease, 1871 from Tahiti, *D. aurantiaca* (Eliot, 1913) from Japan, *D. flava* (Risbec, 1928) from New Caledonia and New South Wales, and *D. flabellifera* (Cheeseman, 1881) from New Zealand all appear to represent the species as we recognize it.

*Doriopsis pecten* (Collingwood, 1881)
Fig. 2

DESCRIPTION: Length, 2 to 16 mm; width, 1 to 7 mm. The animal is oblong-ovate, somewhat rigid, convex above, and the margins of the mantle are thin, parallel, and discrete. The mantle is usually dark blue but is occasionally tinged with pink middorsally; it is minutely granulose with spicular papillae. The rhinophores are elongate, with 8 to 15 fine lamellae; they are retractile into collarless sheaths and are dark blue like the mantle. There are 7 to 16 simply pinnate branchiae arranged in a semicircle and protruding from a collarless flap; the branchiae are also blue. The foot is non-bilabiate and paler blue than the mantle.

The radular formula in two specimens 8 to 13 mm long is 30–32 × 28–42.0.28–42. The radular teeth are as in *D. granulosa* except for their more elongate shape and narrow, pointed cusps. The teeth increase in size centrally within each row, ranging in length from 46 to 108 μ long in a 10-mm specimen. No jaws are present in the buccal apparatus.

The anterior genital mass is indistinguishable from that of *D. granulosa* except for the more elongate shape of the spermatocyst.

HABITS: Like *D. granulosa, D. pecten* is a commonly occurring species; 18 or more specimens have been recorded in February, April, June, July, August, and October; spawn were seen in June, October, and November. Speci-

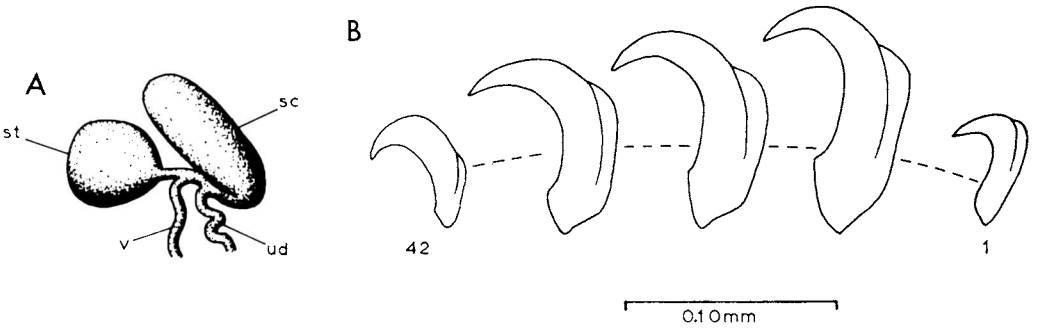



FIG. 2. *Doriopsis pecten* (Collingwood). *A,* Lateral view of the spermatheca and spermatocyst; *B,* lateral view of the left-half row of radular teeth. *ud,* Uterine duct; other lettering as before.

TABLE 1

MONTHLY RECORDS OF HAWAIIAN DORIDACEA FROM 1962–1966
(x = 1–5 specimens; xx = more than 5 specimens; $\bar{x}$ = spawn record)

| FAMILY AND SPECIES | JAN. | FEB. | MAR. | APR. | MAY | JUN. | JUL. | AUG. | SEP. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DORIDIDAE | | | | | | | | | | | | |
| Doridinae | | | | | | | | | | | | |
| *Doriopsis granulosa* | x | x | | x | x | | $\bar{x}$ | | | x | x | x |
| *Doriopsis pecten* | | x | | x | | $\bar{x}$ | x | x | | $\bar{x}$ | $\bar{x}$ | |
| *Doriorbis nucleola* | | | | x | | x | x | | | | | x |
| Archidoridinae | | | | | | | | | | | | |
| *Archidoris hawaiiensis* | | | | | $\bar{x}$ | x | | | | | | |
| *Archidoris nubilosa* | | x | x | | | x | | | x | x | | |
| Platydoridiinae | | | | | | | | | | | | |
| *Platydoris formosa* | x | | | | | | | | | | | x |
| *Platydoris* sp. | | | | | | | | | | | | x |
| Kentrodoridinae | | | | | | | | | | | | |
| *Asteronotus cespitosus* | x | x | | | | x | | | | x | | |
| *Jorunna tomentosa* | x | x | x | x | x | x | x | x | x | $\bar{x}$ | x | x |
| Discodoridinae | | | | | | | | | | | | |
| *Carminodoris grandiflora* | | | | | | | x | | | | | |
| *Carminodoris nodulosa* | | x | x | | x | | | x | | | | |
| *Discodoris fragilis* | x | x | x | x | x | | x | | | x | | x |
| Trippinae | | | | | | | | | | | | |
| *Trippa echinata* | | x | x | x | xx | $\bar{x}$ | xx | x | | x | | |
| *Trippa osseosa* | | | | | | | x | | | | | |
| *Trippa scabriuscula* | x | | x | | | x | x | | | | | |
| Halgerdinae | | | | | | | | | | | | |
| *Halgerda apiculata* | x | | | x | | | x | | | | | |
| *Halgerda* sp. cf. *graphica* | | $\bar{x}$ | | | | | | x | | x | | |
| *Halgerda rubra* | $\bar{x}$ | | | | | | | | x | | | |
| Diaululinae | | | | | | | | | | | | |
| *Thordisa hilaris* | | x | | x | | x | $\bar{x}$ | x | | | | |
| *Thordisa setosa* | x | x | | | x | x | x | | | x | x | x |
| *Peltodoris fellowsi* | | | | | x | | x | | | x | | |
| Chromodoridinae | | | | | | | | | | | | |
| *Ceratosoma cornigerum* | x | | | | | | | | | | | |
| *Chromodoris albopustulosa* | x | x | x | x | x | x | x | | | $\bar{x}$ | | |
| *Chromodoris decora* | | | | | | | x | | | x | | $\bar{x}$ |
| *Chromodoris imperialis* | | | | | | | | | | | | x |
| *Chromodoris lilacina* | x | x | x | x | x | x | $\bar{x}$ | | x | | x | x |
| *Chromodoris petechialis* | | | | | x | | | | | | x | x |
| *Chromodoris trimarginata* | x | | x | x | x | | x | | | x | | |
| *Chromodoris youngbleuthi* | | | | | x | x | | | | | | |
| *Hypselodoris daniellae* | | | x | x | x | x | x | | | | | |
| *Hypselodoris lineata* | | | | x | $\bar{x}$ | $\bar{x}$ | x | x | | | x | x |
| *Hypselodoris peasei* | | x | x | x | | x | x | | x | x | | $\bar{x}$ |
| *Hypselodoris vibrata* | | x | x | x | | | x | | | | | |

TABLE 1 (*continued*)

| FAMILY AND SPECIES | JAN. | FEB. | MAR. | APR. | MAY | JUN. | JUL. | AUG. | SEP. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HEXABRANCHIDAE | | | | | | | | | | | | |
| *Hexabranchus aureomarginatus* | x | x | | x | x | x | | | | | | |
| *Hexabranchus marginatus* | x | x | | | | x | | x | | | x | |
| *Hexabranchus* sp. cf. *pulchellus* | x | | | | | x | | x | | | | |
| ACTINOCYCLIDAE | | | | | | | | | | | | |
| *Actinocyclus japonicus* | | | | | | | x̄ | | | | | |
| DENDRODORIDIDAE | | | | | | | | | | | | |
| *Dendrodoris coronata* | | x | x | x | x | | | x | | x | | |
| *Dendrodoris nigra* | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ | x̄ |
| *Dendrodoris tuberculosa* | | x | | | | x | x | | | | | |
| POLYCERIDAE | | | | | | | | | | | | |
| Gymnodoridinae | | | | | | | | | | | | |
| *Gymnodoris alba* | | | | x | | | | | | | | |
| *Gymnodoris bicolor* | | x | | x | | | | x | x | x̄ | x̄ | |
| *Gymnodoris okinawae* | | x | x | | x̄ | x̄ | x | x | | x | x̄ | |
| *Gymnodoris plebeia* | x | x | | | | | | | | | | |
| Triophinae | | | | | | | | | | | | |
| *Plocamopherus maculatus* | x | | | | | | x | | | | | |
| VAYSSIEREIDAE | | | | | | | | | | | | |
| *Okadaia elegans* | x | x | x | x | x | x | x | x | x | x | x | x |
| GONIODORIDIDAE | | | | | | | | | | | | |
| *Goniodoris* sp. cf. *joubini* | x | x | x | | | | | | | | | x |
| *Okenia* sp. | | | | | | | | | | x | | |
| *Trapania* sp. | x | | | | | | | | | | | x |

mens of *D. pecten* are usually found on a blue sponge on which they are almost invisible; all have been found under rocks in the shallow waters shoreward of fringing reefs at Diamond Head, Hanauma Bay, and Nanakuli, Oahu, and near Koloa, Kauai. The spawn consist of pale yellow ribbons with as many as 6 whorls.

REMARKS: Although *D. pecten* has been listed as a "blue variety" of *D. viridis* Pease, 1860 (Risbec, 1928, 1953; Allan, 1947; Baba and Hamatani, 1961), morphological and ecological studies indicate that *D. pecten* is a valid species, distinct from *D. viridis,* specimens of which have been studied from Eniwetok, Marshall Islands. The blue coloration of *D. pecten* is thus a species-specific character as originally suggested by Collingwood (1881).

### *Doriorbis* Kay and Young, new genus

The genus *Doriorbis* is erected for a species described from Hawaii by Pease (1860), *Doris nucleola.* The genus is characterized by a rigid, scabrous mantle covered with small, irregular papillae and spicules, and with a T- or Y-shaped yellow medial streak extending from the rhinophores to the middorsum. The rhinophores are rodlike and finely lamellate, and there are 5 or 6 simply pinnate branchiae arranged in a circle about the posterior, middorsal anus. Both rhinophores and branchiae are retractile into sheaths. The radular teeth are simply hamate and similar to those of *Doriopsis* except that the outer 6 to 8 lateral teeth have several small outer denticles. The buccal mass is similar to that in *Doriopsis* and is without jaws. The midgut is large and an elongate caecum projects anteriorly from the left ventrolateral side of the midgut; a pair of elongate salivary glands extends from the buccal mass to the anteroventral end of the digestive gland. The genital mass is almost indistinguishable from that of *Doriopsis,* with a parallel arrangement of the spermatheca and spermatocyst in the female duct system.

The most important characters of the genus (in order of decreasing diagnostic importance) are: (1) simply pinnate branchiae arranged as a circlet about a posterior, middorsal anus and retractile into a circular sheath; (2) hamate lateral teeth with outermost laterals denticulate; (3) a Y- or T-shaped yellow medial streak extending from the rhinophores to the middorsum.

The genus is named for the characteristic circular arrangement of branchiae (*orbis* = circle), which contrasts with the crescentic arrangement of branchiae in *Doriopsis*.

*Doriorbis nucleola* (Pease, 1860)
Figs. 3, 15

*Doris nucleola* Pease, 1860:29. Sandwich Islands [Hawaiian Islands]; Abraham, 1877:211; Bergh, 1881*a*:Pl. G, figs. 10, 11; Pruvot-Fol, 1947:108.

*Doris papillosa* Pease, 1860:30. Sandwich Islands [Hawaiian Islands]; Pruvot-Fol, 1947:108 (non-Kelaart).

*Doris papillata* "Pease," Abraham, 1877:211.

*Doris tincta* Pease, 1864:132 (non-Kelaart).

DESCRIPTION: Length, 7 to 15 mm; width, 4 to 6 mm. The animal is ovate, distinctly convex, rigid and scaly to the touch, and the mantle forms a discrete margin about the foot. The mantle is variable in color, usually brown or gray-blue, with a T- or Y-shaped yellow splash extending middorsally from the rhinophores; there is a sparse scattering of small, irregular papillae and a few spicules on the mantle. The rhinophores are small and set far apart, and each is encircled by a star-shaped sheath with 5 upstanding points; the lamellae are brown, fine, and each terminates abruptly in an acuminate apex. There are 5 or 6 simply pinnate branchiae which are also brown; the branchial cavity is simple, decorated only by sparse papillae. The foot is bilabiate.

The radular formula for a single specimen is 36 × 42.0.42. The radular teeth are hamate, acutely curvate, and smooth except for the outer laterals which have several small, outer denticles. Within each radular row the dominant tooth, 150μ in length, is central, and the smallest tooth, 53μ in length, is innermost.

The ejaculatory and vaginal ducts are separate. There are no hooks in the ejaculatory duct. Both the ovate spermatheca and the slightly larger spherical spermatocyst are connected to the female duct system by short ducts. The vaginal and uterine ducts exhibit a parallel arrangement as do species of *Doriopsis*. The uterine duct enters the albumin and mucous gland at the junction of the ampullary and prostatic ducts.

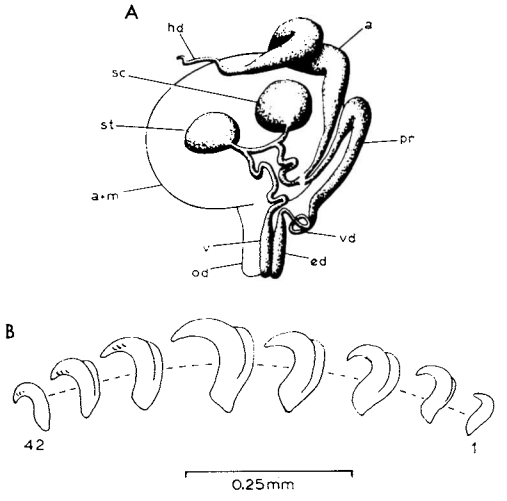



FIG. 3. *Doriorbis nucleola* (Pease). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

HABITS: Six specimens have been collected, all except one under rocks in the shallow waters shoreward of fringing reefs at Punaluu, Oahu, and near Koloa, Kauai; a single specimen was collected on the reef platform at Ala Moana, Oahu. The specimens were collected in July and December 1962, and in April and June 1963. When disturbed the animal rolls itself into a ball.

REMARKS: Pease (1860) described two species from the Hawaiian Islands to which our specimens are referable. The facies of both species are almost identical: *D. papillosa* was described by Pease as "oval, rigid, rounded alike at both ends, convexly rounded above. . . . upper surface covered with small papillae, not very crowded . . ."; *D. nucleola* was "oval.

rigid, rounded at both extremities and convexly rounded above . . . surface rough, with remote papillae and small laciniated processes . . . ." The species differ in the descriptions only in color, *D. papillosa* being "greyish. Dorsal region livid" and *D. nucleola* "orange, dusky along the dorsal region and shaded with purple on each side of the branchiae." The Garrett figure of *D. nucleola* in Bergh (1881*a*) confirms the identification of that species despite the rather too symmetrical branchiae and the somewhat excessively prominent papillae. Because of the color variation shown by our specimens we include *D. papillosa* in the synonymy of *D. nucleola.*

*Doris carinata* Alder and Hancock, 1866, described from the Indian Ocean, may be a synonym, both the description and the figure resembling our specimens.

## Subfamily ARCHIDORIDINAE

Bergh (1884*b*) included in this subfamily those dorids with a "consistency not hard, form plump and slightly depressed; back more or less granular or tuberculate, the openings for the rhinophores simple; the tentacles short; retractile gill of few tripinnate or quadripinnate leaves; the foot broad with a furrow on the anterior margin; labial disk clothed by simple, thick cuticle; radula with naked rachis; the pleurae with numerous hook-shaped plates; large ventricle free; penis and vagina unarmed." An additional character in the Archidoridinae is the unarmed jaw.

The subfamily is represented by two species in Hawaiian waters.

***Archidoris hawaiiensis*** Kay and Young, new species

Figs. 4, 5

DESCRIPTION: Length, 110 mm; width, 50 mm. The animal is ovate, wider toward the middle than anteriorly or posteriorly, crisp to the touch, the dorsum distinctly convex, and the mantle skirt thin, flaring irregularly around the foot. The mantle is red-brown with patches of darker color and minute white spots ocellated with black near the margins; the dorsum is covered with small, round papillae. The rhinophores are elongate, with 9 or 10 fine lamellae, and retractile into smooth sheaths; they are the same

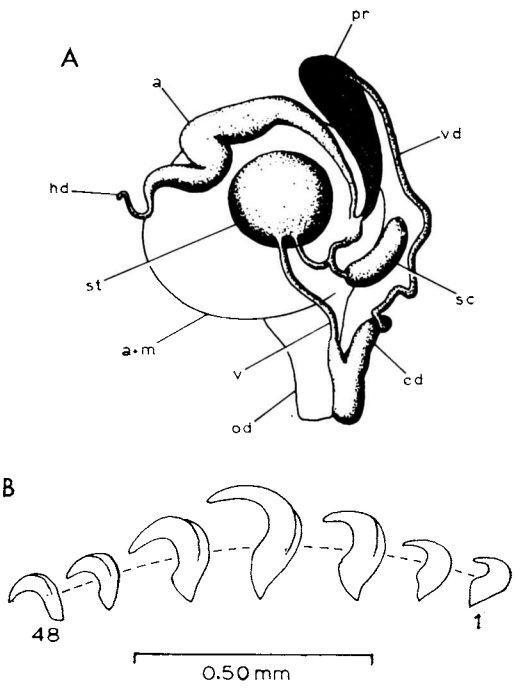



FIG. 4. *Archidoris hawaiiensis* Kay and Young. *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

red-brown as the mantle but with white tips. There are 5 feathery branchiae which are transparent brown and generally lighter in color than the rest of the animal. The foot is white, mottled with purple brown.

The radular formula for a single specimen is 22 × 48.0.48. The radular teeth are hamate with acutely curvate cusps. Within each radular row the dominant tooth is central, and 240μ in length; the smallest tooth is innermost, and 105μ in length. The jaws are unarmed buccal plates of thick cuticle.

A common orifice is shared by the ejaculatory and vaginal ducts. There are no hooks in the ejaculatory duct. The vas deferens is long and slightly convolute; it leads into a finely lobulate prostate gland. The spermatheca and spermatocyst are semiserially arranged. The vaginal duct is long in comparison with the spermathecal and uterine ducts; it leads directly into the spherical spermatheca. The spermatocyst is elongate, sausage-shaped, and connected to the spermathecal duct by a short spermatocystic duct. The spermatheca is approximately 3 times larger

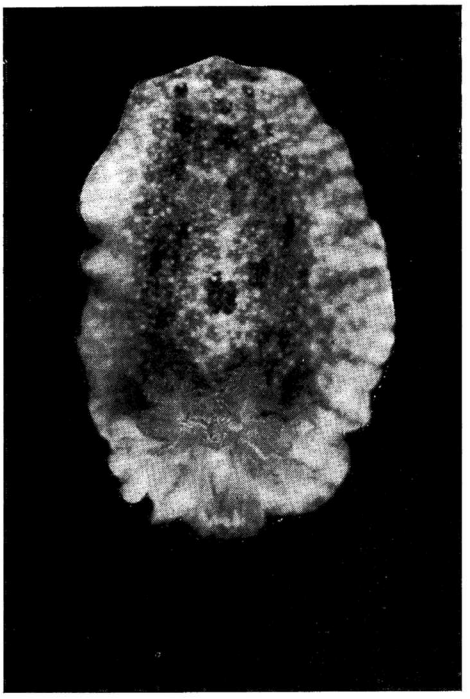


FIG. 5. *Archidoris hawaiiensis* Kay and Young. Dorsal view, 110 × 50 mm.

than the spermatocyst. A common junction at the albumin and mucous gland is formed by the uterine, prostatic, and ampullary ducts.

HABITS: Two adult specimens were found in shallow water in Kaneohe Bay, Oahu, in May 1962; both spawned large, white egg masses in the laboratory. A single specimen, white with mauve blotches, was found under a rock in the shallow waters shoreward of the fringing reef near Koloa, Kauai, in June 1962.

REMARKS: *Archidoris* Bergh, 1878*a*, while sharing with other dorid genera such characters as a granular or tuberculate mantle, numerous hamate teeth, and unarmed genitalia, is distinguished by buccal plates of thick cuticle which lack conspicuous armature.

The holotype and paratype of *A. hawaiiensis* have been deposited in the B. P. Bishop Museum, Honolulu, Hawaii.

*Archidoris nubilosa* (Pease, 1871)
Figs. 6, 7

*Doris nubilosa* Pease, 1871:13, pl. 6. Huaheine [Tahiti].

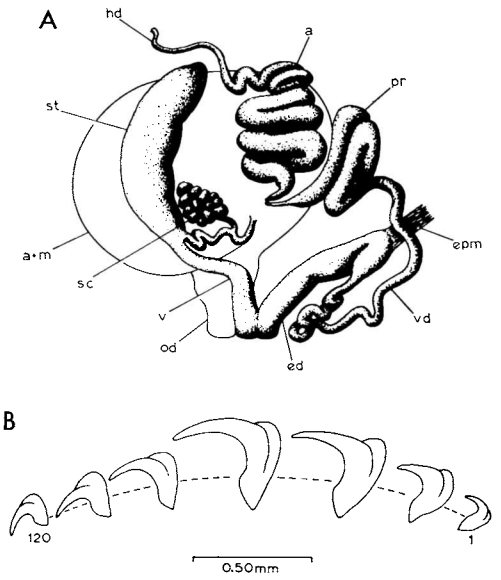



FIG. 6. *Archidoris nubilosa* (Pease). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. *epm,* Extrinsic penial muscle; other lettering as before.

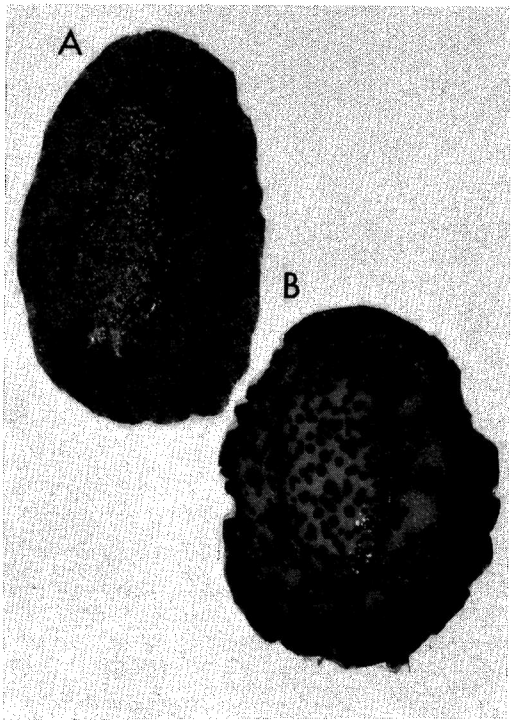



FIG. 7. *Archidoris nubilosa* (Pease). *A,* Dorsal view; *B,* ventral view; 110 × 85 mm.

?*Discodoris nubilosa* Pease, Pruvot-Fol, 1947: 113.

DESCRIPTION: Length, 110 to 200 mm; width, 85 to 160 mm. The animal is broadly oval, very soft and flaccid, the dorsum convex, and the mantle margins thin and undulating. The mantle is mottled with brown and gray, ornamented with closely set, unequal-sized soft papillae and tentacular processes, those toward the margins smaller and thinner than the medial structures. The rhinophores are gray-brown with white tips, clublike, and retractile into sheaths decorated with fine papillae. There are 6 feathery branchiae which are posteriorly recumbent; the rachis is white and the pinnae light brown veined with darker brown. The foot is broad, and white with purple-red spots and a purple margin.

The radular formula for a specimen 200 mm in length is 52 × 120.0.120. The radular teeth are simply hamate and characteristically have long hooks. Within each radular row the dominant tooth, with a 420μ hook length and 330μ tooth height, is central. The smallest outermost lateral is 120μ in hook length and 150μ in tooth height. The jaws have no hooks, but slightly raised granulations, appearing as dorsoventral ridges, are present.

A common external orifice is shared by the ejaculatory and vaginal ducts. The ejaculatory duct is a muscular penis having an extrinsic muscular attachment to the anterior body wall. The short, broad vaginal duct opens into an elongate, sausage-shaped spermatheca. The slightly convolute spermathecal duct enters a common junction of the spermatocystic and uterine ducts. The spermatocystic duct opens into the coarsely lobulate spermatocyst, and the uterine duct passes into the albumin and mucous gland separately from the junction of the prostatic and ampullary ducts.

HABITS: This is apparently a deep-water species which is only occasionally found in shallow water. Four specimens have been recorded, one in October 1964, the others in September, February, March, and June of other years. The animal secretes great quantities of mucus when disturbed. The mantle margins are extremely flexible, suggesting that *A. nubilosa* may be able to swim as do species of *Hexabranchus*. As in *Discodoris,* large portions of the mantle are cast off when specimens are disturbed.

REMARKS: Although specimens resembling our animals have been described as *Thordisa crosslandi* Eliot (1903), *Archidoris nubilosa* Pease (1871) appears to be an earlier name for the species. As Marcus (1955) has pointed out, species without the pectinate teeth and with jaws are distinct from *Thordisa.*

*Thordisa crosslandi* was described from Zanzibar (Eliot, 1903) while Pease's species was described from Huaheine [Tahiti]. The records indicate that *Archidoris nubilosa* is widely distributed in the Indo-West-Pacific.

## Subfamily PLATYDORIDIINAE

The members of this subfamily include those dorids with a hard, minutely granulate mantle and large disklike hooks in the ejaculatory duct. The genus *Asteronotus* included in the subfamily by Bergh (1892*a*) should be assigned to the Kentrodoridinae because its genital mass possesses a lateral stylet and lacks cirral hooks.

*Platydoris formosa* (Alder and Hancock, 1866)
Figs. 8, 16

DESCRIPTION: Length, 65 to 75 mm; width, 31 to 50 mm. The animal is broadly ovate, the mantle rigid and granular to the touch, thin, and only slightly irregular around the foot. The mantle is white or cream, finely peppered with brown or black and patched with large orange mottlings; it is covered with minute granules. The rhinophores are clublike, orange with white peduncles, and retractile into high, scalloped sheaths. There are 4 to 6 branchiae which are extremely feathery, almost transparent, white or cream, veined with brown; the branchial sheath is scalloped. The foot is narrow, and white with brown or black freckles; the ventral surface of the mantle may have small orange mottlings.

The radular formula for a specimen 65 mm in length is 46 × 109.0.109. The radular teeth are hamate. The outermost laterals have no prominent inner flange as do the inner laterals, and they are the smallest teeth (135μ long) in any given radular row. The dominant tooth is always

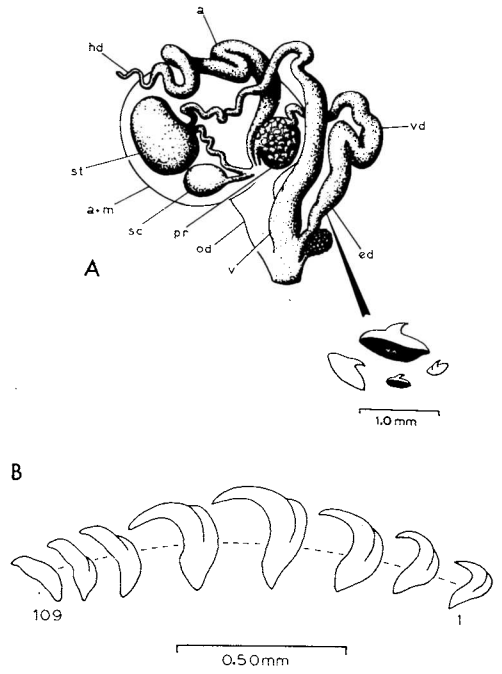



FIG. 8. *Platydoris formosa* (Alder and Hancock). *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

central and has a maximal length of 300μ in a 65-mm specimen.

