

The Ovulidae, Pediculariidae and Triviidae of Fiji

(Mollusca : Gastropoda)

BY

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Vatukoula, Fiji Islands

(Plates 50 to 52; 5 Text figures; 1 Map)

INTRODUCTION

THIS IS THE EIGHTH PART in the series of faunal monographs dealing with the marine mollusca of the Fiji Islands.

Unlike the Cypraeidae, species of Ovulidae, Pediculariidae and Triviidae are moderately rare in Fiji; the minute size and often inaccessible habitat are responsible for their rare occurrence in local collections.

All the species recorded from the Fiji Islands have a Pacific or Indo-Pacific distribution, and the majority of species live within the area of the East African coast and the Tuamotu Archipelago.

In this, as in the previous monographs, only species collected by resident collectors and the author are listed as verified records. For notes on the geography of the Fiji Islands and other pertinent data see CERNOHORSKY, 1964.

TAXONOMY

The higher categories of Cypraeacea have been discussed in a recent publication by SCHILDER (1966). Despite the non-binding recommendation by the International Commission on Zoological Nomenclature that the ending "-oidea" be employed for Superfamilies, most malacologists have accepted the ending "-acea" since the publication of THIELE's 'Handbuch der systematischen Weichtierkunde' (1929). The taxon Cypraeacea has been introduced by SCHILDER (1927) and was accepted by THIELE (*op. cit.*) and most subsequent authors. The superfamilial term Cypraeoidea has been used by IREDALE (1935) and SCHILDER (1939, 1941). Cypraeoidea has, however, been recently re-introduced into literature by IREDALE & McMICHAEL (1962), and the suffix '-acea' has been retained in this publication for some subclasses of molluscs. In view of the non-binding recommendation regarding term endings for superfamilies in zoology, a

standardization of such suffixes by malacologists would be welcome.

The family Lamellariidae has been removed from the Cypraeacea by previous authors and placed in the superfamily Lamellariacea; the families Cypraeidae, Ovulidae, Pediculariidae, and Triviidae have been retained in the Cypraeacea. In a broad classification of all mollusca, the erection of a new superfamily Triviacea for the reception of Triviidae and Pediculariidae, would not appear to contribute to a clearer definition of relationships between these allied families. A continuous upgrading of higher categories of Cypraeacea by specialists may finally result in monofamilial superfamilies if further divisions will prove imperative. Since the ranking of higher taxonomic categories is largely subjective, a retention of Triviidae and Pediculariidae in the Cypraeacea may appear orthodox to the specialist, but would not tend to obscure existing phylogenetic relationships between the families; it would also be more consistent with our present classification of higher categories of other gastropod groups.

Species of Ovulidae have been assigned to various generic groups since the start of organized nomenclature: *Bulla* LINNAEUS, 1758; "*Amphiperas*" GRONOVIVS, 1781 (non binomial); *Ovula* BRUGUIÈRE, 1789; *Volva* and *Cyphoma* RÖDING, 1798; and *Radius* SCHUMACHER, 1817. MONTFORT (1810), who had a decided preference for generic names of masculine gender changed *Ovula* to *Ovulus* and also established *Calpurnus* and *Ultimus*, while SOWERBY (1828) introduced *Ovulum*, which he considered properly latinized. The genera *Ovula* and *Ovulum* remained in use for the remainder of the 19th century together with *Simnia* RISSO, 1826, *Radius* SCHUMACHER and *Neosimnia* FISCHER, 1884. In the early part of the 20th century "*Amphiperas*" was re-introduced and several new genus-group names were proposed by THIELE (1925, 1929), SCHILDER (1927) and IREDALE (1930, 1931, 1935).

Living species of Pediculariidae had a less eventful taxonomic history, due mainly to the small number of species and the somewhat belated appearance of the first Recent species, *Pedicularia sicula* SWAINSON, 1840, in molluscan literature. The authors H. and A. ADAMS (1854) erected the family Pediculariidae and the genera *Pediculariella* THIELE, 1925 and *Pediculariona* (IREDALE, 1935, *nud.*) SCHILDER, 1939 were subsequently established. Most authors considered Pediculariidae worthy of familial rank, but SCHILDER (*op. cit.*) combined all species in the subfamily Pediculariinae within the family Ovulidae; in 1966, however, he distinguished Ovulidae from Pediculariidae and transferred the latter family to Triviacea.

As far as the Triviidae are concerned, authors were unable to reach agreement as to generic placement of the species. Species of Triviinae and Eratoinae were assigned to *Cyp-raea* LINNAEUS, 1758, *Bulla* LINNAEUS, 1758, *Voluta* LINNAEUS, 1758, *Marginella* LAMARCK, 1799, *Colum-bella* LAMARCK, 1799, and other lesser known genera. The introduction of the new genera *Erato* RISSO, 1826, *Lachryma* SOWERBY [1832], (introduced inadvertently), *Trivia* BRODERIP, 1836, *Triviella*, *Trivirostra*, *Niveria* and *Pusula* JOUSSEAUME, 1884, did not appreciably change the taxonomic concept of this group; species of Triviinae continued to be assigned to the Cypraeidae, and Eratoinae to Marginellidae. SCHILDER (1927) thoroughly revised the group according to phylogeny, and IREDALE (1930, 1931, 1935) contributed to the subdivision of the family by establishing several new genus-group names whose validity is seriously questioned by practising malacologists.

IREDALE'S GENUS-GROUP NAMES

Several adverse comments have been passed by recent malacologists and zoologists on the validity of genus- and species-group names proposed by IREDALE (ZILCH, 1960; SOLEM, 1964). Whatever the taxonomic shortcomings of IREDALE's generic diagnoses, their brevity and casualness appear to be the product of taxonomic procedures prevalent among malacologists at the time, in contrast to

present-day systematics. It is unfortunate that authors continue to use genus-group names proposed by IREDALE, which in accordance with the rules of the Code of the ICZN (1964) are *nomina nuda*. Although a common-sense interpretation of the Code of the ICZN appears advisable at times, the rules governing the availability of zoological names are unequivocal: a name can be either valid or invalid, but not tentatively valid.

The usage of Iredalean genus-group names in this monograph made it advisable to test each scientific name established by Iredale between 1930 and 1935 as to its taxonomic availability. It became apparent that Iredale's names fall into three categories: 1) names which are technically and scientifically valid; 2) names which are technically *nomina nuda*; and 3) names which are technically valid but scientifically *nomina dubia*.

The majority of Iredale's names proposed prior to 1931 satisfy the requirements of art. 12 in conjunction with art. 16(v) or 16(vi) of the Code of the ICZN; their definition may not be scientifically adequate, but they are certainly available. Names established after 1930 are either valid, invalid or *nomina dubia*; the first must be accepted, the second rejected; it is the *nomina dubia* which will pose a taxonomic problem.

A list of genus-group and specific names proposed by IREDALE (1931, 1935), which qualify as *nomina nuda* (art. 13, ICZN) is appended. In all cases these genus-group names have been diagnosed by SCHILDER (1939) and validated by SCHILDER as author:

Ellatrivia (IREDALE, 1931, *nud.*) SCHILDER, 1939

- 1931. *Ellatrivia* IREDALE, Rec. Aust. Mus. 18: 221 (nom. nud.)
- 1935. *Ellatrivia* IREDALE, Aust. Zool. 8: 100 (nom. nud.)
- 1935. *Ellatrivia* SCHILDER, Proc. Malacol. Soc. London, 21: 330 (nom. nud. - no type fixation, art. 13(b) of ICZN)
- 1939. *Ellatrivia* SCHILDER, Arch. Molluskenk. 71: 173, fig. 26 (type spec. by OD *Triviella merces* IREDALE, 1924)

Fossatrivia (IREDALE, 1931, *nud.*) SCHILDER, 1939

- 1931. *Fossatrivia* IREDALE, Rec. Aust. Mus., 18: 222 (nom. nud.)
- 1935. *Fossatrivia* IREDALE, Aust. Zool., 8: 100 (nom. nud.)
- 1939. *Fossatrivia* SCHILDER, Arch. Molluskenk., 71: 173 (type spec. by OD *Trivia caelatura* HEDLEY, 1918)

Explanation of Plate 50

- Figure 1: *Ovula ovum* (LINNAEUS). Fiji. (x 0.5)
- Figure 2: *Ovula costellata* (LAMARCK). Fiji. (x 1.0)
- Figures 3 and 3a: *Calpurnus verrucosus* (LINNAEUS). Fiji. (x 2.0)
- Figure 4: *Calpurnus lacteus* (LAMARCK). Fiji. (x 2.5)
- Figure 5: *Primovula punctata* (DUCLOS). Fiji. (x 3.0)

Figure 10: *Phenacovulva birostris* (LINNAEUS). Fiji. (x 2.5)

- Figure 6: *Prionovulva fruticum* (REEVE). Fiji. (x 2.0)
- Figure 7: *Prosimnia coarctata* (ADAMS & REEVE). Fiji. (x 3.5)
- Figure 8: *Primovula striatula* (SOWERBY). Fiji. (x 5.0)
- Figure 9: *Volva volva* (LINNAEUS). Fiji. (x 0.6)
- Figure 9a: *Volva volva* (LINNAEUS). Fiji, juvenile specimen (x 1.0)

