CYCLOPHORIDAE AND PUPINIDAE OF CAROLINE, FIJIAN, AND SAMOAN ISLANDS

BY

WILLIAM J. CLENCH

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By WILLIAM J. CLENCH
CURATOR OF MOLLUSKS, HARVARD UNIVERSITY

INTRODUCTION

The following report is based largely upon the extensive collection of Pacific island mollusks in Bernice P. Bishop Museum. The study was made possible by a Yale-Bishop Museum Fellowship which was granted for the winter of 1940-1941. Upon my return to Cambridge, the collection of mollusks in my charge was reviewed for additional data for the two families considered in this paper.

I am exceedingly grateful to the Yale University Committee and to the Trustees of Bishop Museum for this fellowship and for the rare opportunity to study in the Hawaiian Islands. The value to the individual scientist of an opportunity of this sort far transcends the published results of a single report. Such an experience with the chance of seeing new and different animals and plants in the field and under totally different conditions naturally tends to shift preconceived viewpoints obtained from other field experience. Certainly, among zoologists, the malacologist is particularly favored in the Hawaiian Islands, where speciation among the land mollusks has reached a high degree of development and where much classic work on this subject has been written.

To the staff members of Bishop Museum I am indebted for a host of favors and kindnesses, particularly Margaret Titcomb, librarian, Eloise Christian, editor of Museum publications, and Yoshio Kondo, assistant malacologist and artist, who made most of the line drawings illustrating this report.

Casual thanks are not adequate to express my indebtedness to Sir Peter Buck, the Museum Director, and to the late C. Montague Cooke, Jr., malacologist, for all they did to make my stay in the islands so delightful and profitable. For the asking, both were always ready to share their profound knowledge of the entire Pacific area.

The present study can be considered as only a revision of previous knowledge with a few additions to the number of genera and species occurring in these island groups. A more fundamental report must be delayed until there is far more knowledge of the mollusks of Melanesia, especially of New Guinea.

The genus *Ostodes* is the only genus in either family that has reached Poly-

[1] Exclusive of the Diplommatininae.

nesia, and this genus occurs only in the Samoan Islands. However, members of both families have reached many islands in the Carolines.

As far as I know, all genera in the two families occurring in the island groups are considered terrestrial or, at best, only semi-arboreal and seldom occur abundantly as individuals. Mechanical dispersal would appear to be exceedingly difficult and perhaps impossible over wide areas, as they have failed to reach any of the island groups to the east and north of the Samoan Islands.

As stated above, far more material from New Guinea and the adjacent island groups is necessary before any understanding of geographical relationships can be had. It is rather remarkable that so few trained malacologists have been in the island archipelagoes that compose Melanesia. Much of the collecting has been done by interested but casual collectors, mainly concerned with other studies, and by traders and missionaries. As a consequence, the more obvious forms have come to be known while the more secretive mollusks have escaped notice.

To me, one of the most beautiful tree snails in the world is *Papuina pulcherrima* Rensch from Manus in the Admiralty Islands. This rather large tree snail was discovered in 1932 by a missionary. Only two specimens were obtained. In 1933, Mr. and Mrs. W. F. Coultas, during the Whitney Expedition of the American Museum of Natural History, collected over 100 more at three different stations on this little-known island. One wonders how many more species of the less conspicuous forms are yet to be found in this area.

Most of the land mollusks of New Guinea are known only from coastal localities. What the interior mountain ranges may hold is anyone's guess, but the chances are that far more species are yet to be described than are now known to exist on this island.

A war-time article, "New Guinea's mountain and swampland dwellers" by Colonel R. T. Elsmore (National Geographic Magazine, **88,** 1945), shows beautiful pictures of massive limestone outcrops. If these limestone areas are at all equivalent to the rich collecting on the limestone areas of Cuba, certainly a new horizon will be reached in New Guinea.

The symbols BBM, MCZ, and AMNH are used in the locality citations in this paper for, respectively, Bishop Museum, the Museum of Comparative Zoölogy, and the American Museum of Natural History.

CYCLOPHORIDAE

Various species in the Cyclophoridae which occur in New Caledonia, the New Hebrides, and the Solomon Islands are not considered in detail in this study. Sufficient material has been at hand for a generic study, but not enough for a complete understanding of the many species involved.

SPECIES FROM THE VARIOUS ISLAND GROUPS

New Caledonia and Loyalty Islands

The following species occur on New Caledonia and its closely affiliated islands and on the Loyalty Islands, which lie a short distance east of New Caledonia.

Genus **Gassiesia,** new genus

Shell depressed-turbinate, the aperture circular to subcircular and nearly holostomatous. Surface sculpture of spiral threads or chords, with axial sculpture, when present, of growth lines or flattened ridges. Color generally grayish white to dull brownish red. Operculum multispiral, corneous, with the nucleus central and slightly depressed.

All species in this genus are known only from New Caledonia. They differ but slightly in shell characters from the Fijian and New Hebridean species but differ considerably in the opercula. As far as the various descriptions cover the forms, they all possess a horny operculum without the accessory calcareous plate.

Genotype: *Cyclostoma artense* Montrouzier.

Gassiesia ammonis Gassies.

Cyclostoma ammonis Gassies, Jour. de Conch. 7: 370, 1859 (Isle of Pines, New Caledonia).

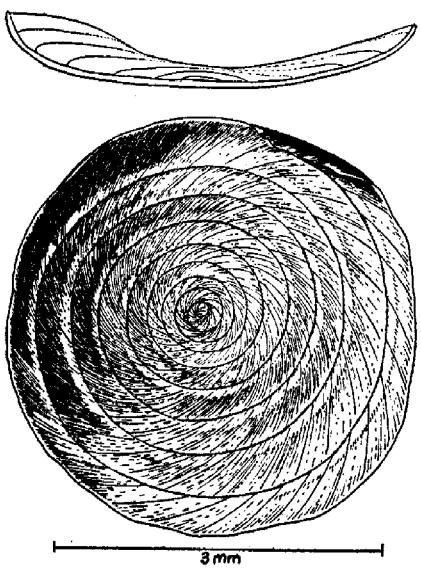

FIGURE 1.—*Gassiesia artensis,* operculum.

Gassiesia artensis Montrouzier (fig. 1).

Cyclotoma [*sic*] *artense* Montrouzier, Jour. de Conch. 7: 286, pl. 8, fig. 1, 1859 (Art Is., New Caledonia).

Gassiesia bocageanus Gassies.

Cyclostoma bocageanum Gassies, Faune Conch. Nouv.-Caledonie, Paris **1**: 76 [280], pl. 2, fig. 2, 1863 (Tuo, Art, and Lifu Isls., New Caledonia).[2]

As stated below, *G. bocageanus* appears to be the same as *G. forbesianus* Pfeiffer from the Santa Cruz Islands.

Gassiesia bocageanus griseus Gassies.

Cyclostoma bocageanum grisea Gassies, Faune Conch. Nouv.-Caledonie, Paris, **1**: 76 [280], 1863.

Gassiesia courdertii Fischer and Bernardi.

Cyclostoma courdertii Fischer and Bernardi, Jour. de Conch. **5**: 299, pl. 9, figs. 3-5, 1857 (New Caledonia).

Cyclostoma couderti [*sic*] Gassies, Faune Conch. Nouv.-Caledonie, Paris **2**: 123, pl. 5, fig. 6, 1871.

Gassiesia guestierianus Gassies.

Cyclostoma guestierianum Gassies, Jour. de Conch. **14**: 50, 1866 (Art Is., New Caledonia); Gassies, Faune Conch. Nouv.-Caledonie, Paris **2**: 123, pl. 5, fig. 5, 1871.

Gassiesia montrouzieri Souverbie.

Cyclostoma montrouzieri Souverbie, Jour. de Conch. **7**: 291, pl. 8, fig. 5, 1859 (Art Is., New Caledonia).

Gassiesia vieillardi Gassies.

Cyclostoma vieillardi Gassies, Jour. de Conch. **18**: 144, 1870; Gassies, Faune Conch. Nouv.-Caledonie, Paris **2**: 124, pl. 5, fig. 7, 1871 (Tuo, Jenjen, Kanala, New Caledonia).

Santa Cruz Islands

Gassiesia forbesianus Pfeiffer.

Cyclostoma (*Cyclophorus*) *forbesianum* Pfeiffer, Zool. Soc. London, Proc., 104, 1855 (Lord Howe Is., New Hebrides [Lord Howe or Santa Cruz Is., Santa Cruz Isls.]).

It is questionable whether this species occurs on Santa Cruz or any other of the Santa Cruz Islands. Cotype material of this species agrees exactly with *G. bocageanus* Gassies from New Caledonia and, in addition, we possess a lot of *G. forbesianus* from Cuming with the locality New Caledonia.

[2] "Faune Conchyliologique Terrestre et Fluvio-Lacustre de la Nouvelle-Calédonie" by J. B. Gassies appeared originally in the Actes de la Société Linnéenne de Bordeaux in three parts, as follows: pt. 1, **24**: 211-330, pls. 1-8, 1863; pt. 2, **28**: 1-212, pls. 1-8, 1871; pt. 3, **34**: 1-107, pls. 1-4, 1880. It was also issued separately. The first part was repaged in the separate, the remaining two parts, as separates, had the same pagination as the originals, as the latter two parts formed the first number in each of their respective volumes. Bracketed pages refer to the original pagination.

The original material was collected by Macgillivray, who had also collected on or had received land mollusks from New Caledonia. It is possible that the labels were mixed.

Caroline Islands

As far as is known, the genus *Dublonia* is limited in these islands to Lugunor [Lukunor] Island and the islands of Truk (also known as Ruk and Hogoleu). The Truk group consists of many small islands, several of which are high. Tol Island, the largest and highest, is four miles long and reaches a maximum altitude of 1,422 feet. A barrier reef, which is over 30 miles wide in longest diameter, surrounds the group.

The islands of Truk are little known faunistically, and several of them have never been collected. Yoshio Kondo, Assistant Malacologist at Bishop Museum, visited the Truk Islands during a collecting trip to the Carolines for the Museum. His time was limited to 19 days, yet an exceedingly large number of new forms was obtained, not only species but entirely new genera and subgenera. As far as we have been able to trace the published records, Hombron and Jacquinot, John Brazier, and J. S. Kubary were the only collectors of land shells who visited these islands prior to the explorations carried out by Kondo. A few species have been credited to O. Finsch, a German ethnologist, but according to Von Möllendorff (34, p. 103)[3] the material originally had been supplied Finsch by Kubary.

More recently, K. Atoda, a collector for Bishop Museum, visited the Truk Islands in early 1941 and added a few records from islands not visited by Kondo.

In 1872, John Brazier, an Australian collector, visited the island of Lukunor while on H.M.S. *Blanche*. A few species of land shells were collected, one species herein described. This atoll, which is only seven feet above high water, lies about 160 miles southeast of Truk.

The number of new subgenera and genera is amazing, as is the occurrence of known genera on Truk which are entirely absent from Ponape, some 370 miles to the east. Ponape was well-investigated, particularly by Kondo, on his trip to the Carolines during the winter of 1935-1936, when he failed to find many of the Truk forms.

Genus **Dublonia,** new genus

Shell very similar to *Fijiopoma liberata* Garrett of Fiji, though opercula of the two species are very different. In *Dublonia,* operculum is horny and deeply depressed toward central nucleus, whereas in *Fijiopoma,* operculum is nearly flat and possesses a strong calcareous plate with an overlapping lamina.

Genotype: *Dublonia brazieri* Clench.

[3] Numbers in parentheses refer to Literature Cited, page 49.

Dublonia brazieri, new species (fig. 2).

Shell depressed, widely umbilicated, rather thin and strongly sculptured. Whorls 4, strongly convex and coiled as a tube. Color white with a dull straw-yellow periostracum. Spire flat, hardly appearing above body whorl. Aperture circular and holostomatous. Umbilicus very wide, the nuclear whorls visible from within. Sculpture of numerous spiral lirae, three or four of the more strongly developed expanding regularly in small bladelike processes. Axial sculpture of fine growth lines. Operculum horny, circular, multispiral and deeply dished or depressed toward central nucleus. Outer surface nearly smooth and somewhat shining. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	3.6	7.8	2.5 × 2.5
Paratype	3.8	8.4	2.5 × 2.6

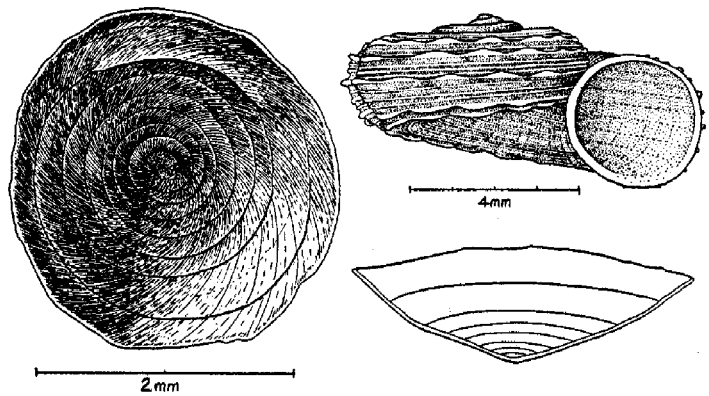

FIGURE 2.—*Dublonia brazieri* (holotype), shell, operculum, and cross section of operculum.

Holotype: BBM 153355, Truk Isls., Dublon Is., halfway up Mt. Tolowan, alt. 600 to 800 ft., collected by Kondo, Dec. 1935. Paratypes: BBM 153356-59, same locality. Additional paratypes from the following stations: BBM 153120, Dublon Is., southeast of Mt. Tolowan, alt. 300-650 ft.; BBM 153720, Truk Isls., Moen Is., Nebokos (dead), and BBM 153854, Moen Is., Man Village (dead); BBM 155635, Truk Isls., Tol Is., Urifei (dead), collected by Kondo, Dec. and Jan. 1935-1936.

A single lot, BBM 86553, from Lukunor Is., 160 miles southeast of Truk, collected by John Brazier, 1872.

The shells of this species are remarkably like specimens of *G. liberata* of the Fijian Islands; the opercula, however, are very different. This species is quite rare, to judge by the few obtained by Kondo.

The record of Brazier from Lukunor Island may well represent an introduction to this island, perhaps by early man. As stated elsewhere, it is a low coral atoll, and Dr. Cooke has informed me that all other known species are "wides" and are generally distributed in the western Pacific.

SAMOA

Genus **Ostodes** Gould

Ostodes Gould, Boston Soc. Nat. Hist., Proc. 8:283, 1862; Kobelt and v. Möllendorff, Deutsche Malak. Ges., Nachr. 29:112, 1897; Kobelt, Das Tierreich 16:153, 1902; Thiele, Handbuch syst. Weicht. 1:99, text fig. 76, 1929 (radula).

Shells globose to depressed-turbinate, rather solid, opaque, and generally strongly sculptured. *O. cookei,* herein described, is smooth, the rest are sculptured with spiral lirae and with somewhat flattened axial plicae. Operculum horny, circular, multispiral, with a central nucleus, entire operculum evenly depressed toward central nucleus.

Genotype: *Cyclostoma strigatum* Gould.

The differential characters in this genus are all somewhat variable, and there is a tendency among certain individual specimens to approximate one species or another. This is especially true of the axial plications, which may be slightly indicated on a few specimens in any one locality of *O. strigatus,* particularly in juvenile forms. Also, the spiral lirae show some variation in their presence or absence on the base of the shells. However, all these variable characters are, in the aggregate, quite specific for any one species.

The lack of space prevents a complete bibliography for each species. All the synonyms are given, however, and reference to Kobelt (27, p. 153) will furnish all of the important references to each of the several species.

The genus *Ostodes,* as we now understand its relationships, is limited to the three larger islands of the Samoan Archipelago, namely, Savaii, Upolu, and Tutuila. It is not known to occur on the easterly, or Manua, islands—Ofu, Olosega, and Tau—all of which have been well-collected by several members of the Bishop Museum staff.

