MONOGRAPHS OF THE GENERA *PAPUSTYLA*, *FORCARTIA* and *MELIOBBA* (PAPUININAE: CAMAENIDAE).

By WILLIAM J. CLENCH, Ph.D.* and RUTH D. TURNER, Ph.D.*

Plates 1-3,
Figures 1-9.

This present study is one of several planned to cover the various genera in the subfamily Papuininae. During the past several years much new alcoholic material has been made available to us so that anatomical data are now available for several species and species groups heretofore unknown.

The subfamily Papuininae in the family Camaenidae ranges from the Moluccas eastward through New Guinea, the Louisiades, Admiralty, Bismarck and Solomon Archipelagoes, and Queensland, Australia. Unlike many of the highly coloured tree snails such as *Liguus*, *Polymita*, *Achatinella* and *Partula*, they are found in a rather inaccessible region of the globe, much of it still imperfectly known, a little of it still wholly unexplored. *Papuina* †, besides possessing many beautiful colour variations, also has many structural differences in the shell contour. The shells may be lenticular, globose, or they may have extended spires which are somewhat bulimoid in shape. *Papuina* and its related genera probably have a very long evolutionary history. The subfamily is widely distributed, but insular isolation of the various elements has allowed remarkable differentiation to take place so that most species are rather sharply defined. This is in direct contrast to *Liguus*, *Polymita*, *Achatinella* and *Partula* where only a limited few species and species groups are really sharply defined, the multitude of species being only slight modifications of a general pattern, either in colour or in shape.

Surprisingly enough, few professional malacologists have ever collected "*Papuina*". Most of the early described species were obtained by traders, explorers or collectors of other animal groups and the collecting of *Papuina* was purely incidental to other interests. Locality data were mixed, probably guessed at in many cases, and species were assigned to islands not at all their original localities. Also, in the early days, the terms Solomon, Admiralty and Bismarck Islands were loosely interchangeable or, at least, not clearly defined. Consequently many of the early records have little meaning when considered in the light of our present and rather sharp differentiation of these archipelagoes.

Difficulties in understanding many species still exist. Many of the species were inadequately described, often without figures, and others with incorrect locality data. Confusion about certain species will naturally exist for many years to come, at least until the type specimens, if they are still extant, can be examined.

In certain places *Papuina* must be extraordinarily abundant, at least if we may judge by the remarkable series obtained by Mr. W. F. Coultas in the Bismarck and Admiralty Islands during the Whitney South Sea Expedition. The same is true of Dr. W. M. Mann's collecting in the Solomons in 1918. Though, in general, his series of the various species collected were small, as his interest was in another field, he told us that

* Museum of Comparative Zoology at Harvard College, Massachusetts, U.S.A.

† In the introduction of this paper we are using "*Papuina*" in the broad sense, as the genus has been generally understood during the past two generations.

Reprinted from the
Journal of the Malacological Society of Australia
6: 2 22: 1962

Papuina boivini Petit were everywhere on the trunks of the palm trees at Fulakora, Isabel Is., Solomon Islands.

Iredale [1] gave family status to the genus *Papuina* v. Martens and the few genera originally associated with it. No differential characters are given, either based on the morphology of the shell or on any of the soft parts, to separate this group from the family Camaenidae. In this and in a subsequent publication [2] a large number of genera are proposed, apparently chosen at random, with type species selections for fixation. Few or no relationships are given for these various genera, and the descriptive diagnoses for the genera concerned are remarkable for their brevity. In other words, the entire burden of proving the taxonomic value of these genera will rest upon subsequent workers. This will be difficult. In the first place, specimens of Iredale's many new species will be needed and these should be preserved in alcohol, for anatomical work is needed in order to have a proper understanding of the interrelationships of these "genera".

We do not intend to minimize the fact that *Papuina* in the broad sense is a complex assemblage of generic elements and should, when the necessary data are at hand, be split into as many genera as the data warrant. We do hold, however, that to create arbitrarily a host of new names without giving the necessary supporting facts is both poor taxonomy and unsound biology.

Pilsbry, in 1894, when reviewing the genus *Papuina* as it was then understood, stated "The great variation observed in the genitalia and teeth of the species examined show that here lies a wide field for future cultivation. These features are, no doubt, characteristic of minor groups in the genus and their investigation will lead to valuable results in the classification of the group and secondarily may be of use in the study of geographical distribution and migration." As stated above, Iredale without further anatomical work, raised the genus to the rank of family, the Papuinidae, and gave generic names to most of Pilsbry's "species groups". There is no question that the ultimate answer to this complex group of species is somewhere between these two extremes.

In the present study, which is only a small part of the planned monographic study of the subfamily Papuininae, dissections have been made of six species, five of which are figured. In addition, anatomical studies have been made of eleven other species which are not discussed in this report. The striking differences in the reproductive anatomy of various species indicate that they have been long established. When resemblances do occur they lend strength to their generic grouping. Variations in the anatomy of the reproductive system within the species is often the result of the particular phase of the breeding cycle in which the animal happened to be at the time of capture. Differences in the relative proportions, of the various organs seem to be of little value and should not be used unless sufficient specimens can be dissected to show that they are constant throughout the year. As shown in the two illustrations of the reproductive anatomy of *P. hindei* (Figs. 4, 5) the spermathecal duct doubles in length when the uterus is full of well developed eggs because the duct is attached by mesenteries to the uterus and is interwoven among the eggs and consequently stretches as the

1 Australian Zoologist, 9 : 91, Nov. 1938.
2 Australian Zoologist, *10* : 74-85, Dec. 1941.

eggs develop. The penis in such a specimen is proportionately very much smaller and the exhausted albumen gland greatly reduced in size. The tremendous size of the penial organs of *P. pulcherrima* as shown in Fig. 2 (2) may indicate that the animal was taken during, just before or after copulation, though the five specimens dissected were all the same.

The structure of the walls of the penis, the shape of the penis papilla, and the presence or absence of the epiphallus and flagellum all appear to be good characters for taxonomic purposes. The presence or absence of an organ is a far more satisfactory character for specific work than any variation in size.

Very little is known concerning the breeding period or mating habits of the Papuininae, although they are probably similar to other members of the Camaenidae. Through the kindness of Donald F. McMichael we had a series of preserved specimens of *P. hindei* for study. In one of these the uterus was filled with eggs, the largest of which is 5 mm. in length. The eggs are white and when fully developed have a rather thick, granular, calcareous shell.

A great deal more work must be done before generalizations can be made concerning the relationships of the shell, the anatomy, the radula and the jaws in classifying this large and diverse subfamily. However, to date it would appear that there is a strong correlation as indicated in the following chart.

CHART COMPARING SOME OF THE MAJOR CHARACTERS OF SPECIES OF *MELIOBBA* and *PAPUSTYLA*.

	Meliobba			*Papustyla*			
	popondetta	*mcmichaeli*	*helenae*	*pulcherrima*	*hindei*	*xanthochila*	*chancei*[a]
SHELL							
1) depressed globose	X	X	X				
2) attenuate				X	X	X	X
RADULA							
1) straight rows	X	X	X				
2) V-shaped rows				X	X	X	X
JAWS							
1) smooth	X	X					
2) ribbed			X	X	X	X	?
EPIPHALLUS							
1) stout and recurved	X	X	X				
2) thin and not recurved				X	X	?	X
FLAGELLUM							
1) present	X	X					
2) absent			X	X	X	?	X
SPERMATHECAL DUCT							
1) short	X	X	X				
2) long				X	X	X	X

[a] Based on work of I. Rensch.

FIGURE 1.

From the foregoing chart it would appear that the presence or absence of flagellum on the epiphallus and the ribbing of the jaws are probably not dependable as characters for generic diagnosis. It must be remembered that the anatomy of very few species is known and that changes in generic definitions may well have to be made before the series of monographs is finished.

Pilsbry (1894) divides the radula of *Papuina s.l.* into two main groups: (1) those with the transverse rows of teeth straight and with the teeth varying in shape toward the marginals; (2) those with the transverse rows of teeth V-shaped and the teeth all of the same general form. We agree with Pilsbry on the arrangement of the teeth, but have found that in *P. hindei* and *P. pulcherrima* there is considerable change in the shape of the teeth even though they are arranged in V-shaped rows, while in *xanthochila* the teeth are similar. The arrangement of the teeth in straight or V-shaped rows is probably basic and will indicate generic relationships, while the shape of the marginal teeth is a secondary variation of value on the specific level only.

We are greatly in need of preserved material and would appreciate hearing from anyone who could help us secure it.

ACKNOWLEDGEMENTS.

We are most grateful to several persons for the loan of specimens as well as for gifts of material upon which these studies are based.

ABBOTT, R. T., Academy of Natural Sciences, Philadelphia, Pennsylvania.

DANCE, S. P., British Museum (Nat. Hist.), London, England.

DELL, R. K., Dominion Museum, Wellington, New Zealand.

EMERSON, WILLIAM K., American Museum of Natural History, New York, N.Y.

FORCART, LOTHAR, Naturhistorisches Museum, Basel, Switzerland.

HAAS, FRITZ, Chicago Natural History Museum, Chicago, Illinois.

JACKSON, R. W., Cambridge, Maryland.

KEEN, MYRA, Stanford University, Stanford, California.

MACPHERSON, J. HOPE, National Museum of Victoria, Melbourne.

McMICHAEL, D. F., Australian Museum, Sydney, N.S.W., Australia.

POWELL, A. W. B., Auckland Institute and Museum, Auckland, New Zealand.

REHDER, HARALD A., United States National Museum, Washington, D.C.

RENSCH, BERNARD, Zoologisches Institut der Universität, Münster, West Germany.

SEYD, EDMUND L., Manchester Museum, Manchester, England.

VAN BENTHEM JUTTING, W. S. S., Zoologisch Museum, Amsterdam, Holland.