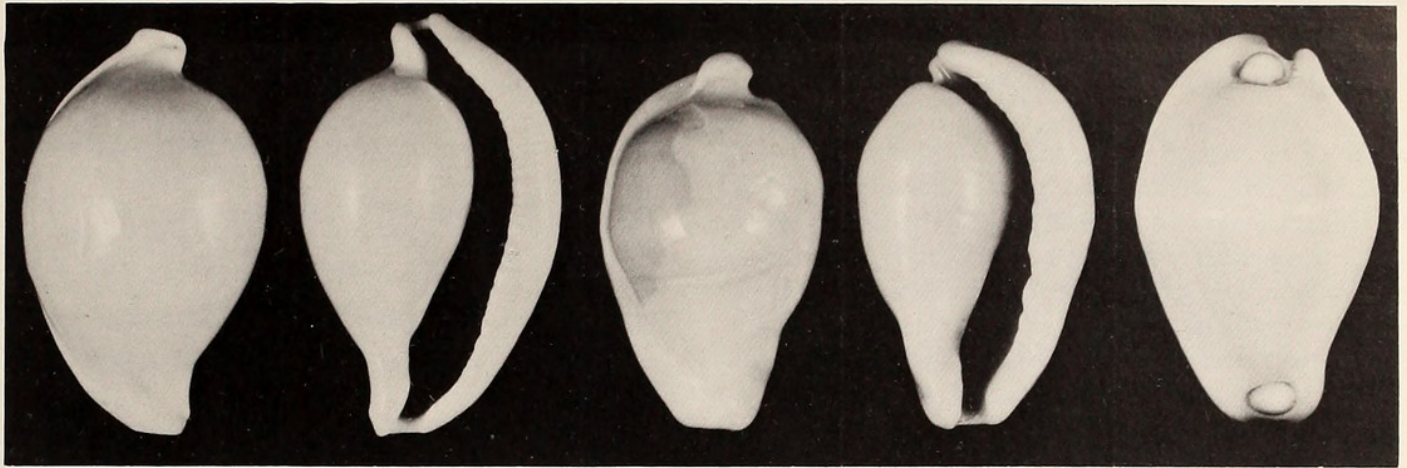


Figure 1

Figure 2

Figure 3

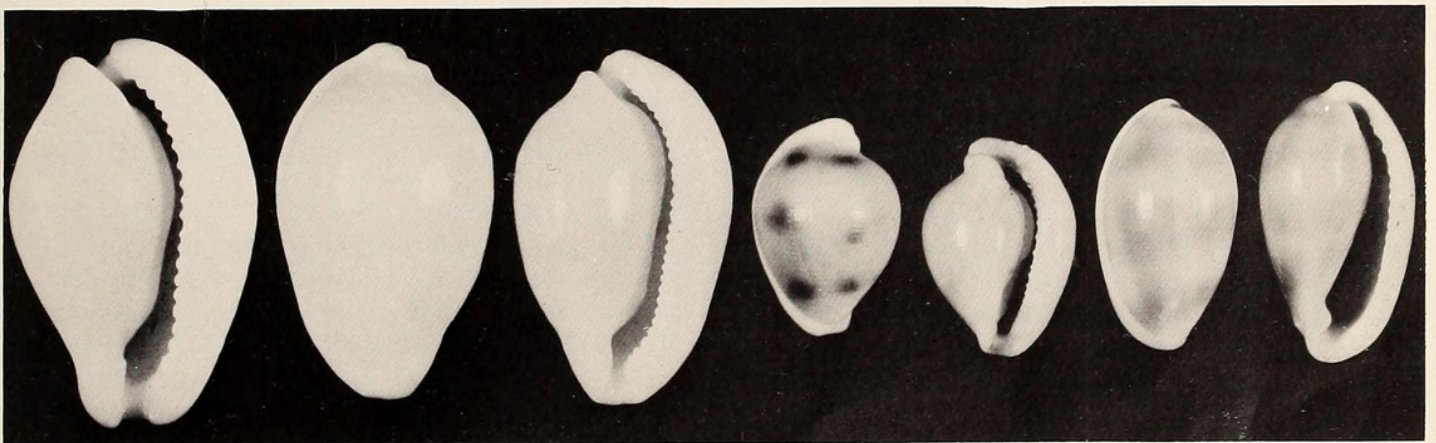


Figure 3 a

Figure 4

Figure 5

Figure 6

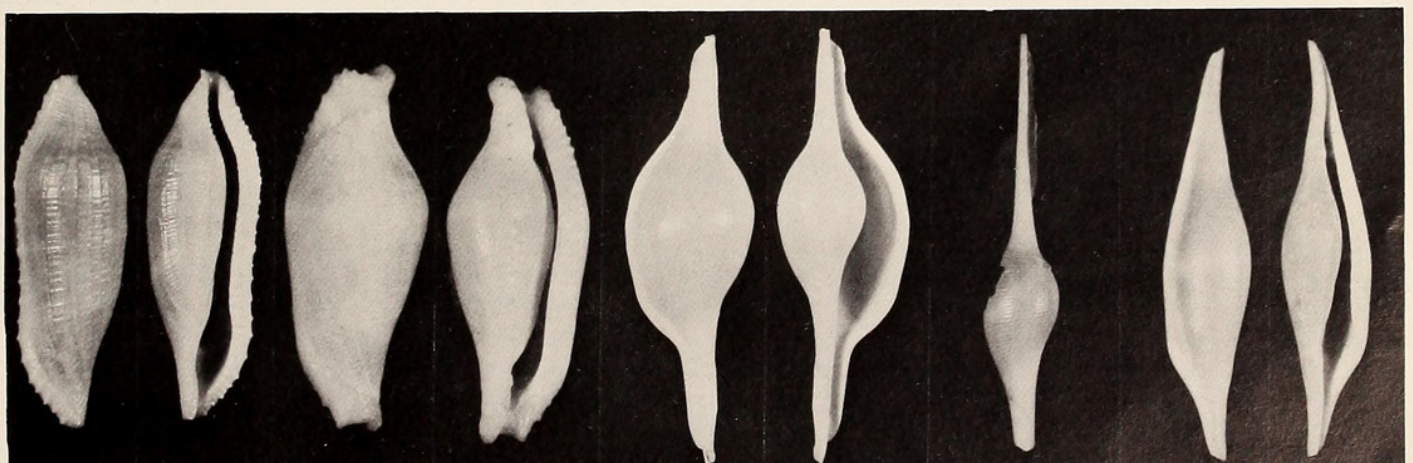


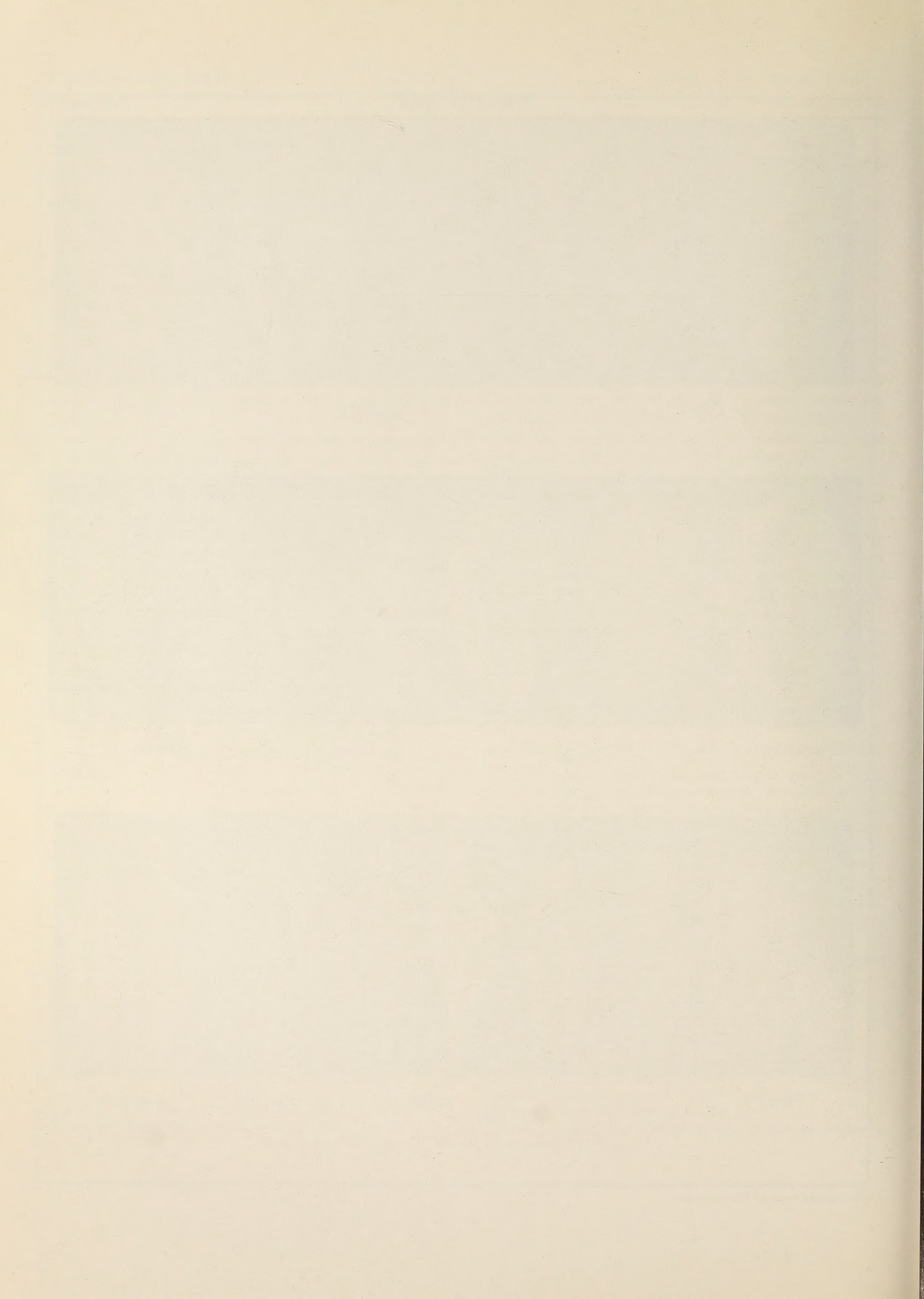
Figure 7

Figure 8

Figure 9

Figure 9 a

Figure 10



Volva volva cumulata (IREDALE, 1931, *nud.*) IREDALE, 19351931. *Volva volva cumulata* IREDALE, Rec. Aust. Mus., 18: 222 (nom. nud.)1932. *Volva cumulata* SCHILDER, Proc. Malacol. Soc. London, 20: 56 (nom. nud.)1935. *Volva volva cumulata* IREDALE, Aust. Zool. 8: 104*Pellasiimnia* (IREDALE, 1931, *nud.*) SCHILDER, 19391931. *Pellasiimnia* IREDALE, Rec. Aust. Mus., 18: 222 (nom. nud.)1932. *Pellasiimnia* SCHILDER, Proc. Malacol. Soc. London, 20: 54 (in synonymy of *Neosimnia* FISCHER, 1884 – no type fixation, art. 13(b) of ICZN)1935. *Pellasiimnia* IREDALE, Aust. Zool. 8: 104 (nom. nud.)1939. *Pellasiimnia* SCHILDER, Arch. Molluskenk., 71: 195 (type spec. by OD *Ovulum angasi* REEVE, 1865)*Margovula* (IREDALE, 1935, *nud.*) SCHILDER, 19391935. *Margovula* IREDALE, Aust. Zool. 8: 103 (nom. nud.)1939. *Margovula* SCHILDER, Arch. Molluskenk. 71: 200 (published in synonymy of *Diminovula* IREDALE, 1930 – type spec. by OD *M. pyriformis* (SOWERBY, 1828))1941. *Margovula* SCHILDER, Arch. Molluskenk. 73: 68

Margovula appears to have been validated by SCHILDER (1939) through publication in synonymy (art. 11(d) of ICZN) and subsequent adoption by SCHILDER (1941) as a senior synonym of *Diminovula* IREDALE, 1930.

Pediculariona IREDALE, 1935 (p. 101) was diagnosed as follows: "The elevated sculptured spire later buried in the shell separates this [*Pediculariona*] distinctly, and there are representatives of this in Queensland." This inadequate diagnosis could be interpreted as a statement purporting to give characters differentiating the taxon, but by the same token it is this particular diagnostic character which places it in the synonymy of *Pedicularia* SWAINSON, 1840.

METHODS

The nomenclature of diagnostic characters of Ovulidae follows SCHILDER (1932, p. 57, fig. 20). The number of dorsal ribs quoted for species of Triviidae consists of the total of centrally-placed ribs on both sides of the dorsal groove or dorsal centre; the loop-like ribs confined within the outlets of the extremities have been excluded from the count. Only mature specimens have been utilized for morphometric measurements.

The following abbreviations are used in this paper:

L = Length of shell expressed in millimeters (mm)

W = Width of shell expressed in % of length

H = Height of shell expressed in % of length

LT = Number of labial teeth

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I wish to thank the following collectors for the loan of study material: Mrs. M. Ashton, Proserpine; Mr. R. F. Browne, Nausori; Mr. J. Candries, Suva; Mrs. F. Fitzmaurice, Kurrimine Beach; Mr. & Mrs. F. Freitag, Suva; Mr. & Mrs. A. Jameson, Lautoka; Mr. A. Jennings, Auckland; and Mrs. M. Wood, Nadi.

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MESOGASTROPODA

CYPRAEACEA

OVULIDAE FLEMING, 1828 (*nom. corr.* OVULADAE)

1854. AMPHIPERASIDAE H. & A. ADAMS, Gen. Rec. Moll., 1: 269

1929. AMPHIPERATIDAE WINKWORTH, Proc. Malacol. Soc. London,
18: 298

The shells of Ovulidae are pyriform or fusiform in shape, uni-coloured, spotted or banded, and the extremities are either short or produced; shells are smooth or transversely striate and some species have a dorsal carina. The labial side is margined, columellar side rounded, labial lip with or without denticles, columella generally edentulous.

The animals are similar to the Cypraeidae, i. e. they possess a foot, mantle, tentacles, eyes, and a siphon; the papillae, however, are generally shorter. The anatomy of the Ovulidae has been described by THIELE (1929) and SCHILDER (1932, 1939, 1944).

The radula is taenioglossate with 7 teeth per row; Recent species of Eocypraeinae have an additional edentulous connecting plate. Rhachidians are variable, but generally have a large central cusp and often side-denticles; laterals are large, with a beak-like main cusp and generally side-denticles on the cutting edge. Marginals are fairly uniform throughout the family and the inner marginals are smaller than the outer ones; flabellae are numerous, slender, extended, recurved and bifid or sometimes trifid at the distal end. SCHILDER (1932) considered the anatomy and radula features of Ovulidae to be rather similar among the genera and subgenera, and his subdivision has therefore been restricted to differences in shell morphology. Although the marginals are basically similar

throughout the family, the rhachidians and sometimes the laterals exhibit appreciable differences between species of different genera; on the other hand, however, the radular features of some species of Ovulinae may resemble those of Simniinae.

The majority of Recent ovulids lives in the Indo-Pacific region, and only a few species live in other major faunal regions.

Some Ovulidae share the same habitat with cypraeids, while others are associated with octocorals and sea-fans. The food-requirements of tropical ovulids are not known; however, food is possibly extracted from the same host-coral on which they live.