Mousson (36, p. 180) cites *O. strigatus* as occurring on Manua, on the authority of Gould, but we have failed to find any published reference by Gould for any *Ostodes* occurring outside of Savaii, Upolu, and Tutuila.

The eight named forms are found distributed as follows, a single species, *O. upolensis,* being found on two islands:

SAVAII ISLAND	UPOLU ISLAND	TUTUILA ISLAND
upolensis	upolensis	adjunctus
savaii	plicatus	strigatus
garretti	tiara	
	cookei	

The relationship of *O. cookei* to the other species is not clear. The remaining seven forms appear to be grouped by size, number of whorls according to size, whorl contour, and sculptured characters into three groups which may have been evolved prior to the fragmentation of the present island system, or at least subsequent to the present island relationships. The two islands nearest

each other, Savaii and Upolu, also show the nearest relationships among the species, other than *O. savaii,* which appears to resemble *strigatus* of Tutuila more closely than it does the approximate form of *plicatus* on Upolu. However, this may mean also that the spiral lirae was the more primitive type of sculpturing, as it still occurs on all the forms except *cookei,* though even here high magnification indicates periostracal lines indicative of this character. If this be so, the most active differentiation has taken place on Upolu, where half of the eight known forms are found and where occur the most simplified species, *O. savaii, O. strigatus,* and *O. adjunctus.* In relationship these species appear to be grouped as follows:

O. cookei	O. adjunctus	O. strigatus	O. tiara
	O. upolensis	O. savaii	O. garretti
		O. plicatus	

Key to the Species of Ostodes (Samoa)

1. Shell less than 14 mm. wide 3
2. Shell more than 14 mm. wide 13
3. Shell less than 8 mm. high 5
4. Shell more than 8 mm. high 9
5. Shell smooth ..... **O. cookei.**
6. Shell with spiral lirae 7
7. Shell with axial plications and spiral lirae ..... **O. upolensis.**
8. Shell with only spiral lirae ..... **O. adjunctus.**
9. Shell with axial plications and spiral lirae ..... **O. plicatus.**
10. Shell with only spiral lirae 11
11. Shell with base smooth ..... **O. strigatus.**
12. Shell with spiral lirae on base ..... **O. savaii.**
13. Shells proportionately different (see descriptions) ..... **O. tiara** and **O. garretti.**

Ostodes cookei, new species (fig. 3, *a*).

Shell depressed-turbinate, rather thin, widely umbilicate and smooth. Whorls 4.5 to 5 and strongly convex. Color white and pale yellowish straw on the remaining semi-deciduous periostracum. Spire depressed and obtuse. Aperture circular to suboval, holostomatous and slightly pressed against whorl above. Umbilicus wide and deep, first postnuclear whorl visible from within. Sculpture of only very fine axial growth lines on a shining surface. Under a 14-power lens, exceedingly faint spiral lines are visible, in no way raised above surface as threads. Operculum horny, multispiral, deeply depressed with nucleus not papilliform below but only as the lowest point of the evenly depressed area. Measurements (in millimeters):

	Height	Width	Aperture
Holotype, BBM	6.4	8.7	2.7 × 3.3
Paratype, BBM	4.6	6.8	2.6 × 2.5
Paratype, MCZ	5.6	7.7	2.7 × 3

Holotype: BBM 9711, Upolu Is., Tiavi, alt. 2,100 ft., collected by E. C. Zimmerman, June 1940. Paratypes: BBM 186184 and MCZ 140504, same locality. Only three specimens obtained.

This species seems to stand somewhat isolated from all other *Ostodes* so far known from the Samoan Islands. The lack of sculpture and the smoothly convex whorls differentiate it from the remaining species.

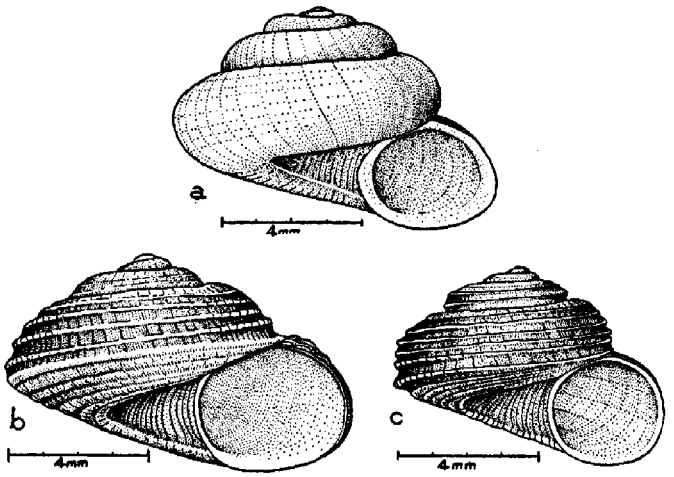

FIGURE 3.—a, *Ostodes cookei,* holotype; b, *O. adjunctus;* c, *O. upolensis,* holotype.

Ostodes adjunctus Mousson (fig. 3, *b*).

Ostodes adjunctus Mousson, Jour. de Conch. **17**: 351, pl. 14, fig. 9, 1869 (Tutuila, Samoa); Kobelt, Das Tierreich **16**: 153, 1902.

Shell sculptured, depressed-turbinate and somewhat solid. Whorls 4.5 to 4.75, strongly convex and carinate, the worls produced evenly along lower margin of carina. Aperture occasionally depressed by a slight downward development of whorl. Color dirty white (blackish-brown periostracum nearly completely deciduous) with the early 3 to 3.5 whorls generally colored dull pinkish white. Spire depressed, somewhat convex. Aperture subcircular, holostomatous with a faint obtuse angle at base of columellar margin. Umbilicus deep, funicular to nearly cylindric in shape and margined by a ridge or costa. Sculpture of rather strong spiral costae, usually 4 or 5 costae above peripheral and 5 or 6 below, the latter somewhat smaller. Peripheral carina is only a slightly larger costa which forms terminal point of whorl angle. Axial sculpture of fine growth lines in addition to exceedingly fine silk-like threads more or less axially arranged. Operculum horny, multispiral, circular, with the nucleus depressed. In profile and upside down, operculum appears as a triangle, the nucleus forming the apex. Outer surface of operculum usually covered with bits of foreign matter. Measurements (in millimeters):

	Height	Width	Aperture
BBM 84429	7.2	8.6	4 × 3.6
BBM 84429	6.2	8.2	3.5 × 3.6
BBM 83327	6.5	9.3	3.7 × 3.8
BBM 83327	6.6	9.2	3.7 × 3.9

Type locality: Tutuila Is. (Mousson).

Types not seen. As Mousson did not indicate a specific locality on Tutuila, the type locality is here selected to be the region of Pago Pago Bay. Mousson's material was collected originally by E. Graeffe.

Tutuila Is.: BBM 83949-54, 83995-98, Fagasa and nearby valley; BBM 83883, Pago Pago, alt. 200 to 500 ft.; BBM 83479, 1 mile northeast of Vatia, alt. 100 to 150 ft.; BBM 83501-2, Amalau Bay, alt. 100 ft.; BBM 83327-8, 83344, 83357, northwest slope on Mt. Pioa, alt. 600 to 800 ft.; BBM 85555, trail between Olofau and Amouli, alt. 300 to 400 ft.; BBM 84429, ridge east of Amouli. (All above records obtained on the Samoan Expedition by Cooke, Dranga, Judd, and Tuifea, Feb. to April 1926.) BBM 53540, 53554, Pago Pago, alt. 200 to 600 ft., collected by Mrs. A. M. Stokes, July 1920; BBM 161265, Vatia Trail, alt. 800 to 1,100 ft., collected by W. F. Coultas, Oct. 1936; BBM 97017, Aua-Afono Trail, alt. 1,000 ft., collected by D. T. Fullaway, Feb. 1930; MCZ 119933, Amouli, and MCZ 132904, one-half way between Pago Pago and Alofau, collected by R. T. Abbott.

This species is related to *O. upolensis* Mousson from Upolu, but differs in that it lacks the strong axial plicae and is a little larger and somewhat higher in proportion to its width. The base of the present form may be smooth, though it is generally sculptured with spiral lirae.

Ostodes upolensis Mousson (figs. 3, *c;* 28, *e*).[4]

Cyclophorus upolensis Mousson, Jour. de Conch. **13**: 180, 1865 (Upolu, Samoa).

Ostodes upolensis Kobelt, Das Tierreich **16**: 157, 1902.

Shell depressed-turbinate, fairly solid, umbilicate, and sculptured. Whorls 4.5 to 4.75, strongly convex and subcarinated. Color dirty white, or isabelline, with brownish-yellow, deciduous periostracum. Spire depressed, obtuse, and moderately convex. Aperture subcircular and holostomatous. Umbilicus wide and deep and abruptly descending from inner basal carina. Sculpture of numerous spiral carinae, the peripheral one forming the terminus of the whorl angle. Axial sculpture of flat and obtuse plicae generally apparent but not always pronounced. In addition, there are fine axial growth-striae. Operculum horny, circular, multispiral, depressed, nucleus central and somewhat papilliform below. Measurements (in millimeters):

	Height	Width	Aperture
BBM 186307	6.6	7.8	3.1 × 3.4
BBM 186307	6.2	7.4	3 × 3.1
BBM 95726	5.7	7.2	3 × 2.9
BBM 95726	5.2	6.2	2.5 × 2.7

Type locality: Upolu Is.

Holotype: MCZ 141001; paratypes MCZ 141002, BBM 188848, all from the Museum Godeffroy, collected by E. Graeffe. I select Malololelei, Upolu, 5 miles south of Apia as the type locality. Material from this place is identical with specimens of the type lot in our possession.

Upolu Is.: BBM 115397 (ex Fulton), BBM 95726, Latuafara, alt. 216 ft., collected by E. Christophersen, 1929; BBM 185843, Mt. Vaea, collected by W. Harris, July 1937; BBM 186413, Lake Lanutoo, alt. 2,400 ft., collected by O. H. Swezey, June 1940; BBM 186195, 186198-200, 186207-8, Malololelei, alt. 1,500 ft.; BBM 186476, 186484, Sinaele, alt. 1,400 ft.; BBM 186021-23,

[4] Figure 28 is on page 48.

Afiamalu, alt. 2,200 ft.; BBM 186179, 186307, Tiavi, alt. 1,900 to 2,010 ft. (These last records collected by Zimmerman during June and July 1940.) Savaii Is.: BBM 75788, Salailua, alt. 1,200 to 2,000 ft., collected by E. H. Bryan, Jr., May 1924.

As stated in the remarks under *O. adjunctus,* these two species are closely related, and differ mainly in the development of strong axial plications. The base, as in the latter species, may be smooth and partially or entirely sculptured by the spiral lirae.

The single specimen obtained on Savaii appears to be identical with Upolu material.

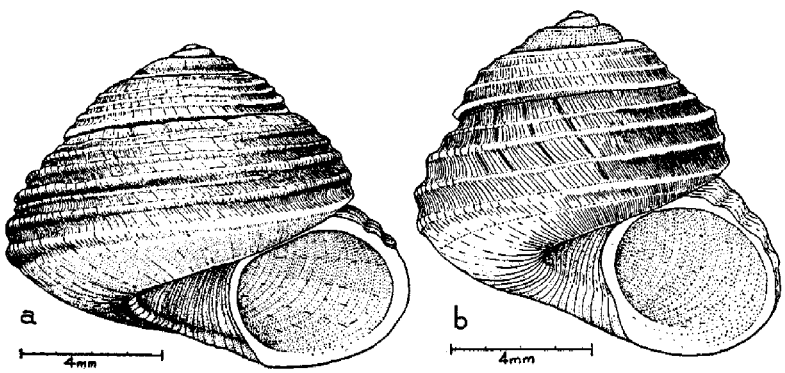

FIGURE 4.—**a-b,** *Ostodes strigatus; a,* cotype.

Ostodes strigatus Gould (fig. 4, *a, b*).

Cyclostoma strigatum Gould, Boston Soc. Nat. Hist., Proc. **2**: 204, 1847 (Upolu, Samoa); Gould, U. S. Expl. Exped. **12**: 102, pl. 8, fig. 117 *a-b,* 1852.

Cyclostoma albida Hombron and Jacquinot, Voy. Pôle Sud **5** [**4** (2)]: 50, pl. 12, figs. 25-28, 1854 (Samoa).

Ostodes strigatus, Kobelt, Das Tierreich **16**: 156, 1902.

Shell sculptured, moderately umbilicate, globose-turbinate and solid. Whorls 5 to 5.5, subcarinate and strongly convex. Last whorl occasionally depressed below periphery of preceding whorl just before aperture. Color dirty white with a blackish-brown, deciduous periostracum, which clings to shells in depressions between spiral costae giving a superficial color banding to shells. Rarely shells are pinkish, either on nuclear whorls alone or a general diffusion of this color throughout the entire shell. Spire moderately extended and slightly convex. Aperture subcircular, holostomatous though pressed slightly upon the whorl above. A slight obtuse angle is produced at base of aperture and at columellar margin. Umbilicus deep, moderately wide and distinctly margined by a basal angle. Sculpture of strong spiral costae, usually 4 above peripheral costa. Base of whorl below periphery with costae faintly produced or absent, though umbilical margin may be pinched into a moderate costa. Axial sculpture of rather fine growth-lines and with areas showing a silken luster of periostracal impressions. Operculum horny, circular,

multispiral, and dish-shaped. Outer surface generally with accumulated debris, lower surface smooth and shining, nucleus papilliform. Measurements (in millimeters):

	Height	Width	Aperture
BBM 97141	10.2	9.8	4.4 × 4.5
BBM 97141	10.1	9.8	4.6 × 4.4
BBM 83660	10.1	9.8	4.2 × 4.2
BBM 83660	9.4	10.2	5.6 × 4.4
BBM 85298	10.3	9.4	4 × 4.4
BBM 85298	8.6	9.7	4.3 × 4.1

Type locality: Upolu Is. [?].

There appears to be no question that Gould was in error in assigning this species to Upolu rather than to Tutuila. This may have been responsible for the belief that *O. strigatus* and *O. plicatus* were synonyms, as indicated by a few authors. In my opinion, however, the two forms are quite distinct.

Tutuila Is.: BBM 85268, 85298, Laulii Valley, alt. 100 to 500 ft.; BBM 83660, Fagatoga, alt. 100 to 900 ft.; BBM 84568, foot of Mt. Tau, alt. 80 ft.; BBM 84080, 84097, Logatala Ridge, alt. 200 ft.; BBM 84736-37, Leone, alt. 150 ft.; BBM 84796-99, Leone-Aolaoa Trail, alt. 900 to 1,200 ft. (All above records collected by Samoan Expedition in March 1926.) An additional record, BBM 97141, was collected by D. T. Fullaway in 1930 on the Fagasa-Maupasaga Trail, alt. 500 ft. (fig. 4, *b*).

I select the area at Fagatoga, Tutuila as the type locality for this species. A cotype of Gould is figured (MCZ 141006). (See figure 4, *a*.)

This species is most nearly allied to *O. savaii,* herein described, differing

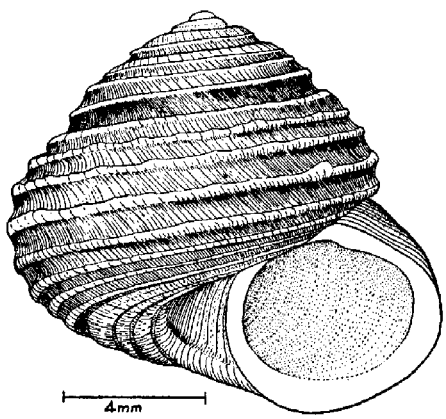

FIGURE 5.—*Ostodes savaii,* holotype.

mainly in that it has a smooth base and is proportionately a little higher than wide and is, on the average, a little smaller. From *O. plicatus,* this form differs in that it lacks the strong axial plications.