VAN DER SCHALIE, HENRY, University of Michigan, Ann Arbor, Michigan.

In addition, we are deeply indebted to Peter Dance, D. F. McMichael and Lothar Forcart for photographs of the holotypes of Papuininae contained in the collections under their charge, and to John Armstrong, formerly of the American Museum of Natural History and D. F. McMichael for alcoholic material of "*Papuina*" upon which the present anatomical studies were made. Without the aid and co-operation of these colleagues, these studies would not have been attempted.

ABBREVIATIONS.

AI—Auckland Institute and Museum, Auckland, New Zealand.
AM—Australian Museum, Sydney, Australia.
AMNH— American Museum of Natural History, New York, N.Y.
BM(NH)—British Museum (Natural History), London, England.
BPBM—B. P. Bishop Museum, Honolulu, Hawaii.
CM—Chicago Natural History Museum, Chicago, Illinois.
CMP—Carnegie Museum, Pittsburgh, Pennsylvania.
MCZ—Museum of Comparative Zoology, Cambridge, Mass.
MM—Manchester Museum, Manchester, England.
NMV—National Museum of Victoria, Melbourne, Australia.
UM—Museum of Zoology, University of Michigan, Ann Arbor, Mich.
USNM—United States National Museum, Washington, D.C.
ZM—Zoologisch Museum, Amsterdam, Holland.

Genus *PAPUSTYLA* Pilsbry

Papustyla Pilsbry 1893, Manual of Conchology (2) 8: 243; Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 460.

Type species: *Cochlostyla hindei* Cox, subsequent designation, Rensch 1934, p. 36.

Shell generally attenuate, smooth and glossy. Lip not descending, usually broadly reflected and lacking the papuinoid notch. Imperforate or perforate. Colour generally a uniform white, brown or green with or without spiral bands. Lip white, brown or yellow.

The genus *Papustyla* is known only from Manus Island in the Admiralty Archipelago, New Britain Island in the Bismarcks and the two northern most islands, Bougainville and Choiseul, in the Solomons.

It is possible that a few of the small but attenuated species from the Solomon Islands belong to *Papustyla*. Their generic position will remain unknown until anatomical material is available for study.

Papustyla pulcherrima (I. Rensch)
Pl. 1, fig. 1; Figs. 2, 3(4), 6(1).

Papuina pulcherrima I. Rensch 1931, Zoologischer Anzeiger 95: 187, fig. 1 (Manus Island, Admiralty Islands); 1934, Archiv für Naturgeschichte (n.s.) 3: 468, text fig. 10.

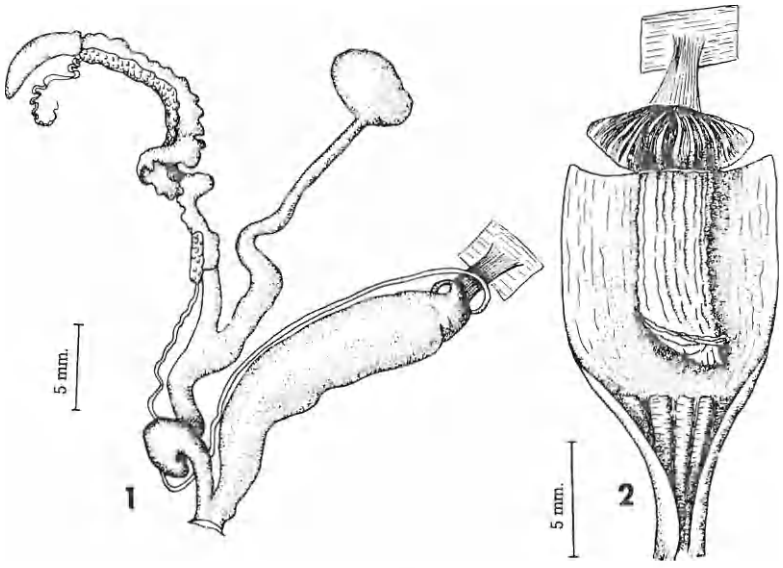

Fig. 2

Anatomy of the reproductive system of *Papustyla pulcherrima* (Rensch). Fig. 1, complete system. Fig. 2, dissected penis. See Fig. 8 for labelling.

Description: Shell extended, conic, rather light in structure but strong, reaching about 44 mm. in length, imperforate and smooth. Whorls six, slightly convex, and the last whorl showing a slight keel or angle just below the whorl periphery. Colour: first two and a half whorls a grayish white infused with reddish brown, particularly on the lower half of each whorl. Remaining whorls an intense pea-green with a canary-yellow band just below the periphery. On the earlier whorls this yellow band shows up along the suture. Lip and columella china-white. Spire extended, produced at an angle of about 55°. Aperture subquadrate. Parietal lip consisting of only a very thin glaze. Palatal lip reflected, slightly thickened and obtusely pointed at the peripheral area. In profile, the palatal lip is very slightly sigmoid in outline and produced at an angle of about 55° from the base. Papuinoid notch hardly indicated. Columella nearly straight, somewhat thickened below and very slightly twisted. Suture well defined and but slightly indented. Sculpture consisting of exceedingly fine growth lines, the entire shell appearing very smooth and glossy. Nuclear whorls two and a half to three, smooth and somewhat obtuse.

In the five specimens of *Papustyla pulcherrima* dissected, the spermathecal duct was very long and closely attached to the uterus by mesenteries, the globular spermatheca lying near the base of the albumen gland. The vas deferens is extremely long, winding around the oviduct, the vagina and the penis. The penis is very large, as shown in Fig. 2. It is thin-walled except near the opening into the atrium where there are

heavy muscular ridges. The penis papilla is large, cylindrical and heavily ridged. The epiphallus is thin and greatly reduced, possibly a result of the stage of the breeding cycle when it was collected. All specimens dissected were from a single lot and showed remarkable uniformity in the structure of the organs.

Length	Width	
43.0 mm.	28.5 mm.	Drabui Village, Manus Island
44.0 mm.	30.5 mm.	Drabui Village, Manus Island
40.6 mm.	26.8 mm.	Drabui Village, Manus Island
35.2 mm.	26.0 mm.	Drabui Village, Manus Island

Types: The holotype of *Papuina pulcherrima* Rensch is in the Berlin Museum; the type locality is Manus Island, Admiralty Islands.

Remarks: This is an exceedingly characteristic species. Its intense green coloration makes it almost unique among all known species of land molluscs. It is probably equalled in coloration only by *Helicina viridis* from Hispaniola in the West Indies. This coloration is invested entirely in the periostracum, with a yellow layer underlying the green. Specimens lose the green periostracum very soon after death of the mollusc, leaving the shells almost a pure, dull white, the green periostracum remaining only on the parietal wall where it has been glazed over and thus protected.

See *Remarks* under *novaepommeraniae* for comparisons.

Range: Known only from Manus Island, Admiralty Archipelago.

Specimens examined: ADMIRALTY ARCHIPELAGO MANUS ISLAND: Drabui Village; Petaiya; Tavi Village: Malai Village (AMNH; MCZ); Pundrau (BPBM); Tungon (ANSP; Berlin Museum); Lorengau (MCZ).

Papustyla hindei (Cox)

Pl. 1, figs. 9-10, Pl. 3, fig. 8; Figs. 3(5), 4, 5, 6(2).

Cochlostyla hindei Cox 1888, Proc. Linnean Soc. New South Wales (2) 2: 1063 (New Ireland).

Helix (*Geostrochus* [sic]) *heimburgi* Brancsik 1891, Jahresheft Naturwissenschaftlichen Vereines Trencsener Comitates 13: 80, pl. 7, fig. 2a-b (Matupit, Nov. Brittania).

Cochlostyla ? *finschi* v. Martens 1894, Conchologische Mittheilungen 3: 12, pl. 46, fig. 5-6 (Polynesia or New Guinea); v. Martens 1897, Archiv für Naturgeschichte 63: 43, pl. 8, fig. 5-6 (New Britain).

Papuina (*Papustyla*) *hindei* Cox. Thiele 1928, Zoologische Jahrbücher 55: 140, pl. 5, fig. 31.

Papuina infracolorata I. & B. Rensch, 1929, Zoologischer Anzeiger 80: 77. (Welten Bucht [Wide Bay] south coast of New Britain).

Description: Shell extended, conic, light in structure but strong, reaching 49 mm. (two inches) in height, imperforate and smooth. Whorls seven and moderately convex. Colour, nuclear whorls a rather dark brown, remaining whorls a shining light brown with a fine dark brown sub-sutural line, lip a very dark brownish black, interior of aperture whitish. Occasional specimens have light straw-yellow nuclear whorls with the remainder of the shell a uniform dark chocolate-brown. Columella white,