Ovulinae FLEMING, 1828

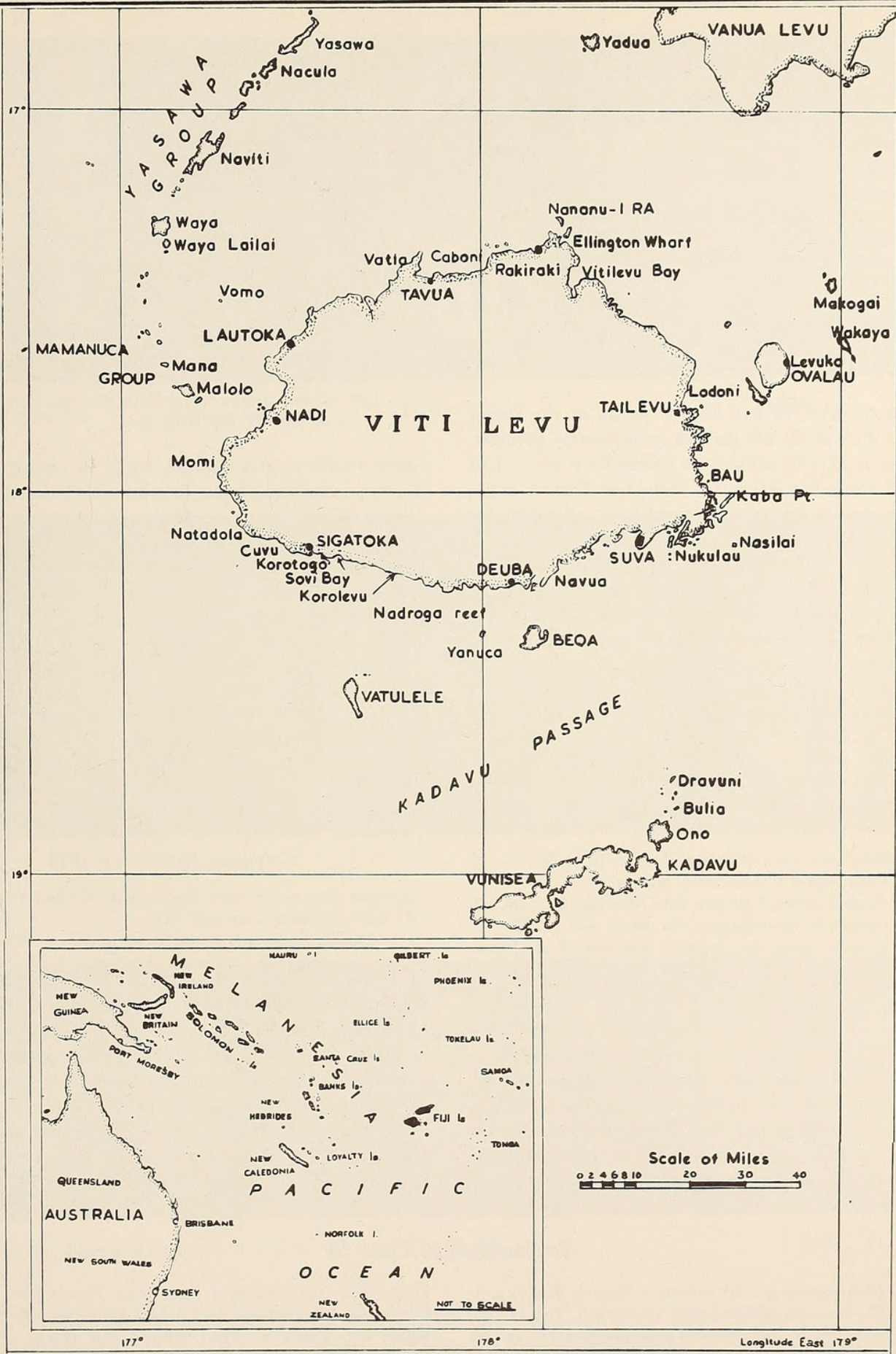
1929. Amphiperasinac THIELE, Handb. syst. Weichtierk., p. 270

1932. Amphiperatinac SCHILDER, Proc. Malacol. Soc. London,
20: 46

The subfamily contains a group of species with pyriform, inflated shells with short extremities, a plain, spotted or banded dorsum, which is either smooth, transversely striate or carinate. Columellar teeth are absent, labial teeth developed and the anterior terminal ridge on the columella is prominent; the fossula is smooth and broad. The rhachidians and lateral teeth of the radula are variable, marginals with numerous slender flabellae.

Species of Ovulinae are distributed in all major Oceans, but species of the genus *Pseudosimnia* SCHILDER, 1927, are restricted to the Mediterranean and the Eastern Atlantic.

Species of Ovulinae inhabit crevices of coral rocks, or occasionally live in folds or at the base of soft coral or on gorgonians.



Ovula BRUGUIÈRE, 1789

Ovula BRUGUIÈRE, 1789, Hist. nat. vers, Index, p. 15. Type species by SD (LAMARCK, 1801) *Ovula oviformis* LAMARCK, 1801 = *Bulla ovum* LINNAEUS, 1758.

1781. "*Amphiperas*" GRONOVIVS, Ind. Zooph. Gron., p. 293 (non binom.)
 1798. *Ovula* LAMARCK, Tabl. Encycl. Méth., plts. 357-358 (no type selected)
 1810. *Ovulus* MONTFORT, Conch. Syst., 2: 634 (nom. nov. pro *Ovula* BRUGUIÈRE, 1789)
 1828. *Ovulum* SOWERBY, Zool. Journ. 4: 145 (nom. nov. pro *Ovula* BRUGUIÈRE, 1789)
 1935. *Parlicium* IREDALE, Aust. Zool., 8: 101 (Type species by OD *Ovula costellata* LAMARCK, 1811)

The genus contains the two largest species of the family Ovulidae; their shells are smooth or obsoletely carinate, the interior is dark in colour, the columella is edentulous and labial teeth are irregular. Only two Recent Indo-Pacific species are known, and fossil species have so far not been recorded.

Discussion: The genus *Parlicium* IREDALE has been established for *Ovula costellata* LAMARCK on the basis of a difference in animal features and the formation of the posterior canal. Differences in animal features are specific characters and the diagnostic difference in the formation of the posterior canal appears to be of insufficient taxonomic importance to warrant the erection of a new monotypic genus.

Ovula ovum (LINNAEUS, 1758)

(Plate 50, Figure 1)

1758. *Bulla ovum* LINNAEUS, Syst. Nat., ed. 10, p. 725, no. 327
 1798. *Volva cygnea* RÖDING, Mus. Bolt., p. 21, no. 255
 1811. *Ovula oviformis* LAMARCK, Ann. Mus. Hist. Nat., 16: 110
 1817. *Ovula alba* SCHUMACHER, Ess. nouv. syst., p. 258
 1828. *Ovulum ovum* var. *pygmaea* SOWERBY, Zool. Journ., 4: 149
 1905. *Amphiperas ovum* (LINNAEUS), BERGH, Siboga Exp., 50: plt. 5, fig. 21 (animal)

Shell: Large and ovate, extremities produced, porcellaneous white, interior orange-brown; dorsum either moderately smooth or with 1 - 4 fine transverse carinate lines. Labial lip convex, teeth irregular and often bifid, numbering from 35 to 45; columella edentulous, second funiculum strong and projecting, fossula absent.

L: 65 - 110 mm; W: 58 - 64%

Type Locality: Oceano Asiatico ("Amboina," IREDALE, 1935).

Habitat: On soft coral, from 1 - 4 fathoms. Common.

Distribution: Throughout the Fiji Islands. - From Madagascar through the tropical Indo-Pacific to the Tuamotu Archipelago.

Ovula costellata LAMARCK, 1811

(Plate 50, Figure 2)

1811. *Ovula costellata* LAMARCK, Ann. Mus. Hist. Nat. 16: 110
 1817. *Ovula imperialis* DILLWYN, Descr. cat. rec. shells 1: 470
 1822. *Ovula angulosa* LAMARCK, Anim. sans vert., 7: 367
 1829. *Ovula columba* SCHUBERT & WAGNER, Conch. Cab., 12: 116; plt. 228, figs. 4043, 4044

Shell: Pyriform and inflated, white in colour, centre of dorsum occasionally pink, interior violet; dorsum with an obsolete dorsal carina, transverse carinate lines and striae at extremities. Labial lip convex, teeth irregular, numbering from 19 to 23; columella edentulous, occasionally with 3 - 4 obsolete columellar teeth, anterior terminal ridge obsolete, fossula absent.

L: 38 - 42 mm; W: 62 - 65%

Type Locality: L'Océan des Grandes Indes ("Friendly Isles," MARTYN, 1886) [= Tonga Islands].

Habitat: On soft coral, from 1 - 4 fathoms. - Rare.

Distribution: Southwest Viti Levu. - From East Africa through the tropical Indo-Pacific to Japan and the Tonga Islands.

Calpurnus MONTFORT, 1810

Calpurnus MONTFORT, 1810, Conch. Syst., 2: 638. Type species by OD *Bulla verrucosa* LINNAEUS, 1758.

1840. *Cypraella* SWAINSON, Treat. Malac., p. 325 (Type species by M *Bulla verrucosa* LINNAEUS, 1758)

Shells of the genus are moderately small, angulately pyriform, smooth or striate, and white in colour; the dorsal carina is prominent, obsolete or absent, extremities with or without a yellow-ringed wart-like knob. Columella is edentulous, labial lip prominently denticulate.

The radula (*fide* SCHEPMAN, 1909) has rhachidians which carry a massive central cusp which protrudes over the concave plate margin; one small accessory denticle is

Explanation of Plate 51

Figure 11: *Phenacovolva gracilis* (ADAMS & REEVE). Fiji. (x 2.5)Figure 12: *Phenacovolva philippinarum* (SOWERBY). Fiji. (x 1.3)Figure 13: Host coral of *Phenacovolva philippinarum*. Fiji. (x 1.0)Figure 14: *Pseudocypraea adamsonii* (SOWERBY). Fiji. (x 5.0)Figure 19: *Trivirostra hordacea* (KIENER). Fiji. (x 8.0)Figure 15: *Trivirostra oryza* (LAMARCK). Fiji. (x 4.0)Figure 16: *Trivirostra* species (= ? *T. scabriuscula* GRAY). Fiji. (x 5)Figure 17: *Trivirostra edgari* (SHAW). Fiji. (x 4.5)Figure 18: *Trivirostra exigua* (GRAY). Fiji. (x 6.5)