A finely lobulate gland is found at the base of the ejaculatory duct. The ejaculatory duct, vaginal duct, and oviduct share a common orifice. The broad ejaculatory duct is lined with a few large, irregularly sized hooks (0.25 to 0.1 mm long) and is joined to the spherical, finely lobulate prostate gland by a loosely convolute vas deferens. The vaginal duct is broad and lined with a chitin-like material. The spermatheca and spermatocyst are semiserially arranged. The spermatheca is bean-shaped and more than twice the size of the pyriform spermatocyst. The spermatocystic duct enters the spermathecal duct at the junction of the prostatic and ampullary ducts at the albumin and mucous gland.

HABITS: Two specimens have been collected, both on the reef platform at Ala Moana, Oahu, one in December 1961, the other in January 1966.

REMARKS: *P. formosa* has been recorded from a number of localities in the Indo-West-Pacific and appears to be widely distributed; it has not previously been reported from the Hawaiian Islands.

*Platydoris* sp.
Fig. 9

DESCRIPTION: Length, 47 mm; width, 24 mm. The animal is oval, rigid and granular to the touch; the mantle is thin and slightly irregular around the foot. The mantle is dark orange-red, mottled with irregular patches of white; it is ornamented by minute granules. The rhinophores are small and inconspicuous, orange with white tips. There are 8 feathery branchiae, orange on the rachis and base, with gray pinnae. The foot is narrow, and light orange-red.

The radular formula for the single specimen examined is 42 × 58.0.58. The radular teeth are hamate. The outermost laterals are smaller and more elongate than the inner laterals and there is slight indication of outer denticles but no inner flange. The dominant tooth is central within each radular row.

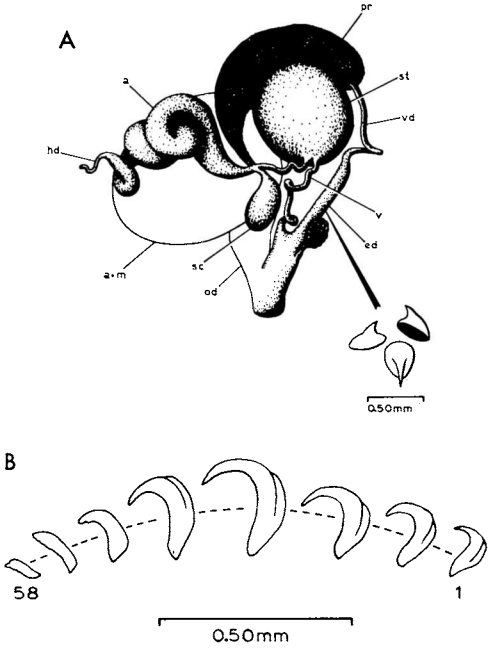



FIG. 9. *Platydoris* sp. *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

A small, coarsely lobulate gland is present at the base of the ejaculatory duct. The ejaculatory duct, vaginal duct, and oviduct share a common external orifice. There are several cirral hooks, 250 to 350μ long, in the ejaculatory duct. The prostate gland is elongate and finely lobulate. The loosely convolute vaginal duct leads directly to the spherical spermatheca. The spermatocyst is pyriform and less than one-third the size of the spermatheca.

REMARKS: A single specimen of this species was collected on the reef platform at Ala Moana, Oahu, in December 1961. We have been unable to find a description to fit this species, but until more specimens are available we will not describe it as new.

## Subfamily KENTRODORIDINAE

In the Kentrodoridinae the mantle is either smooth or minutely spiculate; there is a lateral stylet in the genital mass and the ejaculatory duct is unarmed. The radular teeth are simply hamate, and the buccal mass is without jaws.

Although Bergh (1892*a*) placed *Asteronotus* in the Platydoridinae, the occurrence of a lateral stylet in the genital mass of *Asteronotus* seems sufficient reason to include it in this subfamily.

*Asteronotus cespitosus* (van Hasselt, 1824)
Figs. 10, 20

*Doris foetida* Pease, 1860:31. Sandwich Islands [Hawaiian Islands].

DESCRIPTION: Length, 42 to 130 mm; width, 24 mm. The animal is broadly ovate, depressed, soft and leathery in consistency, and the mantle margin is thin and irregular. The mantle is gray-brown or yellow, ornamented by an anteroposteriorly oriented medial ridge which is irregularly pustulose, with smaller ridges and protuberances laterally. The rhinophores are large and perfoliate, pale gray on transparent peduncles, and retractile into plain, tubular sheaths. There are 6 feathery branchiae; the gills are retractile into a prominent branchial sheath which is divided into 6 lobes. The foot is yellow-white.

The radular formula for two specimens, 42 and 130 mm long, is 30–36 × 35–59.0.35–59. The radular teeth are hamate. The dominant tooth is central in each row; it is 330μ long in a 42-mm specimen and 450μ long in a 130-mm specimen. The smallest, outermost tooth is 105μ long in the smaller specimen, 180μ long in the larger.

A lateral stylet is present, as in *Jorunna tomentosa,* and is joined by a duct leading to a lobulate gland. A separate duct leads from the lobulate gland to the albumin and mucous gland. A common external orifice is shared by the sheaths of the lateral stylet, ejaculatory duct, and vaginal duct. There are no hooks in the lumen of the ejaculatory duct which joins the finely lobulate prostate gland through a fairly long, straight vas deferens. The vaginal duct leads directly to the oblong-oval spermatheca from which issues a separate spermathecal duct. The spermathecal duct enters the common junction of the prostatic duct, ampullary duct, duct of the lateral stylet, and spermatocystic duct at the albumin and mucous gland. The spermatocyst is pyriform and less than one-half the size of the spermatheca.

HABITS: Four specimens have been recorded, two from the reef platform at Ala Moana, Oahu, in January and June 1962, the third (and largest) from a depth of 1.75 meters off Pupukea, Oahu, in October 1963, and a fourth in February 1966.

REMARKS: The specimens match Pease's (1860) description of *Doris foetida*: "Oval, ridgid . . . rugose and with a few ridges, one of which is a longitudinal medial line, others transverse . . . purplish brown, fawn, or yellowish brown. . . ." We did not, however, note the "strong and disagreeable odor" which Pease described. Garrett (unpublished manuscript, B. P. Bishop Museum) amplified Pease's description, noting that he obtained the type of Pease's species on Kauai, and found several in Fiji: "It is a very large species attaining a length of 6–7 inches and varies more or less in the disposition of the ridges and tubercles."

Whether or not the Pease species is a synonym, our specimens clearly represent the species called *Asteronotus hemprichii* Ehrenberg as described by Eliot (1903, 1908) from Zanzibar and other areas in the Indian Ocean, and *A. cespitosus* van Hasselt described by Baba (1936)

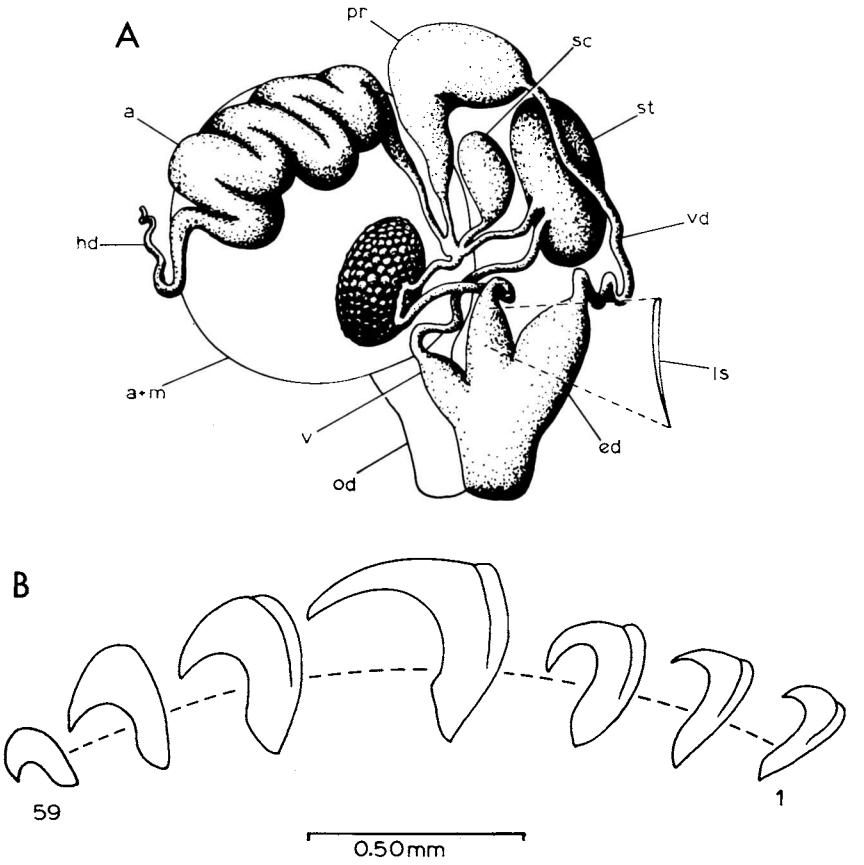



FIG. 10. *Asteronotus cespitosus* (van Hasselt). *A,* Lateral view of the genital mass and an offset of the lateral stylet; *B,* lateral view of the left-half row of radular teeth. *ls,* Lateral stylet; other lettering as before.

from the Ryukyu Islands. We have used the earlier name for a species which appears to be widely distributed in the Indo-West-Pacific.

*Jorunna tomentosa* (Cuvier, 1804)
Figs. 11, 17

DESCRIPTION: Length, 4 to 12 mm; width, 2 to 6 mm. The animal is elongate-oval, convex, soft; and the mantle margins are only slightly irregular about the foot. The mantle is pale gray to drab with spots of brown or gray forming roughly parallel rows laterally; the middorsal region often has a pink tint. The mantle is covered by a thick covering of minute papillae from which project straight spicules which give the animal a rather fuzzy appearance. The rhinophores are short, close-set, thick, and with 7 to 9 oblique lamellae and a tubular (mucronate) tip; they are gray to brown and retractile into papillate sheaths. There are 5 to 11 branched bi- and tripinnate branchiae, dusky gray to brown like the rhinophores; they form a posteriorly directed basket-like structure around the anal papilla when the animal is active.

The radular formula for two specimens, 10 and 12 mm long, is 14–20 × 20–24.0.20–24. The radular teeth are hamate, without denticles. The outermost laterals are smaller (55μ) and more elongate than the inner lateral teeth. The dominant tooth is central within each row and has a maximal length of 165μ in a 12-mm specimen.

A lateral stylet is present; it appears to serve as a stimulatory device during copulation. The stylet is enclosed within a hollow, eversible sheath which connects with a tightly convolute

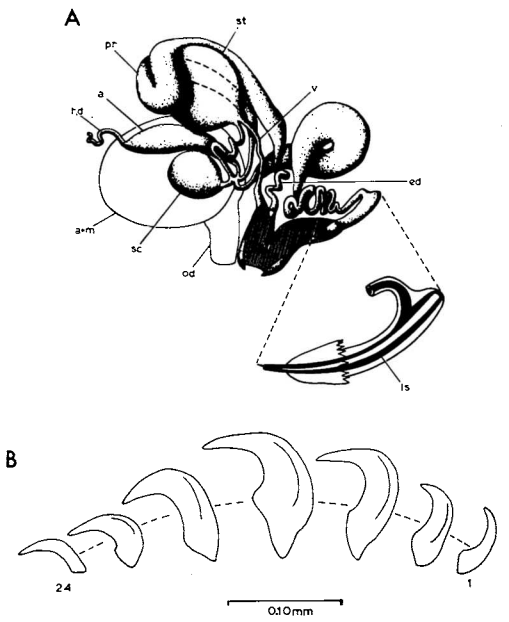



FIG. 11. *Jorunna tomentosa* (Cuvier). *A,* Lateral view of the genital mass and an offset of the lateral stylet and its sheath; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

duct. The duct of the lateral stylet leads into a coiled granular structure which, in turn, connects with the albumin and mucous gland. A common external genital orifice is shared by the sheaths of the lateral stylet, ejaculatory duct, and vaginal duct. The ejaculatory duct, which has no hooks in its lumen, appears to merge directly with a long prostate gland which partially envelopes the spermatheca. The spherical spermatheca is nearly twice the diameter of the similarly spherical spermatocyst. The spermatocyst connects with the spermatothecal duct at the common junction of the ampullary duct, prostatic duct, and duct of the lateral stylet in the albumin and mucous gland.

HABITS: This is a commonly occurring dorid, with specimens frequently found under rocks in the shallow waters shoreward of fringing reefs on both Oahu and Kauai throughout the year.

REMARKS: *J. tomentosa* apparently occurs throughout the world; it is well known along the coasts of southern Britain and has also been reported from Australia and the west coast of the United States.

## Subfamily DISCODORIDINAE

Bergh (1877*b*) included in the Discodoridinae those dorids with a minutely granulate mantle. If the subfamily is defined as including the rasping sponge-feeding dorids which are distinguished by jaws set with rods in the form of transverse ringlike growths, it will also include *Carminodoris* which has a pustulose mantle.

*Carminodoris grandiflora* (Pease, 1860)
Fig. 12

*Doris grandiflora* Pease, 1860:30–31. Sandwich Islands [Hawaiian Islands].

*Doris grandifloriger* Abraham, 1877:206. *Lapsus.*

*Dendrodoris grandiflora* Pease, Pruvot-Fol, 1947:108.

DESCRIPTION: Length, 38 mm; width, 25 mm (preserved). The animal is oblong-oval, rigid, convex above, and the mantle margins are thin but barely undulated. The mantle is fawn, reticulated with paler coloration and with splashes of brown; it is ornamented with large, somewhat irregular pustules. The rhinophores are stout and close-set, the peduncle equal in length to the lamellar portion; they are retractile into tubular sheaths and are fawn in color. There are 5 feathery branchiae which are procumbent and dusky fawn in color.

The radular formula for a single specimen is 40 × 120.0.120. The radular teeth are hamate. The innermost laterals are smooth but the succeeding laterals in each row have minute, outer denticles. Within each row the dominant tooth is central, 285μ in length; the outermost lateral is the smallest tooth in the row, with a length of 135μ. The 2 lateral jaws are set with small rods measuring 30 to 36μ in length and which bear transverse ringlike growths.

A convoluted, blind-ended vestibular gland without either armature or style opens into a common genital vestibule with the ejaculatory and vaginal ducts. The lumen of the ejaculatory duct bears small hooks which measure 75 to 135μ in length. Hooks are also found in the

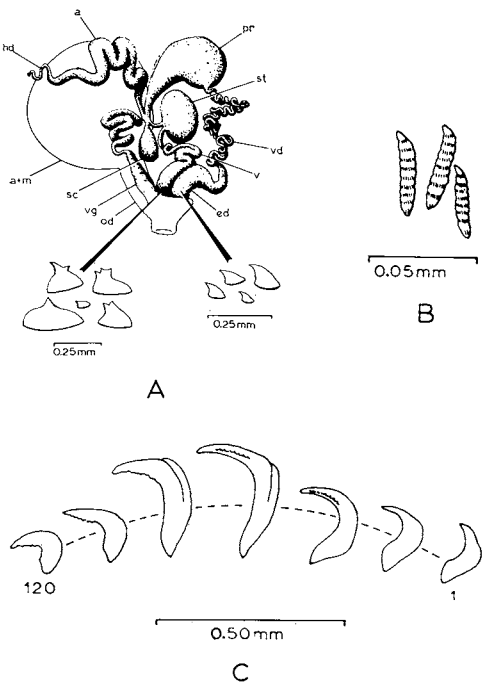



FIG. 12. *Carminodoris grandiflora* (Pease). *A,* Lateral view of the genital mass and offsets of the cirral hooks and vaginal armature; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. *vg,* Vestibular gland; other lettering as before.

vaginal duct but they are more variable in size, measuring 60 to 300μ in length, and are uni- or multitipped. The vas deferens is long and tightly convolute. The prostate gland is pyriform and finely lobulate. The vaginal duct leads directly to the ovate spermatheca. The short spermathecal duct leads to the junction at the albumin and mucous gland with the spermatocystic, prostatic, and ampullary ducts. The spermatocystic duct is short and passes directly into the pyriform spermatocyst, which is about one-half the size of the spermatheca.

HABITS: A single specimen has been recorded; it was found exposed on a reef in Kaneohe Bay in July 1964.

REMARKS: A comparison of Pease's (1860) description with our specimen leaves little doubt that our animal represents his species. Although superficially it resembles *Dendrodoris tuberculata,* which probably led Pruvot-Fol (1947) to suggest that Pease's species was a dendrodorid, the cephalic tentacles, buccal apparatus, and genitalia are those of the Doridiidae, while the denticulate hamate teeth and pustulose mantle are features of Bergh's (1889*a*) genus *Carminodoris.*

*Carminodoris nodulosa* (Angas, 1864)
Figs. 13, 18

DESCRIPTION: Length, 26 to 35 mm; width, 23 to 24 mm. The animal is oval, crisp and rigid, the dorsum convex, and the mantle margins thin and undulating. The mantle is mottled light brown with splashes of darker brown, and there is a central antero-posteriorly directed band of red-brown; except for the central red-brown band the mantle is studded with small

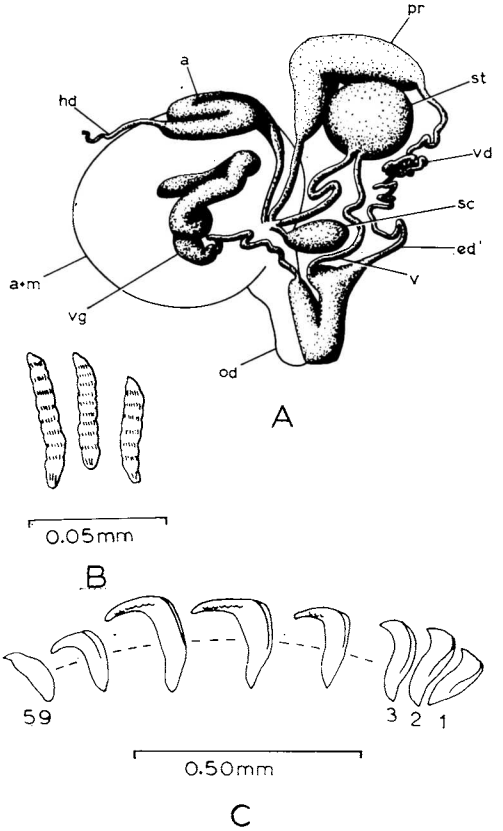



FIG. 13. *Carminodoris nodulosa* (Angas). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

pustules which are especially numerous toward the edge of the mantle. The rhinophores are large, perfoliate and brown; they are retractile into scalloped sheaths. There are 7 large branchiae surrounding an elongate, crenulated anal papilla; the branchiae are cream with flecks of brown. The branchial sheath is scalloped at the edges and completely encloses the branchiae when they are retracted.

The radular formula for a single specimen is 28 × 59.0.59. The radular teeth are hamate. The inner and outer laterals are smooth, and are the smallest teeth in the radular row; the outermost lateral is 120μ long. The central laterals are dominant and minutely denticulate on their outer edge; the largest central tooth is 225μ in length. The jaws are densely set with rods, 33–52μ long, bearing ringlike growths.

A blind-ended, convoluted vestibular gland opens into the common genital vestibule with the ejaculatory and vaginal ducts; all three ducts are unarmed. The vas deferens is long and tightly convolute; it passes into the smooth, elongate prostate gland. The vaginal duct leads directly into the spermatheca. The spermathecal duct is nearly the same length as the vaginal duct and opens into the junction of the spermatocystic, prostatic, and ampullary ducts of the albumin and mucous gland. The short spermatocystic duct opens into the pyriform spermatocyst which is about one-half the size of the spermatheca.

HABITS: Five specimens have been collected, four in February, March, May, and August 1962 on the reef platform at Ala Moana, Oahu, and the fifth in May 1962 on a wave-swept bench at Diamond Head Beach Park, Oahu.

REMARKS: Angas' (1864) description and figure of *Doris nodulosa* from Port Jackson, New South Wales, match our specimens in all respects. Burn (1965) recorded the species from northern New South Wales to central Victoria in Australia. Like the preceding species, *C. nodulosa* exhibits the denticulate hamate teeth and pustulose mantle of *Carminodoris* Bergh.

*Discodoris fragilis* (Alder and Hancock, 1866)
Figs. 14, 19

DESCRIPTION: Length, 5 to 35 mm; width, 2 to 20 mm. The animal is broadly oval, crisp and

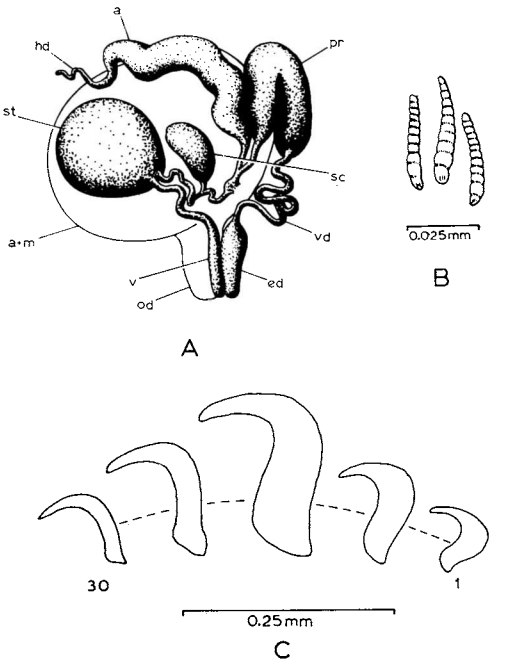
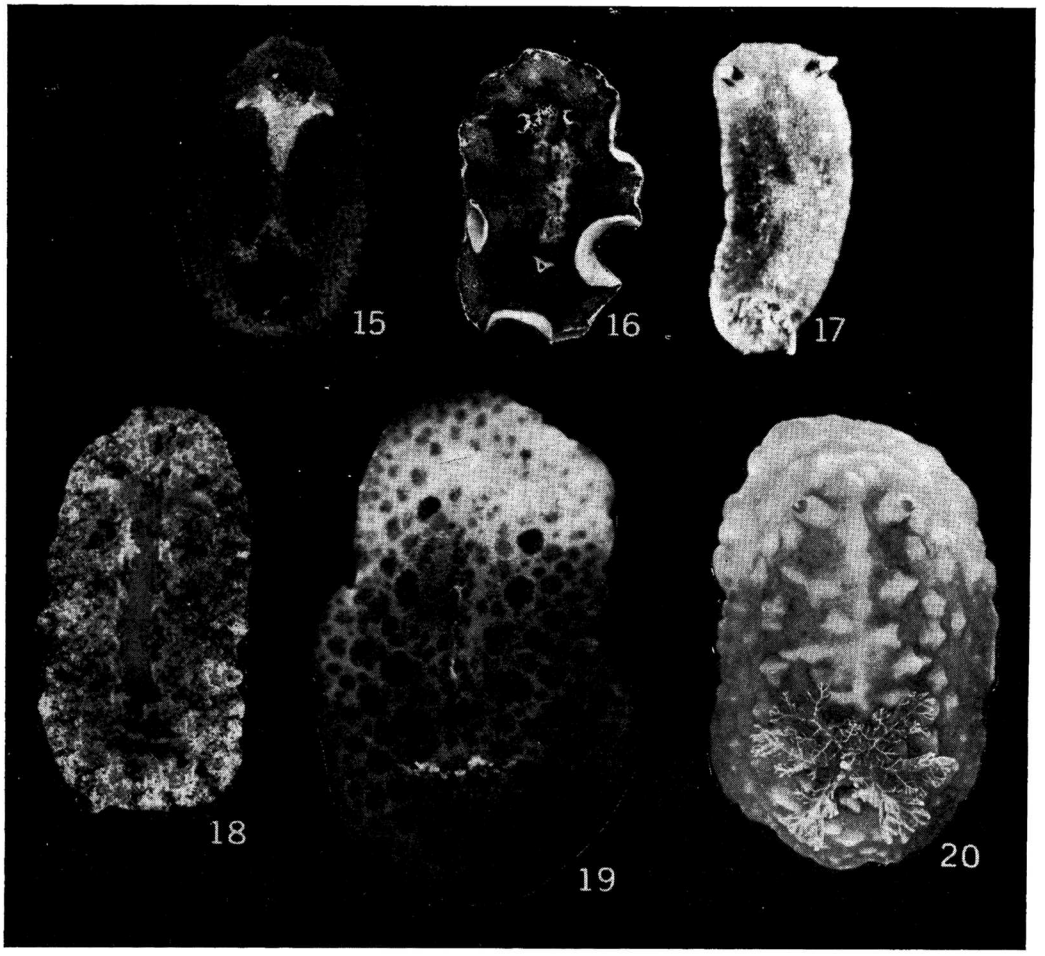



FIG. 14. *Discodoris fragilis* (Alder and Hancock). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

rigid, barely convex above, and the mantle margins are thin and undulated. The mantle is gray, mottled with light and dark, and often with patches of dark pigment laterally; it is ornamented with a dense mat of small, short, upstanding clusters of spicules. The rhinophores are slender and fusiform, with 15 to 20 lamellae; they are dusky in color, tipped with cream and have a tubelike apex; they are retractile into papillate sheaths. There are 4 to 6 tri- or quadripinnate branchiae which are dusky like the rhinophores and retractile into a cavity edged with papillae. The ventral surface of the mantle and the foot are cream with dark specklings.

The radular formula for two specimens is 18–22 × 28–30.0.28–30. The radular teeth are simply hamate, without denticles. The dominant tooth is central in each row; it has a maximal length of 180μ. The innermost lateral is more acutely curvate and smaller (75μ long) than the succeeding lateral teeth. The lateral jaws bear numerous rods which are 10 to 35μ long and which have transverse growth rings.




FIGS. 15–20

15. *Doriorbis nucleola* (Pease), 13 × 10 mm.
16. *Platydoris formosa* (Alder and Hancock), 65 × 31 mm.
17. *Jorunna tomentosa* (Cuvier), 10 × 5 mm.
18. *Carminodoris nodulosa* (Angas), 33 × 19 mm.
19. *Discodoris fragilis* (Alder and Hancock), 32 × 17 mm.
20. *Asteronotus cespitosus* (van Hasselt), 85 × 50 mm.

The ejaculatory and vaginal ducts have separate external orifices. The ejaculatory duct is a penis which merges imperceptibly with the vas deferens. The prostatic duct of the large, elongate prostate gland forms a common duct with the ampullary duct which, in turn, enters the albumin and mucous gland. There is a semiserial arrangement of the ovate spermatheca and the smaller pyriform spermatocyst. The long, narrow vaginal duct leads directly into the spermatheca. The spermatocyst is connected to the spermathecal and uterine ducts by a short spermatocystic duct. The uterine duct enters the albumin and mucous gland separately from the common prostatic-uterine duct.

The egg mass spawned by a 35-mm specimen was a smooth, 3-whorled ribbon which measured 245 mm in length and 3.5 mm in width. It contained approximately 300 ova per mm$^2$. Each ovum was cream colored, 65μ in diameter, and enclosed by a capsule 100μ in diameter.