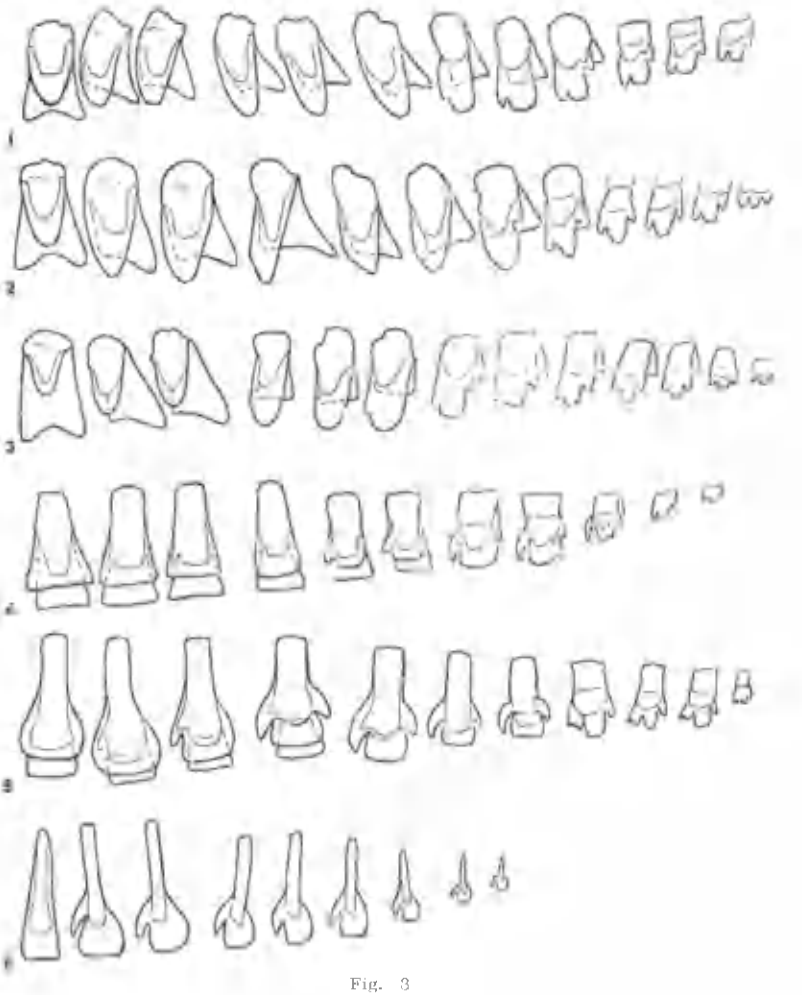

Fig. 3
Radulae

Fig. 1, *Meliobba helenae* Clench and Turner.
Fig. 2, *Meliobba michaeli* Clench and Turner.
Fig. 3, *Meliobba popondetta* Clench and Turner
Fig. 4, *Papustyla pulcherrima* (Reusch).
Fig. 5, *Papustyla hindei* (Cox).
Fig. 6, *Papustyla xanthochila* (Pfeiffer).

but surrounded by a rather wide band of blackish brown. Spire extended and produced at an angle of about 48°. Aperture sub-ovate Parietal lip consisting of only a very thin glaze. Palatal lip expanded and somewhat thickened. In profile, very slightly sigmoid in outline and produced at an angle of 55° from the base. Columella nearly straight, not materially thickened and apparently not twisted. Suture well defined and slightly

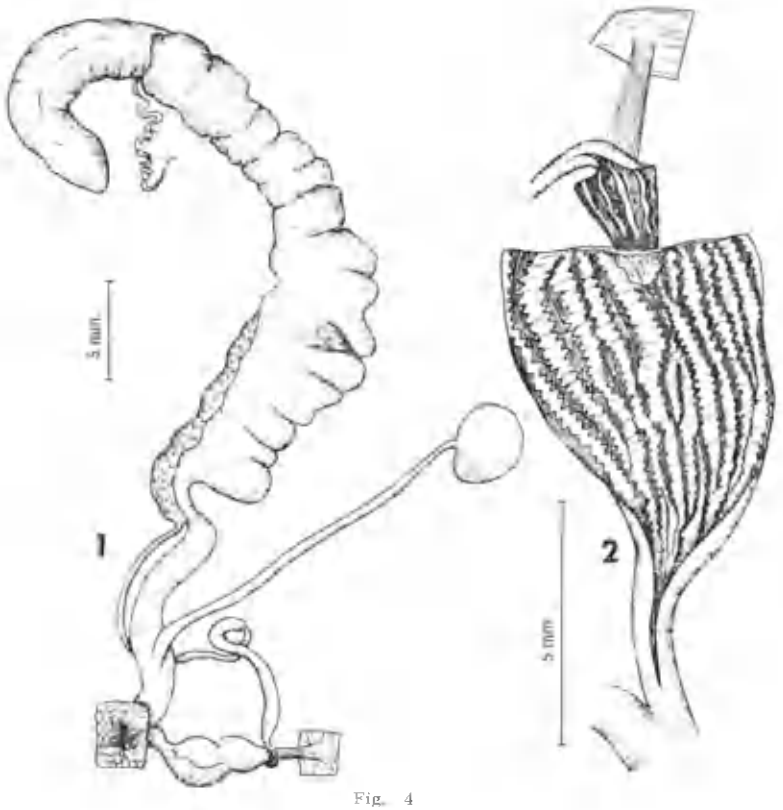

Fig. 4

Anatomy of the reproductive system of *Papustyla hindei* (Cox). Fig. 1, complete system. Fig. 2, dissected penis. See Fig. 8 for labelling.

indented. Sculpture consisting only of exceedingly fine growth lines, the shell appearing very smooth. Nuclear whorls two and a half to three, smooth and obtuse.

The anatomy of *Papustyla hindei* is similar to that of *P. pulcherrima*, though the penis of *hindei* is very much smaller and has a long, thin epiphallus with the vas deferens entering at the end. The wall of the penis has numerous high, irregular flutes and the penis papilla is very small as shown in Fig. 4. Whether these striking differences between *pulcherrima* and *hindei* are a reflection of the breeding condition of the animals it is impossible to say. In one specimen of *hindei* the uterus was filled with developing eggs, those near the vagina being fully developed and having a granular, calcareous shell. The differences in the relative proportions of the various organs in a specimen carrying eggs and one without are shown in Figs. 4, 5. The radula and jaw of *hindei* is similar to that of *pulcherrima* as shown on Fig. 3.

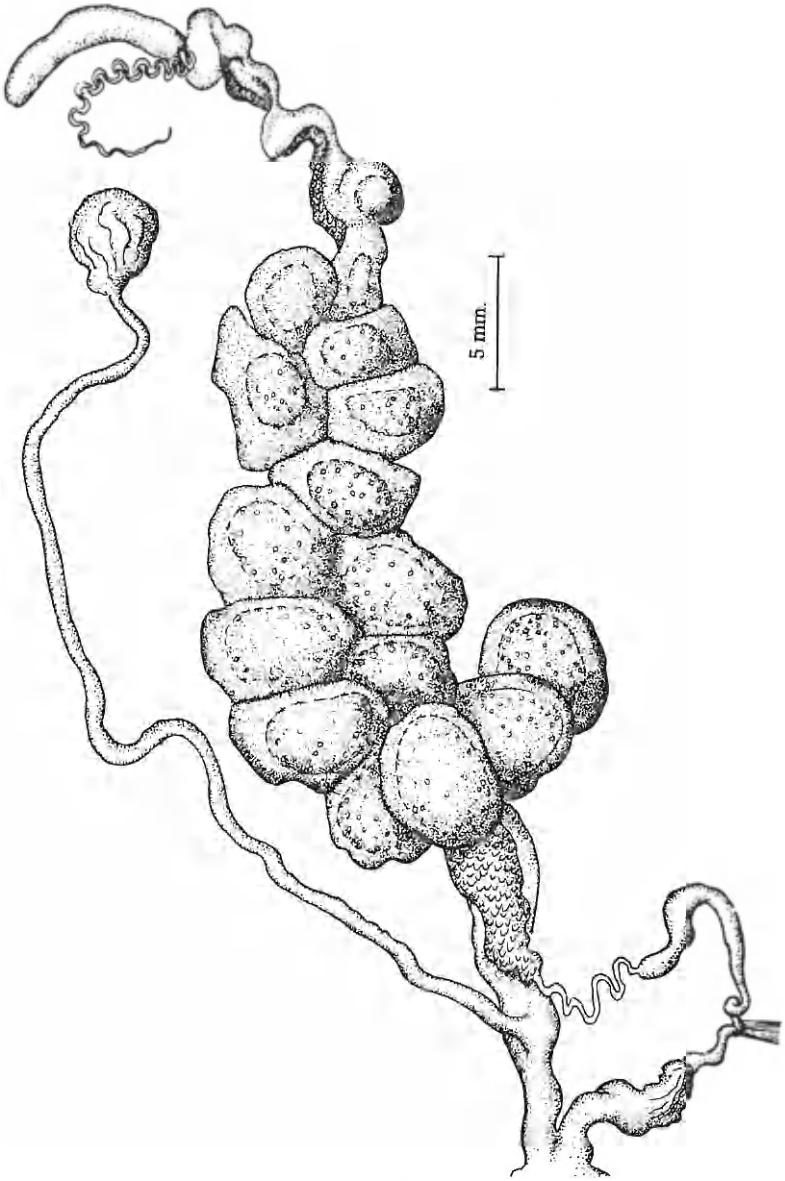

Fig. 5

Papustyla hindei (Cox) Specimen with uterus filled with eggs.

Length	Width	
48.0 mm.	25.0 mm.	Wide Bay, New Britain
47.0 mm.	25.8 mm.	Wide Bay, New Britain
41.5 mm.	23.3 mm.	Wide Bay, New Britain
42.0 mm.	22.0 mm.	Lower Mewoulou River, Wide Bay, New Britain.

Types: The holotype of *Cochlostyla hindei* Cox is in the Australian Museum, Sydney, No. C. 62674. The type locality New Ireland is in error. This species is known only from New Britain.

Remarks: The shell proper is a light pinkish brown, the periostracum being a shiny and somewhat uniform brown. The coloration of the brownish lip, the sub-sutural line and the columellar band of colour are invested in the shell proper and not in the periostracum.

Range: Found only on New Britain Island.

Specimens examined: BISMARCK ARCHIPELAGO. NEW BRITAIN: Wide Bay (MCZ); Wide Bay, Lower Mewoulou River (MCZ; ANSP); Rahum (AM).

Papustyla novaepommeraniae (I. & B. Rensch)
Pl. 1, fig. 6.

Papuina novaepommeraniae I. & B. Rensch 1929, Zoologische Anzeiger 80: 77. (Mountains at Matlip, Weiten Bucht [Wide Bay], Neu Pommern [New Britain], Bismarck Archipelago); I. Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 466.