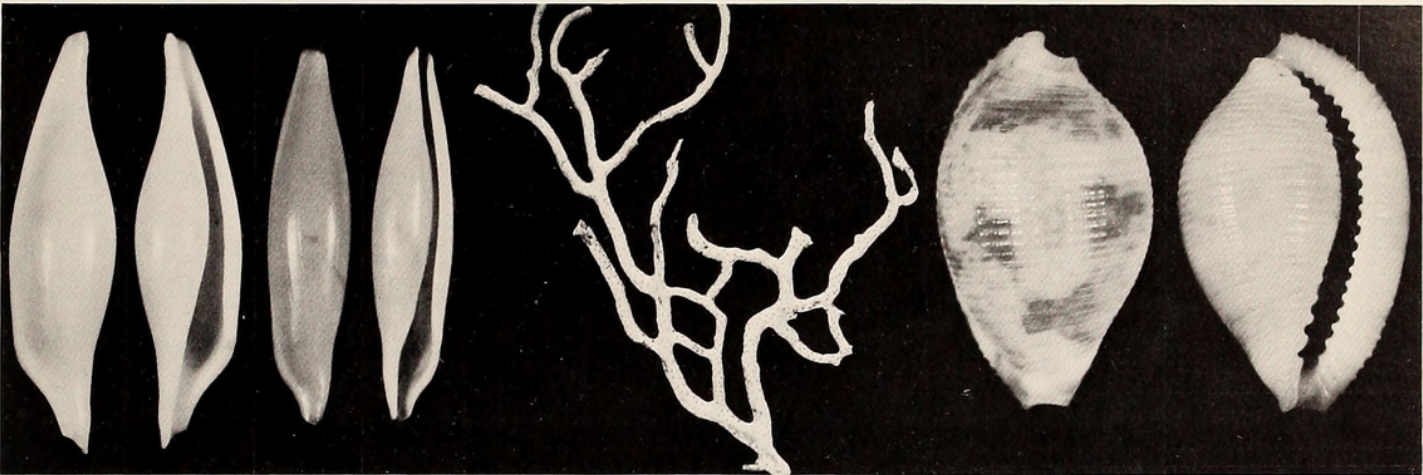


Figure 11

Figure 12

Figure 13

Figure 14

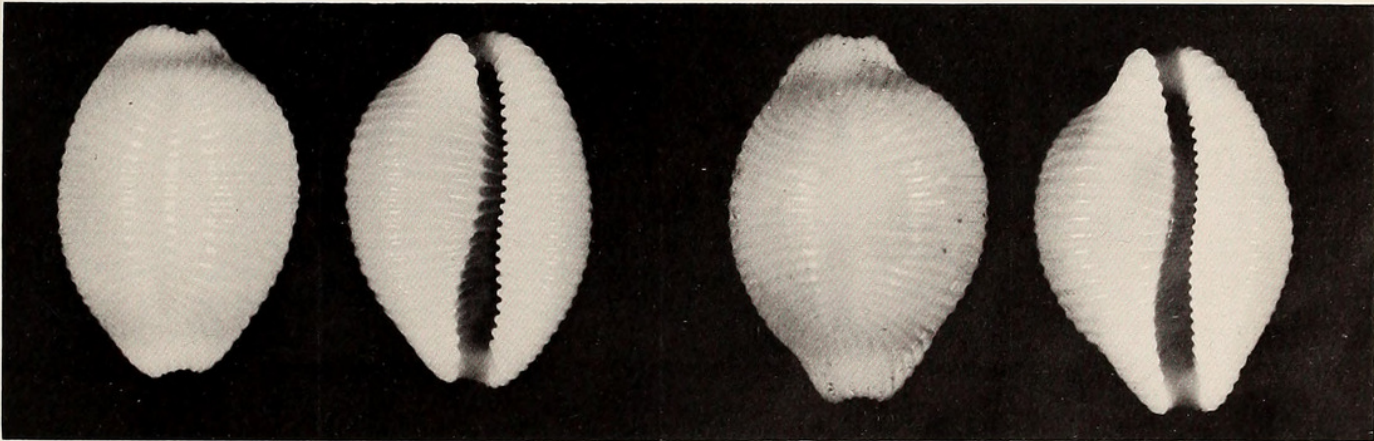


Figure 15

Figure 16

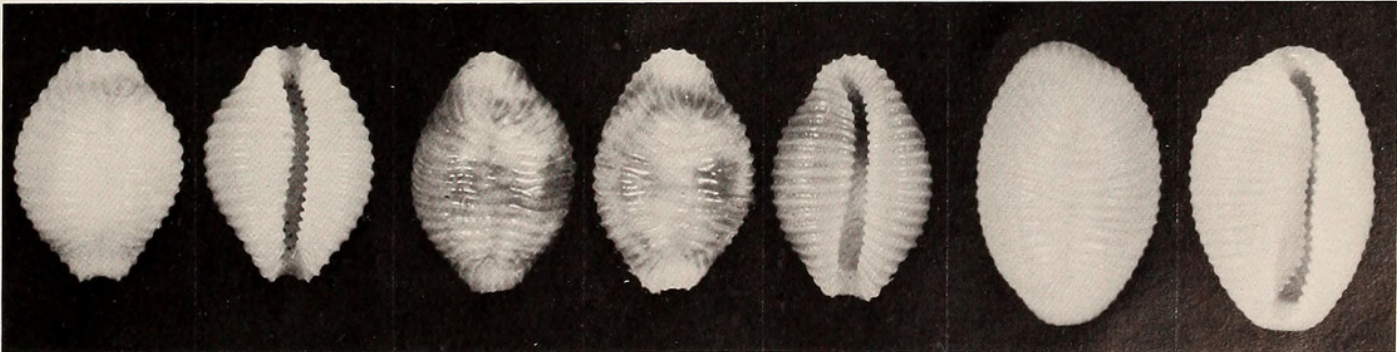
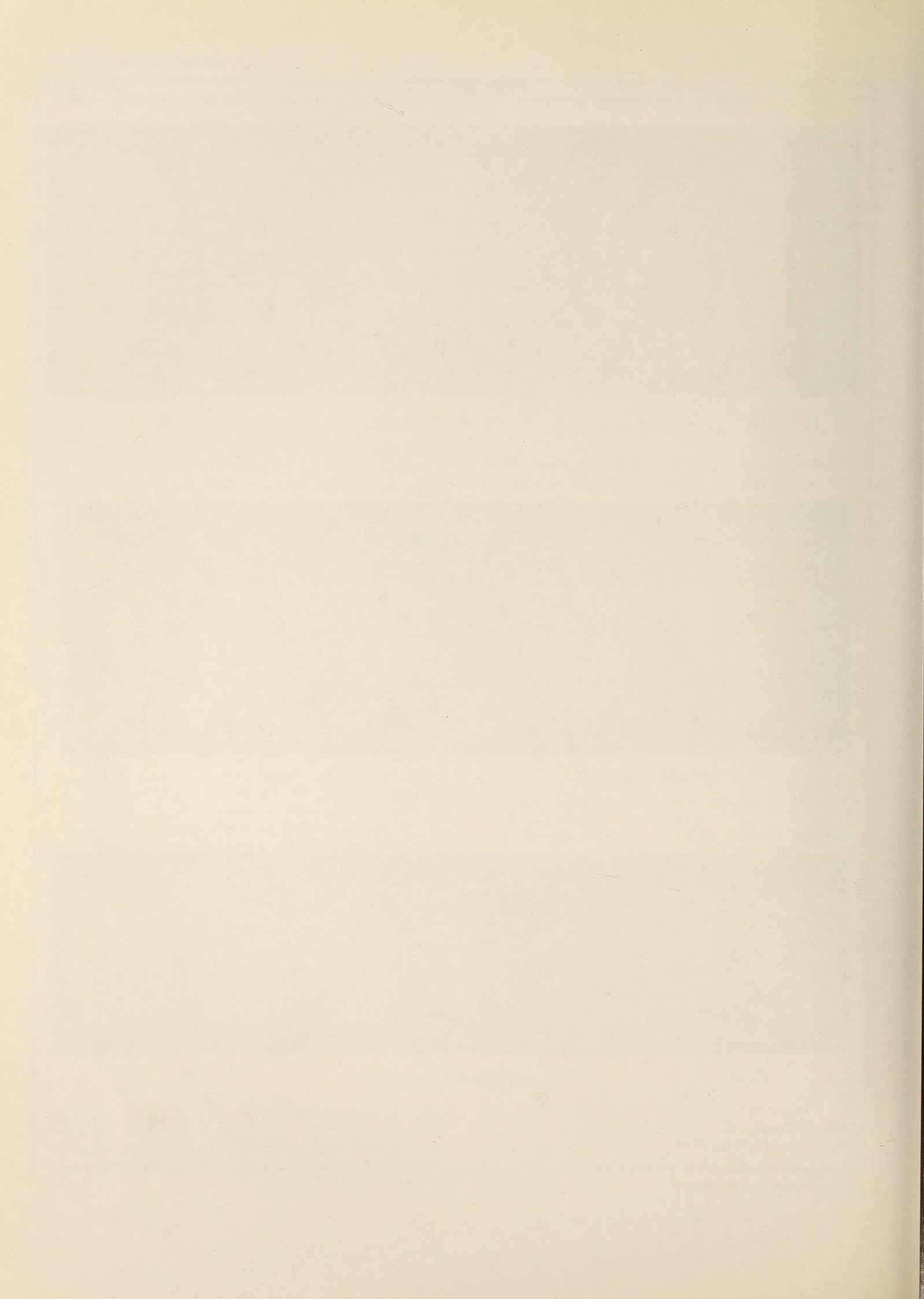


Figure 17

Figure 18

Figure 19



positioned at either side of the cusp; laterals are simple and curved, and a small denticle is positioned centrally on the main cusp; marginals are similar to those of other groups of *Ovulidae*.

Species of *Calpurnus* are associated with soft coral.

Calpurnus (Calpurnus) verrucosus (LINNAEUS, 1758)

(Plate 50, Figures 3, 3 a)

1758. *Bulla verrucosa* LINNAEUS, Syst. Nat., ed. 10, p. 726, no. 330

1798. *Volva perla* RÖDING, Mus. Bolten., p. 22, no. 260

1909. *Calpurnus verrucosus* (LINNAEUS) SCHEPMAN, Siboga Exp., 49b: 146; plt. 15, fig. 10 (radula)

1935. *Calpurnus verrucosus* (LINNAEUS) IREDALE, Aust. Zool., 8: 102; plt. 8, figs. 4, 4 a (animal)

Shell: Angulately ovate and humped, white in colour, extremities flushed with light rose-purple, ornamented with 2 prominent orange-ringed wart-like tubercles. Dorsum with a prominent central transverse carina and numerous fine striae; sides minutely granulose, granules extending partly towards dorsum. Aperture dilated anteriorly, labial lip flattened and with 17-23 prominent teeth which extend towards the margins; columella edentulous, columellar anterior ridge indistinct, fossula shallow and smooth.

Animal: Foot and siphon are white in colour, mantle is smooth, white to greyish-white, spotted with small pink spots over entire mantle surface.

L: 18 - 27 mm; W: 59 - 67%

Type Locality: In India Orientali ("Amboina," IREDALE, 1935).

Habitat: In folds and at the base of soft coral, in shallow and deeper water. — Moderately common.

Distribution: Throughout the Fiji Islands. — From Madagascar through the tropical Indo-Pacific to Japan and the Fiji Islands.

Discussion: In the majority of Fiji specimens examined, the anterior extremity is partly recurved towards the aperture.

(*Procalpurnus*) THIELE, 1929

Procalpurnus THIELE, 1929, Handb. syst. Weichtierk., p. 272. Type species by *M. Ovula lactea* LAMARCK, 1811.

The subgenus, which is monotypic, contains a species which lacks the wart-like nodes at extremities and central dorsal carina. The rhachidians of the radula of the type species of *Procalpurnus* are also dissimilar to those of the type species of *Calpurnus*.

Calpurnus (Procalpurnus) lacteus (LAMARCK, 1811)

(Plate 50, Figure 4)

1811. *Ovula lactea* LAMARCK, Ann. Mus. Hist. Nat., 16: 111

1863. *Amphiperas semistriata* PEASE, Proc. Zool. Soc. London for 1862: 241 ("Pacific Islands")

1935. *Procalpurnus lacteus* (LAMARCK), IREDALE, Aust. Zool. 8: 103; pl. 8, figs. 3, 3 a (animal)

1965. *Amphiperas semistriata* PEASE, KAY, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl. 1: 74; plt. 12, figs. 5, 6 (lecto-type)

Shell: Elongate-ovate to broadly ovate, white in colour; the dorsal carina is obsolete in most specimens, but some specimens show 1 or 2 weak carinae. Dorsum with 20 - 50 transverse striae which are distributed along the entire length of the shell but may become obsolete centrally and confined to the extremities. Labial lip is flattened, teeth

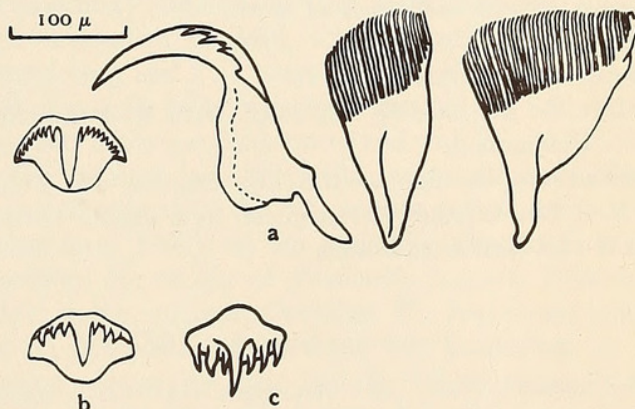


Figure 1

Calpurnus (Procalpurnus) lacteus (LAMARCK)

Fiji Islands

a - Half row of radular teeth

b - Rhachidian of radula (ventral view)

c - (dorsal view)

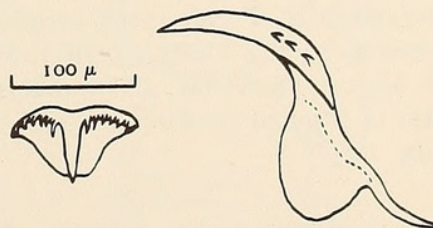


Figure 2

Calpurnus (Procalpurnus) lacteus (LAMARCK)

Pearl Reef, Queensland, Australia

Rhachidian and lateral teeth of radula

prominent, numbering from 20 to 31; columella edentulous, anterior columellar terminal ridge prominent and oblique, fossula smooth.

Animal: Foot blackish-grey, mantle smooth, jet-black and ornamented with small white spots; tentacles black, siphon black and finely ciliated at the distal end.

Radula: The odontophore is 4.6 mm long and 0.68 mm wide in an animal with a shell 17.4 mm in length; fully formed rows of teeth number 138 (plus 14 nascentes) and early rows of teeth are greatly worn. The rhachidian is small, 0.09 mm wide, with a long central cusp and 3 - 9 side-cusps; laterals are large, with a massive main cusp and 3 - 4 side denticles. Inner marginals have *ca.* 18 and outer marginals *ca.* 38 flabellae which are curved and bifid at the distal end.

A specimen from Queensland had a radula 3.9 mm long and 0.7 mm wide and a shell 17.8 mm in length; the rhachidians were 0.1 mm wide and the ribbon contained 132 rows (plus 9 nascentes) of teeth.

L: 12 - 19 mm; W: 54 - 63%

Type Locality: Timor.

Habitat: At the base of soft coral, from 0 - 4 fathoms. Uncommon.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to the Society and Hawaiian Islands.

Prosimnia SCHILDER, 1927

Prosimnia SCHILDER, 1927, Arch. Naturgesch. 91A: 77. Type species by OD *Ovula semperi* WEINKAUFF, 1881 = *Ovulum coarctatum* ADAMS & REEVE, 1848.

The shell of the type species is elongate-cylindrical, the dorsum is carinate and spirally striate, labial lip densely denticulate, columellar lip with short denticles on axis, fossula narrow and denticulate.

The radula of the type species has been described by SCHILDER (1944, p. 32) and was said to be somewhat similar to the radula of *Pseudosimnia carnea* (POIRET, 1789) as figured by THIELE (1929, fig. 287). The radula of *Primovula beckerii* (SOWERBY, 1900) differs appreciably from that of *Prosimnia coarctata* (*vide* BARNARD, 1963, p. 50, fig. 6c).

Prosimnia coarctata (ADAMS & REEVE, 1848)

(Plate 50, Figure 7)

1848. *Ovulum coarctatum* ADAMS & REEVE, Zool. Voy. Sam., p. 21; plt. 6, figs. 2a, 2b

1881. *Ovula semperi* WEINKAUFF, Conch. Cab., ed. 2, 5: 190; plt. 48, figs. 14, 15

1882. *Ovula semperi* WEINKAUFF, Jahrb. Deut. Malakol. Gesellschaft, p. 174 (nom. corr.)

1944. *Primovula coarctata* (ADAMS & REEVE), SCHILDER, Ark. Zool., 36A: 32 (descr. radula)

Shell: Small, slender and cylindrical, orange-brown or orange-fawn in colour, labial margin and labial lip bright yellowish-orange. Dorsum sculptured with a prominent elevated dorsal keel and occasionally 1 - 2 smaller keels; transverse striae vary in thickness and number from 55 to 70 and are intersected by longitudinal growth striae. Labial lip flattened and curved, teeth sharply sculptured but irregular and numbering from 43 to 53, partly extending over the shell-margin; columella denticulate almost along entire length to funiculum, teeth small, numbering from 45 to 50; anterior columellar terminal ridge is absent, first funiculum is crenulate, second funiculum prominent, fossula narrow and projecting, smooth and denticulate.