Ostodes savaii, new species (figs. 5, 6).

Similar to *O. strigatus* in general outline but generally a little larger and having base of last whorl sculptured with rather strong spiral lirae or costae. Individual speci-

mens of both species, however, approximate one another; that is, few specimens of *strigatus* in a large number examined show traces of the basal lirae, or have their basal lirae absent or weakly developed. Rarely, spiral lirae are lacking from entire shell and there are faint indications of axial costae, a character well-developed in *O. plicatus*. Measurements (in millimeters):

	Height	Width	Aperture
BBM holotype	12.4	12.2	4.6 × 5
BBM paratype	11.6	11	5.5 × 5
BBM paratype	11.5	11.5	5.5 × 5.4
MCZ paratype	11	11.4	5 × 5
MCZ paratype	11.4	11.3	5.5 × 5.1

Holotype: BBM 9710, Savaii Is., Salailua, alt. 300 to 600 ft., collected by Christophersen, Oct. 1931. Paratypes BBM 108239-42, MCZ 140501 from same locality and following localities on Savaii, collected by Christophersen in 1931; BBM 108185, Matavanu, alt. ± 3,000 ft.; BBM 108332, Siuvao-Auala (1 to 4 miles inland), alt. 500 to 2,000 ft.

As stated under *O. strigatus*, these two species are very close in their relationships. The differences are, however, quite constant.

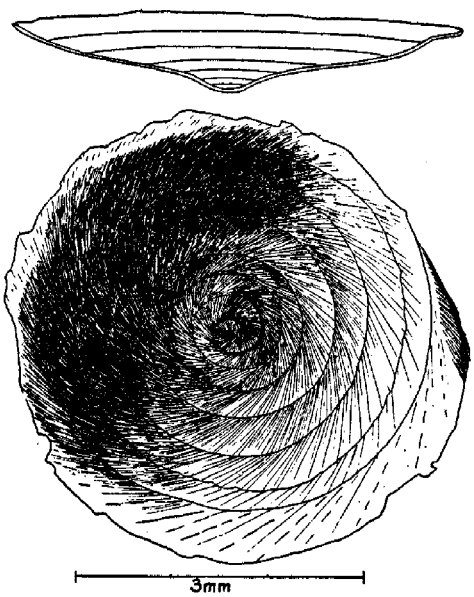

FIGURE 6.—*Ostodes savaii*, operculum and cross section of operculum.

Ostodes plicatus Gould (fig. 7, *a*).

Cyclostoma plicatum Gould, Boston Soc. Nat. Hist., Proc. **2**: 205, 1847 (Upolu, Samoa); Gould, U. S. Expl. Exped. **12**: 103, pl. 8, fig. 118 *a-b*, 1852.

Cyclostoma apiae Récluz, Jour. de Conch. 2: 213, pl. 6, figs. 10-11, 1851 (Apia, Opolu [Upolu], Samoa).

Cyclostoma pulverulentum (Philippi) Pfeiffer, Conch.-Cab. **1** (19) : 301, pl. 40, figs. 13-14, 1854 (Upolu).

Cyclostoma gassiesi Souverbie, Jour. de Conch. **7** : 294, pl. 8, fig. 6, 1859.

Ostodes plicatus, Kobelt, Das Tierreich **16** : 156, 1902.

Pfeiffer (45, p. 301) introduced in 1854 the name *pulverulentum* to replace *Cyclostoma plicata* Gould (1847) *non C. plicata* Verneuil (1845). This latter name by Verneuil for a fossil species is not given by Sherborn and may be only a manuscript name available to Pfeiffer at that time. He listed it as a name only (46, vol. 1, p. 317). Later he discarded the name *pulverulentum,* listing it as a synonym under *plicatus* Gould (46, vol. 4, p. 115).

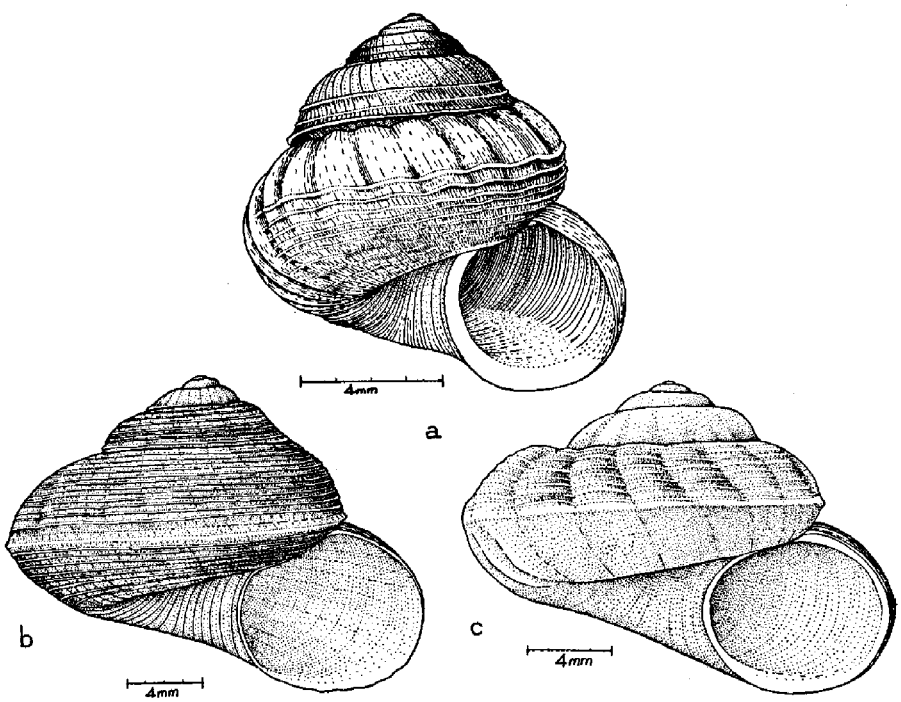

FIGURE 7.—**a,** *Ostodes plicatus;* **b,** *O. tiara;* **c,** *O. garretti,* holotype.

I am confident that *Cyclostoma gassiesi* Souverbie (54, p. 294) is an absolute synonym of *O. plicatus.* The large series of specimens in Bishop Museum agrees with the description and figure of *gassiesi.* A common variation in *O. plicatus* and in other *Ostodes* is having the body whorl formed somewhat below the peripheral carina of the whorl above, which gives rise to the flattened area on the penultimate whorl. Kobelt (27, p. 155) was of the belief that *gassiesi* could hardly be separated from *plicatus.*

Shell solid, sculptured, umbilicated, and subglobose. Whorls 5.5 to 5.75, convex, rounded to subcarinate. Young shells sharply carinate with lower half of whorl flat.

In mature shells the last whorl is rounded with an almost complete loss of the peripheral carina. Color dirty white to brownish red (rare) with portions of the deciduous periostracum remaining between axial plicae and spiral striae. Spire somewhat extended, sides flat to moderately convex. Aperture subcircular, holostomatous, and pressed against whorl above. A moderate angle is formed at base of aperture and at columellar margin. Umbilicus narrow and deep, generally margined by an angle along inner face of whorl. Sculpture of numerous spiral costae, generally 6 to 8 above whorl periphery. Axial sculpture of numerous, broad, flat plications that usually extend across entire whorl though they occasionally are somewhat stronger above periphery. Plications rarely absent. Exceedingly fine growth lines are present. A silken luster faintly visible under a 14-power lens. Operculum horny, circular, multispiral, depressed and with a central nucleus. Upper (outer) surface generally covered with accumulated debris, lower surface smooth and shining with the nucleus papilliform. Measurements (in millimeters):

	Height	Width	Aperture
BBM 186453	11.5	9.7	5.2 × 4.4
BBM 186453	10.5	10.1	5.1 × 4.7
BBM 186449	11.2	10.1	5.4 × 4.8
BBM 186449	10.6	10.3	5.5 × 4.7

Type locality: Upolu Is.

Upolu Is.: BBM 86188, Apia, collected by W. P. Cockerell, 1924; BBM 54407, central Upolu, collected by D. S. Gifford, 1920; BBM 95709, Latuafara, collected by Christophersen, Oct. 1929, alt. 216 ft.; BBM 174696, Vaea, collected by W. Harris, Sept. 1927, alt. 900 ft.; BBM 186380, 186449-50, 186452-53, Tapatapoo, 5 miles southeast of Apia, alt. 800 ft., collected by Zimmerman, June-July 1940; BBM 186180, Tiavi, 7.5 miles south of Apia, alt. 2,100 ft., collected by Zimmerman, June-July 1940; MCZ 5009, Falelatai, collected by W. M. Woodworth, 1898.

O. plicatus is related to *strigatus* and *savaii* by its size and presence of spiral lirae, but differs from both in possessing strong axial plicae. From *upolensis,* which occurs on the same island of Upolu, it differs in being much larger for the same number of whorls and especially in its smoothly convex spire. In *O. upolensis* the strongly convex whorls cause the suture to be far more inset, which interrupts the smooth contour of the spire.

Ostodes tiara Gould (fig. 7, *b*).

Cyclostoma tiara Gould, Boston Soc. Nat. Hist., Proc. **2**: 204, 1847 (Upolu, Samoa); Gould, U. S. Expl. Exped. **12**: 101, pl. 8, fig. 116-*a*, 1852.

Ostodes tiara, Kobelt, Das Tierreich **16**: 156, 1902.

Shell solid, subdepressed and widely umbilicate. Whorls 5 to 5.25, strongly convex, and generally developing a moderate angle at the periphery. Whorls occasionally somewhat irregularly produced along and below peripheral angle, giving them a shingled appearance. Periostracum deciduous, yellowish brown, shell material beneath isabelline to pinkish, the latter color, if present, found on the earlier whorls. Aperture circular to slightly subcircular, simple and holostomatous. Parietal area slightly pressed against whorl above. Umbilicus funicular and deep, about 0.14 total width of shell. Sculpture: nuclear whorls smooth, following whorls develop numerous, rather fine threadlike spiral costae which persist but are generally weaker over last portion of body whorl. These threadlike costae are strongest above periphery, usually extending a little below, but sometimes entirely absent. Post-nuclear whorls develop rather strong, flat, broad axial ridges which impart a crenulated margin at suture. These ridges flatten out and nearly

disappear on last half of body whorl. Fine axial growth lines are also present. Operculum horny, multispiral, circular, with central nucleus depressed, pinched below into a small, rounded point. Measurements (in millimeters):

	Height	Width	Aperture
MCZ 141003	16.5	20	9 × 8.5
MCZ 141003	14	17.5	8 × 8
BBM 194	15	19.5	9.5 × 8
BBM 194	14.5	18.6	9 × 8.1
BBM 186172	11.7	16.4	7 × 7.3

Type locality: Upolu Is.

Upolu: BBM 194 (A. Garrett Coll.); BBM 186172, near Tiavi, collected by Zimmerman, June 1940, alt. 2,100 ft.; MCZ 141003 (ex Museum Godeffroy).

Closely related to the following species, *O. garretti* Clench, but differs in that it is proportionately higher and has a smaller umbilicus.

Ostodes garretti, new species (fig. 7, *c*).

Shell solid, depressed, and widely umbilicated. Whorls 4.75 to 5, strongly convex and developing a fairly strong peripheral keel. Periostracum probably brownish or yellowish brown. Shell dirty white. Aperture circular and holostomatous. Umbilicus wide and deep, funicular, the whorls visible within to the post nuclear whorl. Sculpture of many axial plicae, more or less flattened and crossed by numerous fine spiral lirae that are developed strongest about periphery. Base of whorl smooth, or with lirae but faintly produced. Operculum unknown. Measurements (in millimeters):

	Height	Width	Aperture
BBM holotype	14.6	19.1	7.6 × 8
BBM paratype	14.5	18.1	7.4 × 7.6
MCZ paratype	13.2	15.6	6.9 × 7
BBM paratype	14.4	18	7 × 7.2

Savaii: BBM 108334, Siavao-Auola, alt. 500 to 2,000 ft. Paratype BBM 108216, 108198, MCZ 140524, Salailua, from sea level to ± 2,600 ft. (All collected by Christophersen, Sept.-Dec. 1931.)

Closely related to the previous species, *O. tiara* Gould, from Upolu, but differs in that it is a little more depressed and has a slightly smaller aperture and umbilicus a little wider in proportion to the size of the shell.

Genus **Gonatorhaphe** Von Möllendorff

Gonatorhaphe v. Möllendorff [in] Kobelt and v. Möllendorff, Deutsche Malak. Ges. Nachr. **30**: 155, 1898; v. Möllendorff, Jour. Malac. **7**: 120, 1900; Kobelt, Nassausicher Verein für Nat., Jahrb. **59**: 135, 1906; Thiele, Handbuch syst. Weicht. **1**: 173, 1929.

Shells generally depressed-turbinate, usually quite solid and generally with a deciduous periostracum. All are widely umbilicate with whorls as a coiled tube only slightly appressed upon the whorl above. In rare cases last whorl may be solute or almost so near aperture. Sculpture generally composed of numerous and rather strong spiral lirae and quite frequently with rather broad, somewhat flattened, axial plicae. Operculum flat, multispiral, calcareous and possessing a centrally depressed nucleus. Margin of operculum smoothly rounded.

This genus is limited to the New Hebrides and the Fijian Islands.

Genotype: *Cyclostoma recluzianum* Pfeiffer (= *Cyclostoma fornicatum* Pfeiffer). This genus was first published by Von Möllendorff (33, p. 155) without a description but with a list of species which he considered forming a natural group. Subsequently (34, p. 120) he defined his genus with a meager description and designated *Cyclostoma recluzianum* Pfeiffer as the type. Later (28, p. 135) he redefined this genus and selected another type, *C. daucina* Pfeiffer. This latter type selection is certainly a lapsus.

C. recluzianum (= *fornicatum*) and *C. daucinum* were originally described as coming from the Solomon Islands, but this is in error according to Brazier (4, p. 587). Sykes (56, p. 199) has synonymized *recluzianum* under *fornicatum*, the latter definitely known to occur in the New Hebrides. Nothing approaching *Gonatorhaphe* was obtained in the Solomons by W. M. Mann (MCZ) or by the recent Whitney Expedition to the Solomons (AMNH). Most of this early material came from traders, and the term Solomon Islands was rather loosely applied to the Melanesian islands extending from the Bismarcks south to the New Hebrides.

It is exceedingly difficult to understand why Von Möllendorff placed this genus in the Realiidae rather than the Cyclophoridae on the basis that *Gonatorhaphe* lacked the "marginal channel" on the operculum. This character, though of considerable generic and subgeneric value, is due to the presence of a calcareous plate built upon a base of periostracum. The spiral formation (paucispiral) and the shape of the opercula in the Realiidae differ greatly from the opercula (multispiral) found in the Cyclophoridae. In both families, groups of subgeneric or higher categories exist with or without the calcareous plate. An exact parallel of this condition is found in the Ampullariidae (*Pomacea* and *Pila*) and the Naticidae (*Polinices* and *Natica*), to cite only a few examples. This error was followed later by Thiele (57, p. 173).

New Hebrides

Gonatorhaphe fornicata Pfeiffer.

Cyclostoma (*Cyclophorus*) *fornicatum* Pfeiffer, Zool. Soc. London, Proc., 146, 1852 [1854] (New Hebrides).

Cyclostoma (*Cyclotus*) *recluzianum* Pfeiffer, Zool. Soc. London, Proc., 51, 1853 [1854] (Solomon Isls.).

Cyclotus recluzianus Pfeiffer, Reeve, Conch. Icon. **14** (Cyclotus), sp. no. 53: pl. 9, fig. 53, 1863; Brazier, Zool. Soc. London, Proc., 587, 1871.

Ostodes fornicata Pfeiffer, Sykes, Malac. Soc. London, Proc. **5**: 199, 1902 (Port Fila, Efate Is., New Hebrides).

Brazier (4, p. 587) has the following note on this species and gives the locality as Dillons Bay, Eromanga, New Hebrides.