Papuina papustyloides I. & B. Rensch 1929, Zoologische Anzeiger 80: 78 (Matlip and Waltoc, Weiten Bucht [Wide Bay], Neu Pommern [New Britain], Bismarck Archipelago); I. Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 466.

Description: Shell extended, conic, rather light in structure, reaching about 38 mm. in length, imperforate and smooth. Whorls six, slightly convex and with last whorl having a slight keel at the periphery. Colour a light greenish brown, being much lighter, however, to almost white on the early whorls. There is a narrow band, white overlaid by the yellowish periostracum at the whorl periphery. Spire extended and produced at an angle of 45°. Aperture subovate. Parietal lip consisting of a very thin glaze. Palatal lip narrow, reflected, white in colour and produced at an angle of 40° from the base. Columella nearly straight and somewhat wider at its basal margin. Suture well defined and margined below by a very narrow band. Sculpture consisting of exceedingly fine, oblique and irregular growth lines. Nuclear whorls one and a half, smooth and white.

Length	Width	Whorls	
37.5 mm.	22.0 mm.	6½	Holotype of *P. novaepommeraniae* (Rensch).
38.5 mm.	23.8 mm.	6½	Paratype of *P. novaepommeraniae* (Rensch).
33.5 mm.	20.5 mm.	6½	Holotype of *P. papustyloides* (Rensch).
35.1 mm.	22.2 mm.	6½	Paratype of *P. papustyloides* (Rensch).
38.3 mm.	22.5 mm.	6	Matlip, Wide Bay, New Britain Is.

Types: The holotypes of both *P. novaepommeraniae* and *P. papustyloides* are in the Zoologischen Museum, Berlin. A paratype of *P. novaepommeraniae* is in the Museum of Comparative Zoology, No. 83855. The type locality is Matlip, Wide Bay, New Britain, Bismarck Archipelago.

Remarks: This species appears to be nearest in relationship to *P. pulcherrima* of Manus Island. The striking difference is, of course, the amazing green colour of *pulcherrima*, but in the morphology of the shell the two appear to be very close. From *P. fergusoni* it differs by having more convex whorls and as a consequence a less pronounced keel. In addition, it has a much narrower lip and columella. It does not appear to be closely related to *P. hindei* of this same island.

Range: Known only from the vicinity of Wide Bay, New Britain.

Specimens examined: BISMARCK ARCHIPELAGO. NEW BRITAIN: Matlip, Wide Bay (MCZ).

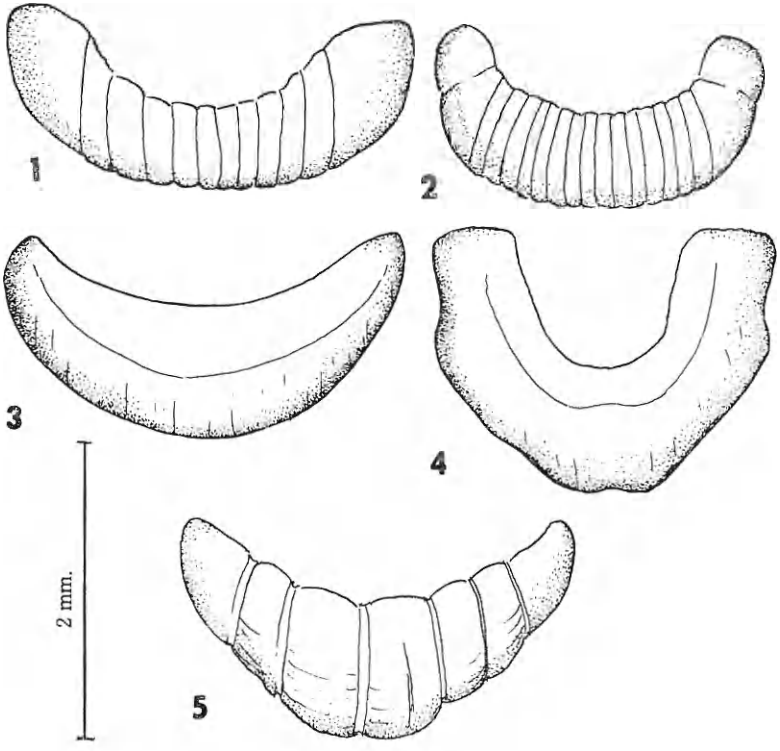

Fig. 6
Jaws

Fig. 1, *Papustyla pulcherrima* (Rensch).
Fig. 2, *Papustyla hindei* (Cox).
Fig. 3, *Meliobba popondetta* Clench and Turner.
Fig. 4, *Meliobba mcmichaeli* Clench and Turner.
Fig. 5, *Meliobba helenae* Clench and Turner.

Papustyla chancei (Cox)

Pl. 1, figs. 2-3.

Helix chancei Cox 1870, Proc. Zoological Society, London, p. 171, pl. 16, fig. 5 (Isabel Island, Solomon Islands).

Helix (Papuina) amphizona Pilsbry 1891, Manual of Conchology (2) 7: 5, pl. 8, fig. 52-54 (Solomon Islands).

Papuina chancei rechingeri Oberwimmer 1909, Denkschriften Akademie der Wissenschaften, Wien 84: 515, pl. 1, fig. 1a-c (Buin, Bougainville Is., Solomon Islands).

Papuina chancei var. *alba* Leschke 1912, Jahrbuch der Hamburgischen Wissensch. Anstalten 29: 101, fig. 6. (Meim Bay, south coast Neu Pommern Is. [New Britain], Bismarck Archipelago).

Papuina josephi Rensch 1930, Zoologischer Anzeiger 92: 226, text fig. 2 (Mensal-Bach, Henry Reid Bay, Neu Pommern [New Britain]).

Papuina chancei (Cox). Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 460, text figs. 5-7.

Description: Shell conic, rather light in structure and reaching about 34 mm. in length, imperforate and smooth. Whorls six to six and a half slightly convex, the last whorl broadly angled. Colour usually light ivory and may be banded with broad bands of dark chocolate-brown above and below the periphery. In others these bands are a very light brownish yellow and in still others the bands may be entirely absent. Rarely the dark bands completely suffuse the shell. The shells are usually rendered somewhat darker by the light yellowish periostracum. The apical whorls may be very dark brown or entirely white. Reflected lip usually white with the area immediately behind much darker. Inner edge of columella usually light in colour and much darker behind. Spire extended and produced at an angle of about 70°. Aperture subquadrate. Parietal lip consisting of a very thin glaze. Palatal lip reflected, broadly and slightly indented at the peripheral area and produced at an angle of 40° from the base. Columella sloping and rather broad. Suture well defined. Sculpture consisting of numerous fine growth lines which are crossed by exceedingly fine and poorly defined threads. Nuclear whorls one and a half and smooth and these may be dark brown or whitish.

Length	Width	
31.0 mm.	30.6 mm.	Wide Bay, New Britain.
33.0 mm.	31.0 mm.	Gazelle Peninsula, New Britain.
33.5 mm.	31.5 mm.	Paratype of *P. chancei rechingeri* Ober.

Types: The holotype of *Helix chancei* Cox is in the Australian Museum, Sydney, Australia, No. C. 62379. A paratype is in the Museum of Comparative Zoology No. 94950. The holotype of *Helix (Papuina) amphizona* Pilsbry is in the Academy of Natural Sciences, Philadelphia, No. 61908. The holotype of *P. chancei rechingeri* Oberwimmer is in the Natural History Museum, Vienna; paratypes are in the Museum of Zoology, University of Michigan, Ann Arbor, Michigan. The holotype of *Papuina chancei alba* Leschke was in the Hamburg Museum, Germany, but was possibly destroyed during World War II. The holotype of *P. josephi* Rensch is in the Berlin Museum. The type localities as given for *chancei* (Isabel Island, Solomon Islands); *amphizona* Pils. (Solomon Islands?);

and *rechingeri* Oberwimmer (Buin, Bougainville) are all in error. So far as we can now determine, this species is definitely known to occur only on New Britain Island in the Bismarck Archipelago.

Remarks: This is a very distinctive species as it is proportionately much wider in relation to its length than other known species of *Papustyla*. It appears to be most closely related to *P. fergusoni* from which it differs in having more globose whorls, a rounded keel at the whorl periphery and in being nearly smooth.

The anatomy of the reproductive system of *P. chancei* as illustrated by I. Rensch (1934, fig. 6) is close to that of *P. hindei*, differing mainly in the greater length of the penis. The radula is also close to that of *hindei* and *pulcherrima*.

Range: Known only from New Britain and the Vitu Islands, Bismarck Archipelago.

Specimens examined: BISMARCK ARCHIPELAGO. NEW BRITAIN: (USNM; MCZ; UM; BMNH); Gazelle Peninsula (UM); Wide Bay and Rabaul (both MCZ); Kailai, Wide Bay; Luvelau (both ANSP). VITU or FRENCH ISLANDS: Unea (MCZ); mountains of Matlip (ANSP); Ralum (AM).

Papustyla fergusoni (H. Adams)
Pl. 1, figs. 7-8.

Geotrochus fergusoni H. Adams 1872, Proc. Zoological Soc., London, p. 614, pl. 42, fig. 14 (New Britain Island [Bismarck Archipelago]).

Helix (Papuina) fergusoni H. Adams. Pilsbry 1891, Manual of Conchology (2) 7: 32, pl. 3, fig. 54.

Papuina fergusoni fergusoni H. Adams. I. Rensch, 1934. Archiv für Naturgeschichte (n.s.) 3: 469.

Papuina schneideri I. & B. Rensch 1929, Zoologischer Anzeiger 80: 77 [not figured], (Mope, Gazelle Halbinsch, Neu Pommern [New Britain]; I. Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 469.