HABITS: This is one of the commonest of the Hawaiian dorids; specimens have been collected

under coral rubble and rocks on the reef platform at Ala Moana, Oahu, and shoreward of fringing reefs near Koloa, Kauai, throughout the year. The animals often shed portions of the mantle when they are disturbed.

REMARKS: *D. fragilis* is a well known species in the Indian Ocean, and thus appears to be widely distributed in the Indo-West-Pacific.

## Subfamily TRIPPINAE

Because the genus *Trippa* exhibits so much variation in external morphology among its members, we place it in a subfamily distinct from the Diaululinae, in which *Trippa* was included by Bergh (1892*a*). The subfamily includes those dorids with compound tubercles and ridged reticulations or papillate and spiculate mantles, simply hamate radular teeth, no jaws or buccal armature, and salivary glands which are often lobulate.

*Trippa echinata* (Pease, 1860)
Figs. 21, 24

*Doris echinata* Pease, 1860:27. Sandwich Islands [Hawaiian Islands]; Abraham, 1877:206; Bergh, 1889*a*:Pl. G, figs. 12–15; Pruvot-Fol, 1947:108.

DESCRIPTION: Length, 4 to 24 mm; width, 3 to 8 mm. The animal is elongate-oval, the margins of the mantle parallel and discrete, the dorsum convex. The mantle is cream-white, often darkened with spots of brown; it is decorated with small, globular, spinose granules. The rhinophores are prominent, close-set, stoutly pedunculate, and mucronate; they are dusky in color. There are 5 tripinnate branchiae which are also dusky; the branchiae retract into a tall, rather conical, stellately ornamented sheath. The foot is white and bilabiate.

The radular formula for three specimens is 14–15 × 21–24.0.21–24. The radular teeth are hamate. The innermost lateral teeth are 60μ long and slightly curvate; the outermost laterals are 45μ long and acutely curvate. The dominant tooth is central and has a maximum size of 210μ.

The ejaculatory and vaginal ducts share a common orifice. A finely lobulate gland encircles the base of the ejaculatory duct; the duct is short and appears to merge directly with the loosely convolute prostate gland. The spermatheca and spermatocyst are semiserially arranged. The vaginal and spermathecal ducts are shorter and straighter than the loosely convolute uterine duct. The spermatocyst is connected to the spermathecal duct by a short spermatocystic duct. The spermatocyst is pyriform and approximately one-half the size of the spherical spermatheca. The uterine duct enters the albumin and mucous gland at the junction of the prostatic and ampullary ducts.

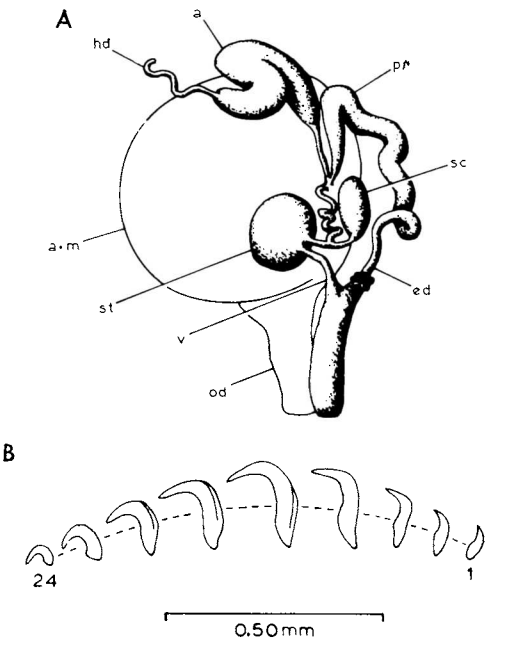



FIG. 21. *Trippa echinata* (Pease). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

HABITS: This is one of the most commonly occurring of the Hawaiian dorids; more than 40 specimens have been collected, usually in pairs, under rocks on the reef platform at Ala Moana, Oahu, and in the shallow waters shoreward of the fringing reefs at Nanakuli, Oahu, and Koloa, Kauai. Animals were recorded from February through August 1962, and in March and June 1963. Spawn were seen in June 1962.

REMARKS: Pease's description (1860) of an

"oblongo-ovate, rigid, scabrous" animal, the "whole dorsal region covered with spinose globular granules . . . light greyish brown . . . a few brown dots along the posterior edge of the mantle," enabled us to identify this species; the identification was confirmed by referring to Garrett's figure in Bergh (1889*a*).

We have not been able to find descriptions of this species in the literature and for the present its known distribution is limited to the Hawaiian Islands.

Although *T. echinata* does not exhibit the conspicuous compound tubercles described by Bergh (1877*b*) as characteristic of *Trippa,* it possesses all of the other features of the genus, and we prefer to expand *Trippa* to encompass dorids with spinose mantles rather than erecting a new genus on the basis of this one, often variable feature.

*Trippa osseosa* (Kelaart, 1859)
Figs. 22, 25

*Doris osseosa* Kelaart, 1859:298.

*Doris excavata* Pease, 1860:26. Sandwich Islands [Hawaiian Islands].

*Doris oreosoma* Pease, 1864:510. (n.n. for *D. excavata* preocc.).

DESCRIPTION: Length, 28 mm; width, 14 mm. The animal is elongate-oval, the mantle convex. The mantle is white with a distinctly dirty gray tint; it is sculptured by a middorsal, anteroposteriorly directed ridge from which branch lateral ridges enclosing rather deep pits. The rhinophores are close-set, elongate and slender, retractile into prominent sheaths crenulated by papillae; they are brown. There are 6 tripinnate gills retractile into a distinctive cavity, crenulate like the rhinophore sheaths and thrown into 6 prominent folds.

The radular formula for the single specimen collected is 20 × 38.0.38. The radular teeth are hamate. The innermost lateral, 60μ long, has a straight, broadened base and a pointed, curvate cusp; the outermost lateral is similar in size but more elongate and gradually curvate along its entire length. The dominant tooth is central and has a maximal length of 230μ.

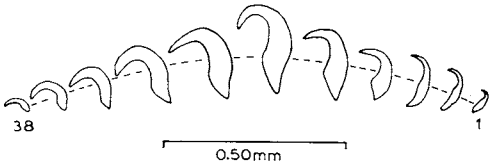



FIG. 22. *Trippa osseosa* (Kelaart). Lateral view of the left-half row of radular teeth.

The components of the genital mass were not discernible in the single specimen available.

HABITS: The single specimen collected was found under a rock on the tidal bench at Diamond Head Beach Park, Oahu, in July 1962.

REMARKS: The specimen resembles Pease's description (1860) of *Doris excavata* but differs in color; Pease's specimen was described as "light orange red, with large patches of light yellowish fawn." Our specimen also resembles those described by Alder and Hancock (1866) from the Indian Ocean, especially with respect to the branchiae which were noted as "scalloped and produced into a lobe"; Eliot (1903) noted that the branchial plumes emerged "horizontally from under the posterior termination of the dorsal ridge." The Alder and Hancock specimen was "greenish drab with minute dark spots"; Eliot's specimens were "pale yellow to gray brown."

This species is characterized by the several features which Bergh (1877*b*) and Eliot (1902) suggested were characteristic of the genus *Trippa.*

*Trippa scabriuscula* (Pease, 1860)
Figs. 23, 26

*Doris scabriuscula* Pease, 1860:27. Sandwich Islands [Hawaiian Islands]; Abraham, 1877:206; Pruvot-Fol, 1947:108.

DESCRIPTION: Length, 16 to 20 mm; width, 6 to 10 mm. The animal is elongate-oval, wider posteriorly than anteriorly; scaly and somewhat rigid to the touch. The mantle is sculptured by reticulate ridges and pits, with pustulate tubercles where the ridges meet; the pustules are especially prominent along the midline. The mantle is gray or olive-green macroscopically, the pustules creamy white, the pits with darker pigmentation. The effect of both sculpture and color is that of a piece of rather coarse sponge. The rhinophores are long and slender but without peduncles and the 18 to 20 lamellae

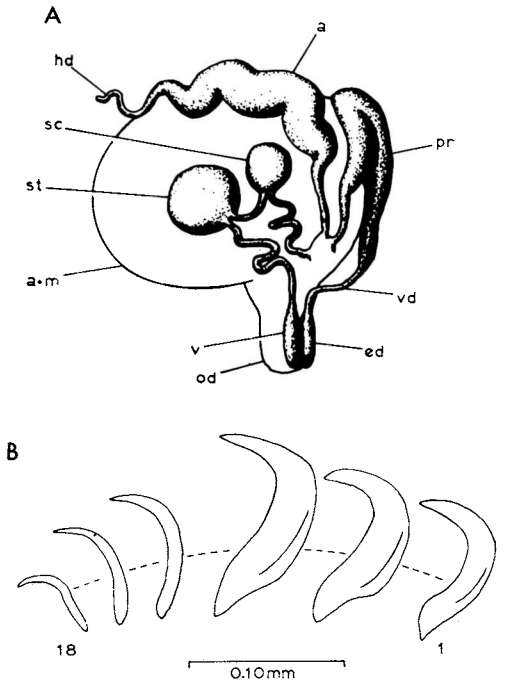
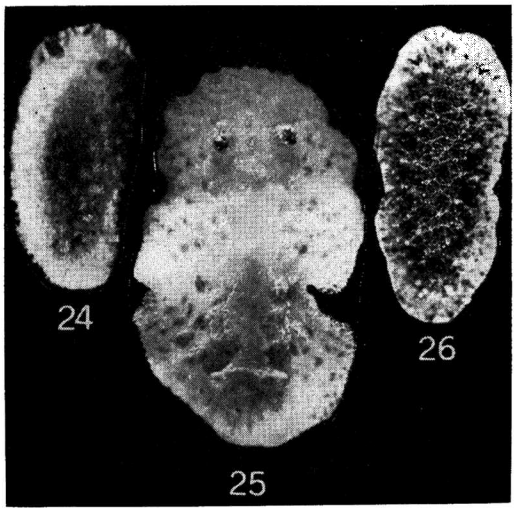



FIG. 23. *Trippa scabriuscula* (Pease). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.




FIGS. 24–26
24. *Trippa echinata* (Pease), 16 × 8 mm.
25. *Trippa osseosa* (Kelaart), 24 × 14 mm.
26. *Trippa scabriuscula* (Pease), 19 × 7 mm.

emerge directly from pustulated sheaths; the rhinophores are gray-green like the mantle. There are 5 or 6 branched, simply pinnate branchiae which are dark gray and retractile into a prominent, smooth, cavernous branchial sheath. The ventral surface of the foot is white or cream; the foot is non-bilabiate.

The radular formula for a single specimen is 17 × 18.0.18. The radular teeth are hamate and smooth. The outermost laterals, with a minimal length of 53μ, are more elongate than are the inner laterals and they lack an inner flange. The dominant tooth is central in each row and is 125μ long.

The ejaculatory and vaginal ducts have separate external orifices. There are no hooks in the short ejaculatory duct. The prostate gland is long and broad. The spermatheca and spermatocyst are serially arranged. The vaginal and uterine ducts both are long; the spermathecal duct is short. The spermatheca and spermatocyst both are spherical and of about the same size. There is a common junction of the uterine, prostatic, and ampullary ducts at the albumin and mucous gland.

HABITS: Five specimens have been collected, three in June and July 1962 on the reef platform at Ala Moana, Oahu, one in January 1965 under a rock on a limestone bench near Koloa, Kauai, and one in March 1965 under a rock in the shallow water shoreward of the fringing reef at Kewalo Basin, Oahu.

REMARKS: *T. scabriuscula* has been identified from Pease's description (1860) of an "oblongo-ovate, rigid, scabrous and convexly rounded" animal with "mamillated conical tubercles, which decrease in size toward the margins, and are united by elevated netlike reticulations. . . . Colour above greyish-olive, with three longitudinal series of dusky spots; dorsal tubercles and reticulations whitish."

This species may be compared with the animals described by Eliot (1900) from Samoa as *T. areolata* (Alder and Hancock, 1866) as "exactly [resembling] a shell or old stone overgrown with sponge . . . invisible when crawling on such objects." *T. areolata* was described from the east coast of India.

*T. scabriuscula* exhibits the conspicuous compound tubercles described by Bergh (1877*b*) as

diagnostic of *Trippa.* Its lack of labial armature and the uniform, simply hamate teeth both are features which Eliot (1902) subsequently suggested were characteristic of *Trippa,* but the lobulate salivary glands described in the genus are absent.

### Subfamily HALGERDINAE

This group was distinguished as a family by Odhner (1934) to include those dorids without labial armature, and with the marginal radular teeth pectinate, a well developed prostate gland, and the mantle smooth or reticulated but not tuberculated. We suggest that the group be recognized as a subfamily whose members are characterized by a firm or fleshy body which may be smooth or rough, a mantle with ridges, reticulations, and depressions or a combination of these features, smooth or denticulate hamate teeth, and an absence of buccal plates or armature.

*Halgerda apiculata* (Alder and Hancock, 1866)
Figs. 27, 29

DESCRIPTION: Length, 29 to 70 mm; width, 12 to 30 mm. The animal is oblong-ovate, rigid and scabrous, convexly rounded above, and the margins of the mantle are thin and irregular about the foot. The mantle is yellow-gray, with brown-gray ridges and darkly pigmented lateral depressions; it is ornamented with ridges and grooves, the ridges forming small tubercles where they meet. The rhinophores are oblong-ovate, with yellow peduncles and brown lamellae; the sheaths are scalloped. There are 6 to 7 feathery branchiae which are dusky in color and retractile into a scalloped sheath. The foot is yellow, narrow, and bilabiate.

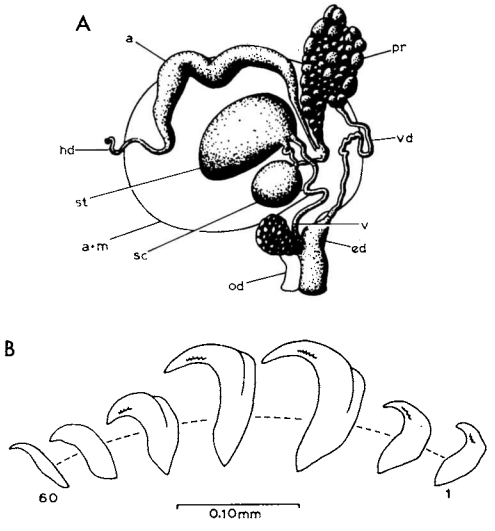



FIG. 27. *Halgerda apiculata* (Alder and Hancock). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

The radular formula for a 29-mm specimen is 39 × 62.0.62. The radular teeth are hamate, the 4 to 6 outer lateral teeth more elongate than the others and smooth, while the remaining teeth have 3 to 5 small outer denticles. The teeth increase in size and denticulation toward the center of each row. The central tooth in each radular row is 116μ long at its maximum length; the smallest innermost tooth is 58μ long.

The ejaculatory and vaginal ducts share a common external orifice. The ejaculatory duct lacks armature and passes into a long and tightly convolute vas deferens. The prostate gland is lobulate. A small lobulate gland is present at the base of the vaginal duct. The spermatheca is ovate and twice the diameter of the spherical spermatocyst. The spermatheca and spermatocyst are serially arranged: the loosely convolute vaginal duct enters the spermatheca directly; the spermathecal duct issues separately from the spermatheca; the spermatocystic duct passes from the spermathecal duct into the spermatocyst; and the uterine duct passes from the junction of the spermatocystic and spermathecal ducts and enters a common junction with the ampullary and prostatic ducts at the albumin and mucous gland.

HABITS: Three specimens have been found on the reef platform at Ala Moana, Oahu, in April and July 1962 and in January 1966.

REMARKS: This species and the two others assigned to the genus in Hawaiian waters exhibit the features of *Halgerda* Bergh, 1880*c* and *Sclerodoris* Eliot, 1903 (now considered a synonym of *Halgerda*): firm or fleshy body which may be smooth or rough; a mantle with ridges, reticulations, and depressions or a combination of all three with irregularities and tubercles;

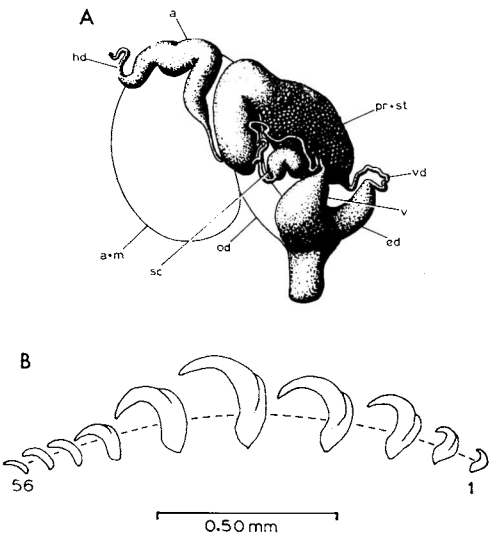
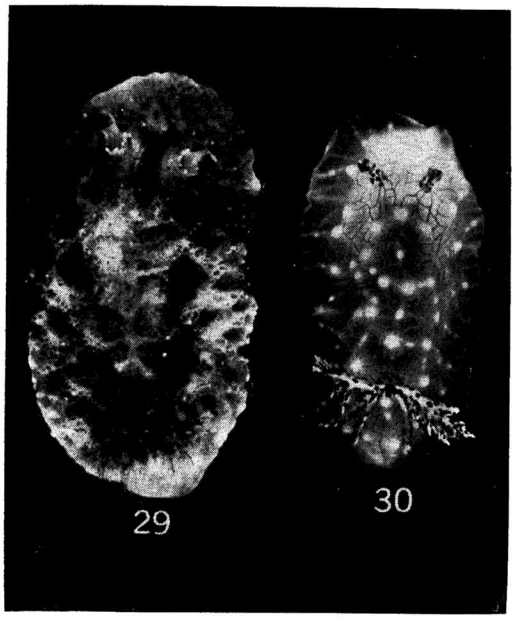



FIG. 28. *Halgerda* sp. cf. *graphica* Basedow and Hedley. *A*, Lateral view of the genital mass; *B*, lateral view of the left-half row of radular teeth. *pr* + *st*, Common prostatic-spermathecal gland; other lettering as before.




FIGS. 29–30

29. *Halgerda apiculata* (Alder and Hancock), 29 × 12 mm.

30. *Halgerda* sp. cf. *graphica* Basedow and Hedley, 30 × 22 mm.

smooth or denticulate hamate radular teeth; and the lack of buccal plates or armature.

Our specimens resemble those described by Alder and Hancock in most respects except that filaments which the original authors described as protruding from the pustules were not seen. Similar animals from Clarence River Heads, New South Wales were described by Allan (1947).

*Halgerda* sp. cf. *graphica* Basedow and Hedley, 1905

Figs. 28, 30

DESCRIPTION: Length, 25 to 30 mm; width, 15 to 22 mm. The animal is oval, smooth and gelatinous to the touch, the dorsum convex, and the margins of the mantle thin but not distinctly irregular about the foot. The mantle is transparent, gelatinous white, with orange lines marking the dorsum and yellow and white tubercles; it is ornamented with maplike ridges forming quadrilateral figures with pustules at their junctions, and there is a middorsal series of pustules forming an indication of a ridge. The rhinophores are long and slender, set close together, transparent white but dotted and splashed with brown-black; they are retractile into a transparent sheath marked with orange. There are 2 branchial rachi, each with 3 or 4 branches; the branchiae are transparent white, spotted with brown-black. The foot is white, margined with yellow-orange.

The radular formula for a 30-mm specimen is 55 × 56.0.56. The radular teeth are hamate. The outer laterals are narrower and more elongate than the inner laterals. The largest teeth in the row are central, and 330μ in length; the shortest teeth are the innermost laterals, and are 45μ in length.

The ejaculatory duct, vaginal duct, and oviducts share a common external orifice. The ejaculatory duct is unarmed. A finely lobulate, thin, layered gland is at the base of the vaginal duct. The prostate gland spreads over the spermatheca, appearing as a large, lobulate common prostatic-spermathecal gland. The short, broad vaginal duct is entirely separate from the loosely convolute spermathecal duct, but a common spermathecal-uterine duct is formed which leads to the small, pyriform spermatocyst. The uterine duct passes into the albumin and mucous gland

at the base of the broad prostatic duct which is joined, in turn, by the ampullary duct.

HABITS: Four specimens have been found, one, which spawned, at a depth of between 13 and 14 meters off Ala Moana, Oahu, in February 1962, another at a depth of 1.5 meters off Pupukea, Oahu, in August 1963, the third at a depth of 13 meters in Waimea Bay, Oahu, in August 1965, and the fourth in October 1965.

REMARKS: Our specimens resemble those described by Basedow and Hedley (1905) from Kangaroo Island, Western Australia, in their elliptical form, opaque white color marked with orange-yellow lines, and white foot with an orange-yellow margin. They differ in that they lack the dark central spots in the centers of the reticulations, the brown rhinophores, black branchiae, and distinct central line in the dorsum. The Australian specimens were recorded from deep water—20 fathoms (240 meters).

*Halgerda rubra* (Bergh, 1905)
Fig. 31

DESCRIPTION: Length, 16 to 88 mm; width, 8 to 40 mm. The animal is oval, smooth and rigid to the touch, the dorsum convex, and the margins of the mantle thin and irregular. The mantle is orange or orange-red with irregular white and/or vermilion spots and with black pigmentation in the concave areas; it is ornamented with raised reticulations which give the animal the appearance of a piece of sponge. The rhinophores are fusiform, orange-red to orange-brown with white or cream-colored tips; the rhinophoral sheath has a jagged edge. There are 5 to 8 tripinnate branchiae which are orange-red to orange-brown, the pinnae edged with white or cream. The foot and ventral surface of the mantle are smooth and orange-red.

The radular formula for a 30-mm specimen is 34 × 53.0.53. The radular teeth are hamate, 75 to 225μ long, the outermost 3 or 4 laterals less curvate than the preceding teeth, and the dominant tooth central in each row.

The ejaculatory and vaginal ducts share a common orifice. The ejaculatory duct is long with cirral hooks 15 to 60μ in length. The vas deferens is short and loosely convolute. The prostate gland is finely lobulate, and there is a

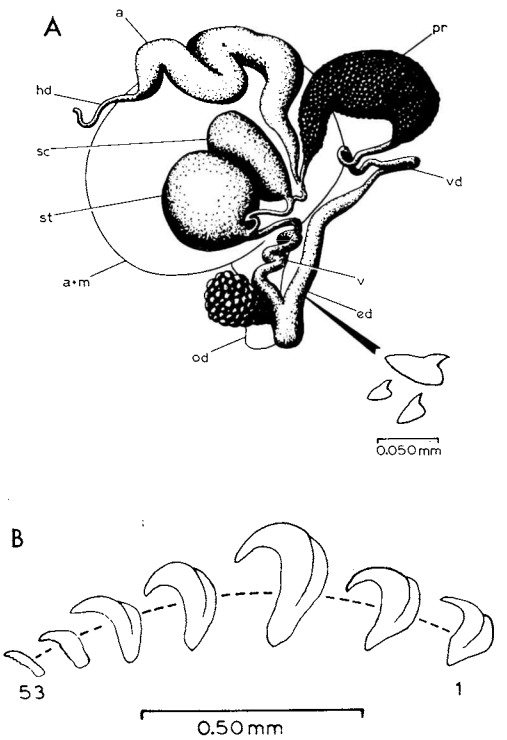



FIG. 31. *Halgerda rubra* Bergh. *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

coarsely lobulate gland at the base of the vaginal duct. The vaginal duct is tightly convolute and long, entering the spherical spermatheca. The spermathecal duct is united with the uterine duct by a short spermatocystic duct which opens into the ovate spermatocyst nearly as large as the spermatheca. The uterine duct is very short, forming the junction of the ampullary and prostatic ducts at the albumin and mucous gland.

HABITS: Three specimens have been recorded, two at depths of 50 and 65 meters off Ewa Beach, Oahu, in September 1965, and one at a depth of 0.5 meter on a bench at Ala Moana, Oahu, in January 1966. The last-mentioned specimen produced an orange, ribbon-like egg mass with 4 whorls.

REMARKS: Our specimens are nearly identical to *Sclerodoris rubra* Eliot, 1903 from Zanzibar,

which was correctly considered by Eliot (1908) to be the same as *Halgerda rubra* Bergh, 1905. The genus *Halgerda* Bergh, 1880*c* takes precedence over *Sclerodoris* Eliot, 1903.

The only dissimilarity between our specimens and those of Eliot (1903) and Bergh (1905) is the presence of hooks in the ejaculatory duct, a character which is often quite variable among the dorids. Bergh's specimen was collected from a depth of 36 meters. Eliot (1908) suggested that the living animal resembles a vermilion sponge which is common on the reefs off Zanzibar.

### Subfamily DIAULULINAE

Bergh (1872*a*) described this subfamily as including those dorids with the body neither hard nor soft, more or less depressed, the mantle minutely villous, often velvety, the branchial aperture round, crenulate, the gills tripinnate, lacking labial armature, the radula without a central tooth, the laterals numerous, hamate, and with the penis unarmed.

*Thordisa hilaris* Bergh, 1905
Figs. 32, 35

DESCRIPTION: Length, 5 to 14 mm; width, 2 to 7 mm. The animal is broadly oval, somewhat depressed, rigid, and like sandpaper to the touch; the mantle skirt is thin, flaring unevenly about the foot. The mantle is orange, microscopically peppered with black, and covered with minute, transparent papillae. The rhinophores are thick, the sheaths circular and crenulate; they are brown-tipped with a white nipple. There are 6 tripinnate branchiae which spread starlike across the posterior of the mantle; they are orange, microscopically peppered with black like the dorsum. The foot is orange, not bilabiate but with a fold anteriorly.

The radular formula for two specimens, 10 and 12 mm long, is 33–35 × 5–9.25–27.0.25–27.5–9. The marginal teeth are finely pectinate. The outermost marginal is 53μ in length and is the shortest tooth in any given radular row. The lateral teeth are hamate and without denticles. The dominant lateral tooth is central and has a maximal length of 166μ.

The ejaculatory and vaginal ducts share a common external orifice. There are no hooks in the ejaculatory duct. The prostate gland is finely lobulate. The spermatheca and the spermatocyst are both connected to the female duct system by separate ducts. The spermatheca has a similar ovate shape but is more than twice the diameter of the spermatocyst. The uterine duct enters the albumin and mucous gland at the junction of the ampullary and prostate ducts.

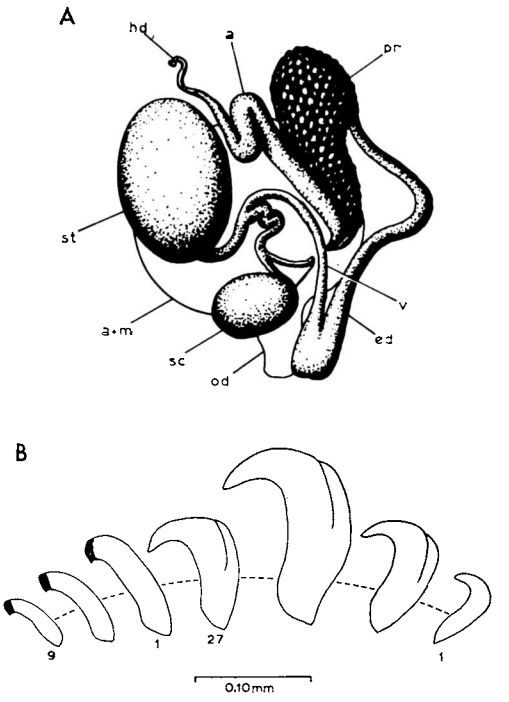



FIG. 32. *Thordisa hilaris* Bergh. *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

HABITS: Twelve specimens have been recorded, all found in pairs under rocks in the shallow waters shoreward of the fringing reef near Koloa, Kauai, in February, April, June, and August 1962, and in April 1963. A single pair was found at Fort Kamehameha, Oahu, in July 1962. The animals are associated with an orange sponge which they resemble in color; they produce orange egg masses, one of which was observed in July 1962.