Animal: Foot light orange, mantle orange to red, siphon and tentacles reddish-orange, eyes black.

L: 11 - 13 mm; W: 31 - 36%

Type Locality: Straits of Sunda, near Java.

Habitat: On red gorgonian coral, from 2 - 3 fathoms. Moderately rare.

Distribution: South and West Viti Levu. - From Madagascar through the tropical Indo-Pacific to Japan and the Fiji Islands.

Primovula THIELE, 1925

Primovula THIELE, 1925, KÜCKENTHAL, Handb. Zool., 5: 88. Type species by OD *Amphiperas beckerii* SOWERBY, 1900.

1961. *Dentiovula* HABE, Col. illust. shells Japan, 2: 41; plt. 19, fig. 1 [Type species by M *D. dorsuosa* (HINDS, 1844)]

1961. *Dentivolva* HABE, Col. illus. shells Japan, 2: App. p. 14 [Type species by OD *D. dorsuosa* (HINDS, 1844)]

1963. *Dentiovula* HABE, SHIKAMA, Sel. shells world, 1: 45; plt. 32, fig. 15 (first reviser)

Shells are small, cylindrical-fusiform, occasionally with a light-coloured central band, a dorsal carina and striae; labial lip flattened, prominently or irregularly denticulate, columella edentulous, labial margin often serrate.

The radula (*fide* BARNARD, 1963) has horizontally egg-shaped rhachidians with a short and stout central cusp and 3 - 4 side denticles; laterals are moderately slender with a main cusp and 4 - 5 accessory denticles on cutting edge; marginals similar to those of other genera of Ovulidae.

Discussion: HABE (1961) established *Dentiovula* on page 41 and later on, on Appendix page 14 described *Denti-*

volva in Japanese. In accordance with art. 32 b of the Code of ICZN (1964), *Dentiovula* is the correct spelling as selected by SHIKAMA (1963), who appears to be the first reviser. The new genus name, however, seems superfluous.

Primovula (Primovula) striatula (SOWERBY, 1828)

(Plate 50, Figure 8)

1828. *Ovulum striatulum* SOWERBY, Zool. Journ., 4: 155
 1830. *Ovulum striatulum* SOWERBY, Spec. Conch., *Ovulum*, 1: 7, fig. 38
 1848. *Ovulum dentatum* ADAMS & REEVE, Zool. Voy. Sam., p. 21; plt. 6, figs. 4 a, 4 b (non *Ovula dentata* FISCHER, 1807)
 1930. *Prosimnia renovata* IREDALE, Mem. Qld. Mus., 10: 85 (nom. nov. pro *Ovula dentata* ADAMS & REEVE, 1848)
 1932. *Prosimnia verconis* COTTON & GODFREY, South Aust. Nat. 13: 46; plt. 1, fig. 15
 1963. *Primovula striata* (sic) SOWERBY, SHIKAMA, Sel. shells world, 1: 45
 1963. *Neosimnia tinctura* GARRARD, Journ. Malacol. Soc. Aust. 7: 45; plt. 7, figs. 5, 6

Shell: Small, cylindrically-fusiform, dark pink in colour with one white central transverse band and pale pink margins and extremities; the dorsum is sculptured with 50 - 60 fine transverse striae and a dorsal carina which may be obsolete. Labial lip is flattened, labial teeth sometimes obsolete anteriorly but reaching margins posteriorly, numbering from 25 to 28; in some specimens the labial teeth are very large and reach as far as the outlets. Anterior columellar terminal ridge is obsolete, first funiculum with 3 - 5 denticles, second funiculum pronounced or indistinct, interior of columella finely striate, fossula excavate and smooth.

L: 7 - 9 mm; **W:** 35 - 39%

Type Locality: Ad littora Oceani Indici; East Indies [= Indonesia].

Habitat: Dredged from 15 - 18 fathoms on coral. Rare.

Distribution: West off Viti Levu. - From the Persian Gulf through the tropical Indo-Pacific to Japan and the Fiji Islands.

Discussion: Fiji specimens are more slender in comparison with specimens from other regions (W: 41 - 49%). The species is extremely variable in colour, some specimens being purplish-pink or purple; for further notes on the species see SCHILDER, 1964.

(*Diminovula*) IREDALE, 1930

Diminovula IREDALE, 1930, Mem. Qld. Mus., 10: 85. Type species by OD *D. verepunctata* IREDALE, 1930 = *Ovula punctata* DUCLOS, 1831

1935. *Margovula* IREDALE, Aust. Zool., 8: 103 (nom. nud.)

1939. *Margovula* SCHILDER, Arch. Molluskenk., 71: 200 (Type species by OD *M. pyriformis* (SOWERBY, 1828))

Species of the subgenus are characterized by their small pyriform shells and somewhat produced extremities; the dorsum is smooth or striate, unicoloured or spotted, labial teeth are developed, columellar teeth obsolete; first funiculum distinct, crenulate or smooth, fossula smooth and concave.

The radula of the type species was not available, but the radula of *Diminovula bimaculata* (A. ADAMS, 1855) from Queensland was examined; this species has essentially similar morphological features as the type species, and has been assigned by SCHILDER (1941) and other authors to *Diminovula*. The radular ribbon was 6.6 mm long and 0.9 mm wide in an animal with a shell 13.5 mm in length; the ribbon contained 111 rows of teeth (plus 12 nascentes) and early rows of teeth were greatly worn. The rhachidian is small, 0.17 mm wide, with a long central cusp and 2 - 3 cusps at either side; laterals large and unicuspid, inner marginals slender and with ca. 12 flabellae, outer marginals broad and with 21 - 23 flabellae.

The radula is basically similar to the radula of *Ovula angasi* REEVE, 1865, the type species of *Pellasiimnia* (vide SCHEPMAN, 1909), in the subfamily Simniinae; it also resembles the radula of *Primovula beckerii* (SOWERBY, 1900) in the subfamily Ovulidae. The laterals are unicuspid in *Diminovula bimaculata*, but denticulate on the cutting edge of the main cusp in *Pellasiimna angasi* and *Primovula beckerii*; this feature, however, is a variable characteristic in other taenioglossate radulae, e.g. in Cymatiidae and Bursidae.

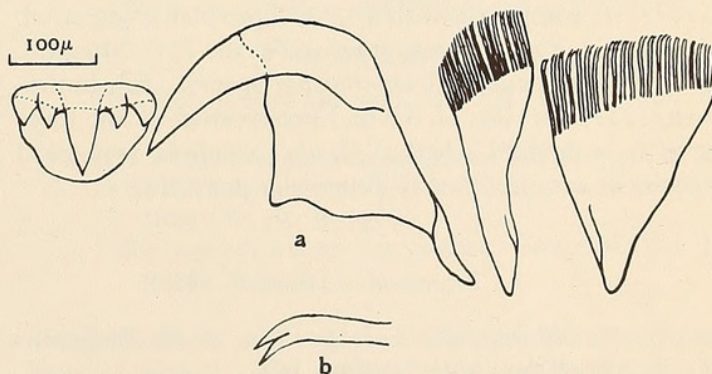


Figure 3

Primovula (Diminovula) bimaculata (A. ADAMS)

- a - Half row of radular teeth
 b - Distal end of flabella (enlarged)

Primovula (Diminovula) punctata (DUCLOS, 1831)

(Plate 50, Figure 5)

1831. *Ovula punctata* DUCLOS, Mag. de Zool., 1: 7; plt. 7, fig. 11930. *Diminovula verepunctata* IREDALE, Mem. Qld. Mus., 10: 851932. *Primovula (Diminovula) cristallina* (KIENER), SCHILDER, Proc. Malacol. Soc. London, 20: 51; plt. 3, figs. 2, 3, 4 (? non KIENER, 1843)

Shell: Small and pyriform, extremities slightly produced; white to creamy-white in colour, generally ornamented with 3 pairs of white spots on dorsum. Some specimens have additional orange transverse lines descending onto the margins from the anterior and posterior pair of spots, and an orange line follows the periphery of the labial margin; extremities are tinged with light yellow. The dorsum is sculptured with 25 - 60 fine transverse striae; labial lip is convex, labial teeth are irregular but prominent, numbering from 19 to 28. The anterior terminal ridge is well developed, columella edentulous, first funiculum projecting and rounded at end, sculptured with 4 - 7 irregular denticles; first posterior outlet is shallow, second funiculum and outlet are obsolete. Fossula is concave and smooth, interior of columella smooth or striate. L: 6 - 11 mm; W: 57 - 65%

Type Locality: I. Bourbon [= Réunion Island, Indian Ocean]

Habitat: Under coral rocks, in shallow and deeper water. Moderately rare.

Distribution: North and Southwest Viti Levu. - From East Africa through the tropical Indo-Pacific to Japan and the Fiji Islands.

Discussion: The *Primovula cristallina* of SCHILDER (1932) is conspecific with *P. punctata*. The holotype of *Ovula cristallina* KIENER, preserved in the Paris Museum, is a worn and calcified *Diminovula* species (*fide* SCHILDER, 1932); in view of the bad preservation of the holotype it is doubtful whether *Ovula cristallina* is a good species or conspecific with *Primovula punctata*.

Prionovolva IREDALE, 1930

Prionovolva IREDALE, 1930. Mem. Qld. Mus., 10: 85. Type species by OD *Ovulum breve* SOWERBY, 1828

1941. *Prionovola* (sic) SCHILDER, Arch. Molluskenk. 73: 1171964. *Prionovola* (sic) CERNOHORSKY, The Veliger 6: 200

The genus contains ovate to pyriform shells which are either banded or unicoloured; the dorsum is smooth, but spirally striate at extremities, labial teeth are irregular but prominent, columella is edentulous. The genus differs

from *Primovula* in the prominently projecting smooth funiculum and columellar carina.

Prionovolva fruticum (REEVE, 1865)

(Plate 50, Figure 6)

1865. *Ovulum fruticum* REEVE, Conch. Icon., *Ovulum*, 15, plt. 4, sp. 16 a, 16 b

Shell: Elongate-ovate, white to pinkish-white in colour, ornamented with 3 - 4 dark pink transverse bands; margins and base are white. The dorsum lacks a dorsal carina, and is sculptured with 8 - 30 transverse striae which are generally confined to the extremities; labial lip is flattened, teeth sharply sculptured, numbering from 19 to 25; some of the labial teeth (*ca.* 2 - 7) extend towards the margin which becomes serrate. Aperture dilated anteriorly, columella edentulous and with a sharp columellar carina, anterior columellar terminal ridge prominent; first funiculum prominent, smooth and projecting, second funiculum absent, fossula short and concave.

L: 10 - 15 mm; W: 52 - 59%

Type Locality: Malacca.

Habitat: Dredged from 10 - 18 fathoms on coral. Moderately rare.

Distribution: West Viti Levu. - From East Africa through the tropical Indo-Pacific to Japan and the Fiji Islands.

Discussion: The dorsal spiral striae are generally confined to the extremities, but may extend across the dorsum, becoming somewhat obsolete centrally. One specimen showed 3 distinct dorsal transverse breaks, while another was rather angulate and had orange extremities and a marginal peripheral line.

Simniinae SCHILDER, 1927

1932. *Volvinæ* SCHILDER, Proc. Malacol. Soc. London, 20: 47 (as *Volvini*)1956. *Volvinæ* ALLAN, Cowry shells of world seas, p. 1261958. *Volvinæ* COTTON, Journ. Malacol. Soc. Austral., 2: 11

Species of Simniinae have elongate-fusiform and depressed shells with produced extremities, shells are unicoloured, occasionally with a median band, smooth or transversely striate; a dorsal carina is obsolete or absent. The columella lacks the anterior terminal ridge, labial teeth are obsolete or absent, columella edentulous, fossula either narrow or absent. The radula is similar to that of the *Ovulinae*.

Species of Simniinae are associated with reef-dwelling gorgonians and alcyonarians, and sometimes adopt the

colour of the host coral; the majority of species is confined to deeper water.

Volva RÖDING, 1798

Volva RÖDING, 1798, Mus. Bolten., p. 21. Type species by T *Bulla volva* LINNAEUS, 1758.

1810. *Radius* MONTFORT, Conch. Syst., 2: 626 (Type species by OD *Bulla volva* LINNAEUS, 1758)

1840. *Birostra* SWAINSON, Treat. Malacol., p. 325 (Type species by OD *Bulla volva* LINNAEUS, 1758)

Shells are pyriform, inflated, extremities greatly produced, dorsum spirally striate; labial lip convex, labial teeth absent or obsolete, columella edentulous, fossula absent.

The radula of the type species (*vide* BARNARD, 1963) has roundly pentagonal rhachidians with a moderately short central cusp and a small accessory denticle at either side; the laterals have a large main cusp and one side cusp on the cutting edge, and a large and slender basal peg; marginals comb-like and similar to those of other genera of Ovulidae.

Volva volva (LINNAEUS, 1758)

(Plate 50, Figures 9, 9a)

1758. *Bulla volva* LINNAEUS, Syst. Nat., ed. 10, p. 725, no. 328

1798. *Volva textoria* RÖDING, Mus. Bolten., p. 22, no. 259

1811. *Ovula striata* LAMARCK, Ann. Mus. Hist. Nat., 16: 113 ("Coast of Brazil" – erroneous)

1931. *Volva volva cumulata* IREDALE, Rec. Aust. Mus., 18: 222 (nom. nud.)