Description: Shell extended, conic, rather light in structure reaching 32 mm. in length, imperforate and sculptured. Whorls six, nearly flat-sided and sharply keeled at the whorl periphery. Colour a nearly uniform straw-yellow. Outer lip white and outer portion of the umbilical area tinged with reddish brown. Spire extended, produced at an angle of about 50°. Aperture subquadrate. Parietal wall thinly glazed. Palatal lip reflected, and in profile view showing a papuinoid notch. The lip is produced at an angle of 45° from the base. Columella broadly arched. Suture well defined but only slightly indented. Sculpture consisting of rather coarse growth lines. Nuclear whorls two and smooth.

Length	Width	
32 mm.	28 mm.	New Britain, Holotype of *G. fergusoni*
30 mm.	27 mm.	New Britain, Holotype of *P. schneideri*

Types: The location of the holotype of *Geotrochus fergusoni* H. Adams is unknown to us. It is not in the British Museum (Natural History). The type locality is New Britain, Bismarck Archipelago. The holotype of *P. schneideri* Rensch is in the Zoologischen Museum, Berlin, from Mope,

Gazelle Peninsula, New Britain. A paratype from the same locality is in the Museum of Comparative Zoology, No. 225205.

Remarks: We have seen only a single specimen of this species and so cannot give any statement as to its variation or range of distribution. It appears to be most closely related to *P. chancei* Cox from which it differs by being smaller, more sharply keeled and by having flat-sided whorls. Unfortunately, Adams made all of his comparisons of *P. fergusoni* with *P. turris* Adams from Waigeu [Waigeo], New Guinea, a species of *Cymotropis*, a genus which simulates very closely attenuated *Papustyla*. I. Rensch (1934) placed *P. schneideri* I. and B. Rensch in the synonymy of *fergusoni* H. Adams.

Range: Known only from New Britain, Bismarck Archipelago.

Specimens examined: BISMARCK ARCHIPELAGO. NEW BRITAIN: Mope (MCZ).

Papustyla fergusoni talaseana I. Rensch

Papuina talaseana I. Rensch 1929, Zoologischer Anzeiger 85: 50, text figure 2 (Talasea, Neu Pommern [New Britain], Bismarck Archipelago).

Papuina fergusoni talaseana I. Rensch 1934, Archiv für Naturgeschichte (n.s.) 3: 471.

Description: "Shell sharply conical, not umbilicate, solid, the apex blunted, six and a half to seven flat to slightly convex whorls, the last whorl descending; colour horn-yellow with dark brown to black spots, which are remnants of the original colour (the shells are somewhat bleached); the first two whorls white; suture thread-like (in two specimens not set off as a thread between the sixth and seventh whorls), in the larger specimen the last whorl somewhat concave close to and below the suture; surface irregularly rib-striate; upper and flatly convex under side provided with a fine, spiral sculpture; aperture rounded rectangularly; outer lip strongly reflected, white; inside of aperture also pure white; columellar margin oblique."

Length	Width	Whorls	
34.4 mm.	32.4 mm.	7	Holotype

Types: Holotype in the Zoologischen Museum, Berlin, Germany. The type locality is Talasea, Neu Pommern [New Britain], Bismarck Archipelago.

Remarks: We have not seen this subspecies and we give above a translation of the original description. As indicated in the synonymy above, I. Rensch in 1934 considered *talaseana* to be a subspecies of *P. fergusoni*. Lacking further evidence we are following this classification at this time. However, when additional material is available for study, *talaseana* may well prove to be a form of *P. chancei* Cox.

Range: Known only from Talasea, New Britain, Bismarck Archipelago.

Papustyla xanthochila (Pfeiffer)
Pl. 1, fig. 4; Pl. 3, fig. 6; Fig. 3(6).

Helix xanthochila Pfeiffer 1860, Proc. Zoological Society, London, p. 192 (Solomon Islands); Pfeiffer 1861, Novitates Conchologicae (1) 2: 175, pl. 47, figs. 5-6.

Description: Shell extended, conic, rather light in structure, reaching about 47 mm. in length, perforate and smooth. Whorls six and a half, moderately convex, and the last whorl without a keel. Colour a china-white, shining, and the inner face and edge of the lip a deep yellow to orange-yellow. Spire extended and produced at an angle of about 58°. Aperture subquadrate. Parietal lip consisting of a very thin glaze. Palatal lip reflected, somewhat thickened and obtusely pointed at the peripheral area. In profile, the lip is very flatly sigmoid and is produced at an angle of 55° from the base. Columella nearly straight and somewhat broadened, partially concealing the umbilicus. Suture well defined. Sculpture consisting of exceedingly fine oblique growth lines. There appears to be no trace of any spiral sculpture. Nuclear whorls one and a half and somewhat discoloured with a light brownish coloration.

Only a single preserved specimen of *Papustyla xanthochila* was available for study and this was in such poor condition that an illustration could not be made. Sufficient facts could be gained from this specimen, however, to state that the anatomy of the reproductive system is very close to that of *P. pulcherrima*. The penis is large, thin walled, and with a large penis papilla.

The radula of *xanthochila* is unique in having very little change in the shape of the teeth from the first lateral to the outermost marginal. The teeth are very long, narrow, closely set, and arranged in broadly V-shaped rows. This is very close to what Pilsbry has shown for *P. vexillaris* Pfeiffer. The jaw in the single specimen was too fragmented to illustrate, but it is definitely ribbed.

Length	Width	
45.0 mm.	30.0 mm.	Buin, Bougainville.
45.5 mm.	28.5 mm.	Moran Village, Bougainville.
46.0 mm.	28.2 mm.	Kokore Village, Bougainville.

Types: The holotype is in the Cuming collection, now in the British Museum. The type locality is here restricted to Buin, Bougainville Island, Solomon Islands. So far as known, this species is restricted to Bougainville Island.

Remarks: For comparisons see *Remarks* under *P. lilium*.

Range: Known only from Bougainville Island, Solomon Islands.

Specimens examined: SOLOMON ISLANDS. BOUGAINVILLE ISLAND: (USNM; CM; ANSP; BPBM); Moran Village; Kokore Village; Buin (all AMNH and MCZ).

Papustyla lilium (Fulton)
Pl. 1, fig. 5; Pl. 3, fig. 7.

Helix (Geotrochus) xanthochila var. Cox, 1873, Proc. Zoological Soc., London, p. 567, pl. 48, fig. 7 (no locality given).

Papuina lilium Fulton 1905, Jour. of Malacology 12: 22, pl. 6, fig. 4a-b (Solomon Islands).

Description: Shell white, extended, conic, rather light in structure and reaching 46 mm. in length, umbilicate and smooth. Whorls six, moderately convex and the last whorl without a keel. Lip broadly reflected, coloured white, and the back of the extended lip strongly crenulated. The

spire is not straight sided as in *xanthochila* but is slightly convex and, in addition, *lilium* has smaller nuclear whorls than *xanthochila*. In all other respects the two species are quite similar.

Length	Width	
46.0 mm.	35.5 mm.	Sasamanga River, Choiseul Island.
42.5 mm.	33.0 mm.	Luti, Choiseul Island.
43.0 mm.	33.5 mm.	Choiseul Island, Paratype.

Types: The holotype of *Papuina lilium* Fulton is in the British Museum (Natural History), No. 1905-10-23-88; a single paratype is in the Museum of Comparative Zoology, No. 151955. We here restrict the type locality to Luti, Choiseul Island, Solomon Islands. An additional paratype is in the Academy of Natural Sciences, Philadelphia, No. 94271.

Remarks: This species, though closely allied to *P. xanthochila*, differs remarkably in certain of its characters. It differs mainly in having a far more broadly expanded lip, almost double that of *P. xanthochila*. The lip is white and, in addition, is strongly crenulated with rather deeply impressed grooves on its outer surface. The spire is slightly concave and not straight-sided and the nuclear whorls are much smaller than those found in *P. xanthochila*.

Range: Known only from Choiseul Island, Solomon Islands.

Specimens examined: SOLOMON ISLANDS. CHOISEUL ISLAND: (UM; USNM; MM; ANSP); Luti; banks of Sasamanga River (both AMNH; MCZ).

FORCARTIA[1], new genus

Shells imperforate, globose to subglobose, smooth or with fine spiral sculpture. Papuinoid notch absent or only faintly indicated. Whorls globose with no indication of a peripheral keel.

Type species: *Papuina buehleri* Rensch.

Papuina globula Rensch is included in this genus on a tentative basis. Lack of a colour pattern and the presence of a fine spiral sculpture may eventually exclude this form when the soft anatomy of both forms has been examined.

Forcartia is known only from Manus Island, Admiralty Archipelago and New Britain Island, Bismarck Archipelago.

No anatomical material is available for these two species. The shells, however, differ from those of all other genera in these two archipelagoes by being globose rather than depressed or attenuated. *Forcartia buehleri*, in addition, has a very different colour pattern.

In distribution this genus is like *Papustyla*, having species on Manus Island in the Admiralty group and New Britain Island in the Bismarck Archipelago with no known species from New Ireland or the many smaller islands between New Britain and Manus.

1 Named for Dr. Lothar Forcart of the Naturhistorisches Museum, Basel, Switzerland.

Forcartia bühleri (Rensch)
Pl. 3, figs. 3, 4.

Papuina bühleri Rensch 1933, Zoologischer Anzeiger 102: 315, fig. 3 (Tungon, Manus Island, Admiralty Islands).

Description: Shell subglobose, rather light in structure, reaching about 35 mm. in greater diameter, imperforate and smooth. Whorls five and strongly convex. Ground colour a light yellowish brown. There is developed a narrow peripheral line of dark mahogany-brown which generally broadens to a wide brownish band on the body whorl or on the last two whorls. The entire shell is flecked with rather small zigzag markings of light yellow, generally in axial arrangement, initiated on the periphery and at the suture and extending below for a short distance. Spire broad and formed at an angle of 85°. Aperture subcircular to subquadrate, the outer lip forming an angle of 40° from the base. Behind the lip the aperture is very slightly constricted and turned down slightly toward the base. Parietal lip consisting of a very thin glaze. Palatal lip reflected, very slightly sigmoid in a profile view. Columella very short, somewhat broad, the thickened area extending obliquely towards the base of the lip. There is a small tooth-like process evolved midway between the columella and the base of the shell. Umbilical area slightly depressed and coloured a dark mahogany-brown. Sculpture consisting of exceedingly fine growth lines. Nuclear whorls smooth and merging completely with the post nuclear whorls, leaving no line of demarcation.

