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**Land Shells (Synceridae)**  
from the Southern and Western Pacific

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MUSEUM OF COMPARATIVE ZOOLOGY

During the course of our studies on the land shells of Pacific islands, many apparently new shells were found in the collection of Bernice P. Bishop Museum. This paper includes two new genera, four new species, and a new subspecies. The genus *Garrettia* has been restudied and type elements drawn of the three known species. The type species of *Quadrasiella* and its operculum have been figured.

Specimen numbers, except those designated MCZ (Museum of Comparative Zoology) refer to the Bishop Museum collection.

The drawings were made by Yoshio Kondo.

Genus **ELECTRINA** Baird

*Electrina* Baird, Nomen. Moll. An. and Shells, British Mus. (1), Cyclophoridae: 30, 1850.

"Operculum orbicular, many-whorled, horny?—Shell conical short, covered with a thin periostraca. Spire conical. Axis perforated. Whorls with a strongly marked keel in the front, forming an edge to the axis. Mouth circular, continued, simple." (Gray, ms.)

Genotype: *Cyclostoma succineum* Sowerby.

The genus *Electrina* is known only from the island of Rapa. It is undoubtedly a local derivative of *Omphalotropis* stock, which it closely resembles in some shell characters and in the teeth. The shells of *Electrina* differ from *Omphalotropis* in that the umbilical keel is continued onto the columellar wall of the aperture, forming a spoutlike process,

whereas in species of *Omphalotropis* the termination of the umbilical keel is indicated only on the base of the columellar lip or is entirely lacking. Except for the operculum, *Electrina* should be considered, at the most, as a subgenus of *Omphalotropis*.

*Electrina* has the most distinct operculum of any of the genera belonging to the tribe *Omphalotropini* as recognized by Thiele. The operculum is somewhat ovate and consists of about three rapidly increasing whorls, with an eccentric nucleus. It is composed of two layers. The inner layer is thin, smooth, corneous, nearly flat, and slightly indented at the nucleus (fig. 1, *c*). The outer layer consists of a thick, strongly sculptured, calcareous deposit which is not as wide as the corneous layer (fig. 1, *d*). A high, nearly circular, calcareous

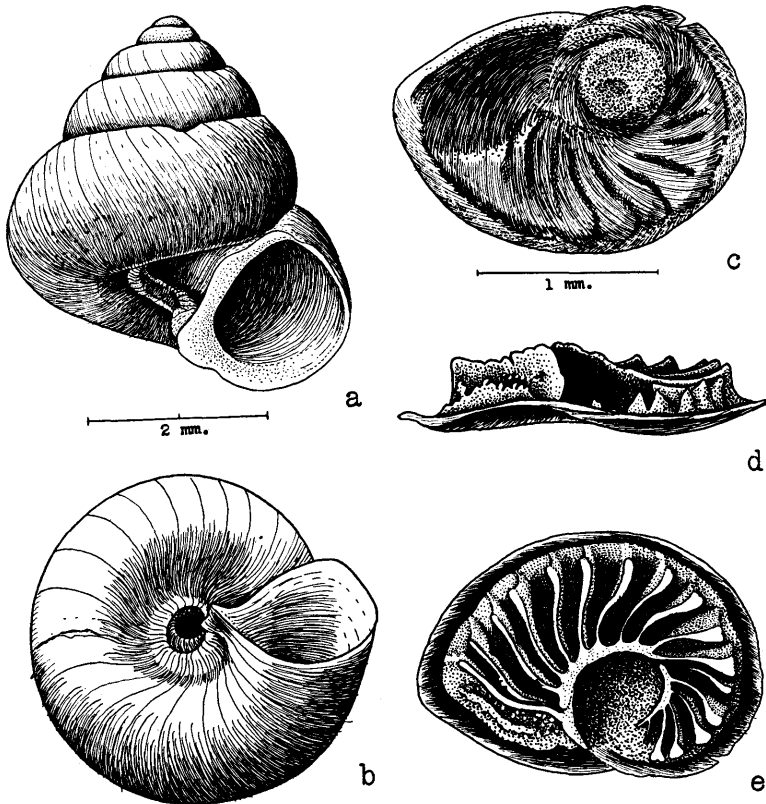


FIGURE 1.—*Electrina succinea*: a, b, shell; c, operculum interior; d, operculum profile; e, operculum exterior.

ridge, almost a whorl in length, is situated above the suture of the last whorl. From this ridge are 11 to 15 prominent radiating calcareous septa (fig. 1, *e*), which are brittle and easily broken. They are thin proximally; distally near their terminations they are thickened, sometimes forked. The outer margin of the operculum is thin and slightly turned outward (fig. 1, *d*).