1935. *Volva volva cumulata* IREDALE, Aust. Zool., 8: 104

1937. *Volva volva surabajensis* SCHILDER, Ing. Ned. Indie, 4: 205 (fossil from Soerabaja)

1941. *Volva (Volva) volva lemurica* SCHILDER, Arch. Molluskenk. 73: 110 (nom. nov. pro *V. volva* var. MELVILL, 1909)

1961. *Volva volva habeii* OYAMA, Venus : Japan. Journ. Malacol., 21: 288; text figs. 3, 4

1963. *Volva volva* (LINNAEUS), BARNARD, Ann. South Afr. Mus., 47 (1): 56; fig. 6d (radula)

Shell: Large and fusiform, inflated centrally, extremities produced into long and slender canals; pinkish-white in colour, margins white, interior of aperture yellowish-brown. Sculptured with ca. 80 transverse striae which become obsolete centrally on dorsum; outer lip convex, ornamented with ca. 14 very obsolete blunt denticles, columella edentulous. Anterior terminal ridge, first funiculum and posterior outlet absent, second funiculum projecting, fossula absent.

Juvenile shells are white in colour, fragile, extremities are greatly produced and slender, and the transverse striae appear as distinct elevated cords on the dorsum.

L: 77–85 mm; W: 28–30%

Type Locality: Ad Jamaicam (Error) ["Ceylon," IREDALE, 1935]

Habitat: In 15 fathoms, on coral rubble and sand substratum. Rare.

Distribution: North and West Viti Levu. – From East Africa through the tropical Indo-Pacific to Japan and the Fiji Islands.

Phenacovolva IREDALE, 1930

Phenacovolva IREDALE, 1930, Mem. Qld. Mus., 10: 85. Type species by OD *P. nectarea* IREDALE, 1930 = *Bulla birostris* LINNAEUS, 1767

1817. *Radius* SCHUMACHER, Ess. nouv. syst., p. 259 (Type species by M R. *brevirostris* SCHUMACHER, 1817 = *Bulla birostris* LINNAEUS, 1767) [non MONTFORT, 1810]

1956. *Phenacolepas* (sic) IREDALE, ALLAN, Cowry shells of world seas, p. 134 [non PILSBRY, 1891]

Shells are moderately small, slender and fusiform, with shorter extremities than in *Volva* s. str.; dorsum smooth or striate, unicoloured or with a light coloured median band. Labial and columellar lips edentulous, fossula absent.

The radula of *Phenacovolva aurantia* (SOWERBY, 1889) [= ? *P. birostris* (LINNAEUS, 1767) or *P. sowerbyana* (WEINKAUFF, 1881)] as figured by BARNARD (1963), is dissimilar to the radula of *Volva* s. str. The rhachidians are triangular, the central cusp is solid but short and flanked by moderately solid side cusps; the laterals and marginals are similar to those of *Volva volva* (LINNAEUS).

Phenacovolva contains a compact group of Recent species which appear to be separable from *Volva* on the basis of shell morphology and radula features.

Phenacovolva birostris (LINNAEUS, 1767)

(Plate 50, Figure 10)

1767. *Bulla birostris* LINNAEUS, Syst. Nat., ed. 12, p. 1182, no. 371

1817. *Radius brevirostris* SCHUMACHER, Ess. nouv. syst., p. 259

1855. *Volva rosea* A. ADAMS, Proc. Zool. Soc. London for 1854: 130; plt. 28, fig. 9

1930. *Phenacovolva nectarea* IREDALE, Mem. Qld. Mus. 10: 85; plt. 9, fig. 6

Shell: Fusiform and rostrate, dark pink in colour, ornamented with a white median transverse band; margins white, extremities brown. Dorsum without a carina, sculptured with ca. 50 transverse striae across dorsum; aperture dilated anteriorly. Labial lip flattened and curved, teeth very obsolete and numbering ca. 20 in the Fiji specimen; anterior columellar terminal ridge absent, first funiculum obsolete, second funiculum projecting and

sculptured with 4 denticles. Interior of columella finely striate, second posterior outlet prominent, fossula absent. L: 20.0 mm; W: 22%

Type Locality: Ad Javam.

Habitat: Dredged in 15 fathoms on coral. — Rare.

Distribution: From Indonesia to Japan and the Fiji Islands.

Discussion: SCHILDER (1966a) pointed out that the type specimen of LINNAEUS' *Bulla birostris* is the same species as *Radius brevirostris* SCHUMACHER, and that the *Volva birostris* auctt. is the species *V. longirostrata* (SOWERBY, 1828). The presence of both species among the types of *Bulla birostris* in the Linnean collection was responsible for the confusion.

The species is known from Fiji from one complete and one partially broken specimen; both, however, are more slender than the usual specimens of *Phenacovolva birostris*, and are also striate across the dorsum along its entire length.

Phenacovolva gracilis (ADAMS & REEVE, 1848)

(Plate 51, Figure 11)

1848. *Ovulum gracile* ADAMS & REEVE, Zool. Voy. Sam., p. 22; plt. 6, figs. 11 a, 11 b, 11 c

Shell: Fusiform and rostrate, pinkish-white in colour, generally with a white median transverse band; an orange coloured line encircles the margins. Dorsum sculptured with ca. 70 transverse striae which become somewhat obsolete centrally. Labial lip convex and curved, ornamented with 15 very obsolete denticles; first funiculum absent, second funiculum projecting, sculptured with 5 denticles; interior of columella finely striate, fossula absent.

L: 20.0 mm; W: ? 26%

Type Locality: East coast of Borneo.

Habitat: Dredged in 15 fathoms on coral rubble substrate. Rare.

Distribution: West off Viti Levu. — From Indonesia to Japan and the Fiji Islands.

Discussion: A small portion of the extremities in the Fiji specimen is missing and the width ratio of 26% appears

therefore somewhat inflated. This species is rather similar to *Phenacovolva birostris* and differs mainly in colouring, the convex labial lip and more dilated aperture. SCHILDER (1932) states that the labial lip of *P. gracilis* is edentulous, but in the Fiji specimen the labial denticles are obsolete, but can nevertheless be counted.

(*Pellasimnia*) (IREDALE, 1931, *nud.*)

SCHILDER, 1939

Pellasimnia SCHILDER, 1939, Arch. Molluskenk. 71: 195. Type species by OD *Ovulum angasi* REEVE, 1865

1931. *Pellasimnia* IREDALE, Rec. Aust. Mus., 18: 222 (nom. nud.)

1939. *Pellasimnia* SCHILDER, Arch. Molluskenk., 71: 195 (first valid description)

Shells of the subgenus are fusiform with pointed extremities, smooth and lack a dorsal carina; dorsum is unicoloured, extremities with or without dark stains. Labial lip reflexed, teeth generally obsolete, columella edentulous, fossula narrow.

The radula of the type species (*vide* SCHEPMAN, 1909) differs in features from those of other genera of Simniinae. The rhachidians are somewhat quadrate, the central cusp is broad and long, and is flanked by two accessory denticles at either side.

Phenacovolva (Pellasimnia) philippinarum
(SOWERBY, 1849)

(Plate 51, Figure 12)

1849. *Ovulum philippinarum* SOWERBY, Proc. Zool. Soc. London, 16: 136

1877. *Volva carpenteri* DUNKER, Malakol. Blätter, 24: 75

1877. *Volva adamsii* DUNKER, Malakol. Blätter, 24: 75

1882. *Radius carpenteri* DUNKER, Ind. Moll. Mar. Jap., p. 102; plt. 13, figs. 1, 2

1882. *Radius adamsii* DUNKER, Ind. Moll. Mar. Jap., p. 102; plt. 13, figs. 3, 4

1889. *Ovulum (Birostra) haynesi* SOWERBY, Journ. Lin. Soc. London, 20: 397; plt. 25, figs. 1, 2

1909. *Amphiperas (Radius) philippinarum* (SOWERBY), SCHEPMAN, Siboga Exp., 49b: 144; plt. 15, fig. 6 (radula)

Explanation of Plate 52

Figures 20 and 20 a: *Trivirostra producta* (GASKOIN). Fiji.
(x 3.2 and 3.0, respectively)

Figure 21: *Trivirostra pellucidula* (REEVE). Fiji. (x 5.0)

Figure 22: *Lachryma sulcifera* (SOWERBY). Fiji, granulose specimen. (x 8.0)

Figure 22 a: *Lachryma sulcifera* (SOWERBY). Fiji, smooth specimen (x 8.0)

Figure 23: *Primovula margarita* (SOWERBY). Holotype, B. M. N. H. Reg. No. 1967613/1. Length: 13.8 mm (holed).

Figure 24: *Primovula margarita* (SOWERBY). Paratype B. M. N. H. Reg. No. 1967613/2. Length 8.2 mm

Figure 25: *Primovula margarita* (SOWERBY). Paratype B. M. N. H. Reg. No. 1967613/3. Length 12.1 mm (holed).