The original or type specimens were collected at the same place by my late friend, Mr. John MacGillivray; and during my visit to Erromanga, six years ago, I found it plentiful under decayed leaves in very damp places near the sea and never upon any other island in the New Hebrides. The late Mr. Cuming was in error when he sent it to Dr. Pfeiffer with the locality "Solomon Islands." I have been through almost every island in the Solomons and have not met with any of the genus *Cyclotus*.

Gonatorhaphe fornicata macgillivrayi Pfeiffer.

Cyclostoma (*Cyclotus*) *macgillivrayi* Pfeiffer, Zool. Soc. London, Proc., 103, 1855 (Aneityum Is., New Hebrides).

Cyclotus macgillivrayi Pfeiffer, Reeve, Conch Icon. **14** (Cyclotus), sp. no. 57: pl. 9, fig. 57, 1863; Brazier, Zool. Soc. London, Proc., 587, 1871.

Cyclotus charmian Hutton, New Zealand Inst., Trans. **16**: 209, 1883 (Horokiwi, Wellington); Suter, Man. New Zealand Mollusca, Wellington, 684, 1913 (New Hebrides).

Ostodes fornicatum macgillivrayi Pfeiffer, Sykes, Malac. Soc. London, Proc. **5**: 19, 1902 (Espiritu and Efate Isls., New Hebrides).

Suter (55, p. 684) has pointed out that Hutton's species *C. charmian,* was by error assigned to New Zealand. He has determined it as *macgillivrayi* of the New Hebrides.

Brazier (4, p. 587) adds the following note and gives the locality as Aneityum Island, New Hebrides.

When Dr. Pfeiffer described this species, he gave the correct locality, and when he brought out his second part of "Monographia Pneumonopomorum," he also gave it correctly, and at the same time a locality of his own, New Georgia, one of the Solomon Islands. It is impossible to find this species at any island in the Solomons. In the third part of the the "Monographia" he only gives "Nov. Hebrid."; but it is only found on one island [Aneityum] of the group, and not on all, as the term New Hebrides would imply.

Fijian Islands

The following species from Fiji appear to be rare. Even Graeffe and Garrett obtained few specimens, and their collecting was done long before the land had been cultivated to the extent that exists today. The only large series available is that of *G. stricta* Garrett from Vatu Lele, collected by H. S. Ladd. Only five living specimens were found, though a series of more than 200 dead shells was collected. Many of the dead shells appear to be very old and may have been accumulated over a long period of time. All of the specific records from Fiji are from the lowlands, ranging from sea level to an altitude of 200 feet.

Key to the Fijian Species

1. Shell more than 13 mm. wide ..... **G. lauensis.**
2. Shell less than 13 mm. wide 3
3. Shells with spiral lirae only ..... **G. intercostata.**
4. Shells with spiral lirae and generally with axial plicae ..... **G. stricta.**

Gonatorhaphe stricta Garrett (figs. 8, *a, b;* 28, *c*).

Ostodes strictus 'Mousson' Garrett, Zool. Soc. London, Proc., 306, 1887 (Vatu Lele, Fiji).

Shell solid, depressed to subdepressed, widely umbilicated and sculptured. Whorls 5 to 5.13 (type series), strongly convex and rarely subcarinate. Color white tinged with faint orange, especially so near aperture. Periostracum yellowish brown and deciduous. Spire variable, generally quite depressed but occasionally elevated and forming an angle ranging from 90 to 115 degrees. Aperture simple, subcircular, slightly flattened on area of attachment to whorl above. Umbilicus open and broad with nuclear whorls seen from within. Sculpture of numerous, more or less equal, fine spiral lirae initiated beyond nuclear whorls. Base of shell usually without spiral lirae, especially in adult specimens. Axial sculpture of rather broad, flattened, irregular plicae mostly developed on midwhorls and not always conspicuous. This occasionally forms a minor crenulation along the rather deeply impressed suture. Operculum calcareous, dish-shaped, multispiral, and with a central nucleus. Outer surface roughened. Inner surface smooth and horny with the nucleus slightly papilliform. Margin channeled. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	10.1	13	5.5 × 5.5
Paratype	9	12	5 × 4.8
Paratype	10	12.1	5 × 4.8

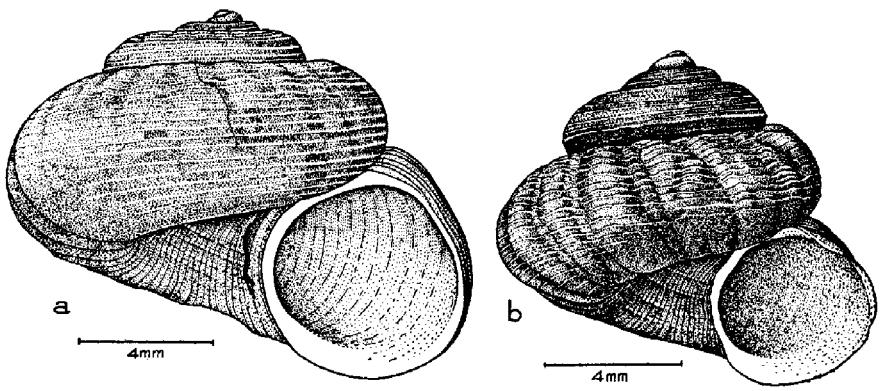

FIGURE 8.—**a-b,** *Gonatorhaphe stricta; a,* holotype.

Holotype: BBM 10004, Vatu Lele Is. (ex Godeffroy Museum, collected by E. Graeffe). Paratypes: BBM 7972, same locality and source. Holotype here selected. Garrett's measurement of height (7 mm.) differs considerably from mine (10 mm.); Garrett apparently measured the height along a diagonal line and not along the axis. The same is true for the height measurement of *G. liberata.*

BBM 88017-28, near middle of Vatu Lele Is.; BBM 88048-53, 87978-80, 87995-96, northwest quarter of Vatu Lele Is., alt. 10 to 20 ft., collected by H. S. Ladd, July 1928.

This species is exceedingly close to, or possibly identical with, *G. intercostata* Mousson. At the present time there is little material of the latter species available for a fair comparison.

The present series, though composed mainly of dead shells, indicates considerable variation in form; and the extremes would probably be considered different species if found in separate areas.

Gonatorhaphe intercostata Mousson (fig. 9).

Cyclophorus (Ostodes) diatretus intercostata Mousson, Jour. de Conch. 18: 180, 1870 (Vanua Valabo [Vanua Mbalavu]).

Ostodes diatretus Garrett, Zool. Soc. London, Proc., 305, 1887; *non* Gould 1847.

Shell depressed, solid, widely umbilicated and sculptured. Whorls 5, strongly convex and slightly carinate. Color white (dead shells). Aperture simple, subcircular and slightly flattened at point of attachment above. Spire depressed and obtuse, forming an angle of 129 to 132 degrees. Umbilicus wide and deep with the nuclear whorls visible from within. Sculpture of numerous fairly coarse spiral lirae more or less evenly disposed over the entire shell other than the nuclear whorls; the two specimens possess rather fine axial plicae. Operculum calcareous, multispiral, and somewhat dished. Outer surface slightly roughened. Measurements (in millimeters):

	Height	Width	Aperture
Topotype	8	12.2	4 × 4.5
Topotype	7.4	11.7	4.6 × 4.4

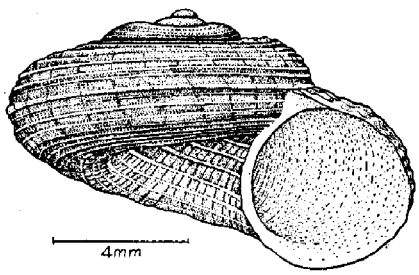

FIGURE 9.—*Gonatorhaphe intercostata,* topotype.

Type locality: Vanua Mbalavu, collected by E. Graeffe. Location of types unknown. They were originally in the Museum Godeffroy.

BBM 2506, Vanua Mbalavu (Garrett Coll.). Garrett (10, p. 305) records also a specimen from Oneata Island, which, with Vanua Mbalavu, is in the Lau, or eastern, group of the Fiji Archipelago; BBM 79112 (dead), East Islet, Kimbombo group (just north of Vanua Mbalavu), alt. 50 to 150 ft., collected by E. H. Bryan, Jr., Sept. 1924; BBM 166657 (dead), Namuka Is., Matandolo, alt. 65 to 75 ft., collected by H. S. Ladd, July 1934.

As stated under *G. stricta,* it is possible that these two species may be the same. The few specimens at hand indicate a very close relationship, though they are not exactly the same. It is perhaps best, as they come from different islands, to hold them distinct until more material is available for study. The name *intercostata* Mousson, is the older.

Gonatorhaphe lauensis, new species (fig. 10).

Shell subglobose, solid, openly umbilicated and sculptured. Whorls 5, strongly convex. Color dirty white (dead shells only). Spire moderately elevated and cast at an angle of 95 degrees. Aperture simple and subcircular. Umbilicus open and deep with the nuclear whorls visible from within. Sculpture of rather coarse spiral lirae crossed with somewhat finer diagonal axial threads giving a moderately reticulated pattern to the surface. Nuclear whorls smooth. Operculum unknown. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	14.5	17	7.4 × 7.2
Paratype	.....	14	5.5 × 6.2

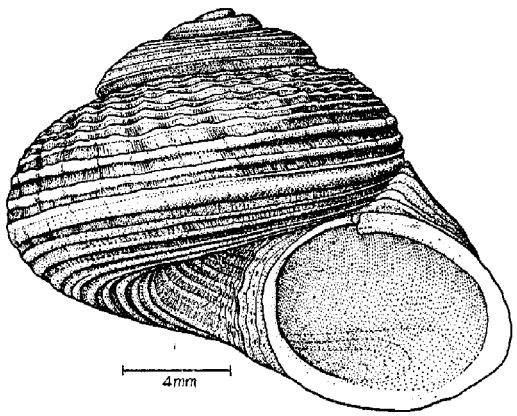

FIGURE 10.— *Gonatorhaphe lauensis,* holotype.

Holotype: BBM 180060, near and south of Marona, Mango, Lau, alt. 200 ft., collected by Kondo, Aug. 1938. A single broken paratype from the same locality.

This species appears to be quite different from the two previously considered forms in its much larger size, its higher and heavier shell and its coarser sculpture. The umbilicus is proportionately smaller and the whorls more narrowly coiled.

Genus **Fijiopoma,** new genus

Shells somewhat similar to *Gonatoraphe,* but more delicately formed, more depressed, and having spiral sculpture with small blade-like processes. Operculum differs quite sharply in having spiral formed by an oblique lamina which overlaps on each coil.

Genotype: *Ostodes liberatus* Garrett.

Fijiopoma liberata Garrett (figs. 11, 12, *a*).

Ostodes liberatus 'Mousson' Garrett, Zool. Soc. London, Proc., 305, 1887 (Viti Levu, Fiji).

Ostodes liberatus soluta Ancey, Le Naturaliste **11**: 291, 1889 (Viti Levu, Fiji).

Shell depressed, rather thin, widely umbilicated and strongly sculptured. Whorls 4, strongly convex and appearing as a coiled tube, last whorl solute or nearly so at aperture. Color white, though covered in part with a light straw-colored periostracum which appears to be somewhat deciduous. Spire depressed and widely obtuse (140 degrees, holotype). Aperture circular, simple and holostomatous. Umbilicus broad and deep and penetrating within to nuclear whorls. Sculpture of numerous spiral lirae, two of which, one above and one below the periphery, are far more strongly developed and are somewhat blade-like. These are not evenly developed but are evenly crenulated, the crenulations, appearing as lirae, pass over flattened and rather indistinct axial plicae. Plicae best developed on post-nuclear whorls but more or less disappear on body whorl, crenulations on lirae continuing, however. Faint axial growth lines visible between lirae. Operculum calcareous, circular, and multispiral, the coils producing moderately flattened lamina on top. Lower face smooth and horny with nucleus slightly protuberant. The edge is slightly indented or with a canal. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	5.6	10.2	3.5 × 3.5
Paratype	5.8	10.3	3.3 × 3.4
Paratype	5.6	9.5	3.1 × 3
Paratype	5.5	9.2	3 × 3

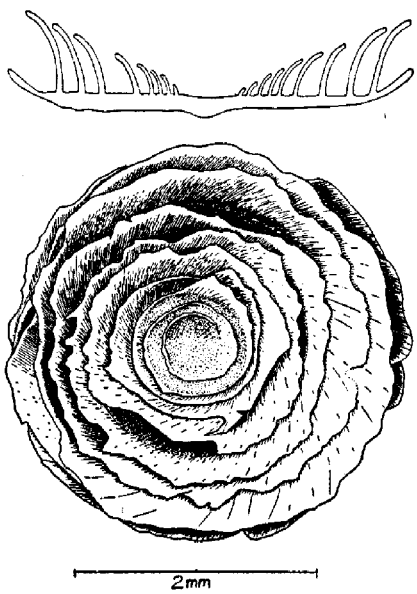

FIGURE 11.—*Fijiopoma liberata,* operculum and cross section of operculum.

Holotype: BBM 10005, Viti Levu (ex Mus. Godeffroy, collected by Graeffe; Garrett Coll.). BBM 7970, three paratypes from same locality.

Mousson never described this species, but apparently named the specimens which were sent to Garrett by the Museum Godeffroy. The specimen that nearest approaches Garrett's measurements is here selected as the holotype.

The subspecies *soluta,* described by Ancey, is perhaps the normal condition of the typical species in the adult stage. Two of the four Garrett specimens are solute, one to the extent of 4 mm.; the remaining two are somewhat young. Ancey mentions that the form he described was from the type series of *liberatus,* possibly the remaining specimens of *liberatus* in the collection of the Museum Godeffroy.

? Fijiopoma diatreta Gould (fig. 12, *b*).

Cyclostoma diatretum Gould, Boston Soc. Nat. Hist., Proc. 2:205, 1847 (Sandalwood Bay, Fiji); Gould, U. S. Expl. Exped. 12:105, pl. 8, fig. 124 *a-b,* 1852.

Shell discoidal, whitish, or pale horn-color, solid; whorls four, rapidly enlarging, forming a flat spire, and sloping downwards to the suture; they are cylindrical, but the surface is made angular above by four smooth, distant, triangular ribs, and has the intervening concave spaces most delicately barred by the lines of growth; beneath concave, widely and loosely umbilicate, and striated with numerous revolving, raised lines. Aperture large, circular, very oblique, barely united to the preceding whorl; lip simple. Length one-fifth of an inch; breadth two fifths of an inch. (Description from Gould.)

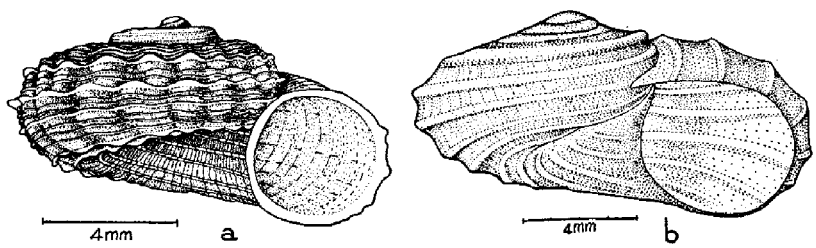

FIGURE 12.—**a,** *Fijiopoma liberata* (holotype); **b,** ?*F. diatreta,* after Gould.

Type locality: Sandalwood Bay [Mbua Bay, Vanua Levu Is.].

I have not seen this species. To judge by the figures alone, it is quite distinct from the remaining Fijian forms and appears nearest to *liberata* in the genus *Fijiopoma.* Gould makes no mention of the operculum. Figure 12, *b* is greatly enlarged and is copied from Gould's plate in the report of the United States Exploring Expedition.