In a juvenile specimen (140242) with  $3\frac{2}{3}$  whorls, the operculum is corneous, very thin, almost flexible, without a calcareous deposit. The outer surface has a few (5 to 6) corneous radial striae near the termination of the last whorl. These striae, low, blunt, and closely spaced, are short and do not extend to the suture. They have about the same degree of development as the striae on the outer surface of the opercula of adult specimens of *Omphalotropis dubia*.

In a slightly older specimen (140241) with  $4\frac{1}{4}$  whorls the outer surface is very slightly concave, horny, with a thin even corneous deposit. Only the two outer calcareous septa are formed. The inner septa are in the process of formation and are represented by some minute calcareous nodules. The sutural septum is very short, just beginning to form. In a shell with 5 whorls (140240) the operculum has all the characters of the opercula of adult specimens, except for size.

**Electrina succinea** (Sowerby) (fig. 1).

*Cyclostoma succineum* Sowerby, Zool. Soc. London, Proc., 32, 1832; Thesaur. Conch., 108, pl. 23, figs. 18, 19, 1842. Pfeiffer, Conchyl. Cab., Cyclostomacea, 24, pl. 3, figs. 12-14, 1846.

*Cyclophorus succineus* Pfeiffer, Zeitschr. f. Malak., 108, 1847.

*Stoastoma succineum* Pfeiffer, Zeitschr. f. Malak., 114-115, 1849.

*Electrina succinea* Gray, Nomen. Moll. An. and Shells, Brit. Mus.

(1), Cyclophoridae: 30, 1850. Thiele, Handb. System. Weicht.

(1): 171, fig. 154, 1929.

Rapa (Opara): (Cuming, May 1828). Tumu Valley, under stones, alt. 150 to 200 ft., 140236-43 (figured specimen 10110); Mt. Morongota, in small valley southwest of peak, under stones, alt. 700 ft., 140411-15; Kopenena Valley, alt. 200 to 600 ft., 143253-57; north-east slope of Mt. Ruatara, near summit of peak, alt. 800 ft., 143560-62; Maitua, back of Ahurei village, 143394-5 (all Mangarevan Expedition, July 1934).

*E. succinea* appeared to be restricted to the central portion of the mountain range which nearly surrounds Ahurei Bay. Specimens were taken from Mount Ruatara north of the tip of the bay to Maitua, the large valley back of Ahurei village. At both extremes specimens were few. It was found most abundantly in the small valleys leading up to the main range, west of the inner half of the bay. Suitable conditions were carefully worked over east of its habitat north and south of the bay, but no specimens were taken. In most localities where it was taken it was fairly abundant under damp stones and in shallow talus at altitudes of 200 to 800 feet. It seems strange that a genus should be restricted in its distribution on such a small island.

No specimen in the Bishop Museum collection is as large as the one which served as Sowerby's type: length 5.0 mm., diameter 3.8 mm. (length 2/10, diameter 3/20 poll.). Pfeiffer's measurements, length 4.0 mm., diameter 4.1 mm., are from a larger than average specimen. Specimens differ somewhat in size and form, even in restricted colonies. With most of the specimens the diameter is about equal to slightly greater than the length. Dimensions<sup>1</sup>:

Locality	Specimen no.	Length	Diam.	Apert. Length	Apert. Diam.	Whorls
Tumu .....	10110	4.10	3.77	1.75	1.92	5¾
Morongota .....	140411	3.38	3.54	1.61	1.67	5½
Kopenena .....	143253	3.54	3.45	1.54	1.64	5¾
Ruatara .....	143560	3.48	3.67	1.70	1.70	5½
Maitua .....	143394	3.41	3.12	1.54	1.45	5½