REMARKS: The pectinate marginal teeth suggest that this species should be assigned to the genus *Thordisa,* and Bergh's description (1905)

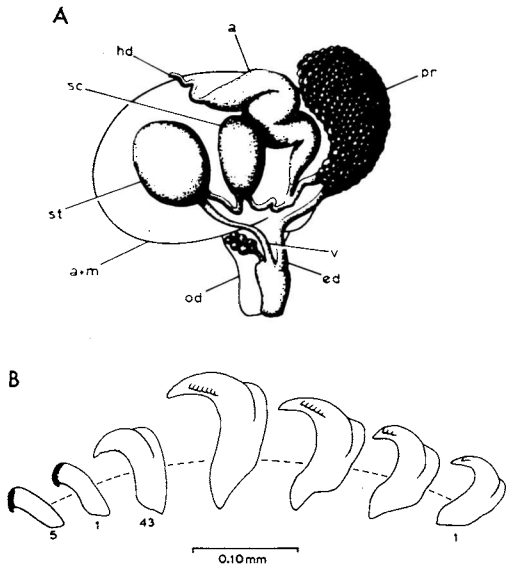



FIG. 33. *Thordisa setosa* (Pease). *A,* Lateral view of the genital mass; *B,* lateral view of the left-half row of radular teeth. Lettering as before.

of *T. hilaris* from the Sulu Sea appears to agree with our specimens.

*Thordisa setosa* (Pease, 1860)
Figs. 33, 34

*Doris setosa* Pease, 1860:26. Sandwich Islands [Hawaiian Islands]; Bergh, 1889*a*: Pl. G, figs. 8, 9; Eliot, 1900:519; Pruvot-Fol, 1947:107–108.

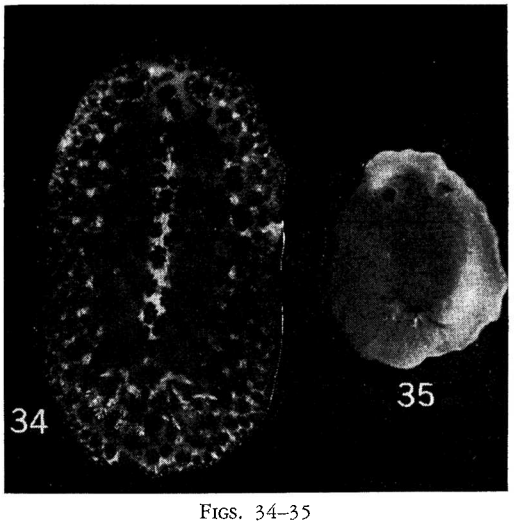
*Doris pilosa* Pease, 1860:27–29. Sandwich Islands [Hawaiian Islands]; Abraham, 1877:206; Pruvot-Fol, 1947:108 (non Muller).

DESCRIPTION: Length, 14 to 55 mm; width, 6 to 20 mm. The animal is broadly oval, depressed, narrower anteriorly than posteriorly, and fairly soft to the touch; the mantle skirt is thin and irregular. The mantle is purple-red or gray with patches of darker pigment; it is ornamented with a dense felting of small, rounded papillae, between which project longer, tentacular processes. The rhinophores are close-set, short, lamellated but without a peduncle; they are ashy gray. There are 10 moderately feathery branchiae which are rather small for the size of the animal; the branchial sheath is barely papillate.

The radular formula for a single specimen is 30 × 5.43.0.43.5. The marginal teeth are short and pectinate; the outermost marginal one is the smallest—59μ in length. The laterals are hamate with 1 to 8 outer denticles. Tooth size and denticulation increase centrally within each row, and the dominant lateral tooth has a maximal length of 132μ.

A common external orifice is shared by the ejaculatory duct, the vaginal duct, and a lobulate gland—the "vestibular gland" of Pruvot-Fol (1954). All of the ducts of the genital mass are short and none is tightly convolute. The prostate gland is large and finely lobulate. The spermatheca and spermatocyst are serially arranged. The spermatheca is only slightly larger than the spermatocyst and both are ovate in shape. The uterine duct enters a common junction with the ampullary and prostatic ducts at the albumin and mucous gland.

HABITS: These animals are rather common, found clinging to the undersurfaces of rocks where they take the shape of the crevice or projection; all have been collected on the reef platform at Ala Moana, Oahu, and in the shallow waters shoreward of the fringing reef at Kewalo, Oahu. Specimens were recorded throughout the year in 1962, and since then less frequently.




FIGS. 34–35
34. *Thordisa setosa* (Pease), 30 × 20 mm.
35. *Thordisa hilaris* Bergh, 14 × 6 mm.

REMARKS: It is not possible to distinguish between Pease's *Doris pilosa* and *D. setosa*; however, since *D. setosa* precedes *D. pilosa* by pagination, we have utilized the former name. Pease's description was of an animal "elongate-oval . . . densely pilose, with slender filamentous processes . . . yellowish-grey, with numerous indistinct black points and abbreviated lines on the dorsal surface."

The animal which Eliot (1900) described from Samoa as *Doris setosa* differs from our specimens in two respects: in his specimens the "villous projections, which contain spicules can be scraped off," and his radula formula of 18 (or 19).0.18 (or 19) is quite different.

This species and the preceding one (*Thordisa hilaris* Bergh) possess the pectinate marginal teeth which Bergh (1872*a*) suggested as characteristic of *Thordisa.*

***Peltodoris fellowsi*** Kay and Young, new species

Figs. 36, 37

DESCRIPTION: Length, 40 mm; width, 20 mm. The animal is oval and depressed, and the mantle is rigid, with the margin broad and irregular. The mantle is white, ornamented with numerous fine granules. The branchial sheath is a transverse 3-lobed crypt. The rhinophores are rodlike, the peduncle red-brown and there are 15 jet black lamellae. The rhinophore sheaths are slightly raised and the margins are smooth. The branchiae are tripinnate with 6 branches from 2 main rachids; the rachis is red-brown, the pinnae jet black. The foot is white.

The radular formula is 23 × 24.0.24. The teeth are 75 to 450μ long, simply hamate, and obtusely curvate with a small outer flange. The dominant tooth is central. There are neither buccal plates nor armature.

The ejaculatory and vaginal ducts have separate orifices. The ejaculatory duct is broad and straight, the vas deferens short and tightly convolute. The prostate gland is large and finely lobulate with no prostatic duct; the spermatocyst and spermatheca are semiserially arranged, the spermatheca only slightly larger than the spermatocyst, and both are ovate. The vaginal duct is long and loosely convolute, leading directly to the spermatocystic duct which is short, opening into the spermatocyst. A short uterine duct passes from the spermatocystic duct to the junction of the ampullary duct and prostate at the albumin and mucous gland.

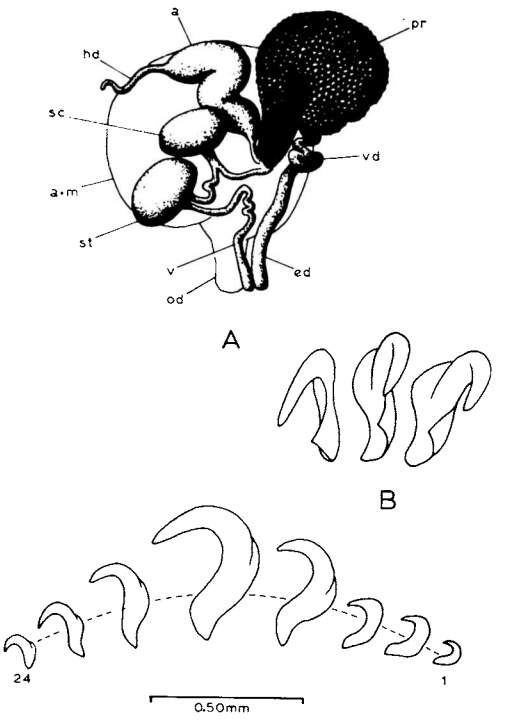



FIG. 36. *Peltodoris fellowsi* Kay and Young. *A,* Lateral view of the genital mass; *B,* posterior view of the radular teeth from the left-half radular row; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

HABITS: Five specimens have been collected, all at depths of 10 meters in dead coral at Pupukea, Oahu, in July 1965 and in May and October 1966.

REMARKS: We have been unable to find this species described previously; its slightly rigid and minutely granulate mantle and the lack of jaws, buccal armature, and genital armature suggest that it fits Bergh's (1880*b*) genus *Peltodoris.*

The holotype and three paratypes have been deposited in the B. P. Bishop Museum, Honolulu, Hawaii. The species is named for David Fellows who first collected a specimen.

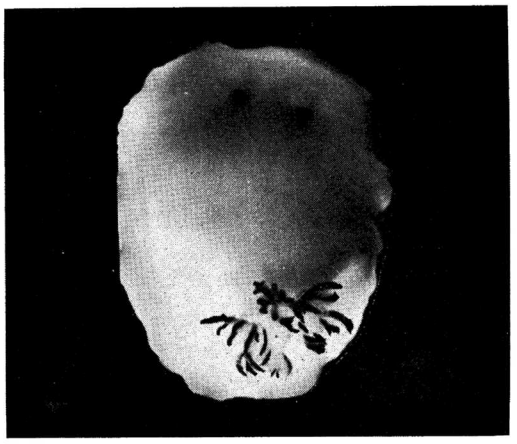


FIG. 37. *Peltodoris fellowsi* Kay and Young, 40 × 20 mm.

Subfamily CHROMODORIDINAE

The diagnostic features of this subfamily are the hooked buccal armature set in a horseshoe-shaped jaw and the genital mass which lacks a spermathecal duct. The Chromodoridinae in Hawaiian waters include three genera, *Ceratosoma* Adams and Reeve, 1848, with a high body and mantle brim, and *Chromodoris* and *Hypselodoris,* with compressed bodies and without a mantle brim. *Chromodoris* is distinguished by its unicuspidate teeth, *Hypselodoris* by its bicuspidate teeth (Odhner, 1957).

*Ceratosoma cornigerum* Adams and Reeve, 1848
Fig. 38

DESCRIPTION: Length, 34 mm; width, 7 mm. The animal is limaciform, rather hard in consistency, the body rising from the head so that the branchiae are higher than the rhinophores, the head with a round frontal veil. The mantle is 3-lobed posteriorly and the foot is prolonged into a tail nearly the same length as the body. The animals are orange-red in color with a few purple spots variously distributed, and areas of white with smaller purple spots beneath the mantle brim. The branchiae and rhinophores are retractile into smooth, swollen sheaths; the branchiae are orange-red, the rhinophores yellow. The foot is white, spotted with purple at the base.

The radular teeth were lost and so are not described.

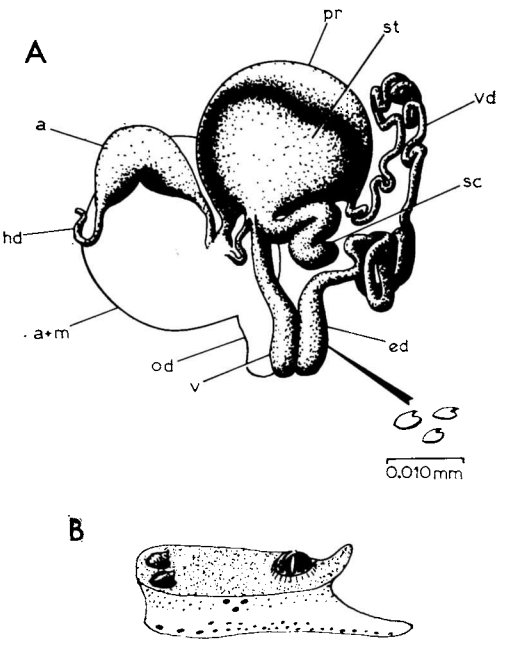



FIG. 38. *Ceratosoma cornigerum* Adams and Reeve. *A,* lateral view of the genital mass and an offset of the cirral hooks. Lettering as before; *B,* lateral view of an adult specimen, 34 × 7 mm.

The genital mass is "chromodorid-like" in configuration. The ejaculatory and vaginal ducts have separate external orifices; there are minute hooks, 3 to 5μ long, in the ejaculatory duct. The ejaculatory duct merges imperceptibly with the vas deferens which, in turn, leads into the prostate gland, a thin glandular sheet spreading over the spermatheca. The broad, straight vaginal duct passes directly into the large, spherical spermatheca between the spermatocyst and the uterine duct. The elongate, convolute spermatocyst arises from the spermatheca separately from the narrow uterine duct which, in turn, passes from the spermatheca into the albumin and mucous glands at the junction of the prostatic and ampullary ducts.

HABITS: A single specimen has been recorded, collected at a depth of 0.5 meter off Barber's Point, Oahu, in January 1965.

REMARKS: *C. cornigerum* has been reported from the Indian Ocean (Eliot, 1904) and Japan (Baba, 1949). In other localities it is apparently

a common shallow-water species: Eliot observed it in shallow pools, crawling over seaweeds, etc., and Burn (1962) stated that *C. brevicaudatum* is a dominant species of the littoral fauna of the whole of southern Australia.

*Chromodoris albopustulosa* (Pease, 1860)
Figs. 39, 53

*Doris albopustulosa* Pease, 1860:30. Sandwich Islands [Hawaiian Islands].
*Chromodoris albopustulosa* Bergh, 1881*a*:82, pl. G, figs. 6, 7; Bergh, 1884*b*:70.
*Glossodoris albopustulosa* Pease, Pruvot-Fol, 1947:108; Pruvot-Fol, 1951:83.

DESCRIPTION: Length, 15 to 25 mm; width, 5 to 7 mm. The animals are oval-oblong, rather wide, soft, and the margin of the mantle tends to override the foot irregularly. The mantle is lemon yellow, ornamented with depressed white pustules, and the mantle margin is edged with purple, either as a continuous band or in spots. The rhinophores are large, well-spaced, and with 6 to 8 lamellae; they vary in color from orange to orange-brown, with the laminae edged in white. The branchiae consist of a basket-like structure of 6 to 11 feathery gills which surround the anal papilla; the branchiae are transparent white. The foot is grooved anteriorly; it tapers and projects posteriorly as a tail. The ventral surface is white.

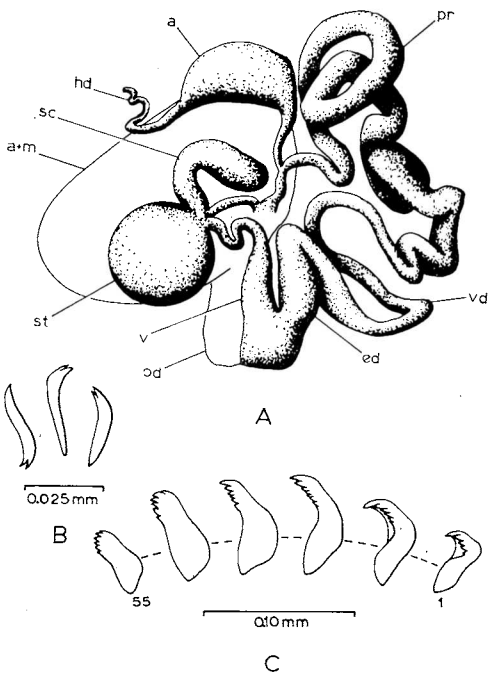



FIG. 39. *Chromodoris albopustulosa* (Pease). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

The radular formula range for two specimens 15 and 25 mm in length is 38–60 × 32–55.0.32–55. The radular teeth are unicuspid with 5 to 8 denticles; they range from 40 to 80μ in length. Length and denticulation increase centrally within each row. The hooklike shape of the innermost laterals grades gradually to the more elongate shape of the outer laterals. The outermost laterals are denticulate at their tips only. The buccal armature consists of simple, bifid hooks, 26 to 30μ long, which are slightly recurved.

The ejaculatory duct, which lacks hooks, shares a common orifice with the vaginal duct. The male duct system is loosely convolute and has a long, yellow midsection. A common duct is formed by the union of the ampullary and prostatic ducts. The short vaginal duct enters a common junction with the spermatheca, spermatocyst, and uterine duct. The spermatheca is ovate and slightly larger than the spermatocyst. The spermatocyst is elongate and incurvate. The short uterine duct enters a junction with the common prostatic-ampullary duct at the albumin and mucous gland.

HABITS: Of the 12 specimens collected, 10 occurred at two stations on Oahu, 2 at one station on Kauai. All were under rocks in shallow water shoreward of fringing reefs. Ten specimens were collected between January and July 1962; the species was not seen again, however, until April 1965 when 2 more specimens were found.

An egg mass was deposited in October 1964 by an 18-mm individual. It consisted of a ribbon-like structure with a smooth free margin; there were 2 whorls, 50 mm in length and 1.25 mm in diameter. The egg mass contained approximately 243 ova per mm², each ovum cream-colored with a yellow-orange body at one side and enclosed by a spherical capsule 100μ in diameter.

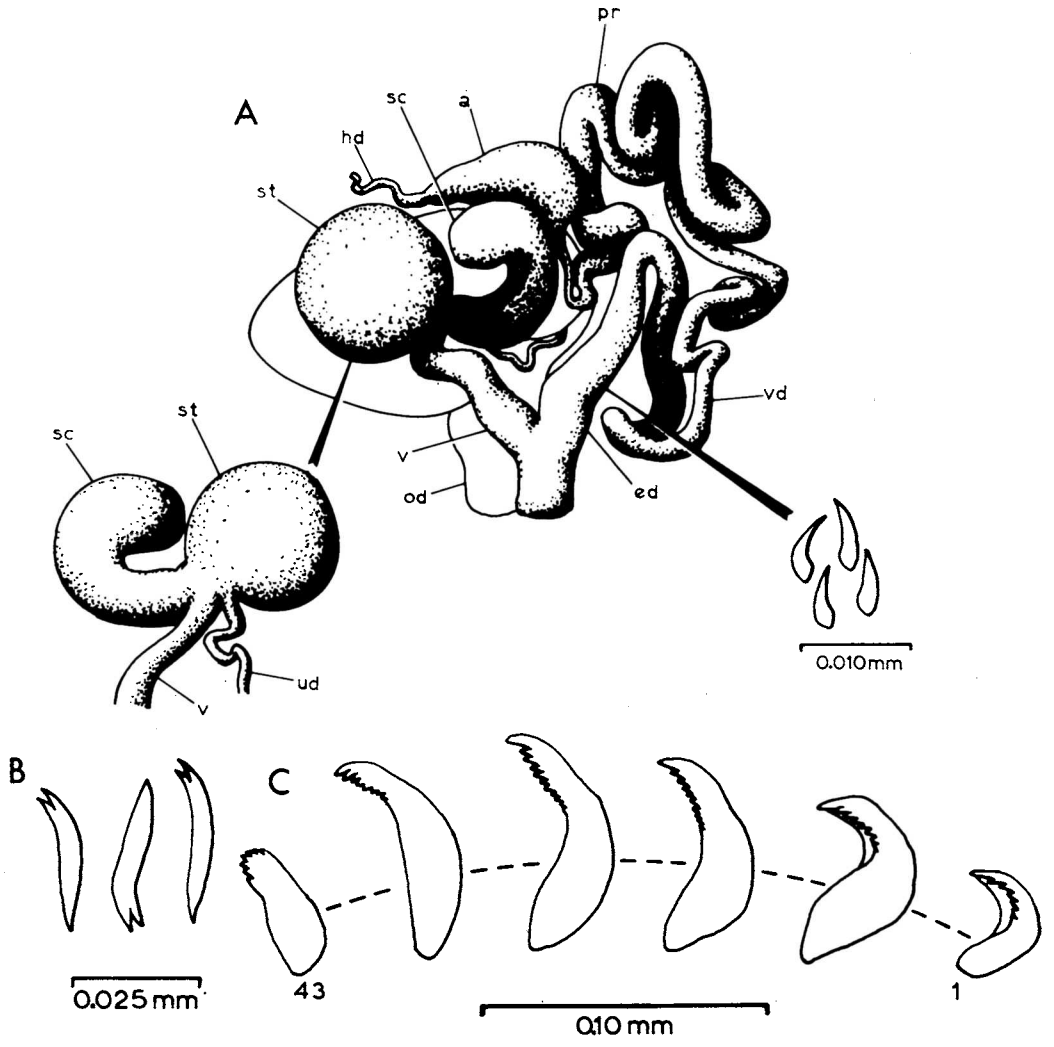



FIG. 40. *Chromodoris decora* (Pease). *A,* Lateral view of the genital mass, medial aspect of the spermatheca showing the arrangement of the female ducts, and an offset of the cirral hooks; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

REMARKS: There are apparently no records of this species in the literature since Pease's original description (Pease, 1860) and subsequent figure (Pease, 1871), except for Eliot's (1904) rather dubiously identified specimen from the Andaman Islands. The specimens we have seen conform to Pease's descriptions in all respects; the species is not synonymous with either *Glossodoris vibrata* (Pease, 1860) or *G. imperialis* (Pease, 1860) as suggested by Pruvot-Fol (1947).

*Chromodoris decora* (Pease, 1860)
Figs. 40, 60

*Doris decora* Pease, 1860:29. Sandwich Islands [Hawaiian Islands].

*Chromodoris decora* Pease, 1866:207; Abraham, 1877:215; Bergh, 1880*a*:25–26, pl. B, figs. 5–8; Bergh, 1884*b*:68; Bergh, 1892*a*:1108.

*Glossodoris decora* Pease, Allan, 1947:441 (Clarence River Heads, New South

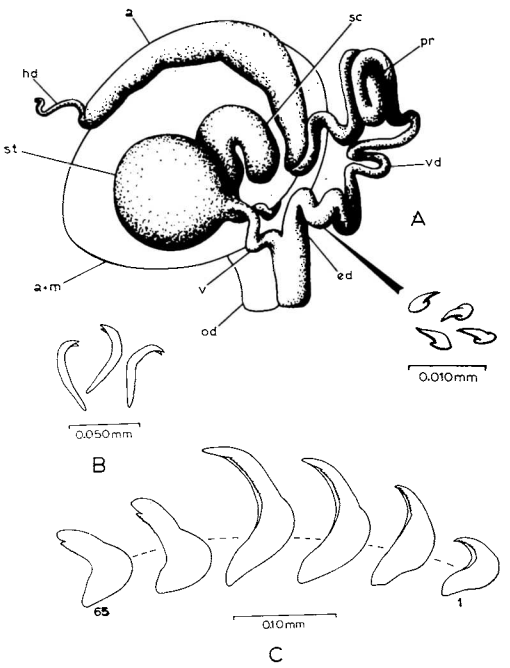



FIG. 41. *Chromodoris imperialis* (Pease). *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

Wales); Pruvot-Fol, 1951:108; Baba, 1953:205 (Japan).

DESCRIPTION: Length, 12 to 20 mm; width, 4 to 5 mm. The animal is oval, broad, somewhat depressed, and the mantle margin spreads out around the foot. The mantle is ivory, with a median flake-white stripe running posteriorly from the rhinophores to the middorsum where it bifurcates and borders the branchial plumes; the white stripe and the margins are dotted with purple, while the margin is bordered by a broad orange band which is also dotted with purple. The medial purple spots in some specimens stand out as small pustules. The rhinophores are close-set, long, with deep lamellae; they are white. There are 5 or 6 simply pinnate branchiae which are also white. The ventral surface of the foot is white, as is the mantle except for the orange margin.

In a 20-mm specimen the radular formula is 48 × 43.0.43. The teeth are unicuspid with 6 to 10 outer denticles. Tooth length and denticulation increase centrally within each radular row. The innermost lateral is hooklike and denticulate along its outer surface; the outermost lateral is elongate and denticulate only at the tip. Maximal tooth length is 73μ; minimal length is 33μ. The buccal armature consists of simple, bifid hooks 30 to 36μ long.

The short ejaculatory duct shares a common orifice with the vaginal duct and is lined with small hooks, 6 to 7μ long. The long, convolute vas deferens merges almost imperceptibly with the prostate gland. The short vaginal duct leads directly to the spherical spermatheca. The elongate, incurvate spermatocyst is nearly as large as the spermatheca; it arises from the junction of the vaginal duct with the spermatheca. The narrow, slightly convolute uterine duct arises laterally from the vaginal-spermathecal junction opposite that of the spermatocyst and enters the albumin and mucous gland near the convergence of the ampullary and prostatic ducts.

HABITS: Seven specimens have been recorded. Six were collected under rocks at low tide on the reef platform at Ala Moana, Oahu, three in July 1962, and three in December 1964; a single specimen was found under a rock in a tidepool on the south shore of Kauai in October 1965.

One of the three specimens collected in December deposited an egg mass in the laboratory. The animal, 20-mm in length, deposited a ribbon of 1½ whorls; the free margin of the ribbon was smooth. The concentration of ova was approximately 250 ova per mm². Each ovum was 80 × 92μ in diameter, cream with a yellow body projecting toward the free margin of the egg mass and encapsulated with a capsule 100 to 112μ in diameter.

REMARKS: As Pruvot-Fol (1947) pointed out, *Chromodoris decora* is scarcely distinguishable from *C. lentiginosa* (Pease, 1871) which was described from Tahiti. The only discernible difference between the Hawaiian specimens and Pease's description and figure is that the rhinophores in the Hawaiian species are white, those of *C. lentiginosa* brown. If the two species are the same, the name *C. decora* has precedence over *C. lentiginosa.*

*C. decora* occurs at least around the periphery of the Pacific, Baba (1953) recording it from

Japan, and Allan (1947) from New South Wales.

*Chromodoris imperialis* (Pease, 1860)
Figs. 41, 59

*Doris prismatica* var. *imperialis* Pease, 1860:32. Sandwich Islands [Hawaiian Islands].
*Doriprismatica imperialis* Pease, 1868:132.
*Glossodoris imperialis* (Pease) Pruvot-Fol, 1951:111.

DESCRIPTION: Length, 65 mm; width, 25 mm. The animal is elongate-oval, soft, depressed, with the mantle margin thin and fluted. The mantle is a rich orange-yellow ocellated with white; the margin is lemon yellow, edged with brilliant purple. The rhinophores are widely spaced, fairly broad with deep lamellae; they are purple, spotted with darker purple and striped with white at the apex. There are 7 doubly pinnate branchiae which are arranged in star-shaped fashion about the anal papilla; they are pale purple with the rachis striped with white.

In a 65-mm specimen the radular formula is 63 × 65.0.65. The radular teeth are unicuspid with 7 to 20 outer denticles. The length and denticulations of the teeth increase centrally in each row, ranging from 66 to 142μ in length. The cusps of the outer teeth are rounded. The buccal armature consists of bifid and recurved hooks 49 to 56μ long.