CAROLINE ISLANDS

Genus **Paramia,** new genus

Shell hardly different from *Gonatorhaphe* but has a totally different form of operculum, which differs in having a low but vertical lamella on upper surface of calcareous plate, which is spirally developed. There is no marginal canal to the calcareous plate, but a periostracal layer extends up obliquely along its sides and even beyond to form a thin flange.

Genotype: *Cyclostoma incisa* Hombron and Jacquinot.

Paramia incisa Hombron and Jacquinot (figs. 13 and 14).

Cyclostoma incisa Hombron and Jacquinot, Voy. Pôle sud **5** [**4**(2)] : 49, pl. 12, figs. 11-15, 1854 (Hogoleu [Truk], Caroline Isls.).

Gonatorhaphe incisa Hombron and Jacquinot, v. Möllendorff, Jour. Malac. **7** : 120, 1900.

Shell rather solid, depressed-turbinate, widely umbilicated and strongly sculptured. Whorls 4.25 to 4.5, strongly convex and appear as a coiled tube. Color isabelline, generally flushed with dull rose, especially on the early whorl. Periostracum deciduous, though portions adhere in depressions between the spiral lirae. Spire greatly depressed, obtuse, and forms an angle of approximately 120 degrees. Aperture subcircular and holostomatous, though the parietal area is pressed against the whorl above. Umbilicus wide and deep, nuclear whorls visible from within. Sculpture of numerous and rather coarse spiral lirae crossed by fine growth lines and fairly strong but flattened axial costae, which are generally found only on body whorl. Nuclear whorls smooth. Suture slightly indented. Operculum circular, flat, and calcareous. Upper surface has a low, vertical multispiral lamella. Lower surface covered with layer of periostracum which extends beyond margin of calcareous plate to form a thin flange. Nucleus central. Measurements (in millimeters) :

	Height	Width	Aperture
Topotype	7.5	9.8	4.1 × 4.5
Topotype	7.5	10.1	4 × 4.5
Topotype	8	10.4	4.5 × 4.6
Topotype	7.6	10.1	4.2 × 4.3

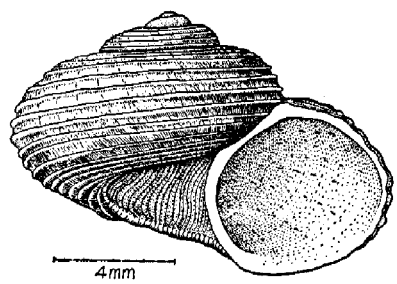

FIGURE 13.—*Paramia incisa.*

Type locality: Hogoleu [Truk]. Hombron and Jacquinot collected on Dublon, Param, and Tsis in the Truk group. I here select the little island of Param as the type locality, as our specimens from Param agree in all details with the original description and figures.

Truk Isls., BBM 155703-04, 155707-10, 155713, 155716, Param Is.; 155230, Moen Is.; 155802, Tsis Is.; 155778-80, Tarik Is.; 153546-47, Dublon Is. (All of the above collected by Kondo during December and January 1935-36, at altitudes under 100 feet.) In early 1941, K. Atoda obtained additional records as follows: BBM 189436, Tsis Is.; 189455, Udot Isls.; 189172, Fefan Is.

The shell characters of this species certainly approach *Gonatorhaphe,* but the sharp differences found in the operculum indicate that its affinities are not congeneric.

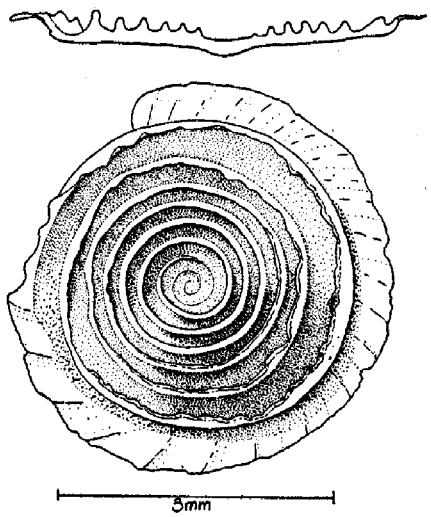

FIGURE 14.—*Paramia incisa,* operculum and cross section of operculum.

Paramia kondoi, new species (figs. 15, *a;* 28, *b*).

Shell depressed-turbinate, rather thin, but strong, umbilicate and generally smooth. Whorls 4.25 to 4.5, strongly convex. Color isabelline to a rather light brownish red, occasional examples possess the color only on the early whorls. Spire depressed, only slightly elevated above contour of body whorl. Spire forming an angle of 120 degrees. Aperture subcircular, upper margin impressed upon the whorl above. Lip simple. Umbilicus rather wide and deep, the nuclear whorls visible from within. Sculpture of very fine growth lines. A few specimens have axial plicae. Operculum flat, having a calcareous plate with a low spiral ridge. Base (lower side) with a thin periostracal layer which extends upward and obliquely at margin and beyond to form a narrow flange. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	7.8	10.4	4.5 × 4.2
Paratype	7	9.8	4 × 4.1
Paratype	7	9.8	4 × 4
Paratype	7.1	9.2	4 × 4

Holotype: BBM 9713, Truk Isls., Moen Is., Nebokos, collected by Kondo, Dec. 1935. Paratypes: BBM 155231-35, MCZ 140539, Nebokos; BBM 155196-200, MCZ 140540, Mt. Tonatau, both on Moen Is., collected by Kondo, Dec. 1935. An additional lot was obtained from Fefan Is. by K. Atoda in 1941, BBM 189176.

This species appears to be quite different from *incisa,* differing particularly in the sculpture.

Kondo found it only on Moen Island at altitudes under 100 feet. It occurs on and under stones, logs, and dead leaves and at the base of tree trunks.

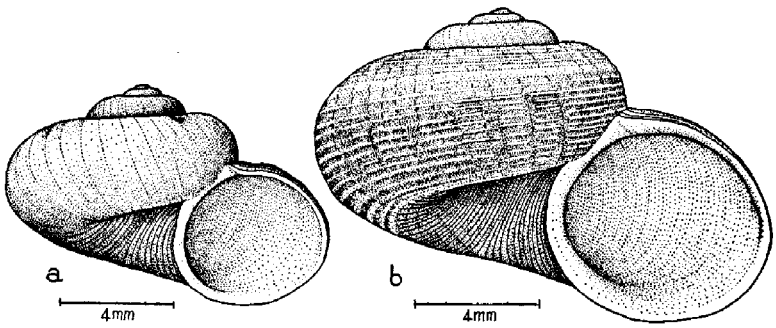

FIGURE 15.—**a,** *Paramia kondoi,* holotype; **b,** *Kondorhaphe kiyokoae,* holotype.

Genus **Kondorhaphe,** new genus

Shell depressed-turbinate, openly umbilicate, lip simple and holostomatous. Periostracum generally persisting, at least in part, on adult shells. Operculum dished, possessing a calcareous plate, a central nucleus, multispiral, the spiral consisting of a narrow flattened band which slightly overlaps on each preceding whorl.

Genotype: *Kondorhaphe kiyokoae* Clench.

This genus appears to differ from other cyclophorids in the Pacific mainly on the basis of its operculum. In shell characters and in operculum it approaches *Gonatorhaphe,* s.s., in which there is a moderate channel developed. In *Kondorhaphe,* the periostracal layer extends obliquely from the base over the channel of the margin. It also has developed a much stronger flat spiral of calcareous material.

Kondorhaphe kiyokoae, new species (figs. 15, *b;* 16; 28, *d*).

Shell rather solid, depressed-turbinate, widely umbilicate, and generally finely sculptured. Whorls 4, strongly convex and tube-like. Color deep chocolate to red brown on adult shells, and overlaying a light orange-brown color impregnated in the shell; this color most strongly developed near aperture. Spire obtuse, slightly to moderately elevated, produced at an angle of 130 degrees. Aperture holostomatous and simple. Umbilicus open and deep, nuclear whorls visible from within. Parietal wall extends slightly over umbilicus. Sculpture of fine spiral threads on postnuclear whorls, which generally disappear on body whorl, or, at most, persists only as faint lines of a slightly different color which are frequently interrupted by axial growth lines. Operculum circular, slightly dished, with a rather thick calcareous plate consisting of a narrow and flat multispiral ridge which is much wider than high. Base of operculum with a thin periostracal layer, which is oblique at operculum margin, though it does not end in a flange. Nucleus central.

	Height	Width	Aperture
Holotype (Dublon)	10	13.5	5.7 × 5.5
Paratype (Dublon)	10.5	13.6	6 × 6
Paratype (Moen)	13	16	7.5 × 7.5
Paratype (Moen)	15.5	18.6	7.6 × 8.4

Holotype: BBM 9712, Truk Isls., Dublon Is., Mt. Tolowan, alt. 600 to 800 ft., collected by Kondo, Dec. 1935. Paratypes: BBM 153097-99, 153119, 153186-89, 153198, 153349-54, 153432-34, 153463-68, from Mt. Tolowan. Additional paratypes from the following places, all collected by Kondo on Dublon Is.: BBM 153277, Sabon; BBM 153548-52, Miseran; BBM 153618, 155322-27, Mt. Fugarau; 153653-55, Ern Hill. Paratypes from these several localities are also deposited in the Museum of Comparative Zoölogy.

In early 1941, K. Atoda obtained the following records: BBM 189234-5, Falo Is.; 189256-7, Moen Is.; 189462, Uman Is.

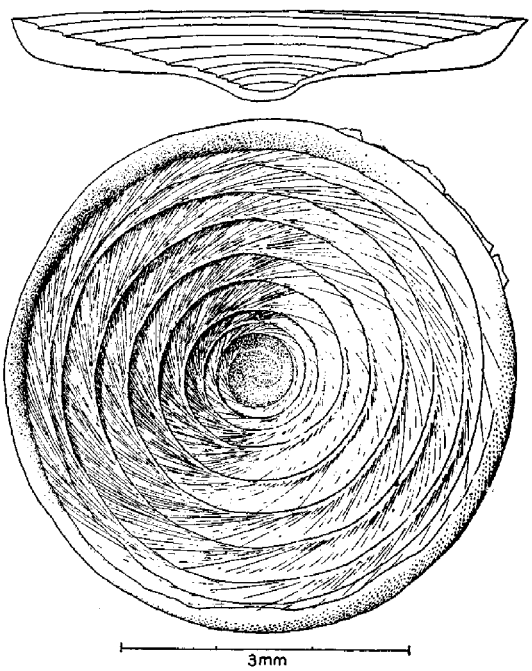

FIGURE 16.—*Kondorhaphe kiyokoae* (holotype), operculum and cross section of operculum.

The following additional specimens were obtained also on the island of Moen by Kondo during December 1935: BBM 153823-27, Mt. Teroken at 900 feet; BBM 153853, Man Village.

This species seems to be quite abundant on the two islands where it occurs. Specimens from Moen are larger, a little darker in coloration, and possess a little stronger sculpture than those of Dublon. However, other than the size, these same characters occur sporadically among Dublon specimens.

PUPINIDAE

Micronesia and Melanesia

Many elements in this family have reached Melanesia and Micronesia, but no species is, as yet, known to occur anywhere in Polynesia. Members of the family Pupinellidae, closely related to the Pupinidae, occur in the Louisiade Archipelago, but I have not had access to sufficient material to warrant their inclusion. A detailed account of these species, however, has been published by E. A. Smith (51, pp. 199-209) and by T. Iredale (26, p. 62). Iredale includes *Pupinella tortirostris* Sowerby as a *Pupina.* The figure and characters mentioned by Sowerby would certainly place this species in the family Pupinellidae and not in the family Pupinidae. It is probably a species in the genus *Fantema* Iredale.

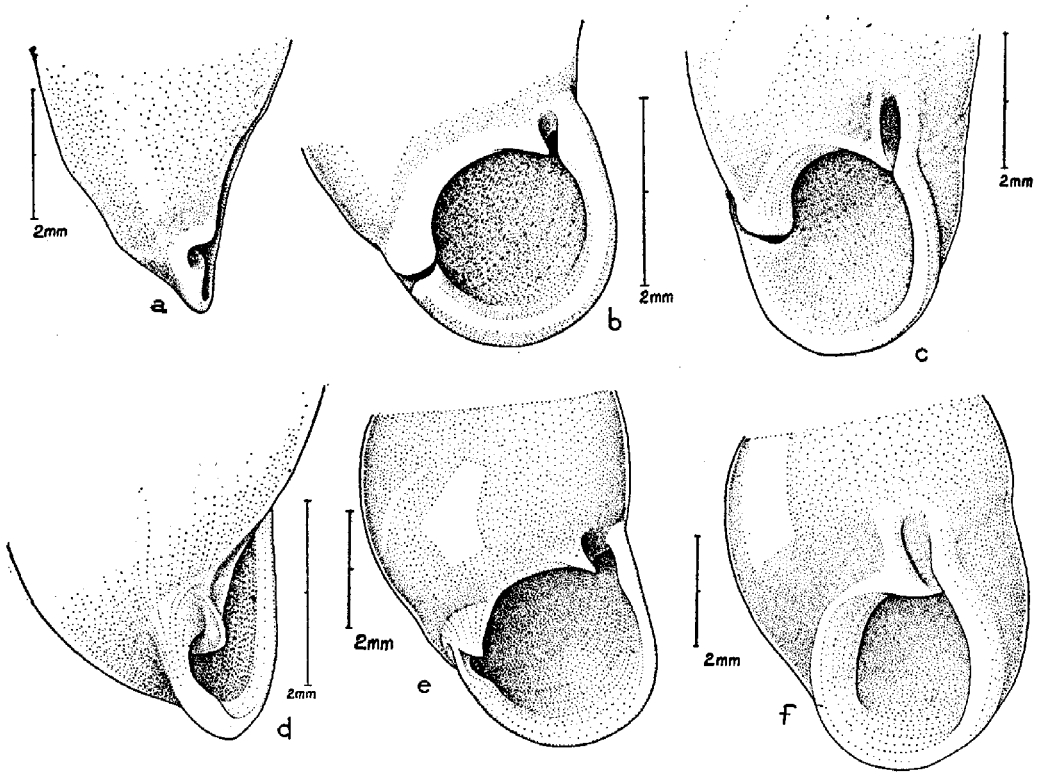

Figure 17.—Apertures of the Pupinidae: **a,** *Kanapa brazieri;* **b,** *Pupina keradreni;* **c,** *Tylotoechus bilinguis;* **d,** *Pupinesia adamsiana;* **e,** *Pupinoa beddomei;* **f,** *Hargravesia polita.*

Genus **Pupina** Vignard

Pupina Vignard, Ann. Sci. Nat. **18**: 440, 1829; Pfeiffer, Conch.-Cab. **1** (19): 199, 1849; Kobelt, Das Tierreich **16**: 302, 1902; Thiele, Handbuch syst. Weicht. **1**: 106, 1929.

Eupupina Pfeiffer, Monogr. Pneumon. viven. **4**: 147, 1876.

[Genotype: *Pupina keradreni,* here selected.]

Pfeiffer (46, vol. 4, p. 147) used the name *Eupupina* only to indicate *Pupina,* s.s. This is an absolute synonym of *Pupina.*

Genotype: *Pupina keradreni* Vignard, monotypic.

All members studied in *Pupina* are small and subcylindrical in outline. They occur in the Solomons, Bismarcks, New Guinea, and north to many of the Caroline Islands.

Key to the Pupinidae

1. Possessing a well-developed parietal tooth 3
2. Possessing no well-developed tooth 9
3. Possessing a columellar notch 5
4. No columellar notch ..... **Hargravesia** (fig. 17, *f*).
5. Having parietal tooth within margin of aperture 7
6. Having the parietal tooth extending outward and up onto body whorls ..... **Tylotoechus** (fig. 17, *c*).
7. Having columellar notch cut parallel with face of aperture ..... **Pupina** (fig. 17, *b*).
8. Having columellar notch cut vertical to face of aperture ..... **Pupinoa** (fig. 17, *e*).
9. Having columellar notch formed into a distinctive fold ..... **Pupinesia** (fig. 17, *d*).
10. Having a strongly and horizontally cut columellar notch ..... **Kanapa** (fig. 17, *a*).