***Electrina succinea orites***,<sup>2</sup> new subspecies (fig. 2).

Specimens of *Electrina* from the upper slopes of the eastern ridge of Mount Perahu differ in some characters from those taken at lower altitudes. These specimens were found at altitudes above 900 feet, nearly all from 1,200 to 1,800 feet. They probably belong to a geographical race rather than to an ecological form. The shells are smaller, about three-fourths the size of the most typical form from Tumu, thinner, color cinnamon buff, being subtranslucent to translucent, with a glossier surface, with 5 to 5¼ whorls. Taken as a whole they appear to be proportionately narrower than the typical form. The calcareous septa on the outer surface of the opercula are finer and

<sup>1</sup> All dimensions are given in millimeters.

<sup>2</sup> 'ορειτης = a mountaineer.

more closely spaced (fig. 2, *b*) and a larger number of these septa are forked distally. Dimensions:

	Length	Diam.	Apert. Length	Apert. Diam.
Holotype .....	3.24	3.07	1.50	1.57
Paratype .....	3.06	2.87	1.37	1.25

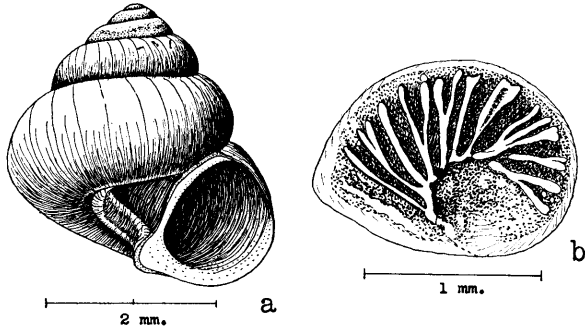


FIGURE 2.—*Electrina succinea orites* (holotype): a, shell; b, operculum exterior.

Rapa: Eastern ridge of Mt. Perahu, under stones, alt. 1,300 to 1,550 ft., holotype 10111, paratypes 135469-71, (Mangarevan Expedition July 28, 1934). Specimens of this subspecies were taken from 10 additional colonies at altitudes between 900 and 1,800 feet.

A few examples are ornamented with a rather wide dark band on the periphery; two examples have a narrow, almost white, peripheral band.

#### Genus **RAPANELLA**, new genus

Shell small, widely umbilicated, subdepressed and with a strong keel margining the umbilicus. This forms a small spoutlike process at its termination on margin of and at base of the columellar lip. Operculum (fig. 3, *b*) nearly circular, very thin, almost transparent, paucispiral, with a slightly eccentric nucleus. The central area is evenly and deeply depressed (fig. 3, *c*).

Genotype: *Rapanella andersoni*, new species.

The shells of *Rapanella* slightly resemble those of *Electrina*. Both genera have the spoutlike process at the base of columellar lip overhanging the umbilicus, the process being formed by the continuation of the basal keel. This keel is just inside the rim of the umbilicus. The two genera differ considerably in outline and the surface texture is much smoother and more glossy in *Rapanella*. They are distinguished, for the most part, on the basis of differences in the opercula. *Electrina* has a somewhat ovate, nearly flat operculum, with a thick calcareous outer surface which is sculptured into distinct, rather high septa. The

operculum of *Rapanella* is almost circular, corneous, very thin, and deeply concave.

***Rapanella andersoni*, new species (fig. 3).**

Shell small, subdepressed, umbilicated, and shining. Whorls  $3\frac{1}{2}$ -4 and very strongly convex. Color a pale straw yellow with a wide chestnut colored band at the periphery, one below the suture, and one covering the base of the shell. In addition there is a faint opalescent sheen over the entire surface of the shell. Spire but slightly extended above the body whorl. Columella moderately and inwardly arched. Aperture subquadrate with a simple lip. Parietal lip pinched to form a narrow pitcher-like spout over the columella. This is the termination of a well-developed basal carina. Umbilicus rather wide and deep, the nuclear whorls visible from within. Sculpture consisting of fine sinuous growth lines. Operculum typical (0.8 mm. in diameter). Dimensions:

	Length	Width	Aperture
Holotype .....	1.9	2.4	1.2
Paratype .....	1.9	2.5	1.2

Rapa: Maitua, next to a marae below Mt. Mangaoa, near foot of cliffs, under damp stones in wet forest, alt. 750 ft., holotype 189005; paratypes 140055, MCZ 140596 (Mangarevan Expedition, July 10, 1934). A few of the additional stations from which specimens were taken by the Mangarevan Expedition are: small valley on the southwest slope of Mt. Tavaitahu, under slightly damp stones, alt. 800 ft.,

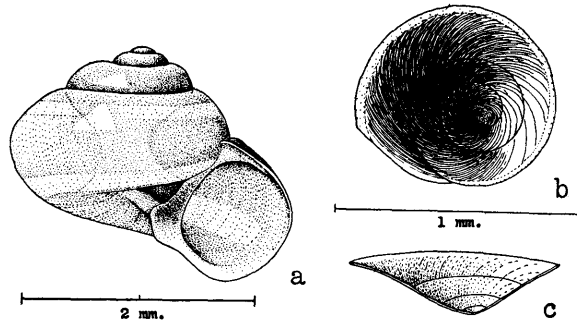


FIGURE 3.—*Rapanella andersoni* (holotype): a, shell; b, operculum exterior; c, operculum cross section.

144201; northeast slope of Mt. Tautautu (east Maitua), near base of cliffs, under damp stones, alt. 600 to 800 ft., 142663; northwest slope of Mt. Tautautu, under similar conditions, alt. 800 ft., 144761; Mt. Tepiahu, near base of damp cliff, 135668; northwest slope of Mt. Tepiahu, under damp stones, alt. 500 to 650 ft., 138097 (all the preceding localities are south of Ahurei Bay); northeast slope of Mt. Ruatara, alt. 800 ft., in sweepings, 135730; Area, slope back of village

under somewhat damp stones, alt. 250 to 450 ft., 140542 (north of Ahurei Bay).

Almost all the specimens were taken in the eastern portion of the island north and south of the bay, which nearly bisects the island. Only one isolated colony, consisting of a few dead shells, was found outside this area; this was on Mt. Ruatara near the northern tip of the bay. It is probably significant that *Electrina succinea* (s.s.) and *Rapanella andersoni*, although found on three occasions in the same area, were not taken in any one colony. Both are found under damp rocks in rather wet forests, *R. andersoni* only at altitudes between 200 and 900 feet. In some of the colonies, especially in Maitua, *Rapanella andersoni* was abundant when conditions were favorable.

It seems strange that two genera apparently derived from the same stock should have distinct areas of distribution on such a small island as Rapa, which has a length of about six miles and a diameter of about five miles.

#### Genus **GARRETTIA** Paetel

*Diadema* Pease, Am. Jour. Conch. 4: 157, 1868 (non *Diadema* Schumacher, 1817; Gray, 1825; Boisduval, 1832; Reichenbach, 1863).  
*Garrettia* Paetel, Cat. Conchyl.-Samm., 124, 1873 (non *Garrettia* Cossmann 1900 = *Garrettina* Thiele 1931).

Genotype: *Pterocyclos* ? *parva* Pease.

*Garrettia*, as now understood, is limited to the Cook Islands in the south central Pacific. Garrett reviewed this genus (1881) but did not refigure the three species. According to Garrett, he had originally collected all three species, which were subsequently described by W. H. Pease. The localities given by Pease were at variance with the data originally supplied by Garrett. We add the corrected data supplied by Garrett. It is not necessary to redescribe those forms, as the pen sketches by Yoshio Kondo clearly indicate the differences between the three species. A full synonymy is given by Garrett and we give the original citations and Garrett's references.

#### **Garrettia parva** (Pease) (fig. 4).

*Pterocyclos* ? *parva* Pease, Am. Jour. Conch. 1: 290, 1865 (Polynesia).

*Diadema parva* Pease, Am. Jour. Conch. 4: 158, 1868. Garrett, Acad. Nat. Sci. Philadelphia, Jour. II, 8: 404, 1881.

Type locality: Aitutaki, Cook Islands.

Cotypes: 10112, 10113, 2119, 188858; MCZ 141025-29.