The ejaculatory and vaginal ducts share a common external orifice. There are a few scattered hooks with a maximum length of 5μ in the ejaculatory duct. The prostate gland is distinguished from the vas deferens by its slightly larger diameter and purple color; both are loosely convolute. The short vaginal duct leads to a common junction with the spermatheca, spermatocyst, and uterine duct. The spermatocyst is long and incurvate. The spermatheca is spherical, more than twice the size of the spermatocyst. The uterine duct passes into the albumin and mucous gland at a considerable distance from the junction of the ampullary and prostatic ducts.

HABITS: The single animal recorded was found at the edge of the reef platform at Ala Moana, Oahu, in December 1964. The animal was in moving water and appeared to have come up from deeper water.

REMARKS: Although the single animal collected does not match Pease's description in all respects, we have tentatively assigned his name to it. The most obvious discrepancy is the lack of purple rings with yellow centers on the foot; there are blotches of purple anteriorly and posteriorly on the foot, however, and in view of the rather wide range in color variation shown among other chromodorids, this feature may well be a color variant.

*Chromodoris lilacina* (Gould, 1852)
Figs. 42, 43

*Doris lilacina* Gould, 1852:297, pl. 22, fig. 392a–b. Sandwich Islands [Hawaiian Islands].

DESCRIPTION: Length, 6 to 30 mm; width, 2 to 7 mm. The animal is oval, convex, soft, and the mantle margin is labile, fluting around the foot or forming a frill around the head region. The mantle is cream-colored, ornamented with bright purple spots which also appear on the foot. The rhinophores are widely spaced, slender, and with 10 to 12 lamellae; they are orange-yellow or straw-colored. There are 6 to 8 simply pinnate branchiae which may appear quite feathery; they are colored like the rhinophores. The ventral surface of the foot and mantle are white; the head has a yellow tint.

These animals are sluggish and short, changing shape rapidly from an elongate form to a broad, convex ball. The mantle edge crinkles around the foot, giving the trilobite-effect described by Gould (1852). The posterior portion of the foot adheres to the substrate so that the animal is often difficult to dislodge.

The radular formula range for two specimens is 61–66 × 38–41.0.38–41. The radular teeth are unicuspid with 2 to 7 outer denticles. Denticulation and length of teeth increase centrally. The innermost laterals, 40μ long, and the central lateral, 76μ long, are hooklike and denticulate along their outer edges. The buccal armature consists of simple, bifid hooks, 30 to 40μ long, which are recurved at mid-length.

The ejaculatory duct has a separate external orifice from that of the vaginal duct. There are

no hooks in the ejaculatory duct, which merges imperceptibly with the vas deferens and prostate gland; the entire male duct system is convolute. The vaginal duct is long and narrow; it leads to the junction of the spermatheca, spermatocyst, and uterine duct. The spermatocyst is convolute and elongate. The spermatheca is oval, often enveloped by the prostate gland and vas deferens. The uterine duct is narrow and convolute; it leads into the albumin and mucous gland near the convergence of the ampullary and prostatic ducts.

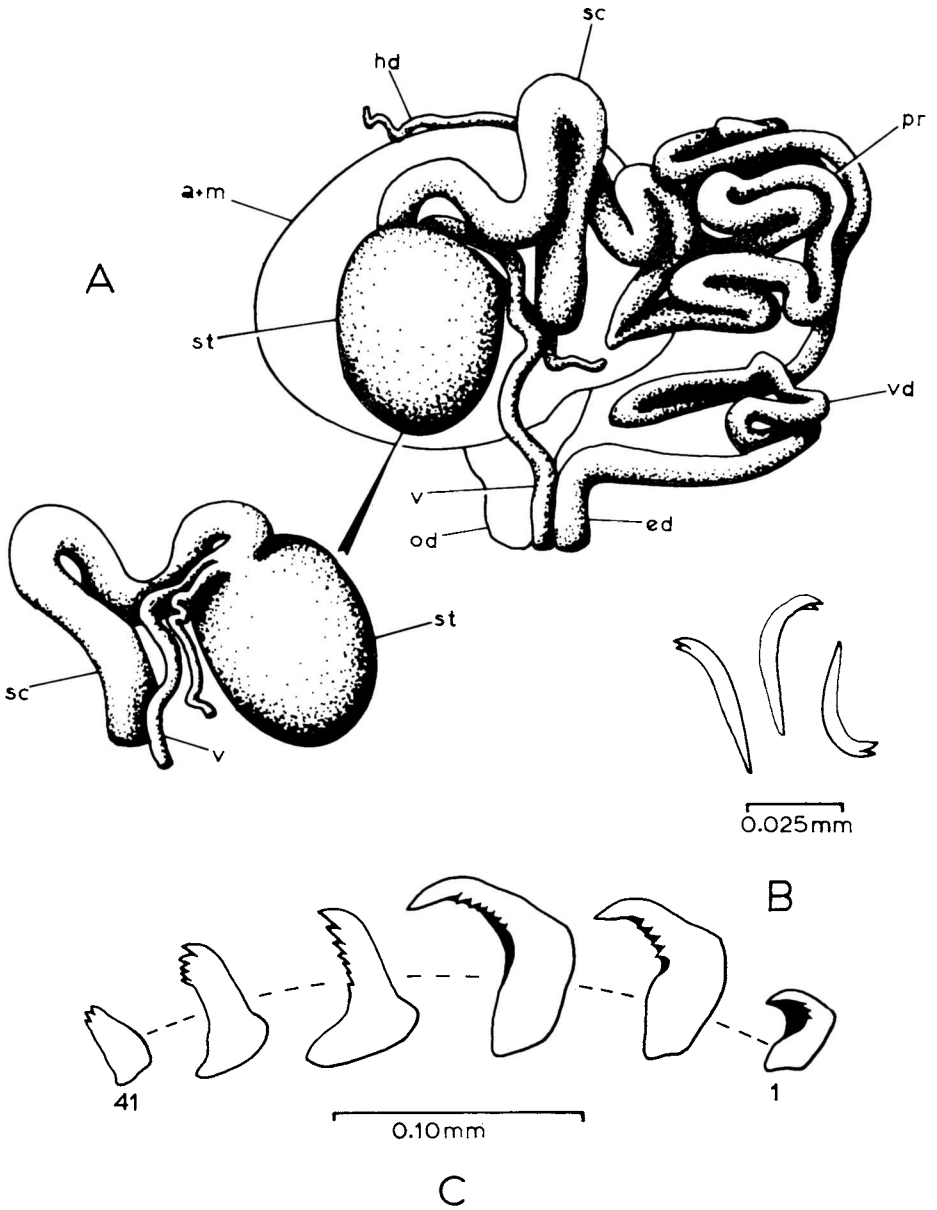



FIG. 42. *Chromodoris lilacina* (Gould). *A,* Lateral view of the genital mass and medial aspect of the spermatheca showing the arrangement of the female ducts; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

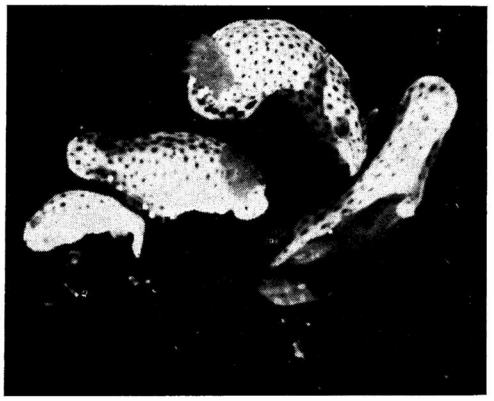


FIG. 43. *Chromodoris lilacina* (Gould), 20 × 7 mm–9 × 4 mm.

HABITS: This was the most abundantly collected of the chromodorids on Oahu in 1962, when more than 50 were collected between January and July. Since 1962 only two or three animals have been seen each year. The animals occur beneath rocks exposed at low tide on the reef platform at Ala Moana, Oahu.

Several animals were found spawning in July 1962; the egg mass consisted of a thin, transparent, flat ribbon of 5 or 6 flat coils about 2 mm in diameter.

REMARKS: Gould's species does not appear to have been recognized since his original description, and Pruvot-Fol (1951) failed to include it in her list of chromodorids. Although Gould's description leaves some question as to whether he was in fact describing a chromodorid, the figure leaves no doubt about the animal.

Bergh's description (1888*a*) of *Chromodoris porcata* from Mauritius matches our specimens in details of color, radular teeth, and buccal armature, while Eliot's description (1906) and figure of *C. amabilis* Kelaart, which he suggested was a synonym of *C. porcata* Bergh, may also represent *C. lilacina.*

*Chromodoris petechialis* (Gould, 1852)
Figs. 44, 52

*Doris petechialis* Gould, 1852:296, fig. 391a. Sandwich Islands [Hawaiian Islands].

*Chromodoris petechialis* Gould, Eliot, 1905: 250.

*Glossodoris petechialis* Gould, Pruvot-Fol, 1951:116.

DESCRIPTION: Length, 40 to 50 mm; width, 15 to 19 mm. The animal is oval, depressed, broadening toward the middle of the body, and the mantle margin is thin, almost fluted at the edges. The mantle is white, reticulated with purple-red, the reticulations forming blotches toward the margin; the mantle is edged with a golden yellow band. The rhinophores are close-set, long, with 20 fine lamellae; they are yellow-orange to orange-red and the peduncle is white. There are 6 to 10 simply pinnate branchiae with a rachis which is quadrangular in cross section; the branchiae form a star-like arrangement around the anal papilla and are smaller posteriorly; they are white, the pinnae edged with light brown or purple. The dorsum of the visible portion of the foot has a single purple-red spot and is often bordered with a yellow band; the ventral surface of the foot is white and the cephalic tentacles yellow.

The radular formula range for two specimens 25 and 40 mm in length is 55–57 × 55–70.0.

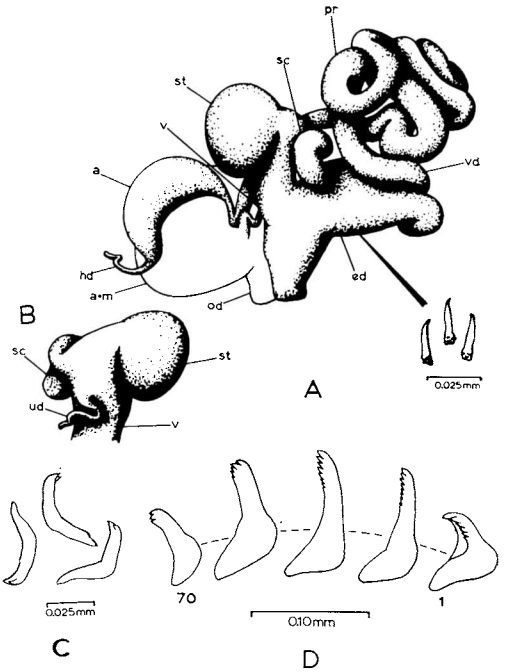



FIG. 44. *Chromodoris petechialis* (Gould). *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* medial view of the spermatheca showing the arrangement of the female ducts; *C,* elements of the buccal armature; *D,* lateral view of the left-half row of radular teeth. Lettering as before.

55–70. The teeth are all unicuspid with 2 to 7 outer denticles. The innermost lateral is hooklike with its outer edge denticulate; the outermost lateral is elongate and narrow, denticulate only at the tips. Within each row, the teeth are smallest medially, ranging from 66 to 80μ in length; the longest teeth are central, 115.5μ in length. The buccal armature is composed of simple, recurved, bifid hooks; the elements are 32 to 68μ long.

The ejaculatory and vaginal ducts share a common external orifice. Elongate bifid hooks, 19 to 33μ long, are present in the lumen of the ejaculatory duct. The long, convolute vas deferens is distinguished from the comparatively short prostate gland by its thicker walls rather than by its diameter. The spherical spermatheca and the elongate, incurvate spermatocyst project laterally from either side of the terminal end of the short, broad vaginal duct. The uterine duct arises from the spermathecal end of the vaginal duct and enters the albumin and mucous glands near the junction of the ampullary and prostatic ducts.

HABITS: Four specimens have been recorded, one collected at night in December 1961, from the reef platform at Ala Moana, Oahu, one from a depth of 8 meters off Sand Island, Oahu, in May 1962, one from a depth of 20 meters off Ewa Beach, Oahu, in May 1964, and the fourth from a depth of 60 meters off Makua, Oahu, in November 1967.

REMARKS: There seems little doubt that our specimens represent Gould's *Doris petechialis*. *Goniobranchus reticulatus* Pease, 1866 presumably from Huaheine (Tahiti) may also represent this species. Specimens which Eliot (1904) described from Zanzibar as *Chromodoris reticulata* match our animals in color pattern and details of radular structure, as do Eliot's (1905*a*, 1905*b*) specimens from the Inland Sea of Japan and from Karachi.

*Chromodoris trimarginata* (Winckworth, 1946) Figs. 45, 55

*Doris marginata* Pease, 1860:30. Sandwich Islands [Hawaiian Islands].

*Chromodoris marginata* Pease, 1866:207; Bergh, 1880*a*:27, pl. B, figs. 22, 23; Bergh, 1884*b*:68; Bergh, 1905:150, pl. III, fig. 13, pl. XVI, figs. 13–15 (Riffe bei Saleyer).

*Glossodoris marginata* Pease, Allan, 1947: 141 (Clarence River Heads, New South Wales); Pruvot-Fol, 1951:121; Baba, 1953:205 (Shirahimaumiushi, Japan); Risbec, 1956:9 (Viet Nam); Kenny 1960: 226 (Queensland).

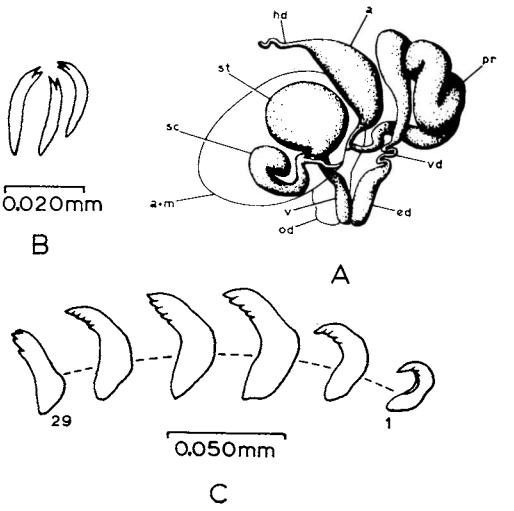



FIG. 45. *Chromodoris trimarginata* (Winckworth). *A*, Lateral view of the genital mass; *B*, elements of the buccal armature; *C*, lateral view of the left-half row of radular teeth. Lettering as before.

DESCRIPTION: Length, 2 to 11 mm; width, 1 to 4 mm. The animal is elongate, convexly rounded above, often somewhat constricted medially and wider posteriorly, and the mantle and viscera tend to flatten over the foot. The mantle is snow-white, as are the branchiae, rhinophores, and foot; the only other coloration present is a brilliant yellow and orange margin around the mantle. The rhinophores are small, close-set, and short, consisting of only about 12 lamellae. There are 6 simply pinnate branchiae.

The radular formula range for two specimens is 36–42 × 24–29.0.24–29. All the radular teeth are unicuspid with 3 to 5 outer denticles. The hooklike shape of the innermost lateral grades laterally to the elongate shape of the outermost lateral. The teeth which are maximal in size are central, 62μ long; the smallest are the innermost laterals which are 33μ long. The

buccal armature consists of simple bifid hooks 19 to 23μ long.

The short ejaculatory duct has a separate external orifice from that of the vaginal duct and passes into the short, convolute vas deferens. The vas deferens leads into a broad, distinctive prostate gland which is loosely convolute. There are no hooks in the ejaculatory duct. The short vaginal duct leads directly into the spherical spermatheca from which issues an elongate, incurvate spermatocyst. From the base of the spermatocyst the narrow uterine duct extends for a short distance and enters the albumin and mucous gland near the junction of the ampullary and prostatic ducts.

HABITS: Eight specimens of *C. trimarginata* have been recorded; all except one, which was found on the island of Kauai, were collected along the south shore of Oahu under sponge-covered rocks in shallow water. The animals were found singly in the months of January, March, April, May, July, and October.

REMARKS: It is apparent from the literature that this is an easily recognized species which occurs at least around the western and northern periphery of the Pacific (Bergh, 1905; Allan, 1947; Baba, 1953; Risbec, 1956), and in the Indian Ocean at Bombay (Winckworth, 1946). The Bergh and Winckworth descriptions of the radula indicate that the specimens they examined were probably conspecific with the Hawaiian material.

Eliot's description (1904) of *Chromodoris aureo-marginata* Cheeseman from New Zealand, which he assigned with some doubt to *C. marginata* Pease, differs from the Hawaiian specimens in having a buccal armature of close-set, short, macelike rods, swollen and bent at the tips, and the radular teeth trifid. Specimens from Suez which Eliot (1908) also questionably referred to *C. marginata* differ from the Hawaiian species in possessing a medial "false tooth" in the radula.

***Chromodoris youngbleuthi*** Kay and Young, new species

Figs. 46, 57

DESCRIPTION: Length, 15 to 21 mm; width, 7 to 9 mm. The animal is elongate, slender, convex, the mantle and viscera maintained discretely above the foot, the mantle slightly crinkled at the edge. The mantle is white, medially minutely freckled with orange-red, margined with white, and edged with a narrow band of orange-yellow. The rhinophores are close-set, slender and elongate, with narrow lamellae; the peduncle is white, and the 10 to 15 lamellae dark orange with a white apex. There are 7 to 10 simply pinnate, vibrating branchiae forming a star-shaped arrangement around the anal papilla; the rachis is white and quadrangular in cross section, the pinnae orange-red tipped with light yellow. Dorsally the foot is freckled with orange-red; ventrally it is white.

In a 21-mm specimen the radular formula is 98 × 30.0.30. The radular teeth are hamate and hooklike with 3 to 8 outer denticles. Both the length and denticulation of the teeth increase centrally within each radular row. The buccal armature consists of simple bifid hooks, 33 to 50μ long, which are recurved at mid-length.

The ejaculatory and vaginal ducts have separate external orifices. There are no hooks in the ejaculatory duct. In the male system there is a short yellow midsection which leads into a thin-walled prostate gland. The ducts of the male system are tightly convolute. The vaginal duct is long and loosely convolute; it leads to a short common duct with the uterine duct. The common vaginal-uterine duct enters the spermatocyst at mid-length. The spermatocyst is elongate and incurvate; it enters directly into the ovate spermatheca which is at least twice the size of the spermatocyst. The uterine duct passes from the common vaginal-uterine duct and enters the albumin and mucous gland at the junction of the ampullary and prostatic ducts.

HABITS: Three specimens have been recorded, two collected at a depth of 12 meters off Moku Manu, Oahu, in June 1965, the other at a similar depth in Hanauma Bay, Oahu, in May 1965.

REMARKS: This species seems quite distinct from other chromodorids with its freckled, orange-red dorsum. It also occurs on the Great Barrier Reef where it is apparently referred to as *C. marginata* (Gillett and McNeill, 1959). The holotype and paratypes have been deposited in the B. P. Bishop Museum, Honolulu, Hawaii.

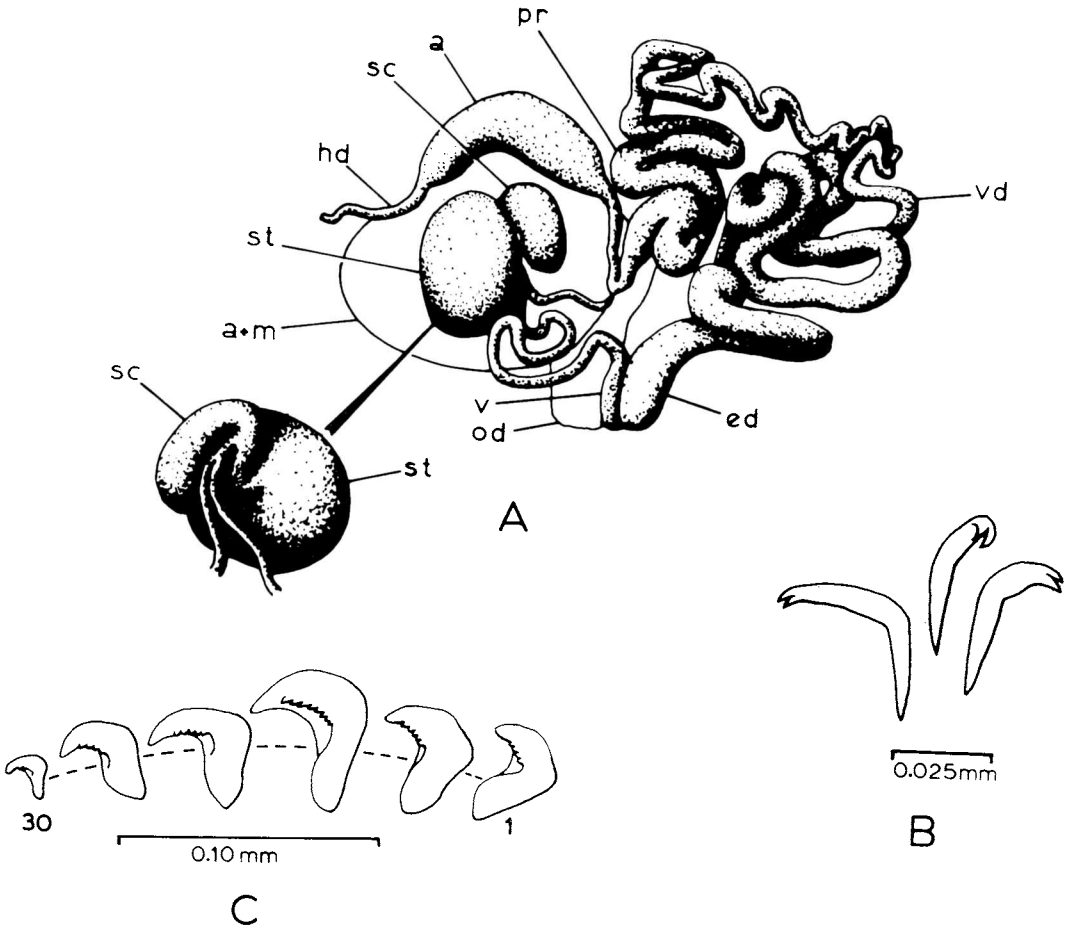



FIG. 46. *Chromodoris youngbleuthi* Kay and Young. *A,* Lateral view of the genital mass and medial aspect of the spermatheca showing the arrangement of the female ducts; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

This species is named for Marshall Youngbleuth who collected both specimens.

***Hypselodoris daniellae*** Kay and Young, new species

Figs. 47, 48

DESCRIPTION: Length, 10 to 21 mm; width, 2 to 3 mm. The animal is elongate, slender, with the mantle and viscera carried discretely above the foot. The mantle is snow-white, margined with a brilliant purple band and edged with white. The rhinophores are long, extending beyond the anterior edge of the mantle, slender and well spaced; the basal portion is white, the apical portion orange. There are 9 quadrangular (in cross section), simply pinnate, branchial plumes which continually vibrate in the living animal; the branchiae are white, banded with orange on the rachis and with occasional splashes of orange on the rachis and also on the pinnae. The foot is white, the dorsal surface with a light purple line which becomes more prominent on the tail than it is under the mantle. The cephalic tentacles are tinted with purple.

The radular formula range in two specimens is 25–30 × 16–30.0.16–23. All of the radular teeth are bicuspid becoming narrower and more elongate laterally; the largest teeth are in the center of each row. The broad innermost tooth in a 15-mm specimen is 16.5μ long and the longest central tooth, 43μ long. The jaw is nar-

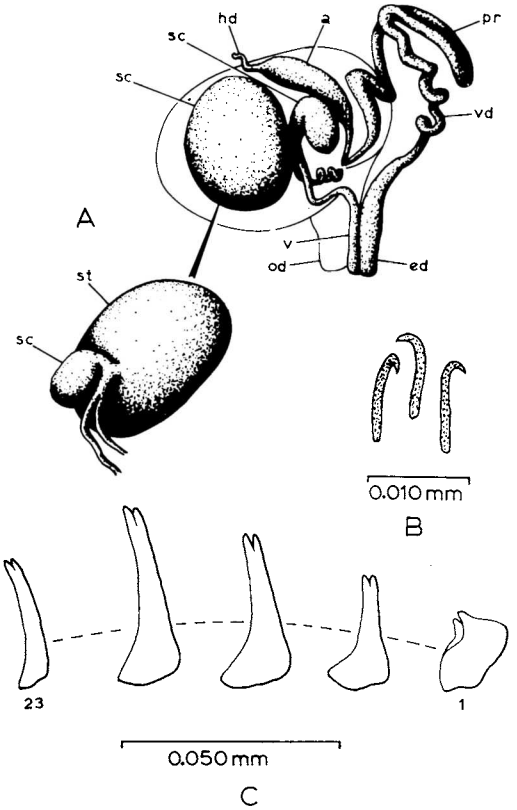



FIG. 47. *Hypselodoris daniellae* Kay and Young. *A,* Lateral view of the genital mass and medial aspect of the spermatheca showing the arrangement of the female ducts; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

rower than in any other Hawaiian hypselodorid but retains the characteristic horseshoe shape of the chromodoridinae. The buccal armature consists of thin, elongate hooks, 7 to 10.5μ in length; they are scattered in the jaws in an apparently random fashion.

The ejaculatory duct, which has a separate external orifice from that of the vaginal duct, merges imperceptibly with the convolute vas deferens. The loosely convolute prostate gland is only slightly wider in diameter than the tightly convolute vas deferens. There are no hooks in the ejaculatory duct. The narrow vaginal duct leads into a common duct with the uterine duct. The common vaginal-uterine duct passes into the base of the pyriform spermatocyst which, in turn, opens directly into the ovate spermatheca

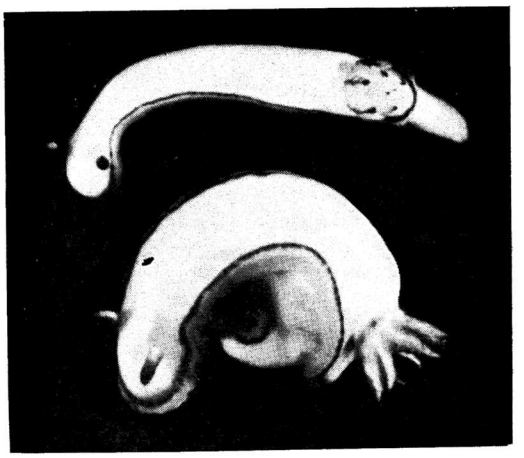


FIG. 48. *Hypselodoris daniellae* Kay and Young, 21 × 3 mm and 15 × 3 mm.

with a diameter more than 3 times that of the spermatocyst. From its junction with the vaginal duct, the convolute uterine duct extends for a short distance and then enters the albumin and mucous gland near the junction of the prostatic and ampullary ducts.

HABITS: All eight specimens of this species which have been recorded were found between March and July 1962, on the reef platform at Ala Moana, Oahu. Six of the specimens were found in pairs in March and April, the remaining two singly in June and July.

REMARKS: *H. daniellae* differs from *C. trimarginata* (see above) in lacking the intramarginal tinge of yellow characteristic of that species, and in both radular and genitalial characters. Specimens described from other areas of the Indo-West-Pacific which resemble our species also have an orange or yellow intramarginal band, but none has been described in sufficient detail so that we can compare radular teeth and genitalia.

*H. daniellae* resembles *H. vibrata* and *Chromodoris youngbleuthi* in its habit of vibrating the branchiae; it differs from all other Hawaiian hypselodorids, however, in that the hooks of the buccal armature are randomly scattered in the jaw rather than being densely concentrated.