Pupina keradreni Vignard, Ann. Sci. Nat. **18**: 440, pl. 11c, 1829 (New Guinea). (See figure 18, *c, d.*)

Pupina mitis Hinds, Ann. Mag. Nat. Hist. **10**: 83, pl. 6, fig. 7, 1842 (New Ireland).

Pupina keraudreni 'Vignard' Pfeiffer, Conch.-Cab. **1** (19): 206, pl. 27, figs. 23-24, 1849.

Pupina miokoana 'Mousson' v. Möllendorff, Deutsche Malak. Ges., Nachr. **29**: 39, 1897 (Mioko Island [Duke of York Islands], Bismarck Archipelago); Kobelt, Das Tierreich **16**: 304, 1902.

Pupina miokoana aperta 'Mouson' v. Möllendorff, Deutsche Malak. Ges., Nachr. **29**: 39, 1897.

Pupina miokoana minor v. Möllendorff, Deutsche Malak. Ges., Nachr. **29**: 39, 1897 (*non minor* Semper 1864; *non minor* Pfeiffer 1865).

Pupina (*Pupina*) *keraudreni* 'Vignard' Kobelt, Das Tierreich, **16**: 304, 1902.

Shell solid, shining and devoid of sculpture. Whorls 6, slightly convex. Color pale yellow to pale pinkish brown. Spire somewhat extended and strongly convex. Columella rather thick and short and cut at a right angle by the columellar notch. Aperture circular

with parietal margin as low ridge which terminates at base of parietal tooth. This latter continues within aperture as a low lamella. Parietal ridge and tooth appear as a single continuous structure. Outer lip thickened and slightly flaring below. No sculpture visible on highly glazed surface of shell. Operculum horny, circular, multispiral and having a central nucleus. Measurements (in millimeters):

	Height	Width	Aperture
Rabaul, New Britain	6.3	3.3	1.6 × 1.5
Paiva, Ugi, Solomons	7.6	3.7	1.5 × 1.6

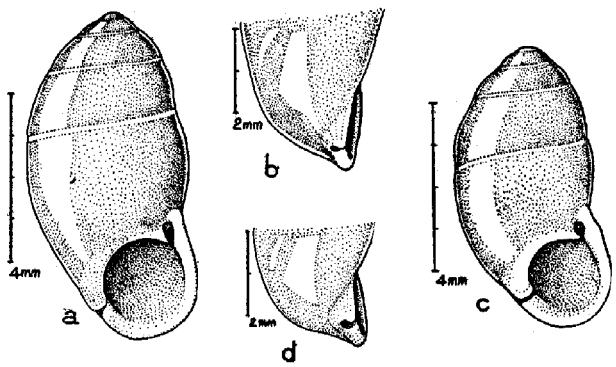

FIGURE 18.—a, *Pupina solomonensis;* b, *P. solomonensis;* c, *P. keradreni;* d, *P. keradreni.*

Type locality: New Guinea.

Cotypes of *P. miokoana minor* (BBM 84787) are identical with specimens that I have considered typical *P. keradreni.*

Bismarck Archipelago: New Britain Is., Rabaul (ex AMNH). Solomon Isls., Santa Isabel Is., Fulakora; Florida Is., Tulagi; Malaita Is., Auki; San Cristoval Is., Pamua, Kira Kira (ex AMNH) and Wainoni Bay; Three Sisters Isls.; Ugi Is.; Santa Anna Is. (All of above lots collected by W. M. Mann unless otherwise noted.)

This species has a rather extensive range in the Solomon and Bismarck Islands. There is some variation in size and a little in shape, but these variations do not appear to be entirely geographic.

Pupina miokoana appears to be an absolute synonym of *P. keradreni.* As mentioned above, cotypes of *P. miokoana minor* are identical with *P. keradreni,* and Kobelt, who worked with the material examined by Von Möllendorff, synonymized *minor* and *aperta* under *miokoana.*

Pupina (Pupina) solomonensis E. A. Smith (fig. 18, *a, b*).

Pupina solomonensis Smith, Zool. Soc. London, 597, pl. 36, fig. 9-9a, 1885 (Shortland and Treasury Isls., Solomons); Kobelt, Das Tierreich **16**: 305, 1902.

Shell solid, shining and devoid of sculpture. Whorls 6, slightly convex. Color reddish brown, varying somewhat from pale throughout to rather dark on some specimens, with a few examples showing a subsutural band of darker color. Aperture circular. Columella

rather short and broad and cut at a right angle by the columellar notch. Parietal wall with a low ridge which terminates on the base of the parietal tooth. Outer lip thickened and barely flaring. Surface of shell shining and devoid of sculpture. Operculum similar to that of *P. keradreni.* Measurements (in millimeters):

	Height	Width	Aperture
Topotype	7.4	3.7	1.8 × 2
Topotype	7.3	3.7	2 × 1.8

Type locality: Treasury and Shortland Isls., Solomons.

Bismarck Archipelago, New Britain Is., Wide Bay (ex B. Rensch); Shortland Is., Faisi; Solomon Isls., Choiseul Is., Choiseul Bay and Bambatani. (Ex AMNH.)

This species is close to *P. keradreni,* differing mainly in its darker coloration and much larger size.

The "red curved line" mentioned by Smith 1885 (52, p. 598) is a character found in many species and appears to be an intensification of the pigmentation as a subsutural line or one following the margin of the columella.

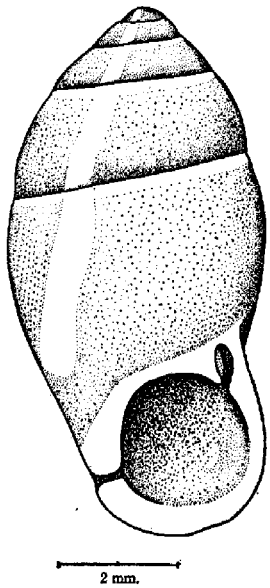

FIGURE 19.—*Pupina huntingtoni,* holotype.

Pupina (Pupina) huntingtoni, new species (fig. 19).

Shell solid, shining, and devoid of sculpture. Whorls 6, early whorls slightly convex, last or body whorl with a flattened left side. Color a brownish pink to brownish yellow. Spire somewhat extended and strongly convex. Columella short and rather thick and cut at a right angle by columellar notch. Aperture circular with parietal margin sharply defined and terminating above in a parietal tooth. This tooth is in reality the forward extension of a lamella which extends backward into the aperture. Columellar notch appears as a slit from above, somewhat widened on outer margin. From the side, it is excavated below to form a tube which recurves up beyond columella. No sculpture visible on highly glazed surface of shell. Operculum horny, circular; multispiral and possessing a central nucleus. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	9.2	4.3	2.1 × 2.2
Paratype	9.9	5.4	2.0 × 3.0

Holotype: MCZ 161588, Solomon Isls., northern coast of Guadalcanal Is., collected by C. S. Richards, Dec. 1944. Paratypes: MCZ 161589, 161590 and BBM 190021, from same area, collected by Richards and Huntington.

This species is larger than either *P. solomonensis* Smith or *P. keradreni* Vignard. In addition, it differs from *P. solomonensis* in having the last whorl straight-sided on the left and not smoothly convex with the whorls above. The columella notch is funnel-shaped when seen from above in *P. huntingtoni,* and not a slit as it appears in *P. solomonensis.* From *P. keradreni,* it differs in being larger and having a more attenuated and pointed spire.

Pupina (Pupina) difficilis Semper (fig. 20, *a*).

Pupina difficilis Semper, Zool. Soc. London, Proc., 252, 1864 (Peleliu and Aibukut, Palau Isls.) v. Möllendorff, Jour. Malac. **7**: 116, 1900.

Pupina (Pupina) difficilis Semper, Kobelt, Das Tierreich **16**: 303, 1902.

Pupina difficilis minor Semper, Zool. Soc. London, Proc., 252, 1864 (Aibukut, Babelthuap Is., Palau Isls.), *non minor* Pfeiffer 1865; *non minor* v. Möllendorff 1897.

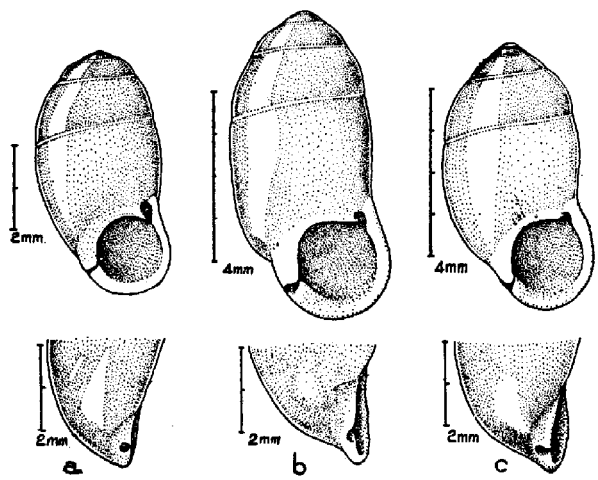

FIGURE 20.—**a,** *Pupina difficilis,* cotype; **b,** *P. brenchleyi,* cotype; **c,** *P. complanata,* holotype.

Shell solid, shining and without sculpture. Whorls 5.5, moderately convex. Color generally a light orange brown, occasional examples are white and yellow. Spire moderately extended and strongly convex with a smooth contour on left side. Columella short, rather thick and cut at a right angle by columellar notch. Aperture circular. Parietal wall not noticeably built forward into a ridge, though parietal lip terminates at base of a strong parietal tooth. Outer lip thickened and very slightly flaring at base.

Upper margin of outer lip slightly sinuous with a fairly large embayment formed between tooth and parietal lip. Surface of shell highly glazed and devoid of sculpture. Operculum horny, multispiral and thin, composed of many layers, not attached as in *P. manni* Clench. Nucleus central. Measurements (in millimeters):

	Height	Width	Aperture
Cotype	5.8	3.1	1.5 × 1.5
Cotype	5.3	3.1	1.6 × 1.4

Type locality: Peleliu Is. and Aibukut [Ngabuked], Babelthuap Is., Palau Isls.

Cotypes: BBM 8036, Palau Isls. (ex F. Haas).

The following lots were collected during April and May 1936 on islands composing the Palau group in the Caroline Islands: Angaur Is.; BBM 158099, southeast coast, alt. 40 ft., collected by Kondo; BBM 158204, Tohaku, alt. 20-30 ft., by S. Ito. Peleliu Is.: BBM 159559, 159918. Koror Is.: BBM 158577; BBM 158659, Aiekasaol, alt. 80-90 ft.; BBM 158624, Ngalielph, alt. 80 ft. Auluptagel Is.: BBM 154768, 154769. Babelthuap Is.: BBM 154915, Ogiwaru-mura; BBM 160332, Galald; BBM 160451, Alkadorokul.

Mr. and Mrs. Kondo also collected a large series of this species during May 1936 on the island of Yap, which lies about 300 miles northeast of the Palau Islands (BBM 155094; BBM 160779, Ken Village). It has recently been obtained by a native collector on Fais Island in the Carolines.

This species, though distinct, is close in its relationships to *P. keradreni*. It differs mainly in that it is usually smaller, has a larger parietal tooth and a larger embayment between the tooth and the outer lip, and has the curve of the outer lip more nearly circular.

The form *minor* Semper appears to have little or no racial significance, as the variation exhibited by any colony usually includes several small specimens that fall well within the limits assigned by Semper.

Pupina (Pupina) brenchleyi E. A. Smith (fig. 20, *b*).

Pupina brenchleyi Smith, Zool. Soc. London, Proc., 490, pl. 40, fig. 8-8a, 1891 (Luunor [Lukunor] Is., Caroline Isls.): v. Möllendorff, Jour. Malac. **7**: 116, 1900.

Pupina (Pupina) brenchleyi Smith, Kobelt, Das Tierreich **16**: 303, 1902.

Shell shining, solid and devoid of sculpture. Whorls 6, moderately convex. Color grayish white. Spire extended and only moderately convex on left side with body whorl nearly straight. Columella short and thick, cut at a right angle by notch. Notch is cut through lip diagonally. Aperture circular. Parietal tooth small with a correspondingly small embayment between tooth and inner and upper margin of lip. Outer lip thickened and flaring below toward lower side. Surface of shell shining and completely devoid of sculpture. Operculum thin, horny, multispiral and with a central nucleus. Measurements (in millimeters):

	Height	Width	Aperture
Cotype	7	3.5	1.9 × 1.7
Cotype	7	3.4	2 × 1.7

Type locality: Lukunor Is., Caroline Isls.

Cotypes: BBM 87582, MCZ 140565, Caroline Isls., Lukunor Is., 160 miles southeast of Truk, collected by Brazier, 1872.

This is a species fairly close in its relationships to *P. difficilis* Semper, differing in that it is larger, has a much flatter convexity to the left side and, more important, has the columellar notch cut diagonally toward the interior rather than in the same plane as the aperture face.

At present, *P. brenchleyi* is known only from Lukunor Island, a low coral atoll, and a single specimen from Salat Atoll in the Truk Islands.

Pupina (Pupina) complanata Pease (fig. 20, *c*).

Registoma complanatum Pease, Zool. Soc. London, Proc., 440, 1860 (Ebon Is., Marshall Isls.).

Pupina complanata Pease, v. Möllendorff, Jour. Malac. **7**: 116, 1900.

Pupina (Pupina) complanata Pease, Kobelt, Das Tierreich **16**: 303, 1902.

Shell rather solid, shining and devoid of sculpture. Whorls 5.5, slightly convex. Color grayish white to deep orange. Spire somewhat extended, strongly and smoothly convex on left side. Columella short and thick, cut at an oblique angle by columellar notch. Aperture circular to subcircular. Parietal tooth small and occasionally inconspicuous, embayment between tooth and outer lip correspondingly small. Outer lip thickened and flaring slightly at base. Shell highly glazed and devoid of sculpture. Operculum horny, circular, multispiral and having a central nucleus. Operculum composed of several very thin layers which appear to be attached only by a cementing factor. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	5.9	3.1	1.8 × 1.6
Paratype BBM	7	3.4	1.8 × 1.7

Type locality: Ebon Is., Marshall Isls. Holotype, MCZ 141018. Paratypes: MCZ 141019, BBM 3214, 188855.

Marshall Isls.: BBM 87583, Jaluit (Bonham or Yaruto), collected by Garrett. Caroline Isls.: Kusaie Is., BBM 155836, Metanenea Hill; BBM 155960, north slope of Mt. Matante, alt. 50-200 ft.; BBM 155821, Lele Islet (all above Kusaie records collected by Mr. and Mrs. Kondo during January 1936); MCZ 141020, Kusaie Is., collected by Garrett (ex Pease Coll.). Ponape Is., BBM 156570, 156701, Wone; BBM 157120, Nanue Islet; BBM 157159, Nantauas Islet; BBM 157042, Ant Atoll (above Ponape records collected by Y. Kondo, Feb. 1936); MCZ 95635, Ponape Is., ex F. Haas.

Pupina complanata is related to *P. difficilis* and *P. brenchleyi*. From *P. difficilis*, it differs in having a much smaller parietal tooth and smaller embayment. The tooth, as well, is rounded over and not as sharply defined as in *P. difficilis*. From *P. brenchleyi*, it differs considerably in the shape and angle of the columellar notch and has a far more convex outline of the shell proper. Profiles of the shell base are quite different in all three species (fig. 20, *c*).

Genus **Pupinoa,** new genus

This genus is characterized by a small columellar fold and, in addition, it is only partially notched. The notch is cut through half of the columella in a vertical direction and not horizontally, as in other Pupinidae considered in this study. So far, the species in this genus are limited to the Bismarck and Louisiade Archipelagoes.

Genotype, *Pupina aurea* Hinds.