Greater diameter	Lesser diameter	Height	
34.5 mm.	29 mm.	28.6 mm.	Paratype
31.2 mm.	26 mm.	24.0 mm.	Pundrau, Manus Is.

Types: Holotype and paratype, Naturhistorisches Museum, Basel, Switzerland; paratype in the Zoologischen Museum, Berlin from Tungon, Manus Island, Admiralty Islands.

Remarks: This is an exceedingly rare species so far as our collections indicate, only six specimens being known to us. *F. buehleri* is very different from any other known papuinid from the Admiralty Islands. It appears to be related but distantly to *Forcartia globula* (Rensch) from New Britain Island, the only other member of this genus. It differs from this species by lacking sculpture and by its type of coloration, *globula* being a uniform semi-opaque creamy white.

Range: Known only from Manus Island, Admiralty Archipelago.

Specimens examined: ADMIRALTY ARCHIPELAGO MANUS ISLAND: Tungon (Basel Museum); Pundrau at 1500 feet (BPBM); Lorengau (MCZ).

Forcartia globula (Rensch)
Pl. 3, fig. 5.

Papuina globula Rensch 1930, Zoologischer Anzeiger 92: 226, text fig. 1 (Pulie River, Cape Merkus, New Britain Is., Bismarck Archipelago).

Description: Shell subglobose, rather strong in structure, reaching about 29 mm. in greater diameter, imperforate and smooth. Whorls four

and strongly convex. Colour a uniform cream with a flush of pink at the umbilical area and on the reflexed lip from the umbilical area to the base. Nuclear whorls may or may not be faintly pinkish. Spire broad and formed at an angle of about 95°. Aperture subcircular, the outer lip forming an angle of 45° from the base. Back of the lip the aperture is slightly constricted and turned down slightly toward the base. Parietal lip consisting of a very light glaze. Palatal lip reflected with no indication of the papuinoid notch. Columella very short, rather broad, the thickened area extending obliquely toward the base of the lip. There is a small tooth-like process evolved midway between the columella and the base of the shell. Umbilical area depressed and coloured pink. Sculpture consisting of numerous and very fine, irregular, wavy threads. Nuclear whorls one and a half and nearly smooth, sculptured only with exceedingly fine and somewhat irregular growth lines.

Greater diameter	Lesser diameter	Height	
29.0 mm.	24.8 mm.	21 mm.	Pilelo Is., New Britain Is.
28.5 mm.	24.0 mm.	20 mm.	Pilelo Is., New Britain Is.

Types: Holotype in the Zoologischen Museum, Berlin, from Pulie River, Cape Merkus, New Britain, Bismarck Archipelago.

Remarks: This is an isolated species and very different from anything else known from the Bismarck Archipelago. See remarks under *F. buehleri* (Rensch).

Range: Known only from New Britain Island, Bismarck Archipelago.

Specimens examined: BISMARCK ARCHIPELAGO. NEW BRITAIN: Pilelo Island, Cape Merkus (CM).

Genus *MELIOBBA* Iredale

Meliobba Iredale 1940, The Australian Naturalist 10: 240, text figures.

Negotobba Iredale 1941, The Australian Zoologist 10: 83, (type species, *Helix goldiei* Brazier).

Type species: *Meliobba shafferyi* Iredale, monotypic.

Shells rather large, lenticular to depressed globose, perforate or imperforate, sculptured, and generally with an acute angulation at the periphery. Colour grayish and usually marbled with purple to reddish brown. Sculpture consisting of irregular ridges or ripples which vary in the different species. Nuclear whorls smooth or with very small ridges emanating from the suture.

Meliobba occurs only in New Guinea and in Northern Queensland. Its distribution in New Guinea is extensive, from near the eastern end westward to at least the region about Hollandia on the north coast. On the south coast of New Guinea *Meliobba* has been reported only as far west as Orokolo, Gulf Division.

Key to the species of *Meliobba*

1.	Shell imperforate	2
	Shell umbilicate	3
2.	Sculpture of interlacing spiral ridges; aperture often with a basal tooth	*shaffcryi*
	Sculpture of fine oblique axial threads; aperture lacking a basal tooth	*helenae*
3.	Shell lenticular	*lintschuana*
	Shell depressed globose	4
4.	Peripheral keel of the body whorl acute	5
	Peripheral keel of the body whorl narrowly rounded	*popondetta*
5.	Spire dome-shaped, formed at an angle of about 110°; spiral sculpture on the base of the body whorl very weak and not interlacing	*mcmichaeli*
	Spire depressed and formed at an angle of about 125°; sculpture on the base of the body whorl of strong interlacing spiral ridges	*goldiei*

Meliobba goldiei (Brazier)
Pl. 2, fig. 4; Pl. 3, figs. 1, 2.

Helix goldei [sic] Brazier 1880 [1881], Proc. Linnean Soc., New South Wales 5: 637 [nomen nudum].

Helix (Obba) oxystoma E. A. Smith 1883, Annals and Magazine of Natural History (5) 11: 191 (D'Entrecasteaux Island off SE Coast of New Guinea); non Thomae 1845.

Helix (Obba) goldiei Brazier 1884, Proc. Linnean Soc., New South Wales 9: 804 [new name for *Helix oxystoma* Smith 1883, non Thomae 1845].

Description: Shell reaching about 42 mm. in greater diameter, discoidal, solid in structure, perforate and sculptured. Whorls four, flattened, having a well developed peripheral keel and with the aperture descending sharply about one centimeter from the lip. Colour a light brownish gray, mottled with dark mahogany to purple, particularly on the body whorl. Spire depressed, obtuse, and produced at an angle of 125°. Aperture broadly ovate and cast at an angle of about 30° from the base. Parietal lip consisting of a small, slightly thickened area or only glazed with dark, mahogany-brown. Palatal lip white and reflected. Columella short, broad and black within. Suture slightly impressed. Umbilicus rather small but deep and partially covered by the columellar reflection. Sculpture consisting of fine, irregular, embossed, interlacing, spiral ridges which are white, the coloration of the shell being mainly in the depressed areas. Nuclear whorls about two, rather large, coloured a reddish brown, smooth and with a few, short, comma-like ridges which emanate from the suture.

Greater diameter	Lesser diameter	Height	
42.5 mm.	34.5 mm.	20.0 mm.	Near Port Moresby.
41.0 mm.	33.1 mm.	21.5 mm.	Inland from Yule Island.
40.5 mm.	33.0 mm.	21.5 mm.	Owen Stanley Range.

Types: The holotype of *M. oxystoma* is in the British Museum (Nat. Hist.) No. 83.1.6.1. According to Brazier, the type locality is "the foot of Mt. Astrolabe" which is inland from Port Moresby. The locality D'Entrecasteaux Island, originally cited by E. A. Smith, is in error.

Remarks: The six species so far known in *Meliobba* are rather distinct. *M. lintschuana* Kobelt differs from *M. goldici* Brazier by being a little smaller, having much finer sculpture, and having the glaze on the parietal area uncoloured. In *M. goldiei* the parietal glaze is a rather dark mahogany-brown. Both these species differ from *M. shafferyi* by being perforate. In addition, this last species has occasionally a well developed tooth on the base of the lip in fully grown specimens.

Range: Known only from New Guinea, extending from Orokolo, Gulf Division south-east to Cloudy Bay, Eastern Division and up to 8000 feet elevation.

Specimens examined: NEW GUINEA: Foot of Mt. Astrolabe (UM); Laloki River, north of Port Moresby (UM); Rouna Falls, Laloki River, 20 miles east of Port Moresby (NMV); near Port Moresby; Inland from Yule Island (both MCZ); Owen Stanley Range at 8000 feet (MCZ; USNM); Cloudy Bay; Manvagolo, 25 miles ENE of Port Moresby; Mt. Astrolabe; Orokolo (all AM).

Meliobba lintschuana (Kobelt)
Pl. 2, fig. 2.

Helix (Papuina) lintschuana Kobelt 1894, Conchylien-Cabinet (2) 1, pt. 12, sec. 4, p. 701, pl. 200, figs. 5, 6 (Djamna Island, New Guinea).

Description: Shell reaching about 39 mm. in greater diameter, solid in structure, perforate and sculptured. Whorls four, depressed and having a well developed peripheral keel, and having the aperture descending sharply about 8 mm. from the lip. Colour a dull gray, very slightly marbled with irregular and small patches of purple. Spire reduced and obtuse and cast at an angle of about 120°. Aperture broadly ovate and produced at an angle of 40° from the base of the shell. Parietal lip thinly glazed and clear with the normal gray colour of the shell showing through. Palatal lip white and rather broadly reflected. Columella short and somewhat broadened. Suture slightly impressed. Umbilicus rather small but deep and almost wholly covered by the columellar reflection; this reflection, however, is not appressed to the shell. Sculpture consisting of rather fine, irregular and embossed ridges which are crossed by innumerable, fine, growth lines. Nuclear whorls about two, rather large, coloured a light gray and with numerous, regularly spaced thread-like ridges emanating from the suture.

Greater diameter	Lesser diameter	Height	
38.0 mm.	29.0 mm.	20 mm.	Holotype.
36.5 mm.	28.5 mm.	15 mm.	Hollandia.
33.5 mm.	27.0 mm.	14 mm.	Hollandia.

Types: The holotype is said by Kobelt to be in the Strubel collection. The type locality is Djamna [Jamna] Island off the north coast of Dutch New Guinea.