The holotype and three paratypes have been deposited in the B. P. Bishop Museum, Hono-

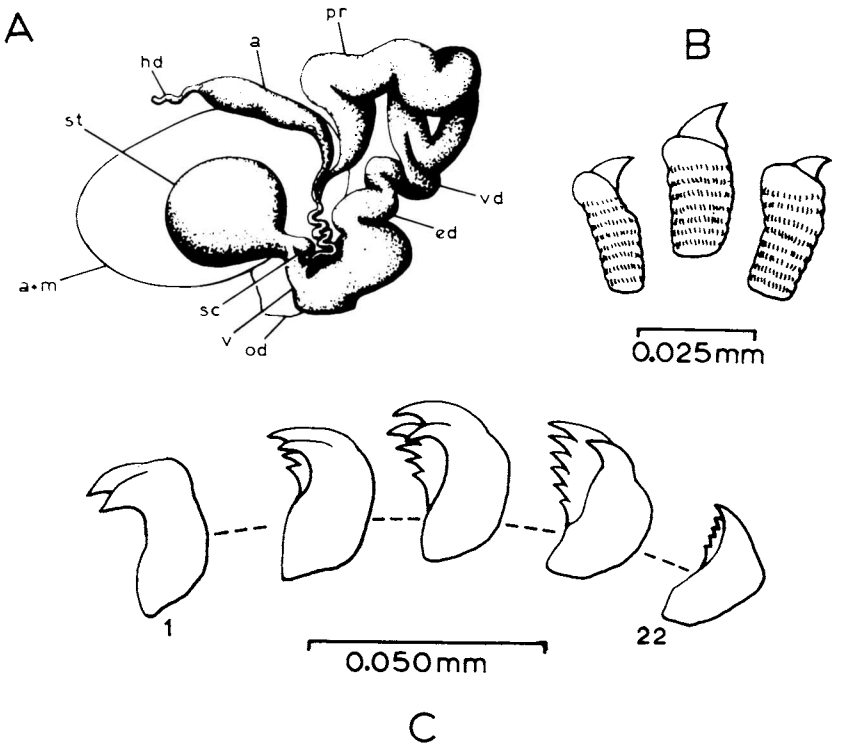



FIG. 49. *Hypselodoris lineata* (Eydoux and Souleyet). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* medial view of the right-half row of radular teeth. Lettering as before.

lulu, Hawaii. *H. daniellae* is named for Mrs. Danielle Barrère Fellows, an enthusiastic malacologist.

*Hypselodoris lineata* (Eydoux and Souleyet, 1852)
Figs. 49, 56

*Doris lineata* Eydoux and Souleyet, 1852:453, pl. 25, figs. 5–9. Sandwich Islands [Hawaiian Islands]. Abraham, 1877:214.
*Doris prismatica* var. *lineata* Pease, 1860:32. Sandwich Islands [Hawaiian Islands].
*Doriprismatica lineata* Pease, 1864:510.
*Chromodoris prismatica* Bergh, 1884*a*:72.
*Glossodoris lineata* (Pease) Ostergaard, 1955: 127, fig. 12; Pruvot-Fol, 1951:116.

DESCRIPTION: Length, 12 to 32 mm; width, 1.75 to 4 mm. The animals are elongate, slender, convex dorsally, with the mantle carried discretely above the foot. The mantle is cream or ivory, ornamented with 4 to 6 longitudinal rows of blue spots, 2 medially and 2 to 4 laterally, the interspaces between the rows with linear splashes of opaque white; the margin is sometimes edged with white, sometimes with a narrow band of blue, and at other times margined with orange-yellow. The rhinophores are slender and tapering, set far apart; the peduncles are white, the 12 lamellae banded with a broad orange stripe and tipped with white. There are 9 to 12 erect, simply pinnate branchiae, the posterior branch often smaller than the others; the branchiae are transparent white with splashes of orange at the tips. The dorsal surface of the foot is margined with a solid blue band and edged with white. The ventral surface of the foot is white, the mantle spotted with blue.

In a 20-mm specimen the radular formula is 35 × 22.0.22. All radular teeth are biscuspid with the exception of the outermost 2 or 3 laterals which are unicuspid; except for the smooth innermost lateral, they bear 1 to 5 outer denticles. The teeth are larger medially and range from 22 to 35μ in length. The buccal

armature consists of single hooks with distinctive, broad bases; they range in length from 23 to 33μ.

The ejaculatory and vaginal ducts share a common external orifice. The ejaculatory duct is broad and without hooks; it appears to lead into a convolute prostate gland without narrowing into a distinct vas deferens. The extremely short vaginal duct leads into a large, spherical spermatheca from which protrudes a very small, pyriform spermatocyst. The tightly convolute uterine duct leaves the basal portion of the vaginal duct and enters the albumin and mucous gland at the junction of the ampullary and prostatic ducts.

HABITS: *H. lineata* has been collected in sheltered, shallow waters shoreward of fringing reefs on the islands of Kauai and Oahu; the animals are always found in areas where there is considerable water movement. They are usually found crawling freely about on the surface of algae-covered rocks, rather than concealed under rocks or in crevices as are the other hypselodorids.

Apparently never abundant, one or two specimens have been found in each of the months April, June, July, August, and November. Egg masses were found in June 1963 and May 1965. They consist of cream-colored, smooth ribbons of a single whorl, 9 mm in length and 1.8 mm in diameter; the masses contained approximately 75 ova per mm$^2$, each ovum enclosed by a spherical capsule 125μ in diameter.

REMARKS: Eydoux and Souleyet (1852) and Pease (1860) both apparently named this species *lineata,* although Pruvot-Fol (1947) has suggested that the descriptions apply to different species. Eydoux and Souleyet's species has since been recognized only by Eliot (1904), while Pease's species has received a variety of names. The discrepancies between the two descriptions can be explained by the variability in color which these animals display. Eliot (1905*a*) and Barnard (1927) have referred specimens from South Africa to this species; their descriptions of bifid teeth with 4 or 5 smaller denticles and 11 branchiae fall within the general facies of the Hawaiian animals.

*Hypselodoris peasei* (Bergh, 1880*a*)
Figs. 50, 54

*Doris picta* Pease, 1860:29. Sandwich Islands [Hawaiian Islands].
*Goniobranchus picta* Pease, 1866:204.
*Chromodoris peasei* Bergh, 1880*a*:26 (non *picta* Schultz-Philippi); Bergh, 1884*a*:70.
*Glossodoris picta* Pease, Pruvot-Fol, 1951: 131.

DESCRIPTION: Length, 4 to 18 mm; width, 1.5 to 4.5 mm. The animal is oval, flattened, and often bulges laterally in the midregion of the body. The mantle is opaque white, inconspicuously and irregularly spotted with orange-yellow; it is margined by a thin band which

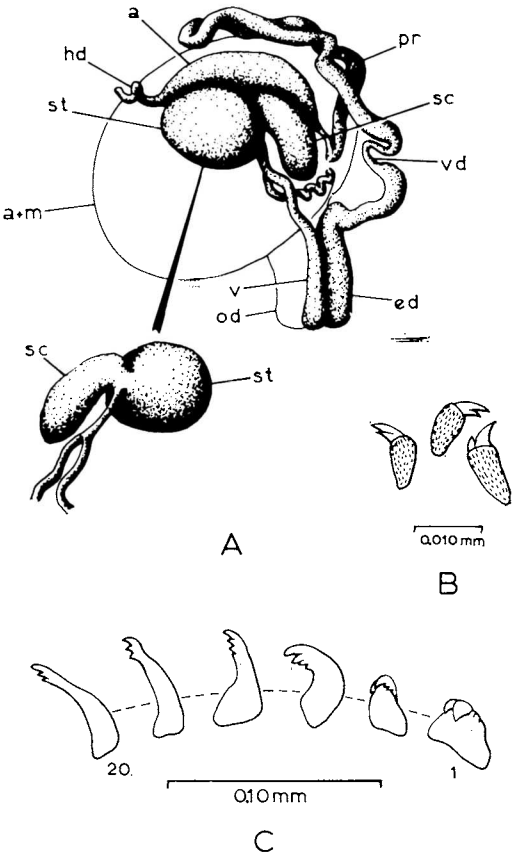



FIG. 50. *Hypselodoris peasei* (Bergh). *A,* Lateral view of the genital mass and medial aspect of the spermatheca showing the arrangement of the female ducts; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

varies from carmine to orange-red from specimen to specimen and even in the same animal. The rhinophores are well spaced, short, with only 4 or 5 lamellae and a long peduncle; the peduncle and most of the lamellae are white; the apical portion of the stalk is tipped with orange. There are 6 small, simply pinnate branchiae which are usually white but which may be splashed with orange in some specimens. The ventral surface is white except for the orange mantle margin.

In two specimens the radular formula range is 26–28 × 17–20.0.17–20. The outermost radular teeth are unicuspid with 2 or 3 outer denticles, whereas the innermost laterals are bicuspid with 3 outer denticles. Laterally within each row, the teeth become narrower and more elongate, ranging from 30 to 50μ in length. The buccal armature consists of bifid hooks with distinctive, broad bases; they range in length from 10 to 16μ.

The ejaculatory and vaginal ducts have separate external orifices. The ejaculatory duct is short, without hooks. The short vas deferens passes into a long prostate gland of smaller diameter. The narrow vaginal duct leads into a common duct with the uterine duct which, in turn, passes into the base of the elongate spermatocyst. The spermatocyst opens directly into the slightly larger, ovate spermatheca. The loosely convolute uterine duct passes from the common vaginal-uterine duct and enters the albumin and mucous gland near the junction of the ampullary and prostatic ducts.

HABITS: This species occurs along a variety of shorelines on Oahu and Kauai; the animals are always found under rocks, usually firmly lodged in crevices on the sponge-covered undersurfaces. Ten specimens have been collected, singly on each occasion. The species appears to be present throughout most of the year. The largest specimens were collected between February and July, the smallest in September and October.

An egg mass which was deposited in December 1964 by a 10-mm specimen consisted of a white, smooth ribbon, 1.25 mm in diameter, of 2 whorls; the egg mass contained approximately 128 ova per mm². Each ovum, 75μ in diameter, was encapsulated by a spherical capsule 100μ in diameter.

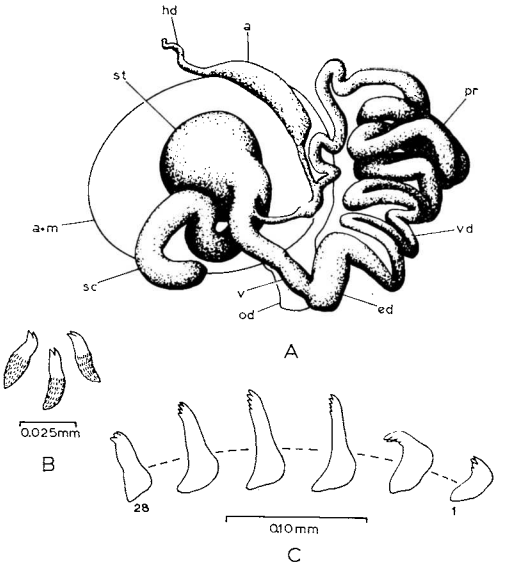


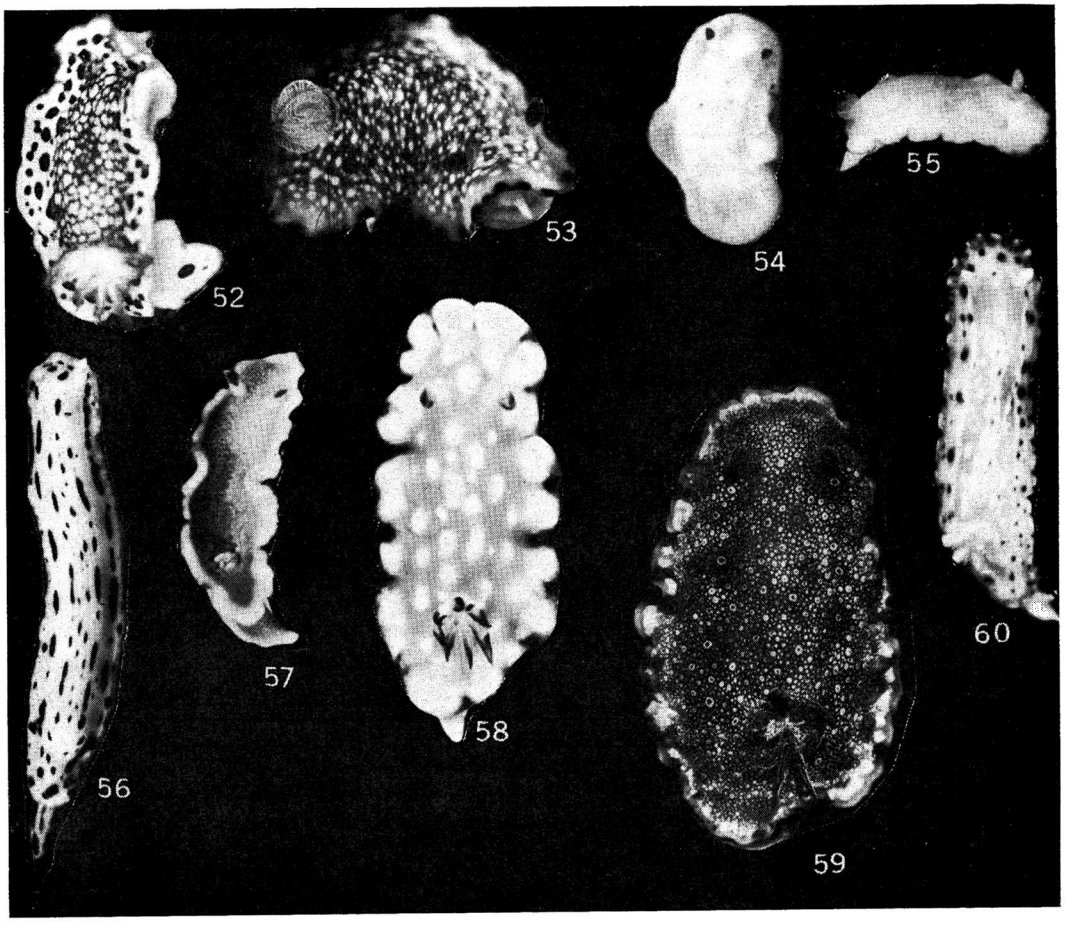

FIG. 51. *Hypselodoris vibrata* (Pease). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

REMARKS: This species falls into the genus *Noumea* Risbec, 1928, distinguished by its peculiar lateral teeth. Although *Hypselodoris peasei* resembles *Noumea nivalis* (Baba, 1949) in size, shape, and color, the radular teeth differ from those described by Baba.

*Hypselodoris vibrata* (Pease, 1860)
Figs. 51, 58

*Doris vibrata* Pease, 1860:28. Sandwich Islands [Hawaiian Islands].
*Doris propinquata* Pease, 1860:28. Sandwich Islands [Hawaiian Islands].
*Goniobranchus vibrata* Pease, 1866:204.
*Chromodoris vibrata* Pease, Bergh, 1884*a*:70, pl. B, figs. 18–21.
*Glossodoris vibrata* Pease, Pruvot-Fol, 1951: 156.

DESCRIPTION: Length, 4 to 35 mm; width, 2 to 14 mm. The animal is elongate-oval, depressed, the mantle margin fluting about the foot so that the shape of the animal is irregular. The mantle is yellow, ornamented with white pustules which vary in degree of development; the margin is edged with purple which forms linear indentations anteriorly and posteriorly and spots laterally. The rhinophores are widely spaced,




FIGS. 52–60

52. *Chromodoris petechialis* (Gould), 40 × 15 mm.
53. *Chromodoris albopustulosa* (Pease), 25 × 7 mm.
54. *Hypselodoris peasei* (Bergh), 4 × 1.5 mm.
55. *Chromodoris trimarginata* (Winckworth), 8 × 3 mm.
56. *Chromodoris lineata* (Eydoux and Souleyet), 32 × 4 mm.
57. *Chromodoris youngbleuthi* Kay and Young, 21 × 9 mm.
58. *Hypselodoris vibrata* (Pease), 20 × 8 mm.
59. *Chromodoris imperialis* (Pease), 65 × 25 mm.
60. *Chromodoris decora* (Pease), 20 × 4 mm.

thin and elongate, with 11 to 25 lamellae; they are white or brown, tipped with purple. There are 8 to 10 simply pinnate, upstanding branchiae, the anterior pairs bifid; they are white, tipped with purple. The branchiae, as the name implies, are vibratile. The anal papilla is long and slender, with a white base tipped with purple. The foot is white, with yellow dorsally, and a terminal, medial, purple streak is often present.

The radular formula range for four specimens 12 to 35 mm long is 38–56 × 28–38.0.28–38. The outer radular teeth are unicuspid with 2 to 4 outer denticles; the innermost laterals are bicuspid with 2 to 3 outer denticles. The hook-like shape of the inner laterals grades to the narrower and more elongate shape of the outer laterals. The teeth of maximum size in each row are central and range from 72 to 92μ in length; the smallest, innermost teeth range from 33 to

40μ. The outermost laterals are denticulate only at their tips. The buccal armature consists of bifid hooks, 29 to 34μ long, with distinctive bases.

The ejaculatory duct, which lacks hooks in its lumen, shares a common external orifice with the vaginal duct. The tightly convolute male duct system is yellow in its midsection. The broad vaginal duct enters a junction with the spermatheca and spermatocyst. The spermatocyst is elongate and convolute; it enters directly into the spherical spermatheca which is about the same size as the spermatocyst. The uterine duct is narrow, straight, and short; it leads from the spermathecal end of the vaginal duct and enters the albumin and mucous gland at the junction of the ampullary and prostatic ducts.

HABITS: Eight specimens of *H. vibrata* have been recorded; six were collected in July 1962, and in February, March, and April 1965 under rocks in shallow water shoreward of fringing reefs on Oahu; two were recorded at a depth of 6 meters at the edge of a patch reef in Kaneohe Bay, Oahu, in March 1966.

REMARKS: Although Pruvot-Fol (1951) suggested that this species might be synonymous with *Chromodoris albopustulosa* Pease, 1860, it is easily distinguished by the smaller number of white pustules on the mantle and the vibrating branchiae. *Doris propinquata* Pease, 1860, appears to be synonymous; Pease's description of the species differs from that of *Hypselodoris vibrata* only in the presence of "papillae" on the mantle. Since these papillae or pustules are glandular structures and variable in development, it seems reasonable to consider *Doris propinquata* a synonym of *H. vibrata.* Neither species has apparently been mentioned in the literature since Pease's description.

*H. vibrata* should be compared with *Glossodoris rudolphii* Bergh (1887*a*) from Tahiti which Garrett (quoted by Bergh) described as "orange-yellow with remote irregular small creamy white spots along the dorsal region. The margin of the mantle is festooned with creamy-white, in which is a row of violet dots. Dorsal tentacles with orange laminae, tips violet. Gills pale with violet tips." The radula figured by Bergh (1887*a*) is similar to that described here.

## HEXABRANCHIDAE

Members of this family are soft-bodied, lacking pustules, tubercles, or spicules, and are conspicuously colored red or yellow. The mantle margin is thin and undulated, and the animals are usually very active, capable of swimming by mantle undulation as well as crawling by the foot. Eliot (1904) found animals swimming a quarter of a mile from the coast in the Maldives. The branchiae consist of 2 separate rachi which are further branched, each rachis contracting into a hollow on the posterior middorsum; the branchiae are not retractile.

These dorids are rasping sponge-feeders.

*Hexabranchus aureomarginatus* Ostergaard, 1955
Figs. 61, 64

*Hexabranchus aureomarginatus* Ostergaard, 1955:132–133, pl. 2, fig. 15. Oahu, Hawaiian Islands.

DESCRIPTION: Length, 30 to 80 mm; width, 18 to 35 mm. The animal is elongate-oval, soft, convex above, and the mantle margins are extremely thin and undulating but tending to curl toward the dorsum more than they do in the

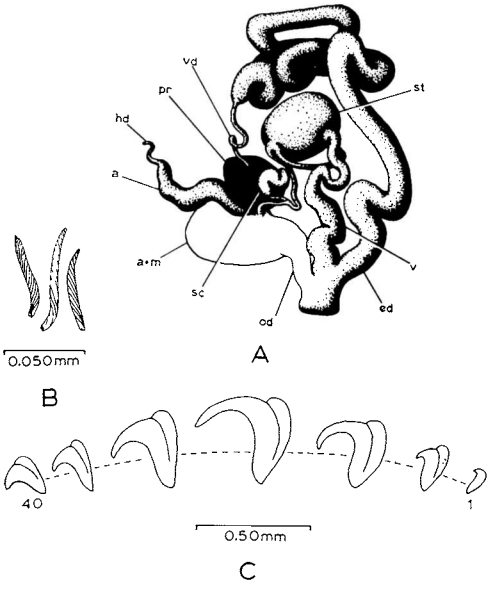



FIG. 61. *Hexabranchus aureomarginatus* Ostergaard. *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

following species, *H. marginatus*. The mantle is red, mottled with a few large peppered white spots, and margined with yellow. The rhinophores are posteriorly oriented, orange-red with yellow peduncles. The branchiae are similar to those in the *H. marginatus,* and yellow, veined with red.

The radular formula for a 55-mm individual is 32 × 40.0.40. The radular teeth are hamate and increase in size centrally within each row to a maximal length of 300μ. The smallest tooth is innermost and is 90μ long. The two anteriorly facing jaws bear densely set sculptured rods, 40 to 60μ long, as buccal armature.

A common genital vestibule is shared by the ejaculatory duct, vaginal duct, and oviduct. The ejaculatory duct encloses a broad, long, and loosely convolute penis. A short, narrow vas deferens leads from the penis into an ovate, lobulate prostate gland which is joined by the ampulla. The ovate spermatheca and the smaller convolute spermatocyst are semiserially arranged, the spermatocyst connected to the spermathecal and uterine ducts by a short spermatocystic duct. The uterine duct opens into the base of the prostate-ampulla junction at the albumin and mucous gland.

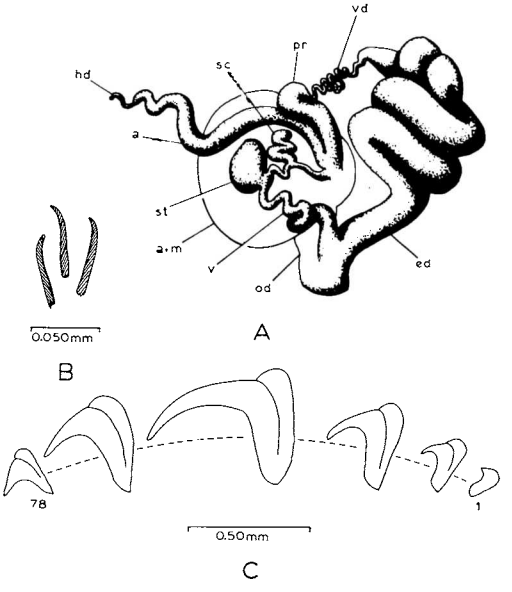



FIG. 62. *Hexabranchus marginatus* (Quoy and Gaimard). *A,* Lateral view of the genital mass; *B,* elements of the buccal armature; *C,* lateral view of the left-half row of radular teeth. Lettering as before.

HABITS: Although animals of this species have been collected in most months of the year, they appear to be most numerous in January, February, and April. This species occurs only where there is considerable water movement, in depths greater than 0.3 meters, and either in areas shoreward of fringing reefs or along the coastline not protected by fringing reefs. Spawn attributable to either this species or *H. marginatus* have been seen in February and July.

REMARKS: *H. aureomarginatus* has been recorded thus far only from the Hawaiian Islands.

*Hexabranchus marginatus* (Quoy and Gaimard, 1832)

Fig. 62

*?Doris sandwichensis* Eydoux and Souleyet, 1852:451–452.

*Doris cardinalis* Gould, 1852:302, pl. 25, fig. 397a. Honolulu, Oahu, Sandwich Islands [Hawaiian Islands].

*Hexabranchus tinkeri* Ostergaard, 1955:128, 130, pl. 2, fig. 14. Oahu, Hawaii.

DESCRIPTION: Length, 45 to 100 mm; width, 27 to 75 mm. The animal is elongate-oval, soft, convex above, and the mantle margins are extremely thin and undulating. The mantle color is basically red, but the middorsum is mottled with yellow and white; the margins are banded with a wide zone of bright red and narrowly edged with a lighter color or white. The rhinophores, as is usual in the group, are elongate and tilted posteriorly; they are red, the sheaths lined with white. The branchiae are large and recumbent, yellow-white with red veining. The foot is yellow or red and the cephalic tentacles are red.

The radular formula for a 150-mm specimen is 45 × 78.0.78. The radular teeth are simply hamate and become larger centrally in each row; the hook length of the dominant tooth is 630μ and its height is 450μ. The innermost lateral is the smallest tooth with a length of 180μ. The buccal armature consists of 50 to 60μ sculptured rods which are very densely set on 2 anteriorly facing lateral jaws at the buccal lip.

A common genital vestibule is shared by the ejaculatory duct, vaginal duct, and oviduct. The ejaculatory duct is broad, very long, and coiled;

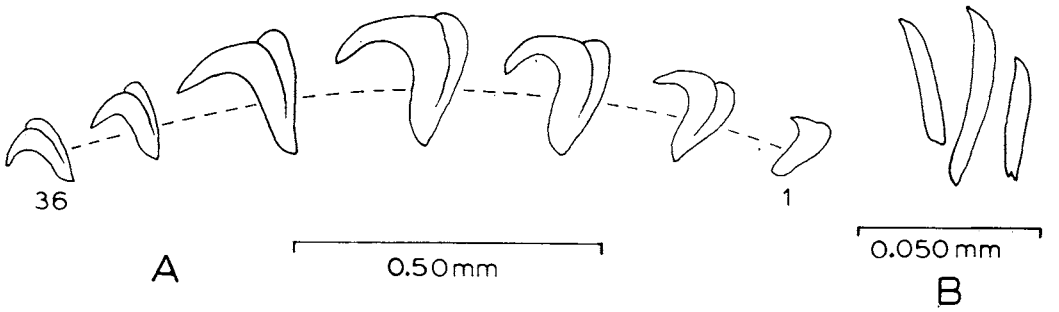



FIG. 63. *Hexabranchus* sp. cf. *pulchellus* (Pease). *A,* Elements of the buccal armature; *B,* lateral view of the left-half row of radular teeth.

it connects with the elongate, smooth prostate gland through a narrow, tightly convoluted vas deferens. The ovate spermatheca and the elongate, convolute spermatocyst are serially arranged. The vaginal duct is long and coiled, whereas the spermathecal and uterine ducts are short and nearly straight. The uterine duct enters the base of the ampulla-prostate junction at the albumin and mucous gland.