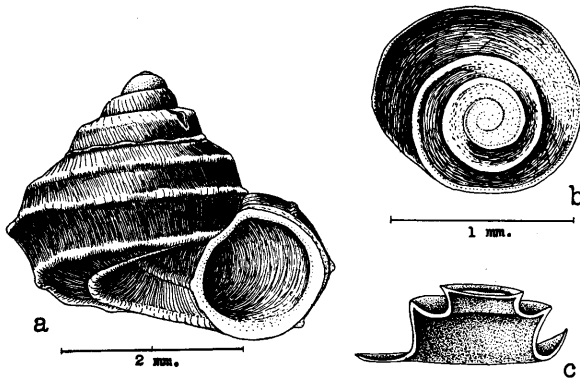


FIGURE 4.—*Garrettia parva* (cotype) : a, shell (10112) ; b, operculum exterior ; c, operculum cross section.

***Garrettia biangulata* (Pease) (fig. 5).**

*Cyclostoma biangulatum* Pease, Zool. Soc. London, Proc., 674, 1864 (1865) (central Pacific).

*Diadema biangulata* Pease, Garrett, Acad. Nat. Sci. Philadelphia, Jour. II, 8: 404, 1881.

Type locality: Aitutaki, Cook Islands.

It is difficult, especially at this later date, to understand the failure of Pease to recognize this species as a member of his genus *Diadema* (= *Garrettia*), which he established in 1868 for *parva* and *rotella*. He did, however, include it under *Diadema* in his list of Polynesian shells (Zool. Soc. London, Proc., 475, 1871).

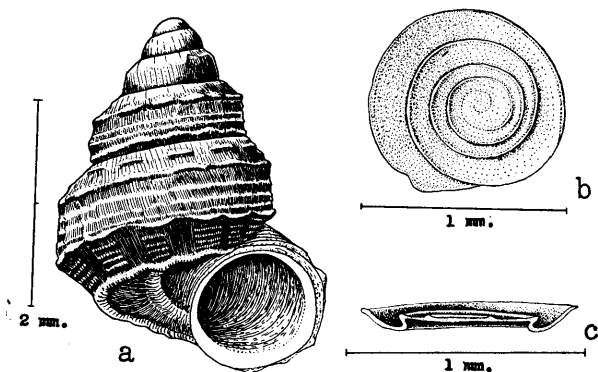


FIGURE 5.—*Garrettia biangulata* (cotype) (10114) ; a, shell ; b, operculum exterior ; c, operculum cross section.



Garrett states that the first material of this species was obtained from a small colony found on the island of Moorea in the Society Islands and was probably introduced by man. So far as we have been able to ascertain, it has not been found subsequently in the Society Islands.

Cotypes: 10114, 2122, 188860; MCZ 141030-33.

**Garrettia rotella** (Pease) (fig. 6).

*Diadema rotella* Pease, Am. Jour. Conch. 4: 158, pl. 12, fig. 13, 1868 (Atiu); Garrett, Acad. Nat. Sci. Philadelphia, Jour. II, 8: 404, 1881.

Type locality: Rarotonga, Cook Islands.

Cotypes: 10115, 2117, 188859; MCZ 141023-24.

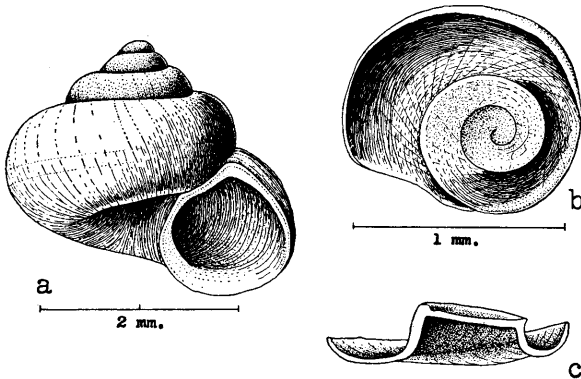


FIGURE 6.—*Garrettia rotella* (cotype): a, shell (10115); b, operculum exterior; c, operculum cross section.

According to Garrett, the original citation of Atiu Island is erroneous. Pease later corrected the error (Zool. Soc. London, Proc., 475, 1871).