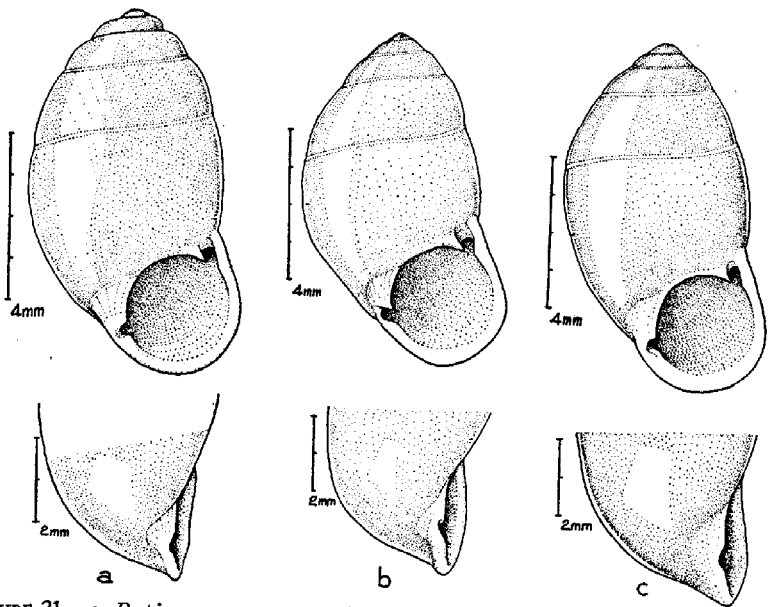

FIGURE 21.—a, *Pupinoa aurea,* cotype (?); b, *P. beddomei,* cotype (?); c, *P. louisiadensis,* holotype.

Pupinoa aurea Hinds (fig. 21, *a*).

Pupina aurea Hinds, Ann. Mag. Nat. Hist. **10**: 83, pl. 6, fig. 6, 1842; Hinds, Voy. Sulphur **2**: 59, pl. 16, figs. 20-21, 1844.

Pupina (*Tylotoechus*) *aurea* Hinds, Kobelt, Das Tierreich **16**: 307, 1902; Pfeiffer, Conch.-Cab. **1** (19): 205, pl. 27, figs. 21-22, 1849.

Shell fairly solid, shining and nearly devoid of sculpture, though there are faint indications of growth lines. Whorls 6, moderately convex, a little more so on first 4 whorls. Color light brownish orange. Spire extended, the left side smoothly convex. Columella wide and rather short, cut by a vertical rather than a horizontal notch. In addition, columellar area is clearly delineated by a decided depression as well as a cleared area in which there are faint axial streaks. Columellar notch cut vertically through inner side of columella. Parietal tooth well-developed but narrow and set obliquely. Parietal embayment, or notch, fairly deep. Aperture subcircular and slightly oblique. Sculpture of faint growth lines. Operculum horny, circular and multispiral and composed of a few very thin layers. Measurements (in millimeters):

	Height	Width	Aperture
Cotype?	9	5.8	2.6 × 2.6

Type locality: New Ireland, Bismarck Archipelago.

MCZ 141021, Bismarck Archipelago, New Ireland, ex Dohrn.

This species differs quite noticeably from the following two forms, *beddomei* and *louisiadensis,* in having a more vertically placed aperture. The earlier whorls are also much more convex.

Pupinoa beddomei Ancey (fig. 21, *b*).

Pupina beddomei Ancey, Linn. Soc. New South Wales, Proc. II, **10**: 379, 1895 (Bismarck Archipelago).

Pupina (*Tylotoechus*) *beddomei* Ancey, Kobelt, Das Tierreich **16**: 308, 1902.

Shell moderately solid, shining and devoid of sculpture, or with growth lines only faintly indicated in a few specimens. Whorls 6, rather convex. Color pale yellow to white. Spire extended and smoothly convex on left side. Columella short, thick and cut nearly across by columellar notch. Columella faintly outlined by color and clearly so by contour of body whorl. Aperture subcircular and set diagonally or obliquely to axis. Parietal tooth narrow but well-developed and set obliquely. Embayment large. Operculum horny, multispiral and thin, composed of a few very thin layers. Nucleus central. Measurements (in millimeters):

	Height	Width	Aperture
Cotypes?	8	4.8	2.2 × 2.5
Cotypes?	8	4.8	2.2 × 2.3

Type locality: Bismarck Archipelago.

Cotypes: (?) MCZ 31045, 141022, Bismarck Archipelago, New Britain, ex C. E. Beddome.

This species is characterized by a fairly strong fold that is initiated as the upper margin of the columellar notch. In profile, the aperture is set back much more from the fore part of the body whorl. A few specimens show faint indication of threadlike axial sculpture.

Pupinoa louisiadensis, new species (fig. 21, *c*).

Shell solid, shining and possessing faint traces of axial threadlike sculpture. Whorls 6, slightly convex. Color white to gray, probably yellow to light orange in fresh material. Spire extended. Columella short and thick, delineated by a faint line above as well as a slight depression in contour, seen in profile. Base of columella bisected by vertical notch, Aperture circular with outer lip thickened and slightly flaring below. Parietal tooth narrow but well-developed and set obliquely. Embayment or parietal notch rather deep. No sculpture. Operculum horny, circular, multispiral with a central nucleus and composed of a few thin layers. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	9	5.3	2.6 × 2.5
Paratype	9.2	5.3	2.7 × 2.6

Holotype: BBM 189002, Louisiade Isls.

Paratype: BBM 1954, MCZ 140575, Louisiade Isls.

Specimens of this new species were obtained by Cox and included in the

Garrett collection. Unfortunately, they were not specifically assigned to any one island in the Louisiades.

The aperture is less oblique than that exhibited by *P. beddomei* but more so than that of *P. aurea.* The faint traces of threadlike sculpture may indicate a connecting link between this group and the Australian species of *Tylotoechus,* many of which are strongly sculptured.

Pupinoa teres Iredale.

Pupina teres Iredale, The Australian Zoologist **10**: 62, 1941 (Round Is., Louisiades).

I have not seen this species. Iredale compares it with *Pupina ovalis* Hedley from Milne Bay, New Guinea, stating that it is "a larger shell, measuring 10 × 6.5 mm., less swollen medially, with the anteria aperture less pronounced." The figure of *ovalis* Hedley is that of a *Pupinoa.*

Genus **Pupinesia,** new genus

Shell similar in general outline to *Pupina* but differs in that upper margin of columellar notch folds back within as a lamella for a full whorl.

Genotype: *Pupina adamsiana* Crosse.

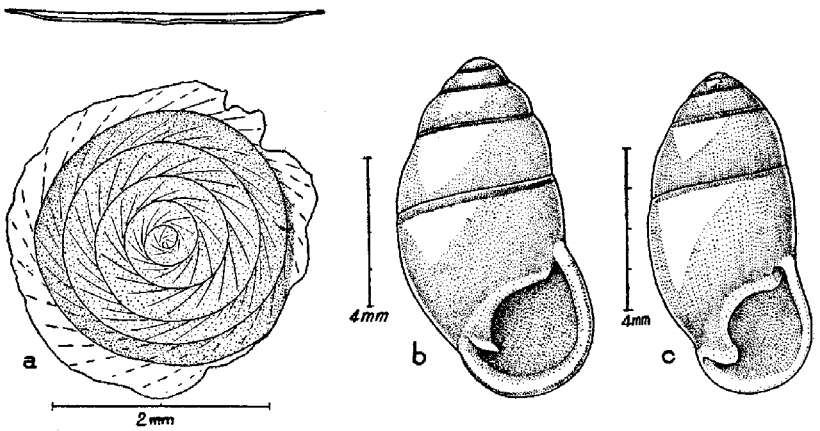

FIGURE 22.—**a,** *Pupinesia adamsiana,* operculum; **b,** *P. adamsiana;* **c,** *P. adamsiana vitiensis,* cotype.

This genus appears to be an offshoot of *Pupina* by the elaboration of the columellar notch. *Pupinesia* also appears to be somewhat intermediate in structure between *Pupina,* s.s. and *Tylotoechus,* as the parietal tooth may be a reduction or perhaps a persistence of a character which later evolved into the more elaborate structure in *Tylotoechus.*

As far as is known, *Pupinesia* is limited to the Fijian Islands.

Pupinesia adamsiana Crosse (figs. 22, *a, b;* 28, *a*).

Pupina adamsiana Crosse, Jour. de Conch. **19**: 326, 1871; Jour. de Conch. **20**: 60, pl. 2, fig. 6, 1872 (Vanua Levu, Fiji).

Hargravesia adamsiana Crosse, Kobelt, Das Tierreich **16**: 326, fig. 73, 1902.

Pupina (*Hargravesia*) *adamsi* Germain, Ann. Inst. Oceanographique (Monaco) **12**: 48, 1932 (*nom. nud.*), *non adamsi* Kobelt 1897 (*nom. nud.*).

Shell rather thin, very shining and without sculpture. Whorls 5.5, moderately convex. Color pale diffused pinkish brown, slightly darker on lower portion of body whorl. A narrow and much darker band follows suture between body whorl and penultimate whorl. Spire extended, cast at an angle of 75 degrees. Columella rather thick and at umbilical area deeply notched, upper margin of notch forming a lamella which folds back on columella for a full whorl. Parietal wall with a small tooth near point of insertion of lip. Aperture subcircular, outer lip slightly thickened and moderately flaring. Surface of shell highly glazed with no trace of sculpture. Operculum horny, multispiral, flat, and with a central nucleus. Entire operculum is exceedingly thin, though the large central area is slightly thicker owing to a marginal flange. Measurements (in millimeters):

	Height	Width	Aperture
Naviti	8.4	4.5	2.7 × 2.2
Naviti	7.2	4.5	3 × 2.2
Viti Levu	8	4.7	3.1 × 2.5

Type locality: Vanua Levu (Crosse).

Fiji: BBM 166594, Yasawa group, Naviti Is., Gelani, collected by C. S. Ford, Dec. 1935, alt. 400 to 500 ft.; BBM 178800, Viti Levu, Mt. Korobamba, collected by Zimmerman, Aug. 1938, under rotten wood, alt. 1,000 ft.; MCZ 36754, Viti Levu, Vesari, collected by W. M. Mann, 1915-1916.

A rare species, to judge by the few records available. The parietal tooth, as figured by Crosse (7, p. 60), appears to be somewhat overdrawn. The published record is limited, as far as I have been able to trace, to the original citation by Crosse to Vanua Levu, and we have added but two additional islands. Germain (16) cites Viti Levu (in error for Vanua Levu, based on the citation of Crosse).

Through some error, Kobelt (27) assigned this species to the wrong genus. His figure is that of *Hargravesia,* but is certainly not *H. adamsiana* which it is supposed to depict, as it is totally different from the original drawing of *H. adamsiana* by Crosse. Curiously enough, Germain further complicates the nomenclature of this species by erroneously calling it *adamsi.*

Pupinesia adamsiana vitiensis Garrett (fig. 22, *c*).

Pupina vitiensis Garrett, Acad. Nat. Sci., Philadelphia, Proc., 233, pl. 3, fig. 62, 1873 (Gomea Is., Fiji); Schmeltz, Mus. Godeffroy, Catalogue **6**: 83, 104, 1877 (Kandavu); Garrett, Zool. Soc. London, Proc., 306, 1887; Germain, Ann. Inst. Oceanographique (Monaco) **12**: 48, 1932.

Pupina (*Pupina*) *vitiensis* Garrett, Kobelt, Das Tierreich **16**: 306, 1902.

Shell quite similar to that of *P. adamsiana,* but differs in that it is smaller, whitish in color, and has the aperture less subcircular by reason of the parietal tooth and embayment between it and insertion point of outer lip. Base of aperture a little flatter and columellar notch lower. Measurements (in millimeters):

	Height	Width	Aperture
MCZ	7	3.6	2.4 × 1.6
BBM	7.5	3.6	2.4 × 1.5

Type locality: Gomea (Ngamea, also known as Gamea and Qamea) Is. Cotypes: BBM 2474 (Garrett Coll.), MCZ 140548 (Pease Coll.) Fiji, Ngamea Is., collected by Garrett.

Garrett apparently was unaware of the existence of *P. adamsiana* Crosse, which was published about two years prior to *P. vitiensis*. Later, in 1887, *adamsiana* was not included in the list Garrett published (10). Both forms appear to be quite distinct, though the differences are not at all great. More material from a wider area may indicate that these forms are of equal specific rank, though they are closely related.

Germain's record for Taviuni Island, Fiji, is based on a generic record only, by Liardet (31, p. 99) and, according to Garrett (10), the record of Schmeltz (49) for Kandavu Island also was an error.

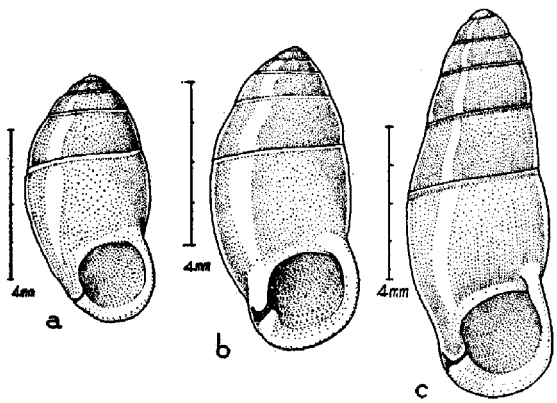

FIGURE 23.—**a**, *Kanapa manni*, holotype; **b**, *K. brazieri*, cotype; **c**, *K. cumingiana*, cotype.

Genus **Kanapa**, new genus

Similar in general shell outline to *Pupina*, s. s., but differs in lack of parietal notch and parietal tooth. Columellar notch is small but enlarged somewhat beneath lip margin.

Genotype: *Registoma brazieri* Crosse.

The three known species in this genus are limited to the southern Solomons and the southern New Hebrides. No *Pupina* have been recorded from the northern islands of the New Hebrides, which lie between Tana and Eromanga in the southern New Hebrides and the Solomons. However, little is known about the New Hebrides, and it is probable that *Pupina* will be found eventually throughout these islands.

Kanapa manni, new species (figs. 23 *a;* 24, *b, c, d*).

Shell moderately elongated, shining, and devoid of sculpture. Whorls 5.5, moderately convex. Color light canary yellow to white. Columella rather thick with columellar notch set diagonally. Aperture circular. Palatal lip thickened and slightly flaring below. No parietal tooth. Surface of shell highly glazed and devoid of sculpture. Operculum horny, circular and multispiral with a central nucleus. Certain opercula are laminated with numerous thin layers which split apart when operculum becomes dry. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	6	3.3	1.5 × 1.6
Paratype	6.1	3.3	1.7 × 1.6

Holotype: MCZ 141012, Solomon Isls., Three Sisters Isls., collected by Mann, 1918. Paratypes: MCZ 32581, 32582 and BBM 188844, from same locality. An additional lot from Wai-ai on San Cristoval Is., Solomons, collected by Mann, 1918.

This is the smallest of the three species in the genus *Kanapa.* The curve of the spire is more convex, especially on the left side, than on either of the other two species. Superficially it is exceedingly close to *P. keradreni* but lacks its parietal tooth and notch.

Kanapa brazieri Crosse (figs. 23, *b;* 24, *a*).

Registoma brazieri Crosse, Jour. de Conch. **18**: 250, 1870 (Erromanga, New Hebrides); Crosse, Jour. de Conch. **19**: 321, pl. 13, fig. 6, 1871.

Pupina (*Pupina*) *brazieri* Crosse, Kobelt, Das Tierreich **16**: 302, 1902.

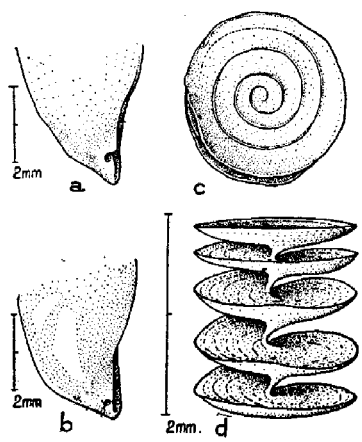

FIGURE 24.—**a,** *Kanapa brazieri,* cotype; **b,** *K. manni,* holotype; **c,** *K. manni,* dorsal view of operculum; **d,** *K. manni,* operculum pulled apart.