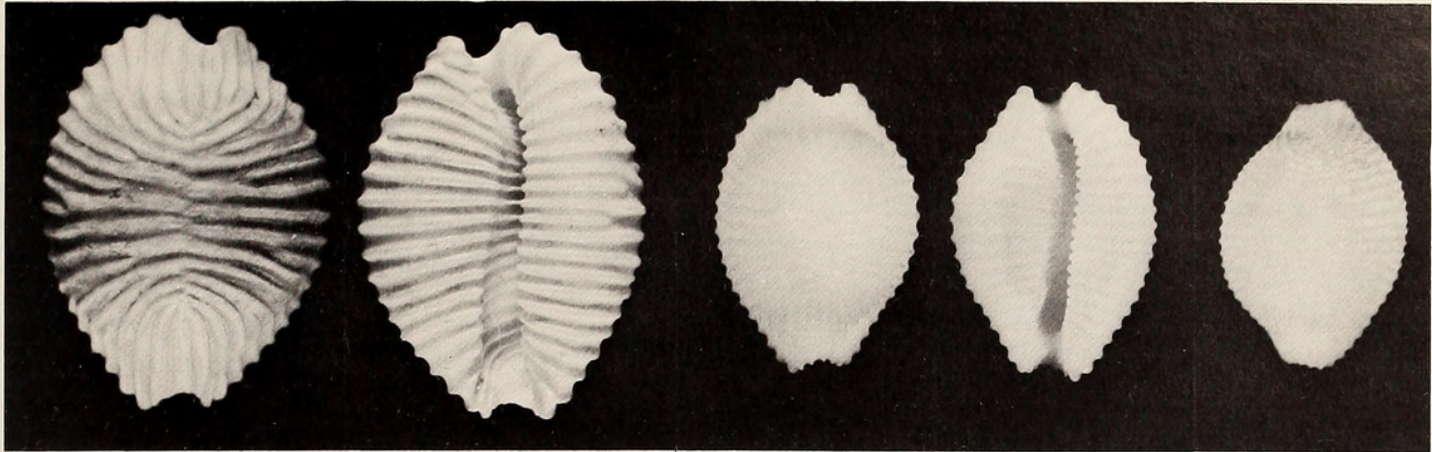


Figure 20

Figure 20 a

Figure 21

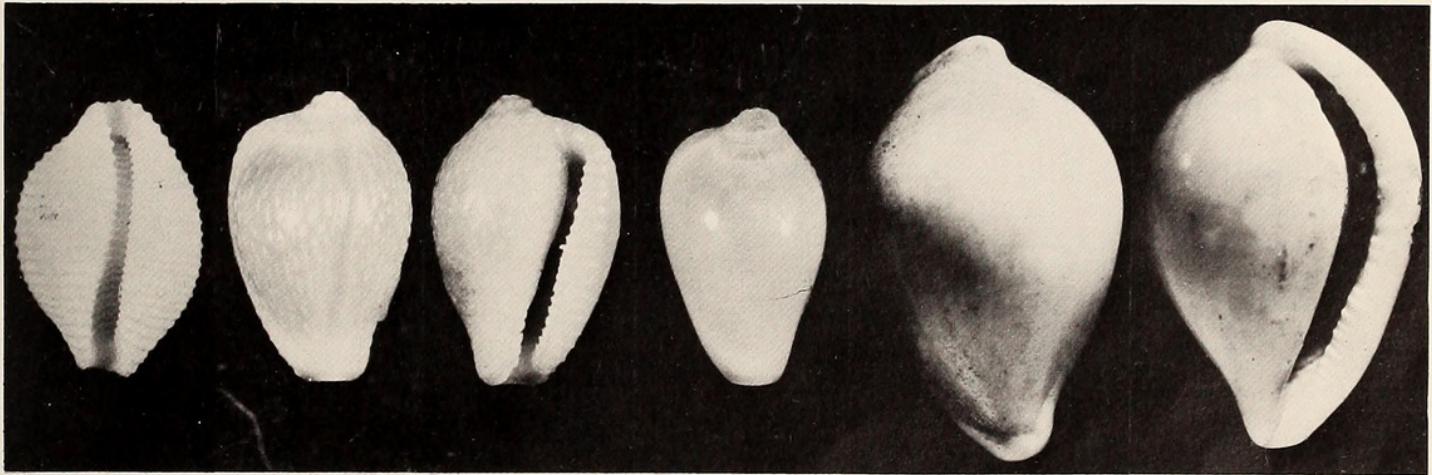


Figure 21 a

Figure 22

Figure 22 a

Figure 23

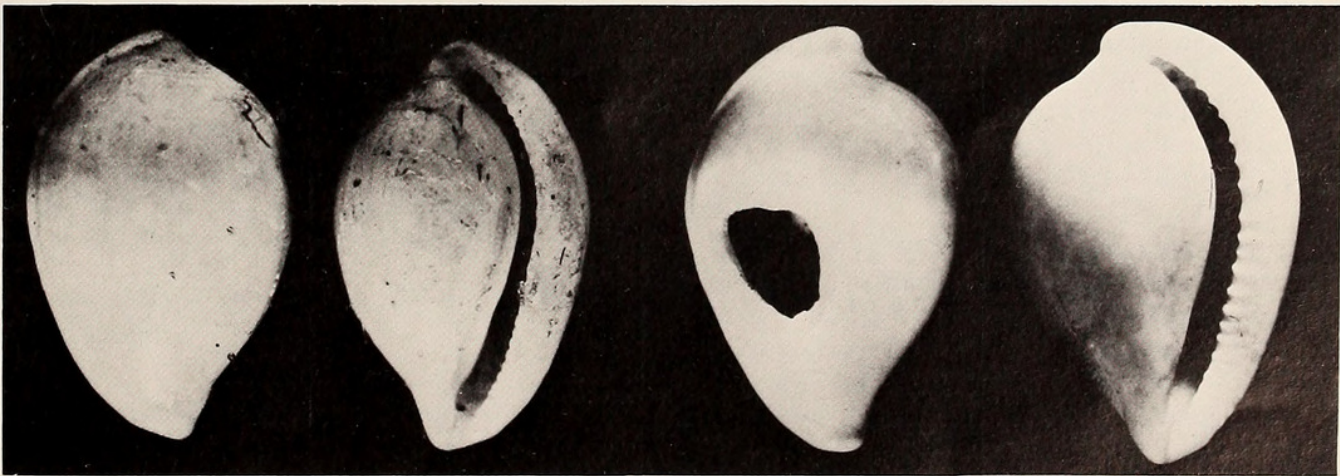
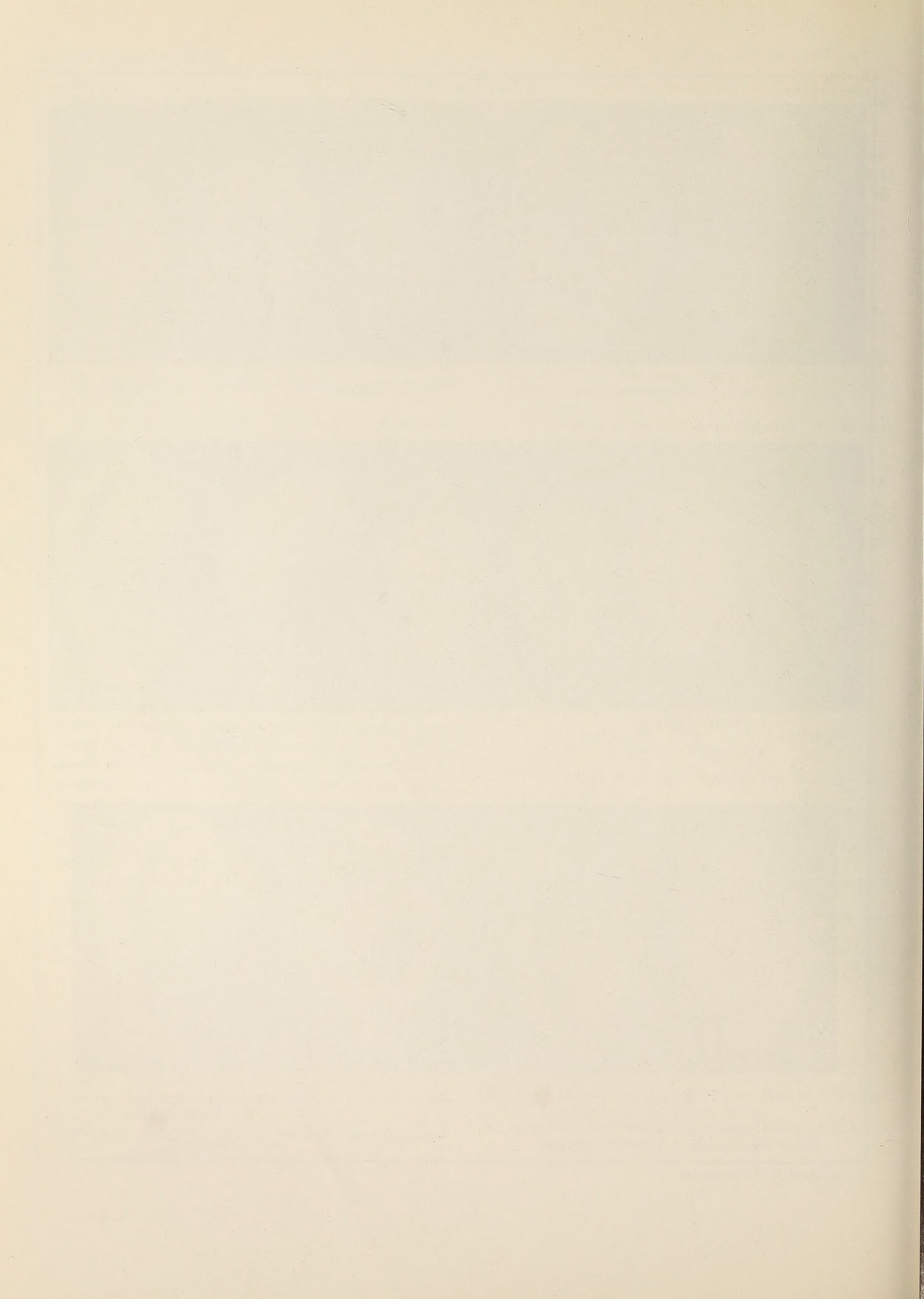


Figure 24

Figure 25



Shell: Elongate-fusiform, striate at extremities, dorsal carina absent; dorsal colour salmon-pink, labial margin light pink, basal colour pinkish-white, extremities dark brown. Labial lip flattened and smooth, anteriorly somewhat recurved, anterior columellar terminal ridge and first funiculum absent, second funiculum moderately projecting, second posterior outlet prominent, fossula absent. L: 33.0 mm; W: 21%

Type Locality: Philippines.

Habitat: On small, black-spotted coral, in shallow water. Rare.

Distribution: South Viti Levu. – From Indonesia to Japan and the Fiji Islands.

Eocypraeinae SCHILDER, 1924

1929. Jenneriinae THIELE, Handb. syst. Weichtierk., p. 269

1939. Sulcocypraeinae SCHILDER, Arch. Molluskenk., 71: 191

Species of Eocypraeinae are characterized by pyriform to ovate shells which are either smooth, transversely ribbed or pustulose; teeth on both lips are well developed, aperture is narrow, columella is ungrooved and the fossula is smooth.

The radulae of living species differ appreciably from those of other families of Cypraeacea. The laterals are broad, with numerous long and slender cusps; marginals are slender and have fewer cusps than have species of Ovulinae. There is an additional smaller edentulous plate which connects the laterals with the marginals; a similar connecting plate is present in the radula of Pediculariidae.

The subfamily contains numerous fossil species but only 2 living relics, i. e. the Indo-Pacific *Pseudocypraea adamsonii* (SOWERBY, 1832) and the West American *Cypropterina pustulata* (LIGHTFOOT, 1786). Living species of Eocypraeinae inhabit crevices and the underside of coral rocks.

Pseudocypraea SCHILDER, 1927

Pseudocypraea SCHILDER, 1927, Arch. Naturgesch., 91A: 71. Type species by OD *Cypraea adamsonii* SOWERBY, 1832

The genus is monotypic and contains only the one Recent Indo-Pacific species.

Pseudocypraea adamsonii (SOWERBY, 1832)

(Plate 51, Figure 14)

1832. *Cypraea adamsonii* SOWERBY, Conch. Illust., Cat. Cyp., p. 11, figs. 7, 7a

1879. *Cypraeovula adamsonii* GRAY, GARRETT, Journ. Conch., 2: 121 (animal description)

1929. *Pseudocypraea adamsonii* (SOWERBY), THIELE, Handb. syst. Weichtierk., p. 270, fig. 285 (radula)

1961. *Pseudocypraea adansonii* (sic) (SOWERBY), HABE, Col. illust. shells Japan, 2: 41; plt. 19, fig. 2

Shell: Small and pyriform, whitish in colour, ornamented with 4 - 5 brown spots on dorsum which are generally arranged in 3 zones, and orange-brown transverse streaks on labial margin. Dorsum sculptured with 35 - 40 coarse and flat dorsal transverse cords. Columellar margin rounded, aperture narrow, base convex, labial teeth strong and produced to margin, numbering from 19 to 23; columellar teeth thickened at aperture, extending to margin, numbering from 18 to 20, interior of columella striate.

L: 8 - 10 mm; W: 58 - 62%

Type Locality: Mauritius.

Habitat: Under coral rocks, in shallow water. – Rare.

Distribution: South Viti Levu. – From Mauritius through the tropical Indo-Pacific to Japan, Fiji and the Tuamotu Archipelago.

Discussion: SCHILDER (1941) does not report the species from the Indian Ocean. I have seen a specimen from Mauritius (coll. E. Couacaud) which appears to confirm the correctness of SOWERBY's type locality.

PEDICULARIIDAE H. & A. ADAMS, 1854

The family contains a group of species with small cap-shaped, unicoloured shells with a flaring margin, striate dorsum with minutely granulose interstices, sharply edged lips and a projecting or covered spire. Juvenile shells are, however, subglobular with a projecting spire and denticulate lips.

The radula is similar to that of Eocypraeinae (Ovulidae); the rhachidians are roughly rectangular, the central cusp is moderately long and flanked by 4 - 7 side denticles; laterals are strong, main cusps large, with 3 - 4 denticles on the cutting edge; marginals are slender and have 2 - 4 finger-like cusps and a shorter claw-like cusp at either side.

Pediculariidae are sessile on stylasterid corals, and their shell-margins correspond to the general outline of the host coral on which they live, and also approximate it in colouring. Representatives of Pediculariidae are found in all major seas.

Discussion: SWAINSON (1840) established *Pedicularia* with the Mediterranean *P. sicula* SWAINSON, 1840, as type species. *Pediculariella* THIELE, 1925, was created for the Californian species *Pedicularia californica* NEWCOMB, 1864. IREDALE (1935) introduced *Pediculariona* for the Australian species *Pedicularia stylasteris* HEDLEY, 1903,

because the shells "superficially differ." Pediculariidae contain only 10 species, some being possible synonyms; they are so similar that some species are being separated on the basis of the number of striations. SCHILDER (1944) found the radula of the Pacific *Pedicularia pacifica* PEASE, 1865, to be similar to the radula of the Mediterranean *P. sicula* SWAINSON, as figured in THIELE (1929). The shells, anatomy and radula features of the 10 Recent species of Pediculariidae are all so basically alike that one would tend to question the taxonomic value of 2 genera created on a geographic basis alone. So far only one fossil species has been recorded: *P. deshayesiana* SEGUENZA, 1865.

Pedicularia SWAINSON, 1840

Pedicularia SWAINSON, 1840, Treat. Malac., pp. 244, 357. Type species by M *P. sicula* SWAINSON, 1840

1844. *Thyreus* PHILIPPI, Enum. Moll. Sic. 2: 92 (Type species by M *T. paradoxus* PHILIPPI, 1844 = *Pedicularia sicula* SWAINSON, 1840)

1863. ? *Dentiora* PEASE, Proc. Zool. Soc. London, p. 240 (Type species by M *D. rubida* PEASE, 1863 = spec. juv. *Pedicularia pacifica* PEASE, 1865)

1925. *Pediculariella* THIELE, KÜCKENTHAL, Handb. Zool., 5: 88 (Type species by OD *Pedicularia californica* NEWCOMB, 1865)

1935. *Pediculariona* IREDALE, Aust. Zool., 8: 101 (Type species by OD *Pedicularia stylasteris* HEDLEY, 1903 = *P. pacifica* PEASE, 1865)

The genus contains only 9 - 10 species which have a world-wide distribution. One cannot describe morphological or anatomical differences between genera or subgenera where such do not exist. SCHILDER (1939) in his diagnosis of genera of Pediculariidae comments: "Unterschiede unsicher; Anatomie abweichend."

Pedicularia pacifica PEASE, 1865

(Text figure 4)

1863. ? *Dentiora rubida* PEASE, Proc. Zool. Soc. London for 1862: 240 (spec. juv.?)