Genus **FIJIANELLA**, new genus

Shell small, subdepressed to elongate, body whorl free or solute. Operculum nearly circular, with slightly more than 4 whorls, the nucleus almost concentric (fig. 7, e), consisting of two layers. Outer layer thickened, calcareous, distinctly concave (fig. 7, d), the whorls marked with distinct oblique striae; the inner corneous (fig. 7, c), thinner, nearly flat, smooth, the whorls indistinctly indicated. Outer layer slightly wider than inner, their edges separated by a deep marginal canal (fig. 7, d). This operculum is distinct from that of any other genus in the family Synceridae. It superficially resembles the operculum of species belonging to the genus *Cyclotus* (s.s.) of the family Cyclophoridae.

Genotype: *Fijianella calciphila*, new species.

The species of the genus have a superficial resemblance to those of *Balambania* Crosse (Jour. de Conch., 49, 1891). Unfortunately the operculum of the latter has not been described. The shells of *Balambania* are more depressed, the apical whorls are oblique to the axis, the surface is granular. Those of *Fijianella* have the apical whorls axial, the surface is marked only with transverse striae, no spinal lines being visible with high magnification.

The form of the opercula of *Fijianella* is distinct from that of any other genus inhabiting the Pacific islands. As far as is known, the only other genus furnished with a marginal canal is *Quadrasiella* from Guam and Ponape. A comparison with the figured operculum of *Quadrasiella mucronata* (fig. 9) shows their dissimilarity.

***Fijianella calciphila*, new species (fig. 7).**

Shell small, medium elongated, umbilicated, rather thin but strong and nearly smooth. Whorls 5 and strongly convex with last whorl free for nearly  $\frac{1}{2}$  its turn. Color of shell grayish white, periostracum cartridge buff. Spire somewhat elongated. No true columella as the last whorl is entirely free. Aperture sub-circular, somewhat flattened along the parietal side. Lip simple. Umbilicus rather small but deep. Suture deeply indented. Sculpture consisting of very fine axial growth lines. Operculum typical, slightly wider than aperture, not retractable; when animal is contracted, the margin of outer layer rests on and just covers the lip. Dimensions:

	Length	Width	Aperture
Holotype .....	4.6	3.4	1.5 × 1.4
Paratype .....	4.2	3.3	1.5 × 1.4

Lau Islands, Yangasa Levu: holotype, 10107; paratypes, 167154-55, MCZ 137107 (H. S. Ladd, July 24, 1936). These shells were collected at the south end of the island at an altitude of 40 feet, in sweepings among limestone rocks.

*F. calciphila* is a species between *F. laddi* and *F. cornucopia*. All are quite closely related, but no intermediate specimens were obtained. However, this intermediate species occurred on a different island from the other two, which are extreme in the development of this remarkable free whorl condition.

Besides the difference in the height of the spire, the amount and extent of the free whorl, the umbilicus also differs. It is rather wide in *F. laddi* and quite narrow in *F. cornucopia*.