Shell somewhat elongate, shining and without sculpture. Whorls 5.5, moderately convex. Spire produced, smoothly convex from above aperture. Columella rather thick and having a notch cut at a right angle to its length. Aperture nearly circular and flaring somewhat at base. Lip thickened. Parietal wall without a tooth or notch. Surface of shell highly glazed and without sculpture. Operculum circular, multispiral, formed of

periostracum in a series of layers which are produced in a spiral about a central axis. Nucleus central. Measurements (in millimeters):

	Height	Width	Aperture
BBM	7	3.1	2 × 1.6
BBM	7.1	3.2	2.1 × 1.6

Type locality: Erromanga [Eromanga], New Hebrides.

Cotypes: BBM 87593, New Hebrides, Eromanga, Dillon Bay, collected by Brazier, 1865. Cotypes: MCZ 141008, Eromanga (Pease Coll.); MCZ 141009, Eromanga (ex Beddome). (Both lots collected by Brazier.)

This species is intermediate in size and form between *P. manni* and *P. cumingiana.*

Kanapa cumingiana Pfeiffer (fig. 23, *c*).

Pupina (*Pregistoma*) [*sic*] *cumingiana* Pfeiffer, Zool. Soc. London, Proc., 52, 1853 (Solomon's [Solomons]).

Registoma cumingiananum Pfeiffer, Monogr. Pneumon. viven. **2**: 97, 1858 (Lord Howes Island, Oceani Australis, Macgillivray).

Pupina (*Registoma*) *cumingiana* Pfeiffer, Monogr. Pneumon. viven **4**: 152, 1876 (Ins. Tana Novarum Hebrid.).

Pupina (*Pupina*) *cumingiana* Pfeiffer, Kobelt, Das Tierreich **16**: 303, 1902.

Pupina cumingiana Pfeiffer, Sykes, Malac. Soc. London, Proc. **5**: 200, 1902.

Shell decidedly elongate, shining and devoid of sculpture. Whorls 5.5 to 6, moderately convex. Color pale orange brown generally well-diffused, though body whorl is usually a little darker. Many examples have suture margined with a narrow band of darker orange brown. Spire extended, acute, somewhat irregular and produced at an angle of 40 degrees. Columella slightly thickened with a notch cut at a right angle near base. Aperture nearly circular with palatal lip thickened and flaring somewhat outwardly. No parietal tooth or notch. No trace of surface sculpture. Operculum thin, horny, circular, and multispiral. Nucleus central. Measurements (in millimeters):

	Height	Width	Aperture
BBM 87561	8.1	3.6	2 × 1.8
BBM 87561	8.4	3.8	2.1 × 1.9

Type locality: Tanna [Tana] Island, New Hebrides. The original locality (Salomon's Islands) as given by Pfeiffer in 1853, is wrong, according to Brazier. This is evidenced also from the several additional places cited by Pfeiffer in his later works. In the collection of Bishop Museum there is a large series of western Pacific land shells received from Brazier and, in the main, collected by him. Many of these, fortunately, carry notes of great value. A series of *P. cumingiana,* part of the original lot collected by Macgillivray (BBM 87561), possesses the following note by Brazier: "*Registoma cumingiana* Pfr. Tanna Island, New Hebrides. These specimens collected by Macgillivray . . . When I was at Tanna in 1865 in HMS Curacoa, it was only the fighting party that was landed. The ship fired shot and shell into their villages. One of our men was shot by the Tanna man (and) he died after being brought on board."

Cotypes: BBM 87561, MCZ 140551, New Hebrides, Tana, collected by Macgillivray, ex Brazier. A large additional series from Tana Is., BBM 79843 and 81645, was collected by E. Robertson, July 1925.

Kanapa cumingiana is known only from the island of Tana in the southern New Hebrides. This is the most attenuated species in the genus *Kanapa* and probably in the entire family. Live shells are a beautiful golden yellow.

Kanapa cumingiana minor Pfeiffer.

Registoma cumingiana minor Pfeiffer, Monogr. Pneumon. viven. 3:97, 1865 (New Caledonia).

This "variety," though insufficiently described, is mentioned by Pfeiffer in the above publication (46, vol. 3) and is indicated without name in the third supplement (46, vol. 4) as "var.," New Caledonia. No species in the Pupinidae has been recorded from New Caledonia by J. B. Gassies, 1863 (14)-1880, or by Kobelt (27).

Genus **Tylotoechus** Kobelt and v. Möllendorff

Mesostoma Heude, Jour. de Conch. **34**: 211, 1886 (*non* Ehrenberg 1836).

Tylotoechus Kobelt and v. Möllendorff, Deutsche Malak. Ges., Nachr. **29**: 145, 1897 (part); Kobelt, Das Tierreich **16**: 306, 1902 (part); Thiele, Handbuch syst. Weicht. **1**: 106, 1929.

Genotype: *Pupina destructa* Heude (monotypic).

Tylotoechus was proposed by Kobelt and Von Möllendorff apparently to replace *Mesostoma* Heude, *non* Ehrenberg. The genotype will have to remain as *Pupina destructa,* as originally proposed by Heude in 1886, being monotypic in *Mesostoma,* which *Tylotoechus* was to replace. Heude described *destructa* as a *Pupina* (20, 1885) and later (21, p. 211) proposed the genus *Mesostoma* to include this species.

As presently understood, this genus has an exceedingly wide distribution, extending from India, South China, and Japan southward and eastward through the East Indies to the Melanesian region and Australia.

Many of the species included by Kobelt (27) in *Tylotoechus* are not, however, in this genus but in *Pupina,* s.s. The single character upon which the genus is based is only the extension of the parietal tooth outward and upward as a tongue-like process on the body whorl in *Tylotoechus,* the parietal tooth remaining within the margin of the aperture in *Pupina,* s.s. Extremes in both cases are easily placed, but many species are exceedingly close to either of the two genera.

Tylotoechus cookei, new species (fig. 25).

Shell short, solid, shining and devoid of sculpture. Whorls 5, moderately convex. Color white to pale brownish orange, strongest on the body whorl and just below the poorly defined sutures. Columella short, arched and cut at a right angle by the columellar

notch. Aperture circular, the parietal area margined by a low ridge which merges into the parietal tooth at its base. This parietal tooth extends upward for a short distance as a tongue-like process on penultimate whorl. Outer or palatal lip thickened and slightly flaring. Surface of shell highly polished and devoid of sculpture. Operculum horny, circular, multispiral and composed of several thin layers in spiral arrangement. Nucleus central. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	4.8	3.2	1.5 × 1.3
Paratype	4.8	3.2	1.5 × 1.3

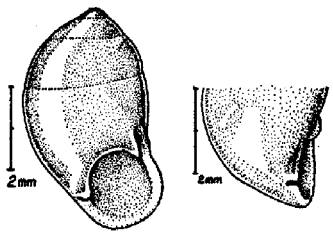

FIGURE 25.—*Tylotoechus cookei,* holotype.

Holotype: MCZ 141013, Solomons, Malaita Is., Auki, collected by Mann, 1918. Paratypes: MCZ 32579 and BBM 188849, same locality and collector.

This is a very small species possessing a strongly convex spire. It does not appear to be closely related to the other species of *Tylotoechus* and is the only species known from the Solomon Islands. Superficially it resembles *Pupina keradreni* and *P. manni* but can readily be differentiated by the columellar notch and parietal tooth.

Genus **Hargravesia** H. Adams

Hargravesia Adams, Zool. Soc. London, Proc., 794, 1870 [1871]; Kobelt, Das Tierreich **16**: 326, 1902.

Hyalopsis Pease, Am. Jour. Conch. **7** (1): 27, 1871.

This genus is characterized by lack of a columellar notch and by possession of a strong parietal tooth which, similar to this structure in *Tylotoechus,* extends outward and up over the body whorl. The parietal wall, as well, is built forward, making the aperture nearly holostomatous.

Hargravesia appears to be related to *Tylotoechus.* Both possess the rather long and outwardly developed parietal tooth; but *Hargravesia* has completely lost the columellar notch.

Genotype: *Hargravesia polita* Adams.

Hargravesia and *Hyalopsis* are absolute synonyms, based upon a series of material which, unfortunately, was sent to two different authors, Adams and Pease. The following note, an original label (BBM 3503) by Brazier, explains the situation:

Hargravesia polita Adams
Hyalopsis tumida Pease

Duke of York island near New Britain. I enclose one with an operculum. Not knowing that Mr. Hargreaves sent specimens to Mr. Henry Adams, I sent specimens to Mr. Pease with other shells from the west Pacific Islands.—J.B.

Kobelt (*27*, p. 326) has included three other species in this genus, in addition to *H. polita.* His inclusion of *H. adamsiana* Crosse is certainly an error based on a misidentification, as his figure 73 shows. The remaining two, *H. luzonica* v. Möllendorff and *H. philippinica* v. Möllendorff are from the Philippines and are questionably members of this genus. I have not seen his *H. luzonica* (which has never been figured), but we have author's examples of *H. philippinica;* and, though they are superficially like *Hargravesia,* there are distinctions which may indicate a different origin.

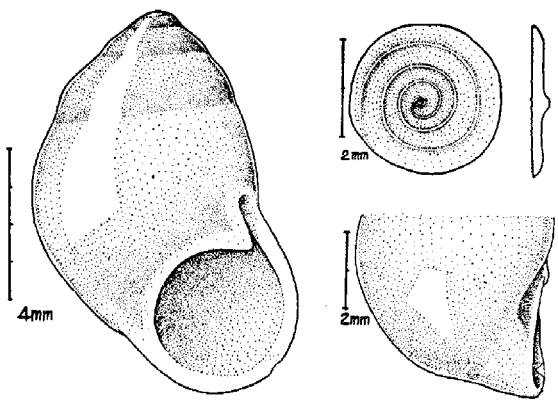

FIGURE 26.—*Hargravesia polita.*

Hargravesia polita H. Adams (fig. 26).

Hargravesia polita Adams, Zool. Soc. London, Proc., 795, 1870 [1871] (Solomon Islands): Kobelt, Das Tierreich **16**: 327, 1902.

Hyalopsis tumida Pease, Am. Jour. Conch. **7** (1): *27*, 1871 (Insulis Solomonsis); Kobelt, Das Tierreich **16**: 327, 1902.

Shell solid, subdepressed and shining. Whorls 6, rather convex. Color grayish white, with lip pure white. Spire slightly produced. Columella short and thick, outlined in color (being pure white), the base continuous with the lip, which is not notched. Aperture circular and with a parietal ridge, making aperture nearly holostomatous. Parietal tooth low, and extending outward and above on the body whorl. Embayment between tooth and lip narrow and somewhat lengthened. Surface of shell shining and porcelanous, devoid of sculpture. Operculum horny, circular, multispiral and flat. Nucleus is central and papilliform below, and spiral forms a slight coiled ridge on outer surface. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	9.2	6.4	2.8 × 2.8
Paratype	8.9	7.1	2.1 × 2.1

Type locality: Solomon Isls. [Duke of York Is., Bismarck Archipelago].

Lectotype: MCZ 93781 (here selected for *Hyalopsis tumida* Pease), Bismarck Archipelago, Duke of York Is. Paratypes: MCZ 93782, BBM 3503.

The Museum of Comparative Zoölogy records are from the Pease collection, and those in Bishop Museum are from the Garrett collection, both originally obtained from Brazier.

Hargravesia richardsi, new species (fig. 27).

Shell very small, solid, rather extended and shining. Whorls 5.5 to 6, slightly convex. Color pale straw yellow with the lip milky white. Spire, somewhat extended. Columella short and rather narrow, base continuous with lip, which is not notched. Aperture circular, with rather strongly developed parietal ridge. Parietal tooth strong, built within aperture, not forming a ridge on outside of parietal margin. Embayment between tooth and lip narrow and somewhat enlarged within. Outer lip below tooth slightly thickened. Surface of shell shining and porcelanous, devoid of sculpture. Operculum unknown. Measurements (in millimeters):

	Height	Width	Aperture
Holotype	4.2	2.3	1× 0.9

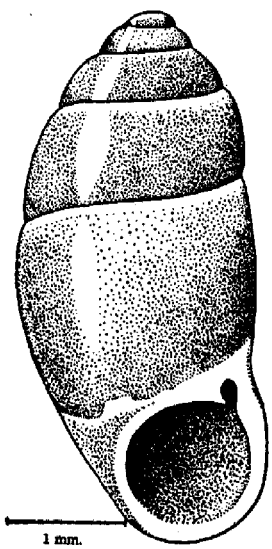

FIGURE 27.—*Hargravesia richardsi,* holotype.

Holotype: MCZ 161591, Solomon Isls., north coast of Guadalcanal Is., collected by Richards, Dec. 1944. Single paratype from same collector and locality.

This remarkable little species is quite different from *H. polita* H. Adams from the Bismarck Archipelago. It is only half as long and proportionately much thinner. In addition, *H. polita* has the outer margin of the parietal tooth

extending up over the parietal area. The spire in the present new species is nearly straight-sided, whereas in *H. polita* the entire left margin of the shell is a smoothly rounded curve. In size, it agrees more closely to *H. philippinica* v. Möllendorff (Sequijor, Philippines) but differs from this species in possessing a more extended spire and more flattened sides.

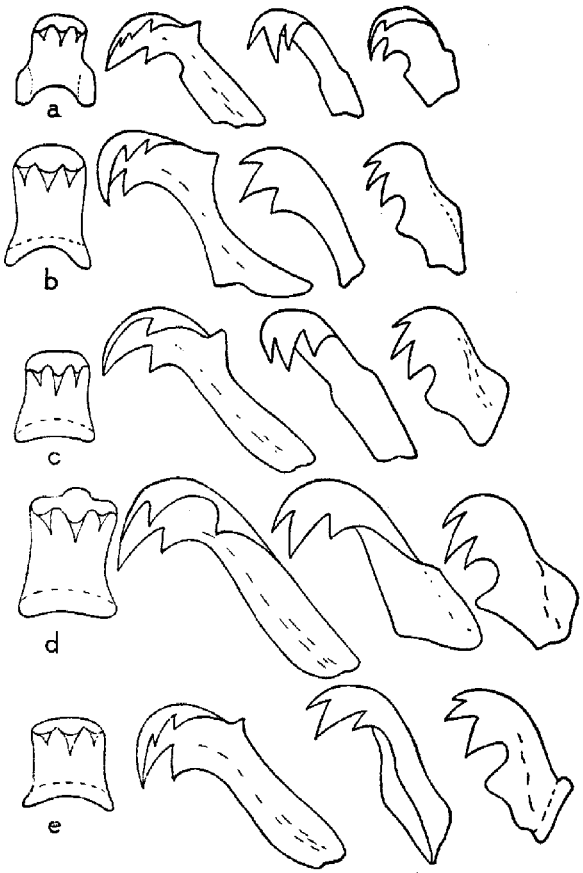

FIGURE 28.—Radulae of the Cyclophoridae and Pupinidae: **a**, *Pupinesia adamsiana;* **b**, *Paramia kondoi;* **c**, *Gonatorhaphe stricta;* **d**, *Kondorhaphe kiyokoae;* **e**, *Ostodes upolensis.*

UNKNOWN SPECIES

Cyclostoma (Cyclostomus ?) carolinense Pfeiffer.

This species was described (Pfeiffer, 46, vol. 1, p. 65) as coming from the Caroline Islands. It was figured by Pfeiffer (45, p. 332). No such species is now known to occur in the Caroline Islands. It would appear, from the figures, to be a West Indian shell, perhaps in *Chondropoma* or a closely allied genus.

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New genera and species are in bold-face type, synonyms are in italic.