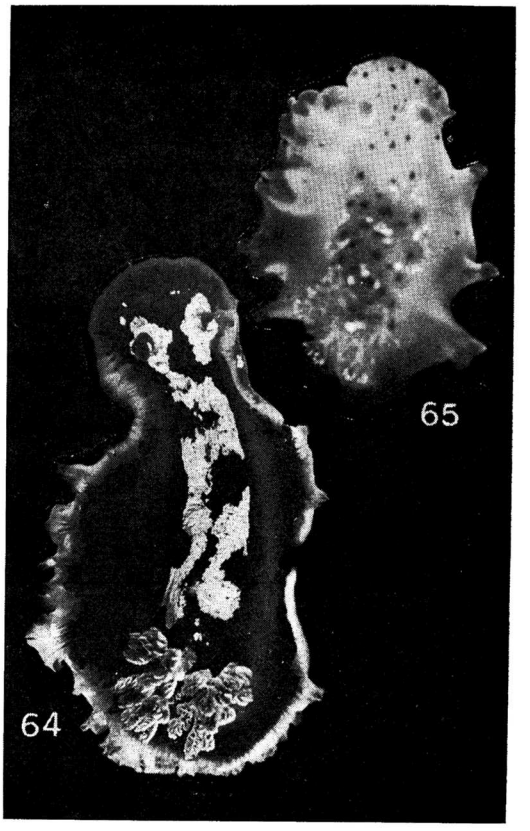
HABITS: As in the case of the preceding species (*H. aureomarginatus*), *H. marginatus* occurs throughout the year but is most numerous in January and February. And, again like *H. aureomarginatus,* this species occurs only in areas where there is considerable water movement, in waters shoreward of fringing reefs or where there is no reef.

An egg mass of a 150-mm specimen was ribbon-like, with an undulated margin, and consisted of 4 whorls 340 mm long and 20 mm wide. The ova were pink and in spherical capsules 85 to 90μ in diameter; the number of ova in the capsules varied from 1 to 4.

*Hexabranchus* sp. cf. *pulchellus* (Pease, 1860)
Figs. 63, 65

*Hexabranchus pulchellus* Pease, 1860:30. Sandwich Islands [Hawaiian Islands]; Abraham, 1877:224; Bergh, 1878*a*:549; 1880*a*:32, pl. B, figs. 14–17; 1889*a*:827; 1892*a*:1091; Pruvot-Fol, 1947:109 (? juv. *H. lacer* Cuvier).

DESCRIPTION: Length, 33 to 35 mm; width, 28 mm. The animal is elongate-oval, soft, convex above, and the mantle margins are thin and undulating. The mantle is golden orange spotted with red, and the margin is edged with white. The rhinophores are dark orange and retractile into orange sheaths which are bordered with crimson. The branchiae are colored as in the two preceding species—yellow veined with red.




FIGS. 64–65
64. *Hexabranchus aureomarginatus* Ostergaard, 80× 65 mm.
65. *Hexabranchus* sp. cf. *pulchellus* (Pease), 35 × 28 mm.

The radular formula for two specimens 33 and 35 mm long is 31–33 × 32–36.0.32–36. The radular teeth are simply hamate and increase in size centrally within each row to a maximum length of 210μ. The innermost lateral is the smallest tooth in each row with a length of 100μ. The buccal armature consists of simple, smooth rods, 33 to 50μ in length; the rods are densely set in the anteriorly directed lateral plates of the buccal lip.

The components of the genital mass were not preserved sufficiently for dissection.

HABITS: Four specimens have been found, one at the edge of the reef platform at Ala Moana, Oahu, in January 1962, two under rocks on the basalt point at Poipu, Kauai, in June and August 1962, and one at a depth of 10 meters in Kahana Bay, Oahu, in June 1962.

REMARKS: While our specimens clearly represent the species which Pease (1860) described ("Pale, with a light yellow tinge along the dorsal region, where there are also numerous carmine dots, similar colored dots around the margins of the mantle, which is edged with white"), the specimens may also represent the juveniles of either *H. aureomarginatus* or *H. marginatus*.

## ACTINOCYCLIDAE

The inclusion of members of the genus *Actinocyclus* Ehrenberg, 1831 (= *Sphaerodoris* Bergh, 1877*b*) in the Dorididae, as suggested by Bergh (1892*a*) and Thiele (1931), appears to be anomalous since these animals not only have jaws and buccal armature which differ from those of the rasping sponge-feeding dorids, but they are also unique in features of the alimentary tract, reproductive system, and egg mass. We suggest the erection of the family Actinocyclidae to include such species as *A. japonicus* (Eliot, 1913) with characters which include: lateral jaws with small fanglike buccal armature; noncleft odontophores with a long, narrow radula; unicuspidate radular teeth with terminal denticles; a papilla-like structure posterior to the odontophore; and a long, straight esophagus with a swollen valvule.

*Actinocyclus japonicus* (Eliot, 1913)
Fig. 66

DESCRIPTION: Length, 60 mm; width, 45 mm. The animal is broadly oval, wider posteriorly than anteriorly, soft to the touch but leathery, and the mantle margin is thin and flares irregularly. The mantle is brown with darker brown pustules on lighter colored, swollen bases; the pustules are more prominent toward the edge of the mantle than middorsally. The rhinophores are large, close-set, and brown with minute white spots. There are 8 feathery branchiae which project posteriorly as a closed basket; the branchial sheath is smooth. The ventral surfaces of the foot and mantle are light gray. There are no oral tentacles.

The radular formula of a 60-mm specimen is 98 × 22.0.22. The innermost lateral is dominant, 116μ in length, and distinct from the succeeding laterals in each row; it is broad and platelike with 5 similar outer denticles. The second lateral is narrow with a long, pointed cusp which is followed by minute outer denticles. The succeeding laterals are similar to the second lateral but decrease gradually in width and length to the minimal 72μ length of the outermost lateral. Narrow lateral jaws are present at the posterior end of the buccal orifice rather than at the buccal lip as they are in the jawed, rasping, sponge-feeding dorids. Regular, dorsoventral rows of 16 to 20μ buccal hooks, which resemble canine teeth, are set in the jaws.

A common external orifice is shared by the ejaculatory duct, vaginal duct, and oviduct. The male duct system is short with no outward indication of a prostate gland; there are no hooks. The vaginal duct is long, very narrow, and tightly convolute; it enters a common junction of the spermathecal, spermatocystic, and uterine ducts. The long spermathecal duct leads into a spherical spermatheca, the short spermatocystic duct opens into a pyriform spermatocyst, and the short uterine duct passes into a common junction with the male duct and ampulla at the albumin and mucous gland.

HABITS: A single specimen has been collected, found exposed on a reef in Kaneohe Bay in July 1963. The animal produced an irregular ribbon of white spawn, differing from the usual

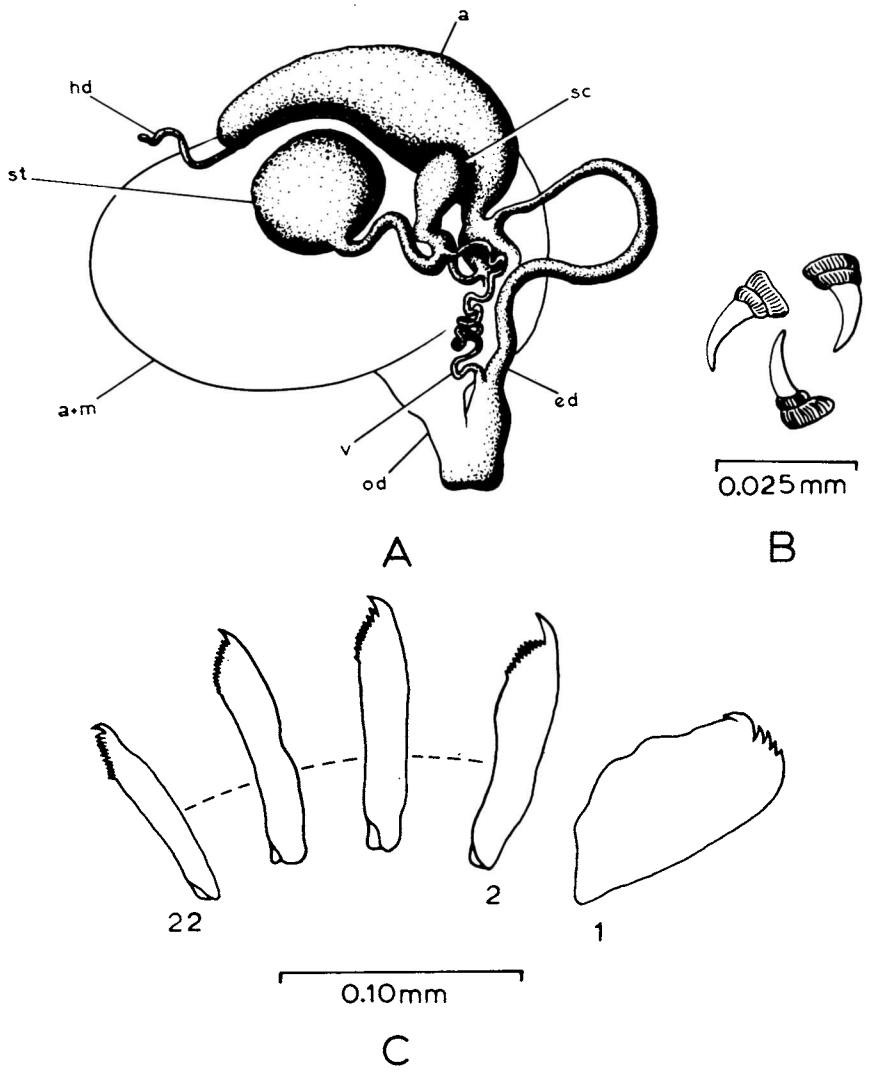



FIG. 66. *Actinocyclus japonicus* (Eliot). *A*, Lateral view of the genital mass; *B*, elements of the buccal armature; *C*, lateral view of the left-half row of radular teeth. Lettering as before.

dorid spawn in that it was not coiled; the ribbon was 5 mm in width.

REMARKS: *A. japonicus* was described from Japan by Eliot (1913), and reported again by Baba (1949); Risbec (1956) reports the same species from Viet Nam as *Aldisa nhatrangensis*.

### DENDRODORIDIDAE

The Dendrodorididae include oval, soft-bodied animals which are either smooth or covered with soft warts or blister-like pustules. The rhinophores are retractile, and the branchiae large, bushy, and retractile into a single cavity. Sponge-feeders, the dendrodorids are recognized by their lack of a radula and the presence of a suctorial buccal apparatus.

Although the dendrodorids have been considered a subfamily of the Dorididae in many schemes of opisthobranch taxonomy, we believe the group is sufficiently distinct as to be more meaningfully recognized as a family.

*Dendrodoris coronata* Kay and Young, new species
Figs. 67, 70

DESCRIPTION: Length, 8 to 30 mm; width, 4 to 17 mm. The animal is broadly oval, wider posteriorly than anteriorly, soft, convex above, and the mantle margins are very thin and undulated. The mantle is transparent white, peppered with black and flaked with white; it is ornamented with numerous but irregular scattered pustules, those immediately anterior to the branchiae crownlike on a transverse raised ridge. The rhinophores are long and slender, with about 12 lamellae; they are fawn, peppered with black. The branchiae are large and feathery; they are fawn as are the rhinophores. The ventral surface of the foot is white. There is a pair of auriculate cephalic tentacles which border the porelike mouth.

The pytaline gland is slightly smaller than the short, stout, buccal bulb from which projects the short pharynx with a single convolution.

A common external orifice is shared by the ejaculatory and vaginal ducts. There are no hooks in the ejaculatory duct. A common prostatic-ampullary duct unites the smooth prostate gland and the fusiform ampulla external to the albumin and mucous gland. The ovate spermatheca and the slightly larger spermatocyst are semiserially arranged. The spermatocyst connects with the spermathecal-uterine duct junction through a short spermatocystic duct. The vaginal and spermathecal ducts are long, tightly convolute, and separate. The short, straight uterine duct enters the albumin and mucous gland at the base of the prostatic-ampullary duct.

HABITS: Nine specimens have been recorded, six from the reef platform at Ala Moana, Oahu, in February, March, and May 1962; one in August 1963 on the limestone beach at Kaimalino, Oahu, one in April 1965 in shallow water shoreward of the fringing reef at Kewalo, Oahu, and one in October 1965 in a tidepool at Poipu, Kauai.

The holotype is 20 mm in length, 10 mm in width. The holotype and a paratype have been deposited in the B. P. Bishop Museum, and paratypes in the U. S. National Museum, Washington, D.C.

The species is named for the middorsal crown of tubercles on the mantle; the crownlike arrangement of the tubercles consistently distinguishes this species from other pustulate dendrodorids.

*Dendrodoris nigra* (Stimpson, 1856)
Figs. 68, 71

*Hexabranchus nebulosa* Pease, 1860:33. Sandwich Islands [Hawaiian Islands]. Pruvot-Fol, 1947:109.

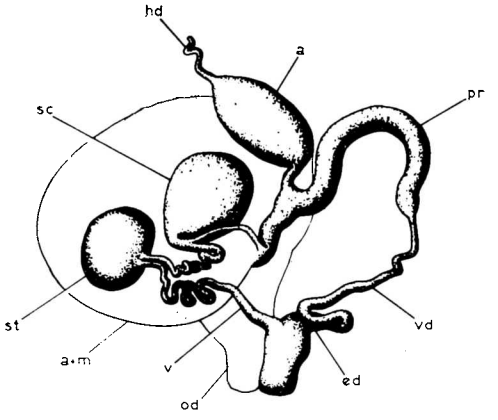



FIG. 67. *Dendrodoris coronata* Kay and Young. Lateral view of the genital mass. Lettering as before.

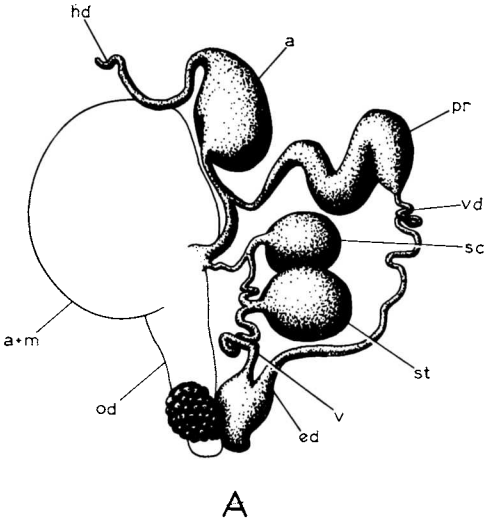



FIG. 68. *Dendrodoris nigra* (Stimpson). Lateral view of the genital mass. Lettering as before.

*Doridopsis nebulosa* Pease, Abraham, 1877: 242.

*Doriopsis nebulosa* Pease, Bergh, 1875*a*:95, pl. 7, fig. 5; pl. 11, fig. 24; Bergh, 1878*a*: 23–24; Bergh, 1884*b*:122–126, pl. 4, figs. 5–6; pl. 5, figs. 28–31 (Honoruru).

*Dendrodoris nigra* Stimpson, Pruvot-Fol, 1947:109.

*Doridopsis macfarlandi* Ostergaard, 1955: 128, fig. 13. Oahu.

DESCRIPTION: Length, up to 30 mm; width, up to 20 mm. The animal is ovate, extremely soft, often convex dorsally, and the margins of the mantle are thin and flaring. The color is variable: usually black with white spots or brown with light yellow spots; the mantle margins may be crimson, light blue, or light purple; juvenile specimens are orange (see below). The mantle is usually smooth but in some specimens it is raised into slight pustules. The rhinophores are long and clublike, their color matching that of the mantle but always tipped with white. There are 6 to 8 feathery branchiae which also match the color of the mantle.

The bilobed ptyaline gland lies immediately ventral to the suctorial buccal bulb and pharynx. The ptyaline gland is larger than the buccal bulb. The pharynx is long and has at least two convolutions.

A common external orifice is shared by the ejaculatory and vaginal ducts. Numerous hooks, 7μ long, line the lumen of the ejaculatory duct. The long, loosely convolute vas deferens leads into a broad, smooth prostate gland which, in turn, connects with the ampullary duct by a short prostatic duct. The spermatheca and spermatocyst are semiserially arranged. The vaginal, spermathecal, and uterine ducts are short and loosely convolute. The spermatocyst is connected to the spermathecal and uterine ducts by a short spermatocystic duct. The ovate spermatheca is slightly larger than the spermatocyst which has a similar ovate shape. The uterine duct enters the base of the common prostatic-ampullary duct at the albumin and mucous gland. There is a finely lobulate gland at the base of the oviduct.

HABITS: *D. nigra* is the most commonly and abundantly occurring of the Hawaiian dorids; the animals are found clinging to the undersurfaces of small rocks and rubble on limestone and detrital wave-washed benches, in tidepools, and in the shallow waters inshore of fringing reefs. As many as 20 animals were recorded in July 1962, while from one to six animals have been collected in other months of the year.

The egg masses are broad, coiled, dark yellow ribbons. The ribbons may measure 240 mm in length and 5.35 mm in width; they contain as many as 450 ova per mm$^2$. The ova change in color from nearly lemon yellow to red-orange during development. Each ovum is 85 to 90μ in diameter and enclosed by an individual spherical capsule 100μ in diameter. There appear to be two spawning peaks, one in June and July, the other in October and November.

The juveniles are orange, and the color change from orange to brown or black occurs when the animals are between 8 and 12 mm in length. Animals less than 9 mm in length are bright orange, those 9 to 12 mm in length are usually dusky, more or less orange, and those more than 12 mm in length, brown or black.

REMARKS: *D. nigra* is a ubiquitous species in the Indo-West-Pacific, notorious for its variability in color and development of pustules. Although many workers have recognized numerous synonyms, there are no suggestions of which we are aware that some of the orange species described in the genus, for example, *D. sordida* (Pease, 1871), should be considered in the synonymy of *D. nigra.* Our observations indicate that, in future studies, small orange dendrodorids with white-tipped rhinophores should be considered juveniles of *D. nigra.*

*Dendrodoris tuberculosa* (Quoy and Gaimard, 1832)

Figs. 69, 72

*Doris rugosa* Pease, 1860:31. Sandwich Islands [Hawaiian Islands].

*Doridopsis rugosa* Pease, Abraham, 1877: 246.

*Dendrodoris rugosa* Pease, Pruvot-Fol, 1947: 108.

DESCRIPTION: Length, 38 to 150 mm; width, 25 to 60 mm. The animal is ovate, convex above, soft to the touch, and the margins of the mantle are thin and project as a wavy flange.

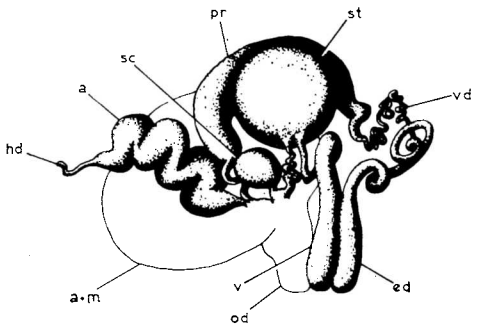
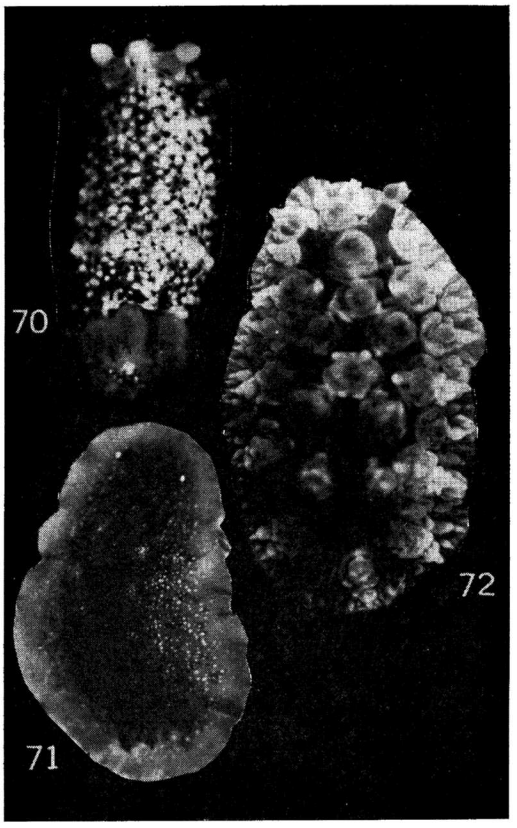



FIG. 69. *Dendrodoris tuberculosa* (Quoy and Gaimard). Lateral view of the genital mass. Lettering as before.

The mantle is gray-brown, shaded with darker brown which forms a network ramifying among the warty protuberances covering the dorsum. The protuberances are irregular in size and pattern, those on the middorsal region larger and surrounding smaller warts, those near the edges of the mantle simple and smaller, becoming rugose near the margin. The rhinophores are stout, on fairly long peduncles, retractile into rounded sheaths; they are colored like the dorsum. There are 5 feathery branchiae arranged around the anal papilla; the branchiae are retractile into a large cavity ornamented with 5 conical, elevated flaps. The branchiae are dusky, with a purple-brown cast. The ventral surface of the foot and mantle are pale brown, with a purple-brown streak running along the inner margin of the mantle; in a 25-mm specimen there were 3 large white spots outlined in black on the foot.

The buccal bulb is more elongate than it is in *D. nigra,* and the ptyaline gland is about the same size as the buccal bulb. The pharynx is long, with 3 or 4 convolutions.

The ejaculatory and vaginal ducts have separate external orifices. The ejaculatory duct is long and coiled, with numerous cirral hooks from 45 to 195μ in length lining the lumen. The vas deferens which is long and tightly convolute leads into a large, smooth prostate gland. The broad vaginal duct passes directly into the spherical spermatheca. The tightly convolute spermathecal duct issues separately from the spermatheca and leads into a junction with the short spermatocystic duct at the albumin and mucous gland. The spermatocyst is pyriform and less than one-half the size of the spermatheca.




FIGS. 70–72
70. *Dendrodoris coronata* Kay and Young, 20 × 7 mm.
71. *Dendrodoris nigra* (Stimpson), 30 × 20 mm.
72. *Dendrodoris tuberculosa* (Quoy and Gaimard), 150 × 90 mm.

HABITS: Five specimens have been recorded, the three largest (100 mm in length or more) in June and July 1962, along shorelines near Koloa, Kauai, and Kaena Point, Oahu, the smaller animals in February 1965, in shallow water shoreward of the fringing reef at Nanakuli, Oahu, and in June 1964, on a patch reef in Kaneohe Bay, Oahu. An egg mass deposited by the Kaneohe Bay specimen, 50 mm in length, was ribbon-like, wavy, with two whorls, 140 mm in length and 3.5 mm in diameter; it was cream colored.

REMARKS: *D. tuberculosa* has been recorded

from Mauritius (Bergh, 1889*a*), Rotuma [Gilbert Islands] (Eliot, 1906), and Japan (Baba, 1936; 1949).

### POLYCERIDAE

The genera comprising this family were described by Eliot (1910*a*) as encompassing those animals with ". . . branchiae forming a tuft, but not retractile into a pocket. Two spermathecae. Shape generally limaciform with appendages. Teeth differentiated. Radula often narrow." In Hawaiian waters two subfamilies are represented.

### Subfamily GYMNODORIDINAE

This group of dorids encompasses those forms with smooth, limaciform bodies; simply pinnate or bipinnate branchiae arranged in a full circle or semicircle about a middorsal, medial anus; with the innermost lateral teeth dissimilar to the succeeding teeth; and with the gonads distinct from the digestive gland.

In *Gymnodoris,* the only genus present in the Islands, the body is somewhat swollen at midlength and tapers posteriorly as a narrow foot. Neither the rhinophores nor the branchiae are cryptic but they may be contractile into temporary depressions. The animals are all light colored: white, cream, or light yellow, and spotted with orange, yellow, or red.

*Gymnodoris alba* (Bergh, 1877*a*)
Fig. 73

DESCRIPTION: Length, to 15 mm; width, 2 to 3 mm. The animal is limaciform, the head forming a narrow cephalic hood with shallow serrations; the oral tentacles are lobiform and small, not visible in dorsal view. The body color is white with orange-red spots. The rhinophores are clublike, with 10 light yellow lamellae which are tipped with orange. The genital orifice is immediately posterior to the cephalic hood. There are 12 simply pinnate white branchiae which are flattened laterally; they are placed in a horseshoe about the anus and decrease in size posteriorly.

The radular formula in a 15-mm specimen is $14 \times 12.0.12$. The first lateral tooth is 40μ long and smaller than the successive teeth in the row.

The ovotestes consist of 2 ovate bodies on either side of and anterolateral to the digestive gland; the genital mass is immediately posterior to the buccal mass. The vas deferens is short and convolute; the prostate gland is large and long, covering the spermatheca; the ejaculatory duct is a cirrus with cirral hooks 17 to 23μ long; the vaginal duct is short and wide; the spermatheca is small and spherical, the spermatocyst small and ovate. The uterine duct enters the albumin and mucous gland at the junction of the ampullary and prostate ducts.

HABITS: This gymnodorid occurs, like the others, on the undersurface of rocks on benches at Diamond Head and Kaimalino, Oahu. It feeds on aeolids, *Favorinus* sp. and *Aeolidella* sp. Like *Gymnodoris plebeia,* it is uncommon.

The egg mass is oval in cross section and consists of 1 or 2 whorls 20 mm in length and 0.9 mm in diameter; there are approximately 55 ova per $mm^2$. Each ovum is encapsulated by a sheath 200μ in long diameter. The ova change from yellow-orange to red-orange during development.

REMARKS: *G. alba* is distinguished from the other gymnodorids by its white body color.

This species was described from the Philippines (Bergh, 1877*a*) and has been reported by Baba (1930, 1949) from Japan and by Eliot (1910*b*) from Cargados Carajas in the Indian Ocean.

*Gymnodoris bicolor* (Alder and Hancock, 1866)
Fig. 74

DESCRIPTION: Length, to 22 mm; width, to 4 mm. The animal is limaciform, the head broadening into a wide cephalic hood with deep serrations. The animals are cream to yellow with orange or orange-red spots which are occasionally raised as pustules; the serrations of the oral hood are often tipped with orange. The oral tentacles are lobiform with rounded tips and are visible in dorsal view. The rhinophores are clublike with 15 to 20 yellow to light brown lamellae. Sausage-shaped epidermal spicules, 188 to 438μ in length, are abundant. The genital orifice is immediately posterior to the

level of the branchiae. There are 8 to 10 simply pinnate branchiae placed in the shape of a horseshoe about the anus; they are cream to light yellow.

The radular formula range for three specimens 8 to 22 mm in length is 16–23 × 16–20.0.16–20. The first lateral tooth is hooklike, 82 to 120μ in length, and larger than the successive teeth in the row.