1865. *Pedicularia pacifica* PEASE, Proc. Zool. Soc. London, p. 516

1868. *Pedicularia pacifica* PEASE, Amer. Journ. Conch., 4: 96; plt. 11, figs. 17, 18

1903. *Pedicularia stylasteris* HEDLEY, Mem. Aust. Mus., 4: 342, figs. 69, 70

1944. *Pedicularia pacifica* PEASE, SCHILDER, Ark. Zool. 36A: 29 - 31 (animal, radula, veligers)

1965. *Pedicularia pacifica* PEASE, KAY, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl., 1: 84; plt. 14, figs. 13, 14 (lectotype 6 x 3 mm)

Shell: Small, irregularly ovate or oblong-ovate, reddish-pink to purple in colour. Dorsum sculptured with numerous concentric ribs and intersecting striae which are alternately coarse and fine. Aperture wide open, margins sharply edged, teeth obsolete in adult specimens; spire visible and clathrate or concealed.

L: 5.5 - 6.2 mm.

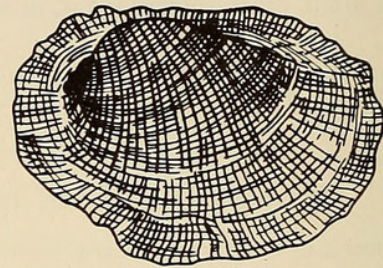


Figure 4

Pedicularia pacifica PEASE
(after SCHILDER, 1931)

Type Locality: Central Pacific (Apaian Island, PEASE, 1868) [= Abaiang Island, Gilbert Islands]

Habitat: Unknown (sessile on coral, *fide* SCHILDER, 1931).

Discussion: The species is known from only 2 beach-worn and partly broken specimens; being unsuitable for photography, a drawing of the species is given from SCHILDER, 1931.

The species has occasionally been reported from the Hawaiian Islands, but according to KAY (1965) it does not live there.

TRIVIIDAE TROSCHEL, 1863

1927. ERATOIDAE SCHILDER, Arch. Naturgesch. 91: 1 (as Eratoinae)

1932. ERATOIDAE SCHILDER, Proc. Malacol. Soc. London, 20: 46

Shells of Triviidae are moderately small or very small, ovate, round and inflated, sometimes biconical, unicoloured, spotted or banded; they are smooth or sculptured with transverse ribs, granules and a dorsal groove. The spire is covered or projecting, aperture wide or narrow, lips denticulate.

The animals of Eratoinae have an open siphon, i.e. grooved, whereas animals of the Triviinae have a closed, tube-like siphon; in other respects they approximate the animals of Cypraeidae. The rhachidians of the radula are either quadrate or trapezoidal, with a larger central cusp and up to a dozen side denticles; laterals are hook-

like, simple, and with or without denticles on the cutting edge; marginals are claw-like, inner marginal occasionally with a small denticle.

Triviidae have a world wide distribution and range farther into colder waters than the Ovulidae. Tropical Triviidae share the same habitat with the Cypraeidae; they are reef-dwellers and live in crevices or on the under-side of coral blocks.

Discussion: SCHILDER (1933) pointed out that the anatomy of Eratoinae hardly differs from that of the Triviinae, and that the radulae are almost identical. All indications are that Eratoinae and Triviinae are closely related, the Eratoinae being the more primitive group of Triviidae from which Recent Triviinae have diverged.

Triviinae TROSCHEL, 1863

1932. Eratoinae SCHILDER, Proc. Malacol. Soc. London, 20: 46

Species of Triviinae have ovate or round, inflated shells which are unicoloured or spotted; the transverse dorsal ribs, which may or may not be interrupted by a dorsal groove, extend onto the base and into the aperture; the dorsal ribs are occasionally noded near the dorsal groove. The spire is generally covered in adult specimens, aperture is linear and sometimes wide, and both lips are denticulate; the columella generally extends deep into the aperture.

Triviinae have a world wide distribution and live in the intertidal zone and in deeper water.

Trivirostra JOUSSEAUME, 1884

Trivirostra JOUSSEAUME, 1884, Bull. Soc. Zool. France, 9: 100. Type species by SD (ROBERTS in TRYON, 1885) *Cypraea scabriuscula* GRAY, 1827 = ? *Cypraea oryza* LAMARCK, 1811

Shells small, generally ovate, white in colour; transversely ribbed, dorsal groove moderately short, interstices of ribs granulose. Sides rounded, aperture narrow, fossula broad, columella intruding deeply into the aperture.

The radula of *Trivirostra* differs in some features from the radula of *Trivia* BRODERIP, 1837 [type species *T. monacha* (DA COSTA, 1778)]. The rhachidians of *Trivia* are quadrate, but are trapezoidal in *Trivirostra*, and the basal pegs are more prominent. The laterals of *Trivirostra* have small accessory denticles on the cutting edge, similar to the laterals of *Trivia arctica* (PULTENEY, 1799), whereas in *Trivia monacha* the laterals lack the small denticles; the marginal teeth of *Trivirostra* are simple and hook-like, and the inner marginal may on occasion have a very small denticle.

Species of the genus inhabit crevices of coral rocks,

and are frequently found on marine benches with a maximum of algal matting.

Trivirostra (Trivirostra) edgari (SHAW, 1909)

(Plate 51, Figure 17)

1849. *Cypraea grando* GASKOIN, Proc. Zool. Soc. London, 16: 96 (non POTIEZ & MICHAUD, 1838)
 1909. *Trivia edgari* SHAW, Proc. Malacol. Soc. London, 8: 310 (nom. nov. pro *Cypraea grando* GASKOIN, 1849)
 1917. *Trivia oryza* ODHNER, Svens. Akad. Handl. 52: 53; plt. 2, figs. 52, 53; text fig. 12 (shell and radula of *Trivirostra oryzoidea* IREDALE, 1935) [non *Trivia oryza* LAMARCK, 1811]
 1935. *Trivirostra oryzoidea* IREDALE, Aust. Zool., 8: 101 (nom. nov. pro *Trivia oryza* ODHNER, 1917)
 1944. *Trivirostra edgari insularum* SCHILDER, Ark. Zool., 36A: 14 (descr. radula)
 1944. *Trivirostra edgari tomlini* SCHILDER, Ark. Zool., 36A: 14

Shell: Small, broadly ovate, extremities produced and broad; white in colour throughout. Sculptured with coarse and elevated transverse ribs and a broad but short dorsal groove which does not interrupt the 23 - 26 dorsal ribs; interstices of ribs are minutely crenulate. Aperture almost central, labial lip with 20 - 23 denticles, columellar lip with 16 - 19 denticles; the interior of the columella extends in a flatly convex arc, and the fossula is moderately narrow and concave and does not protrude towards the labial wall as in *Trivirostra oryza*.

L: 5.9 - 6.6 mm; W: 73 - 79%; H: 66 - 69%

Type Locality: Manilla (Manila, Philippine Islands).

Habitat: Under coral rocks, in shallow water.

Moderately rare.

Distribution: South Viti Levu, Vanua Levu and Taveuni. - From East Africa through the tropical Indo-Pacific to Japan, Hawaii and the Tuamotu Archipelago.

Discussion: Fijian specimens of *Trivirostra edgari* are rather similar in dimensions, teeth and dorsal rib count to the East African race *T. edgari tomlini* SCHILDER.

Trivirostra (Trivirostra) exigua (GRAY, 1831)

(Plate 51, Figure 18)

1831. *Cypraea exigua* GRAY, Zool. Misc., 1: 35
 1833. *Cypraea tremeza* DUCLOS, Mag. de Zool., plt. 25
 1845. *Cypraea gemmula* GOULD, Proc. Boston Soc. Nat. Hist., 2: 27
 1868. *Trivia corrugata* PEASE, Amer. Journ. Conch., 4: 95; plt. 11, figs. 14, 15
 1914. *Trivia exigua* var. *alba* SOWERBY, Proc. Malacol. Soc. London, 11: 10
 1923. *Trivia exigua* (GRAY) VAYSSIÈRE, Ann. Mus. Hist. Nat. Marseilles, 18: 86 - 87; plt. 14, figs. 209 - 212 (anatomy)
 1933. *Trivirostra exigua hyalina* SCHILDER, Zool. Anz., 102: 290

1964. *Cypraea (Trivia) gemmula* GOULD, JOHNSON, U.S.
Nat. Mus. Bull. No. 239: 82; plt. 7, fig. 10 (lectotype)

Shell: Small, roundly pyriform, extremities produced; pinkish-white in colour, ornamented with 2 - 5 pink spots on dorsum, dorsal ribs occasionally pink in colour. Sculptured with 16 - 29 coarse dorsal ribs and an impressed dorsal groove which does not separate the ribs; the ribs are sometimes thickened near the margins of the dorsal groove and interstices of ribs are finely crenulate. Aperture is slightly off-central, labial teeth number from 20 to 23, columellar teeth from 18 to 19; fossula is concave, but extends only slightly towards the labial wall. L: 4.2 - 4.5 mm; W: 66 - 71%; H: 60 - 63%

Type Locality: None ("New South Wales," SOWERBY, [1832]).

Habitat: Under coral rocks, in shallow water.

Moderately rare.

Distribution: South Viti Levu. — Throughout the tropical Pacific.

Trivirostra (Trivirostra) hordacea (KIENER, 1843)

(Plate 51, Figure 19)

1827. ? *Cypraea scabriuscula* var. *minor* GRAY, Zool. Journ., 3: 364
1843. *Cypraea hordacea* KIENER, Spéc. gén. icon. coq. viv., p. 149; pl. 54, figs. 5, 5 a
1845. *Cypraea insecta* MIGHELS, Proc. Boston Soc. Nat. Hist., 2: 24
1870. ? *Cypraea sandwichensis* SOWERBY, Thes. Conch., 4: 47, expl. to plt. 35
1870. ? *Cypraea sandwichensis* SOWERBY, Thes. Conch., 4: 57
1912. *Trivia desirabilis* IREDALE, Proc. Malacol. Soc. London, 10: 226; plt. 9, figs. 8, 9 (Kermadec Island)
1932. *Trivirostra hordacea* (KIENER), SCHILDER, Zool. Anz., 100: 226; fig. 2 (radula)

Shell: Small, subcylindrical and elongate, extremities hardly produced, dorsum depressed; white in colour throughout. Sculptured with fine and numerous transverse ribs which number from 26 to 32; the dorsal groove is long and interrupts the dorsal ribs; interstices of ribs are finely crenulate. Aperture is off-central, outer lip moderately narrow and with 22 - 23 labial teeth; the columella is rather broad and sculptured with 19 - 21 teeth. Fossula broad and concave, only slightly extending towards the labial wall, posterior of columellar lip somewhat truncated.

L: 3.8 - 4.1 mm; W: 64 - 66%; H: 52 - 58%

Type Locality: Mers de l'Inde, les côtes de l'île Bourbon [= Réunion Island].

Habitat: Under coral rocks, in shallow water. — Rare.

Distribution: North and South Viti Levu. — From East

Africa through the tropical Indo-Pacific to Hawaii and the Tuamotu Archipelago.

Trivirostra (Trivirostra) oryza (LAMARCK, 1811)

(Plate 51, Figure 15)

1811. *Cypraea oryza* LAMARCK, Ann. Mus. Hist. Nat., 16: 104
1817. *Cypraea nivea* DILLWYN, Desc. cat. Rec. shells, 1: 466
1817. ? *Cypraea sulcata* var. β DILLWYN, Desc. cat. Rec. shells, 1: 466
1827. ? *Cypraea scabriuscula* GRAY, Zool. Journ., 3: 364
1843. *Cypraea intermedia* KIENER, Spéc. gén. icon. coq. viv., p. 143; plt. 52, figs. 2, 2 a (non GRAY, 1824)
1908. *Trivia oryza* (LAMARCK), BERGH, Semp. Reise Arch. Philipp., 9: 144; plt. 11, figs. 27 - 37 (anatomy)
1909. *Trivia oryza* forma *minor* SCHEPMAN, Siboga Exped., 49b: 137 (non GRAY, 1827)
1932. *Trivirostra oryza triticum* SCHILDER, Foss. Cat., 1/55: 101
1932. *Trivirostra oryza turneri* SCHILDER, Foss. Cat., 1/55: 101

Shell: Small and ovate, extremities generally blunt but sometimes moderately produced; white in colour throughout. Dorsum is ornamented with close-set fine transverse ribs, numbering from 30 to 45; the dorsal groove is either moderately deep or shallow and, in the majority of specimens examined, does not separate the dorsal ribs. Sides are rounded, base convex, aperture narrow, labial lip fairly straight and sculptured with 19 - 26 denticles. Interior of columella curved, fossula broad and concave, and extending towards the labial wall.

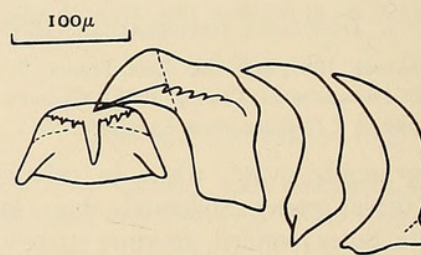


Figure 5

Trivirostra oryza (LAMARCK)
Fiji Islands
Half row of radular teeth

Animal: Sole and dorsum of foot brown, finely veined with white; mantle light grey, flecked with blackish-brown, becoming dark brown towards the mantle margin. Papillae few, short and fringed, yellow in colour. The siphon is cylindrical, closed and tubular, yellow in colour and papillate on the sides. Tentacles are short and blunt at



Cernohorsky, Walter Oliver. 1968. "The Ovulidae, Pediculariidae and Triviidae of Fiji (Mollusca: Gastropoda)." *The veliger* 10, 353–374.

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