Remarks: See under *M. goldiei* (Brazier).

Range: Known only from Jamna Islands and the vicinity of Hollandia, north coast of Dutch New Guinea.

Specimens examined: DUTCH NEW GUINEA, JAMNA ISLAND (type locality); Hollandia (CM).

Meliobba mcmichaeli, new species
Pl. 2, fig. 3; Figs. 3(2), 6(4), 7.

Description: Shell reaching about 42 mm. in greater diameter, discoidal, solid in structure, perforate and finely sculptured. Whorls four and a quarter, depressed and having a well developed peripheral keel which becomes somewhat flattened a short distance back from the aperture. Aperture descending about one centimetre from the lip. Colour a dull ivory with exceedingly irregular and diagonal bands of dark mahogany-brown. Spire depressed, obtuse and produced at an angle of about 110°. Aperture broadly ovate and cast at an angle of about 37°. Parietal lip thinly glazed. Palatal lip ivory in colour, reflected, and lacking a tooth on its inner side. Columella short and relatively broad. Suture slightly impressed. Umbilicus partially covered over by the columellar reflection. Sculpture consisting of numerous fine, irregular ridges which cover the shell surface and which are set obliquely above the periphery and spirally on the base of the shell. Nuclear whorls two, ivory in colour, having small and very fine comma-like ridges at the suture.

The reproductive system of *Meliobba mcmichaeli*, as shown in Fig. 7, is characterized by having a relatively long, thin penis with a proportionately large recurved epiphallus and a large flagellum. The basal portion of the wall of the penis has a few large muscular ridges while the upper third is thin-walled. The penis papilla of the single specimen available for dissection was small. The spermatheca is globular and the spermathecal duct short.

The radula is very similar to that of *papondetta* and *helenae* and the jaw is smooth.

Greater diameter	Lesser diameter	Height	
42.5 mm.	32.5 mm.	23.5 mm.	Paratypes.
41.0 mm.	31.5 mm.	27.5 mm.	Holotype.

Types: Holotype, the Australian Museum, Sydney, Australia, No. C. 62377, from Noorweg, Hollandia, Dutch New Guinea.

Remarks: This species differs from *Meliobba goldiei* Brazier, by having far less sculpture and by having an axial rather than a spiral type of colour pattern, having a less open umbilicus, and by having a somewhat more extended spire. From *M. shafferyi* it differs by having less sculpture, by being partially umbilicate, and in lacking the tooth on the base of the outer lip.

We take pleasure in naming this species after Donald F. McMichael, Curator of Molluscs in the Australian Museum.

Range: North coast of New Guinea in the vicinity of Humboldt Bay.

Specimens examined: DUTCH NEW GUINEA: Noorweg, Hollandia (AM); AUSTRALIAN NEW GUINEA: Angriffs Haven, about 30 miles east of Humboldt Bay (AM).

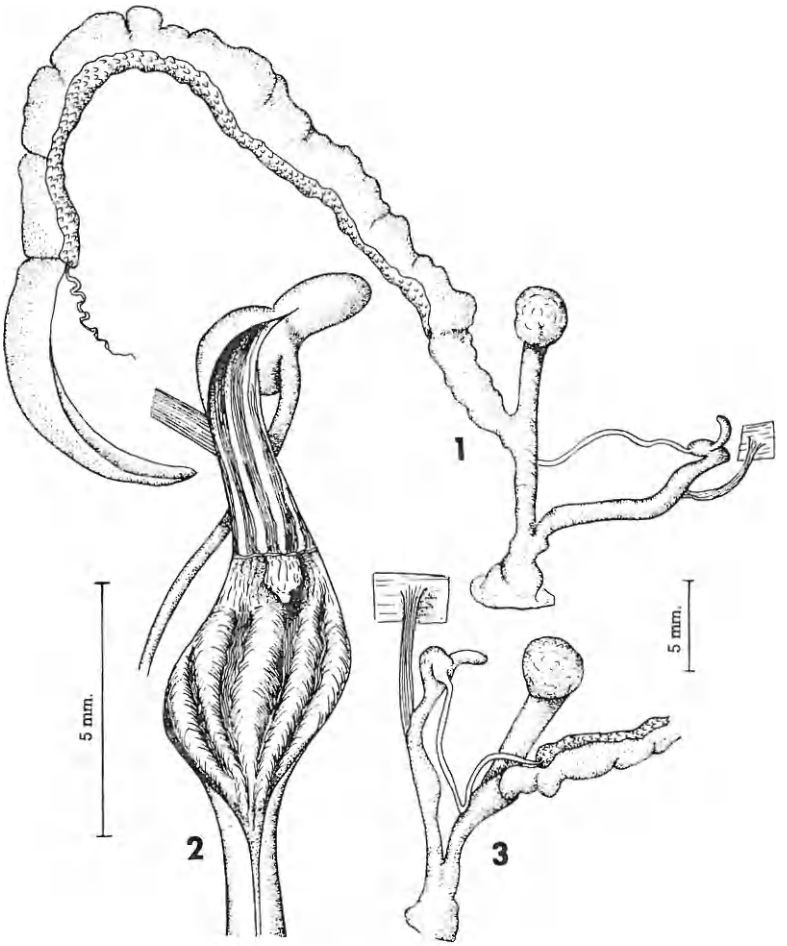

Fig. 7

Anatomy of the reproductive system of *Meliobba mcmichaeli* Clench and Turner. Fig. 1, complete system. Fig. 2, dissected penis. Fig. 3, basal area of reproductive system reversed. See Fig. 8 for labelling.

Meliobba popondetta, new species
Pl. 2, fig. 1; Figs. 3(3), 6(3), 8.

Description: Shell reaching 35 mm. in greater diameter, discoidal, solid in structure, perforate and finely sculptured. Whorls four, depressed, with the periphery of last whorl becoming rounded about half whorl before the aperture. Aperture descending sharply about 8 mm. from the lip. Colour a light brownish gray, mottled with dark mahogany to nearly black and having a well defined peripheral band of brown to brownish black. Spire depressed, obtuse and produced at an angle of about 120°. Aperture broadly ovate and cast at an angle of about 30° from the base. Interior of aperture a dark gray on the palatal wall. Parietal area thinly glazed with mahogany-brown. Palatal lip white and reflected. Columella short, broad and black within. Suture slightly impressed. Umbilicus large, deep, and only slightly covered by the columellar reflection. Sculpture consisting of fine, irregular and inconspicuous ridges which are more or less spirally arranged. Sculpture on the base of the whorl fine, becoming a little coarser near the aperture. Nuclear whorls two, light pinkish brown, smooth with a few exceedingly fine comma-like ridges emanating from the suture.

The reproductive anatomy of *Meliobba popondetta* is characterized by having the duct of the spermatheca short and large, the spermatheca being only slightly larger in diameter than the duct. The penis has a large recurved epiphallus and a small flagellum. The lower portion of the penis is thick walled and has pronounced longitudinal muscular ridges. The upper portion is thin walled and only slightly ridged. The penis papilla is small, triangular in outline and smooth. Only a single specimen was available for dissection.

The radula of *M. popondetta* is very close to that of *M. mcmichaeli* and *helenae* as shown in Fig. 3. The jaw is smooth.

Greater diameter	Lesser diameter	Height	
35.0 mm.	29.0 mm.	20.0 mm.	Holotype.
35.0 mm.	29.0 mm.	19.0 mm.	Paratype.
32.5 mm.	27.5 mm.	19.5 mm.	Paratype.

Types: Holotype, Australian Museum, No. C. 62376 from Mamoo Estate, near Popondetta (about 12 miles S.-W. of Buna), Papua (148° 19′ East; 8° 46′ South), collected by D. F. McMichael, August 31, 1957. Paratypes are in the Museum of Comparative Zoology, No. 221417, from the same locality and from Popondetta in the National Museum of Victoria, Australia. Additional paratype specimens in the British Museum (Natural History), No. 1908.6.2.4, from the Kumusi River, west of Buna, Papua. Paratype specimens from Abau (10° 11′ S; 148° 42′ E) Papua are in the Australian Museum.

Remarks: This species is close in its relationship to *Meliobba goldiei* Brazier. It differs in being somewhat smaller, having a rounded, rather than keeled, body whorl, and in having a larger and less covered umbilicus. From *M. lintschuana* Kobelt it differs in being far less strongly keeled and in being more openly umbilicate. In addition, the columellar area within is nearly black rather than white, and the shell is nearly circular rather than somewhat flattened on the last half of the body whorl as in *lintschuana*.

Range: Known only from the Buna-Popondetta Region, Northern Division, Papua, New Guinea.

Specimens examined. See under *Types*.

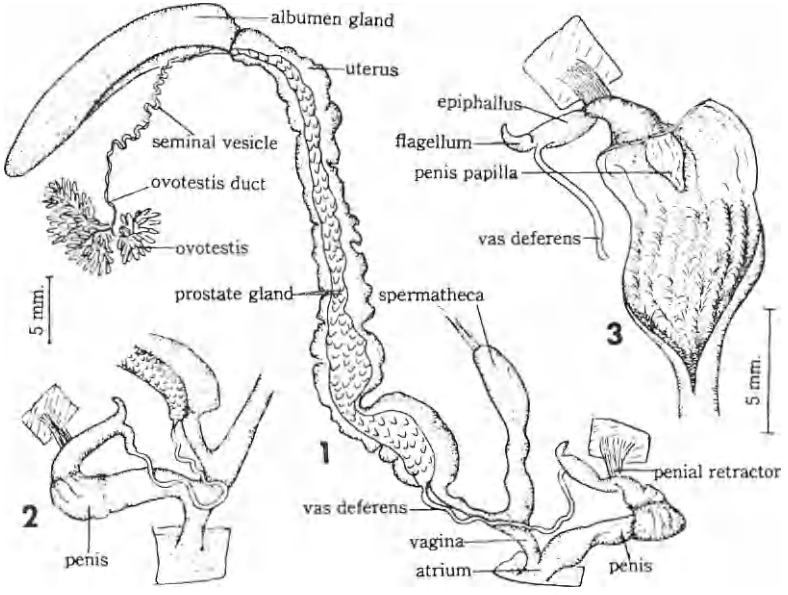

Fig. 8

Anatomy of the reproductive system of *Meliobba popondetta* Clench and Turner. Fig. 1, complete system. Fig. 2, basal area reversed. Fig. 3, enlarged drawing of the dissected penis.