The ovotestes consist of 7 to 8 orange bodies

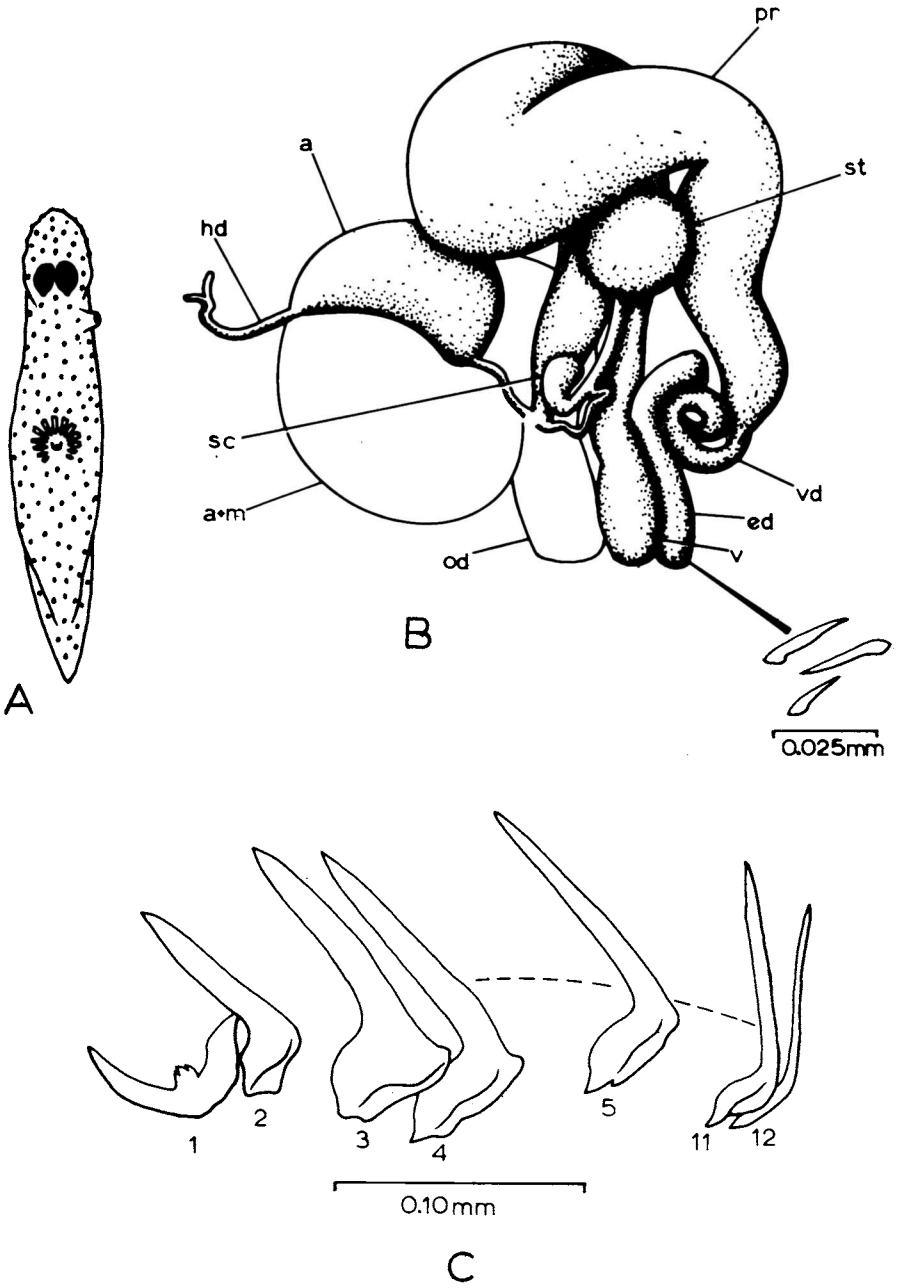



FIG. 73. *Gymnodoris alba* (Bergh). *A,* Dorsal view of an adult, 15 × 3 mm; *B,* lateral view of the genital mass and an offset of the cirral hooks; *C,* lateral view of the right-half row of the radular teeth. Lettering as before.

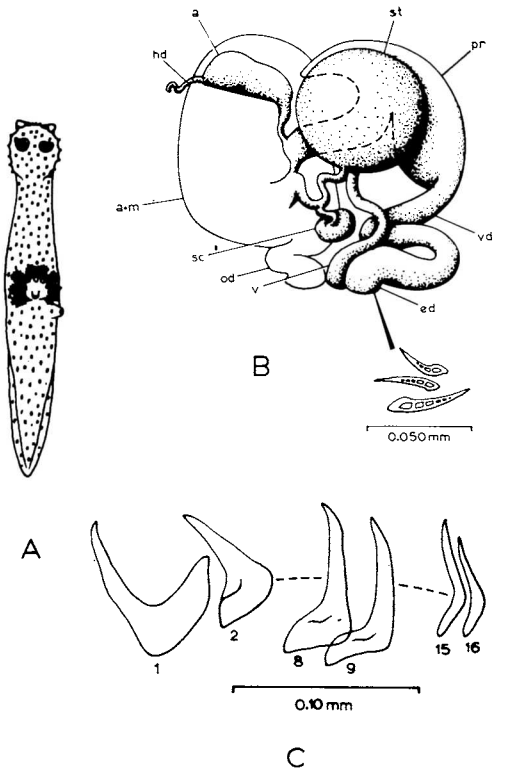



FIG. 74. *Gymnodoris bicolor* (Alder and Hancock). *A,* Dorsal view of an adult, 22 × 4 mm; *B,* lateral view of the genital mass and an offset of the cirral hooks; *C,* lateral view of the right-half row of radular teeth. Lettering as before.

ventral to the digestive gland, whereas the genital mass overlies the digestive gland posterolateral to the branchiae. The vas deferens is short and loosely convolute, with chambered cirral hooks 24 to 36μ long. The spermatheca is large and spherical, the spermatocyst small and ovate. The ampullary duct forms a common duct with the prostatic duct at the albumin and mucous gland.

HABITS: These animals are common under rocks on benches at both Diamond Head and Kaimalino, Oahu, and specimens have also been collected on Kauai. They apparently occur throughout the year. *G. bicolor* feeds on other gymnodorids, *G. okinawae* and *G. plebeia.*

The egg mass is oval in cross section, consisting of 1 or 2 whorls, and is 25 mm in length and 1.13 mm in diameter. It contains approximately 300 ova per mm². Each ovum is encapsulated by a sheath 125μ in long diameter. The ova change from yellow-orange to red-orange in color during development.

REMARKS: Because of the many similarities between *G. bicolor* and another Indo-West-Pacific gymnodorid, *G. citrina,* which has not been recorded from the Hawaiian Islands, most of the species descriptions are inadequate to distinguish between the two species. MacNae (1958), however, has correctly described *G. bicolor* from South Africa, and it must be assumed that the species is widely distributed within the Indo-West-Pacific.

*Gymnodoris okinawae* Baba, 1936
Fig. 75

DESCRIPTION: Length, to 30 mm; width, to 4 mm. The animal is limaciform, the head forming a narrow cephalic hood with shallow serrations. The body is cream to light yellow with yellow-orange to red-orange spots and white pustules over the dorsum; often there are red streaks laterally. The oral tentacles are lobiform and barely visible in dorsal view. The rhinophores are clublike, with 15 to 20 yellow to light brown lamellae. The genital orifice is immediately posterior to the cephalic hood. There are 7 to 12 tripinnate branchiae which are cream to light yellow; the branchiae form a circle about the anus.

The radular formula for three specimens 12 to 24 mm in length is 11–13 × 24–25.0.24–25. The first lateral tooth is hooklike, 84 to 105μ in length and smaller than the succeeding teeth in each row.

The ovotestes consist of 12 to 15 ovoid bodies which are anteroventral to the digestive gland, and the genital mass is immediately posterior to the buccal mass. The vas deferens is long and tightly coiled. The prostate gland is flat and spreads over the spermatheca. The ejaculatory duct consists of a cirrus with cirral hooks 13 to 30μ in length. The vaginal duct is broad and tightly convolute, the spermatheca large and spherical, and the spermatocyst small and ovate. The uterine duct enters the albumin and mucous gland at the junction of the ampullar and prostatic ducts.

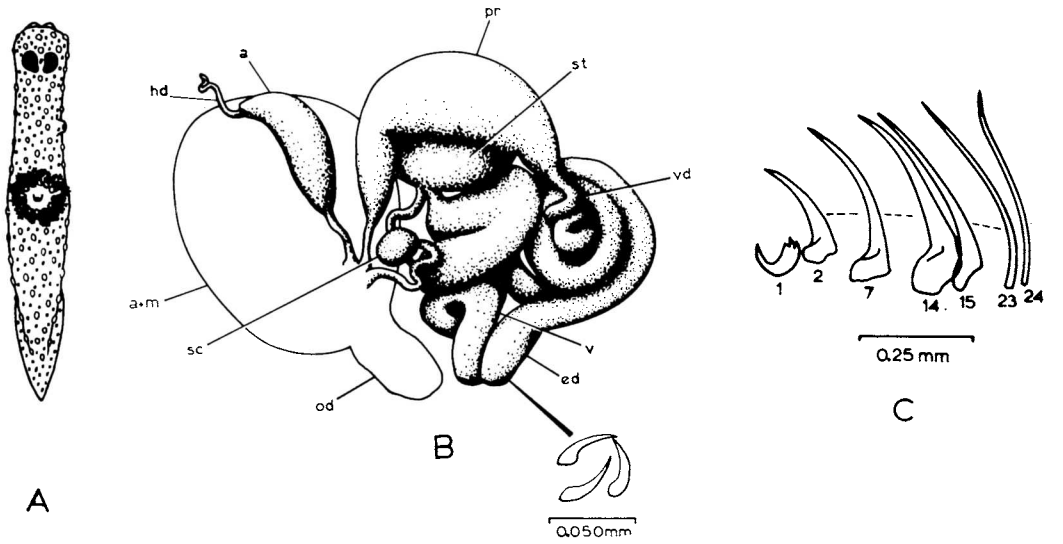



FIG. 75. *Gymnodoris okinawae* Baba. *A,* Dorsal view of an adult, 30 × 4 mm; *B,* lateral view of the genital mass and offset of the cirral hooks; *C,* lateral view of the right-half row of radular teeth. Lettering as before.

HABITS: These animals are common under rocks on benches at both Diamond Head and Kaimalino, Oahu, and specimens have also been collected on Kauai. *G. okinawae* feeds on various species of the sacoglossan genus *Elysia.*

The egg mass is oval in cross section, consisting of 1 to 3 whorls 45 mm in length and 1.4 mm in diameter. Each ovum is encapsulated by a sheath 185μ in diameter. The mass contains approximately 90 ova per mm². The ova change from yellow-orange to red-orange during development.

REMARKS: *G. okinawae* was described from the Ryukyu Islands by Baba (1936).

*Gymnodoris plebeia* (Bergh, 1877*a*)
Fig. 76

DESCRIPTION: Length, to 14 mm; width, to 3 mm. The animal is limaciform and there is no cephalic hood, but the foot extends anterior to the small, lobiform, oral tentacles which are visible in dorsal view. The body is yellow to almost lemon yellow in color, with red-orange spots. The rhinophores are rodlike, set close together, and there are 7 light yellow lamellae. The genital orifice on the right side of the body is midway between the head and the branchiae. There are 4 to 6 simply pinnate or bipinnate branchiae which are light yellow, tipped with deep orange, and set in a horseshoe about the anus.

The radular formula for a specimen 14 mm in length is 10 × 10.0.10. The first lateral tooth is bicuspidate, 33 to 46μ in length, and smaller than the succeeding teeth in each row.

The ovotestes consist of 2 ovoid bodies which are anteroventral to the digestive gland, and the genital mass is immediately posterior to the buccal mass. The vas deferens is long and slightly convolute; the prostate gland is long and covers a portion of the spermatheca; the ejaculatory duct consists of a cirrus with cirral hooks 6 to 7μ long; the vaginal duct is short and straight, the spermatheca large and spherical, and the spermatocyst small and ovate. The ampullary duct enters the albumin and mucous gland.

HABITS: Like the other gymnodorids, this species occurs under rocks on benches at Diamond Head and Kaimalino, Oahu, but unlike *G. bicolor* and *G. okinawae,* it is rarely found. Nothing is known of the feeding habits of *G. plebeia* but the animals are found where both *G. okinawae* and *G. bicolor* are most abundant.

The egg mass is oval in cross section; it consists of one whorl 8 mm in length and 1.4 mm in diameter, and contains approximately 32 ova per mm². The eggs are encapsulated in a sheath

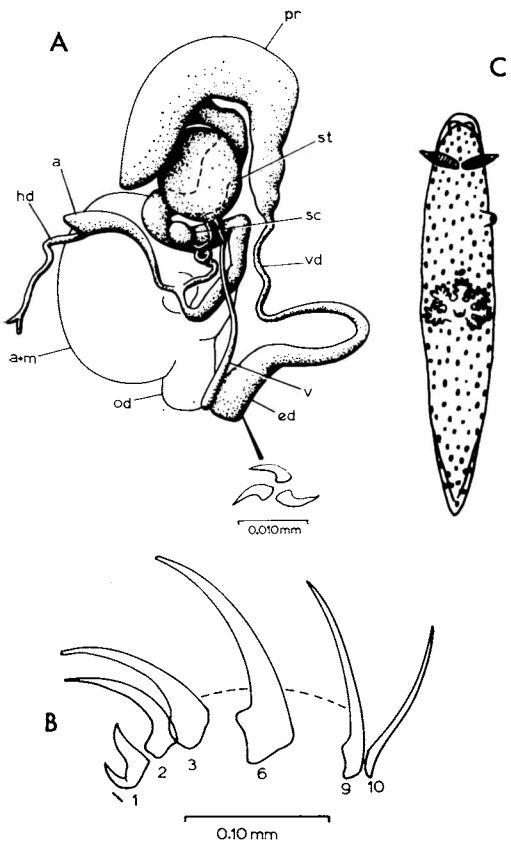



FIG. 76. *Gymnodoris plebeia* (Bergh). *A,* Lateral view of the genital mass and an offset of the cirral hooks; *B,* lateral view of the right-half row of radular teeth; *C,* dorsal view of an adult, 14 × 3 mm. Lettering as before.

225μ in diameter. The ova change from yellow-orange to red-orange during development.

REMARKS: *G. plebeia* is distinguished from the other gymnodorids occurring in Hawaiian waters by its closely set, rodlike rhinophores and the absence of a cephalic hood.

*G. plebeia* was described originally from the Pacific (Bergh, 1877*a*); Risbec's (1928) *Trevelyana suggens* (= *Gymnodoris bicolor,* Risbec, 1953) from New Caledonia appears to be synonymous with *G. plebeia.*

## Subfamily TRIOPHINAE

Eliot (1910*a*) included in this subfamily those genera of the Polyceridae which bear ramose or compound appendages. The radular teeth exhibit considerable variability among members of the subfamily, and rachidian teeth are present in several genera (Odhner, 1941). A single genus, *Plocamopherus,* is present in Hawaiian waters.

*Plocamopherus maculatus* (Pease, 1860)
Figs. 77, 78

*Histiopherus maculatus* Pease, 1860:36. Sandwich Islands [Hawaiian Islands].

*Plocamopherus maculatus* Pease, Abraham, 1877:232; Bergh, 1877*a*:432; Bergh, 1890*a*:950; Bergh, 1892*a*:1146; Pruvot-Fol, 1947:109.

DESCRIPTION: Length, 7 to 21 mm; width, 3 to 5 mm. The animal is limaciform, smooth or with occasional tentacular processes on the body wall. The head is developed as an oval veil somewhat broader than the rest of the body and fimbriated at the edge with tufts of filaments;

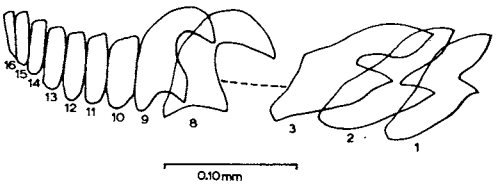



FIG. 77. *Plocamopherus maculatus* (Pease). Medial view of the left-half row of radular teeth.

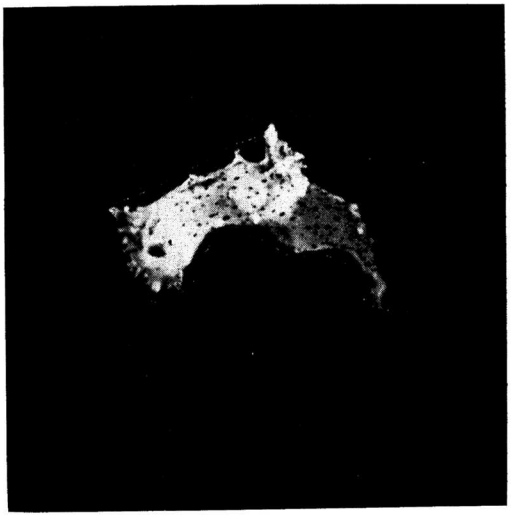


FIG. 78. *Plocamopherus maculatus* (Pease), 14 × 3 mm.

the posterior portion of the body is keeled dorsally and tapered. The body is almost transparent white and spotted with orange and yellow. The rhinophores are large, set laterally on the head; they are thickly lamellated, light yellow-brown and tipped with white. The branchiae are located middorsally, a single rachis directed anteriorly, 2 posteriorly; the branchiae are transparent, freckled with brown and occasionally orange-yellow. There are 2 processes on either side of the body, the anterior pair filamentous, the posterior pair just behind the branchiae with spherical termini.

The radular formula for a 21-mm specimen is 18 × 7.9.0.9.7. The lateral teeth are bicuspidate with the cusps of the outer laterals spaced further apart than they are on the inner laterals. The terminal cusp of the outer lateral is hamate. The central lateral is dominant, 145μ in length. The marginal teeth are flat, platelike, and the outermost marginal, 33μ in length, is the shortest tooth in each radular row. Two cuticular plates are without armature and lateral at the buccal tip.

The components of the genital mass were not discernible.

HABITS: Three specimens have been recorded. One, collected in July 1962, was found on the alga *Acanthophora* to which the animal adhered by its tail. The other two specimens were found in January 1965, under rocks, in seaward tidepools at Poipu, Kauai.

REMARKS: Our specimens differ from the Pease (1860) description in having occasional tentacular processes on the body and in there being only 2 pairs of body processes rather than 3. In other details, however, the animals are comparable with those described by Pease.

## VAYSSIEREIDAE Thiele, 1931

The characters of the family were re-described by Baba (1937) on the basis of his discovery of *Okadaia elegans* Baba, 1931 (described below): those dorids with a small, limaciform body; with simple, non-retractile rhinophores; lacking gills but with the anus middorsal; lacking jaw plates; with a radular formula 2.0.2 or 3.0.3; with testes and ovaries separate, and with the vas deferens armed. *O. elegans* is distinguished by its feeding habit—on boring spirorbid polychaete worms—and by the direct development of its young.

*Okadaia elegans* Baba, 1931
Fig. 79

DESCRIPTION: Length, to 5 mm; width, to 1 mm. The animal is limaciform, with nonlamellate, non-cryptic rhinophores, the anus middorsal, and it lacks branchiae. The body color is light yellow-orange, with the orange-red ovaries visible through the epidermis.

The radular formula is 35–44 × 3.0.3. The innermost lateral is hamate with 4 spiny denticles at the apex; the second lateral is dominant and simply hamate; and the third is in the form of a square plate.

The ovaries and testes are separate but joined by ducts. There are hooks present in the ejaculatory duct. The albumin and mucous glands are separate.

HABITS: These animals are common on the undersurfaces of rocks at all shoreline stations around Oahu and Kauai. They are usually on or near the calcareous, white tubes of spirorbid polychaetes on which they feed. The newly hatched juveniles feed immediately on the polychaetes.

REMARKS: *Okadaia elegans* was described from Japan by Baba (1931, 1937); it also occurs abundantly at Eniwetok, Marshall Islands.

## GONIODORIDIDAE Bergh, 1893

The members of this family resemble the polycerids in external appearance but are distinguished by a pair of well-developed velar tentacles, various mantle appendages, and an "ingluvies buccalis." The few records available


FIG. 79. *Okadaia elegans* Baba. Lateral view of the left- and right-half rows of radular teeth.

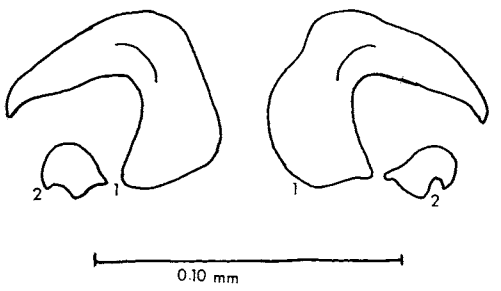



FIG. 80. *Goniodoris* sp. cf. *joubini*. Lateral view of the left- and right-half rows of radular teeth.

indicate the goniodorids are suctorial feeders on ascidians. Because of their small size and cryptic coloration, they are easily overlooked.

*Goniodoris* sp. cf. *joubini* Risbec, 1928
Fig. 80

DESCRIPTION: Length, 6 mm; width, 1 mm. The animal is elongate-oval, tapering posteriorly into an obtuse tail; the mantle forms a curled shelf around the anterior two-thirds of the body but is interrupted at the tail. The mantle, head, and body are smooth, but a tuberculated ridge extends from the termination of the mantle medially along the tail; the tubercles are conical with flattened apices. The mantle and body are maculated with red-brown, there are occasional yellow spots on the head, and the tail tubercles are finely freckled with white. The rhinophores are large, set laterally; the peduncles are swollen and widen into thickly lamellate structures with attenuate tips. The rhinophores are freckled red-brown with white tips. The branchiae are fairly large, forming 3 plumes around the anal papilla; they are simply branched and white. The foot is broader anteriorly than posteriorly and is tentaculiform.

The radular formula for a 6-mm specimen is 26 × 1.1.0.1.1. The innermost tooth is 55μ long, unicuspid and simply hamate; the outermost tooth is 19μ long, unicuspid and angular in shape.

HABITS: Two specimens have been collected, both from under rocks in the shallow shoreward area of the fringing reef at Kewalo Basin, Oahu; one was found in December 1962, the other in March 1963.

REMARKS: The Hawaiian specimens resemble Risbec's (1928) *G. joubini* from New Caledonia in most respects, but they are smaller (*G. joubini* is 18 mm in length) and differ slightly in details of color, in lacking tubercles on the mantle, and in having 26 rather than 40 radular rows. Risbec's figure of the innermost radular tooth indicates a slight hump on the dorsal surface, but he does not mention this in his description. Other species with which the Hawaiian animals should be compared are *G. glabra* Baba, 1949, from Sagami Bay, which is tuberculate and has a very small, hooklike outer radular tooth, and *G. mimula* Marcus, 1955, from Sao Paolo, Brazil, which is similar in color but which has 3 rather than 7 branchiae and bifid radular teeth.

*Okenia* sp.
Fig. 81

DESCRIPTION: Length, 7 mm; width, 1 mm. The animal is limaciform, higher than it is broad, and the mantle edge is split into symmetrically arranged finger-like processes, 8 on each side. The body is translucent white, finely lineated with brown, and embedded with calcareous spicules on the dorsal surface. The rhinophores are papillated on the posterior surface only; they are non-retractile but contractile into sheaths. There is a horseshoe arrangement of 5 simply pinnate branchiae, the posterior pair the smallest. The foot is short and broad with rounded anterior angles.

The radular formula of a 7-mm specimen is 18 × 1.1.0.1.1. The teeth are bicuspid, the outermost oblong, 34μ in length and not denticulate; the innermost tooth is simply hamate, 58μ long and bears 10 to 14 denticles.

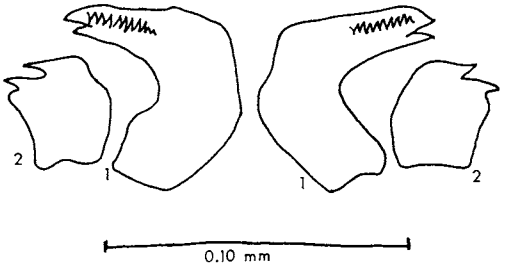



FIG. 81. *Okenia* sp. Lateral view of the left- and right-half rows of radular teeth.

HABITS: Two specimens have been found, both on the green alga *Enteromorpha* inside Kewalo Basin, Oahu, in October 1963.

REMARKS: The rather simple teeth and narrow body appear to distinguish this goniodorid from presently recognized species of *Okenia* but the animals are not preserved well enough for sectioning, and so we are not able to describe this species in sufficient detail for taxonomic purposes.

*Trapania* sp.
Fig. 82

DESCRIPTION: Length, 7 to 10 mm; width, 1 to 2 mm. The animal is limaciform, slender, with the body slightly higher than it is wide and the highest portion of the body lying just in front of the gills. There are 2 pairs of long, finger-like processes, the anterior pair at the base of the rhinophores, the posterior pair just posterior to the branchiae. The animal is pale yellow, finely reticulated with red-brown splashes on the dorsal surface. The rhinophores are long and slender, lamellated, and contractile but not retractile into sheaths; they are brown. The branchiae are paired, the 2 tri-branched, simply pinnate plumes lying laterally on either side of the anal papilla. The foot is slender and narrow, almost half as long as the body, and the anterior edge is prolonged on either side into tentacular processes; it is white.

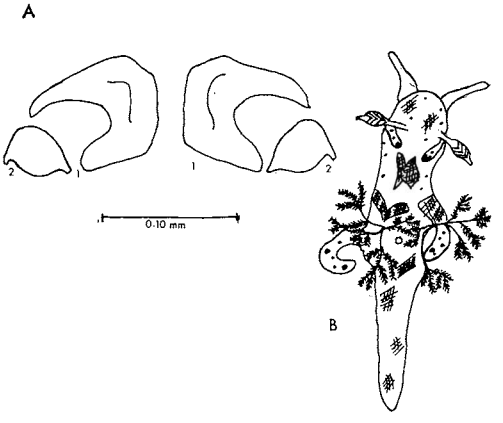



FIG. 82. *Trapania* sp. *A,* Lateral view of the left- and right-half rows of radular teeth; *B,* dorsal view of an adult, 7 × 2 mm.

The radular formula of a 6-mm specimen is 19 × 1.1.0.1.1. The innermost radular tooth is 79μ long, unicuspid, and simply hamate; the outermost tooth is 31μ long, unicuspid, and angular in shape.

HABITS: Four specimens have been collected, all from under rocks in the shallow waters shoreward of the fringing reef at Kewalo Basin, Oahu; one specimen was found in December 1962, three in January 1963.

REMARKS: This goniodorid is assigned to the genus *Trapania* Pruvot-Fol, 1931, on the basis of the appendages associated with the rhinophores and branchiae and its tentaculiform foot. All previously described species in the genus apparently have denticulate teeth. Poor preservation of the animals does not permit description of the anatomy in sufficient detail for taxonomic purposes.

## SUMMARY

1. Forty-nine species of the Doridacea are here recorded from the Hawaiian Islands, five of which are described as new. Except for six species (three newly described and three which lack specific epithets), all the Hawaiian dorids have been reported from elsewhere in the Indo-West-Pacific, and one (*Jorunna tomentosa*) is apparently circumglobal.

2. Although comparatively numerous in species, few of the Hawaiian dorids are abundant or even common. They are found principally in shallow water, occurring in loose rocks and coral rubble on benches and shoreward of fringing reefs. SCUBA divers working at depths of more than 3 meters have collected only five species, while extensive dredging operations have provided four specimens representing two species.

3. Several species apparently occur in different habitats and are far less numerous in the Hawaiian Islands than they are elsewhere in their range—phenomena also reported for some of the Hawaiian prosobranchs (Kay, 1967). Representatives of *Ceratosoma* and *Platydoris,* for example, occur in fairly deep water in the Hawaiian Islands and are known from only one to three specimens; but *Ceratosoma* is a dominant organism in the littoral fauna along the

coast of southern Australia (Burn, 1962), and various species of *Platydoris* are common under stones in the littoral zone in the Indian Ocean and the central Pacific (Eliot, 1905*b*).

4. Of the Hawaiian dorids 75 per cent are sponge-feeders. This is in contrast to the situation in temperate waters, where in British seas at least, the bryozoan- and barnacle-feeding Polycerinae and Onchidorididae comprise 50 per cent of the dorid fauna (Young, in press).

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