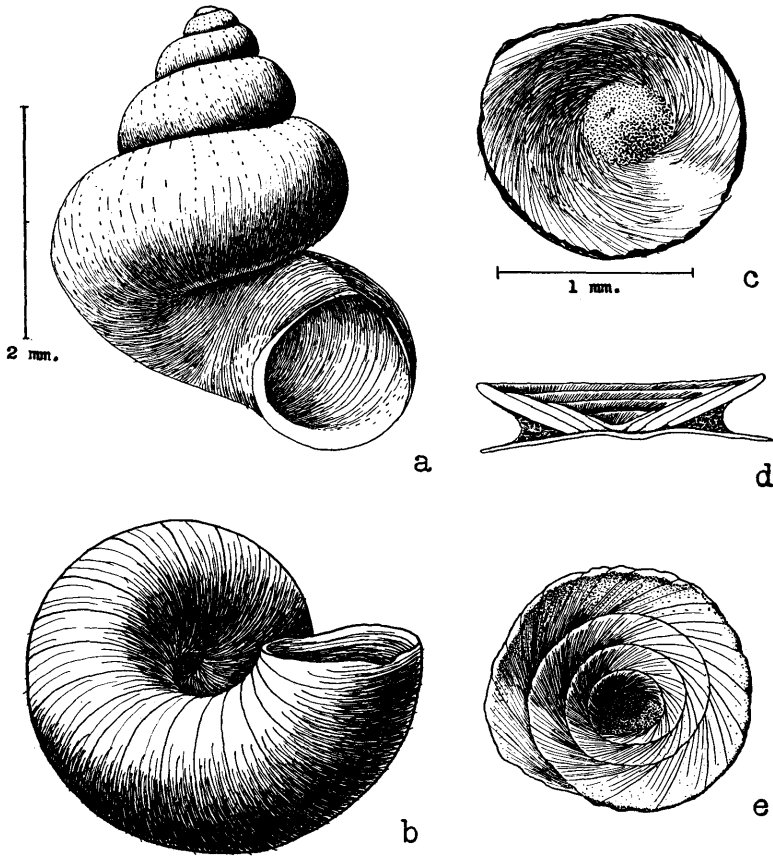


FIGURE 7.—*Fijianella calciphila* (holotype): a, b, shell; c, operculum interior; d, operculum profile; e, operculum exterior.

***Fijianella laddi*, new species (fig. 8, a).**

Shell small, depressed, umbilicated, thin and nearly smooth and having last whorl solute. Whorls  $4\frac{1}{2}$  strongly convex, the last free for about  $\frac{1}{3}$  of a whorl. Color grayish white. Spire slightly elevated. No true columella. Aperture sub-circular with a somewhat flattened parietal area. Lip simple. Umbilicus deep and rather wide, being about  $\frac{1}{5}$  the width of shell base. Suture deeply indented. Sculpture consisting of very fine axial growth lines. Operculum typical. Dimensions :

	Length	Width	Aperture
Holotype .....	3.3	3.7	$1.3 \times 1.1$
Paratype .....	3.1	3.5	$1.4 \times 1.2$

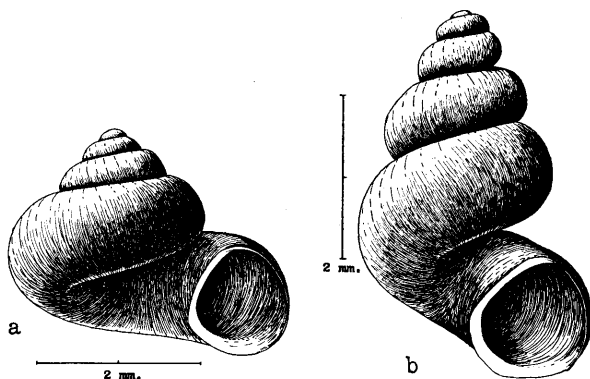


FIGURE 8.—a, *Fijianella laddi* (holotype); b, *F. cornucopia* (holotype).

Lau Islands, Navutu Iloma: holotype: 10108; paratypes, 167081-82, MCZ 137109 (H. S. Ladd, July 24, 1936). These shells were collected at the northeast end of the island among limestone rocks in sweepings at an altitude of  $\pm 100$  feet.

See discussion under *F. calciphila*.

***Fijianella cornucopia*, new species (fig. 8, b).**

Shell small, extended, thin but strong and nearly smooth. Whorls 5 to  $5\frac{1}{4}$ , strongly convex and solute for a full whorl. Color a pale straw to brownish yellow. Spire extended. No true columella as the last whorl is free. Aperture subcircular with a slightly flattened area on the parietal side. Lip simple. Umbilicus narrow and deep. Sculpture consisting of fine growth lines. Operculum typical. Dimensions:

	Length	Width	Aperture
Holotype .....	4.4	2.9	1.5 $\times$ 1.4
Paratype .....	5.3	2.7	1.5 $\times$ 1.4

Lau Islands, Navutu Iloma: holotype, 10109; paratypes, 167083-85, MCZ 137108 (H. S. Ladd, July 24, 1936). These shells were collected at the northeast end of the island at an altitude of  $\pm 100$  feet, in sweepings among limestone rocks.

See discussion under *F. calciphila*.

Genus **QUADRASIELLA** Moellendorff

*QuadrasIELLA* Moellendorff, Nachr. Deutsch. Malak. Gesell. 26: 38, 1894.

Genotype: *QuadrasIELLA mucronata* Moellendorff.

None of the three species included in *Quadrasia* by both Moellendorff and Kobelt has been figured. To make this paper more complete and to illustrate some of the unusual types of these small shells the genus has been included here.

*Quadrasia* is most easily separated from the other genera of Synceridae by its characteristic operculum. In adult specimens the outer calcareous costate layer of the operculum is wider than the aperture. The corneous inner layer is thin and narrower than the outer (fig. 9, *c, d*). Between the two is a deep, wide canal into which the lip is inserted when the animal is contracted.

***Quadrasia mucronata*** Moellendorff, Nachr. Deutsch. Malak. Gesell. 26: 38, 1894 (fig. 9).

Type locality, Guam, Marianas Islands.

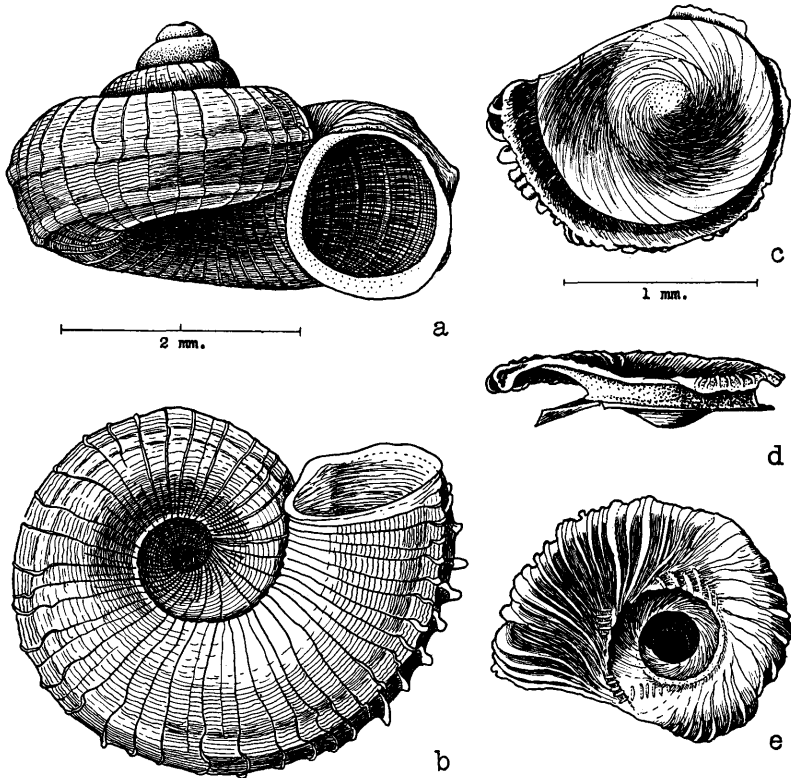


FIGURE 9.—*Quadrasia mucronata* (cotype): a, b, shell; c, operculum interior; d, operculum profile; e, operculum exterior.

Guam: "cotype" 86234 (Quadras); Ucodo [Ukudu?], in dense forest, limestone plateau, under stones and logs, alt. 300 ft., 82752 (H. G. Hornbostel, Nov. 11, 1925).

A specimen "cotype" from the original material of this species was received as an exchange from the Senckenbergische Naturforschende Gesellschaft Frankfurt a. Main, through Dr. F. Haas. The operculum of this specimen is slightly broken, hence the operculum of one collected at a later date has been used for illustration.

The operculum is somewhat circular, with the parietal margin slightly flattened, with about  $3\frac{1}{2}$  whorls, and with a slightly eccentric nucleus (fig. 9, *c*). The inner corneous layer is flat except that over the nucleus it is raised into a low, blunt cone (fig. 9, *d*), smooth shining, indistinctly radially striate. The outer layer consists of a thick calcareous deposit, with a wide perspective umbilicus (fig. 9, *e*), descending in a rather broad spiral terrace for about  $2\frac{1}{4}$  whorls. Its surface is sculptured with strong obliquely radiating costae, stronger toward the margin and extending over the margin to the rim of the canal.