Meliobba helenae Clench and Turner
Figs. 3(1), 6(5), 9.

Meliobba helenae Clench and Turner 1960, Journal of the Malacological Society of Australia, No. 4: 30, pl. 3.

For a description of this species see No. 4 of this Journal as noted above.

Known only from the type locality, Asai-Simbai Divide, Schrader Range, a few miles due west of Aiome, Territory of New Guinea (Aiome is at 05° 05′ South; 144° 50′ East).

The striking feature of the reproductive anatomy of *Meliobba helenae*, as shown in Fig. 9, is the short, thick penis which has a large, recurved

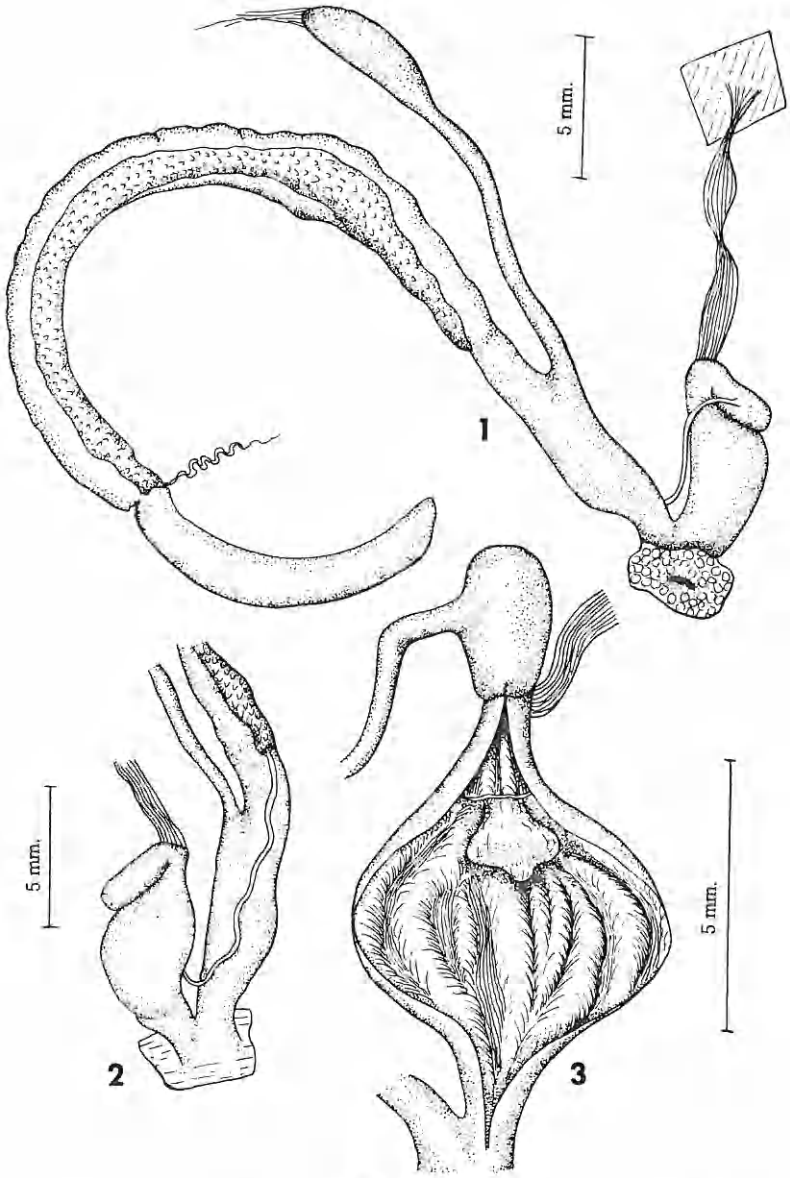

Fig. 9

Anatomy of the reproductive system of *Meliobba helenae* Clench and Turner. Fig. 1, complete system. Fig. 2, basal area reversed. Fig. 3, dissected penis. See Fig. 8 for labelling.

epiphallus with the vas deferens entering on the side of the epiphallus. The walls of the penis are thick and have a few large muscular ridges which diminish in size toward the epiphallus. The penis papilla is rather small, broad and smooth. The spermatheca is elliptical in outline, the spermathecal duct short and nearly equalling the spermatheca in diameter. Only a single specimen of this species was available for dissection.

The radula of *M. helenae* is very close to that of *mcmichaeli* and *popondetta* but the jaw differs in being ridged rather than smooth.

Meliobba shafferyi Iredale

Plate 2, figs. 5, 6.

Meliobba shafferyi Iredale, 1940, Australian Naturalist 10: 239-240, text figures (near Mossman, Queensland, Australia).

Description: Shell reaching about 44 mm. in greater diameter, discoidal, solid in structure, imperforate and sculptured. Whorls five, flattened, having a well developed peripheral keel and having the aperture descending sharply about 1 cm. from the lip. Colour a shining greyish ivory on the ridges and purplish to reddish brown in the depressions. Behind the aperture and on the base, the periostracum is diffused with a rich yellowish brown coloration. Spire depressed, obtuse, and produced at an angle of about 115°. Aperture broadly ovate and cast at an angle of about 40° from the base. Parietal lip thinly glazed. Palatal lip white, reflected, and supporting a long, broad tooth near the base of the columella. Columella short and relatively broad. Suture slightly impressed. Umbilicus covered over by the columellar reflection which is completely fused to the body whorl. Sculpture consisting of numerous, irregular ridges which cover the shell surface and which are set obliquely above the periphery and spirally on the base of the shell. Nuclear whorls two, smooth, dark reddish brown in colour and lacking the comma-like ridges at the sutures.

Greater diameter	Lesser diameter	Height	
43 mm.	35 mm.	25 mm.	Holotype
44.5 mm.	37.5 mm.	21 mm.	Queensland

Types: The holotype of this species is in the Australian Museum, No. C. 62205, and is from Mt. Alexander, Mossman, North Queensland, Australia, J. Shaffery, collector. Paratype, Museum of Comparative Zoology, No. 235650.

Remarks: M. shafferyi and *M. helenae* differ from other species of *Meliobba* by being imperforate. Occasional specimens of *M. shafferyi* have a long and well-defined tooth on the basal margin of the outer lip.

Range: Known only from northern Queensland, Australia.

Specimens examined: See under *Types*.

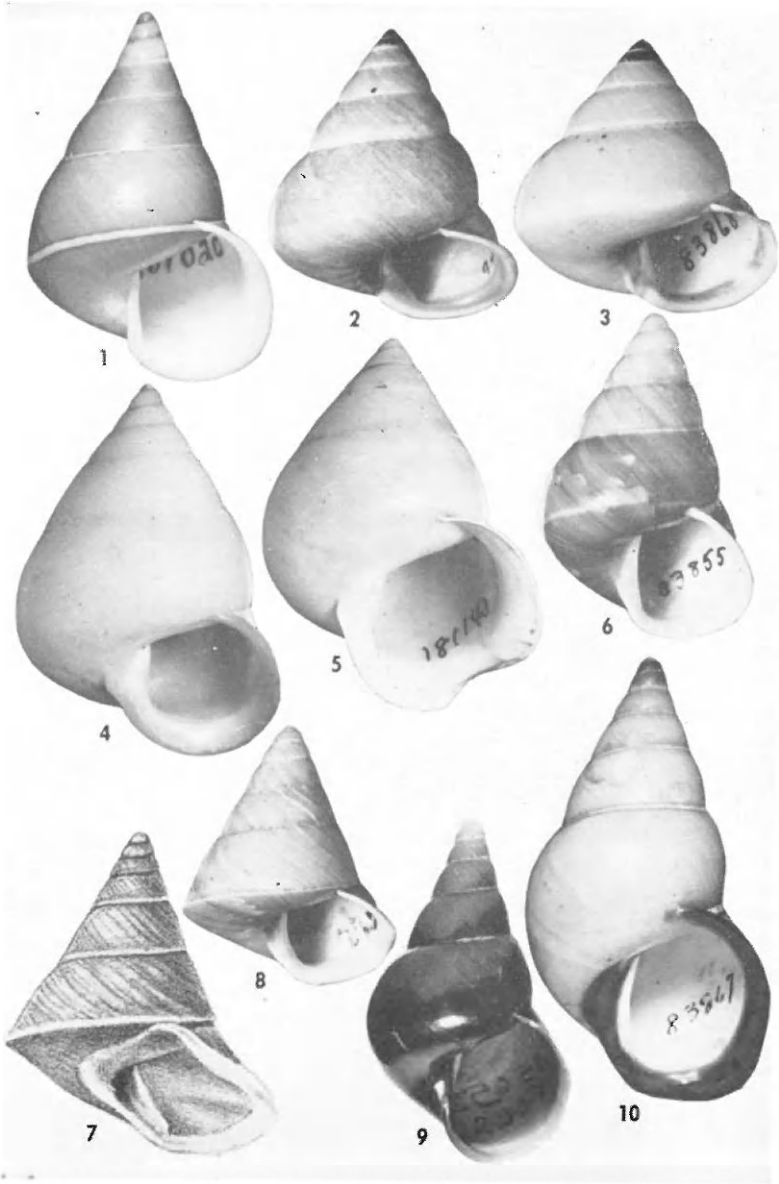

PLATE I.

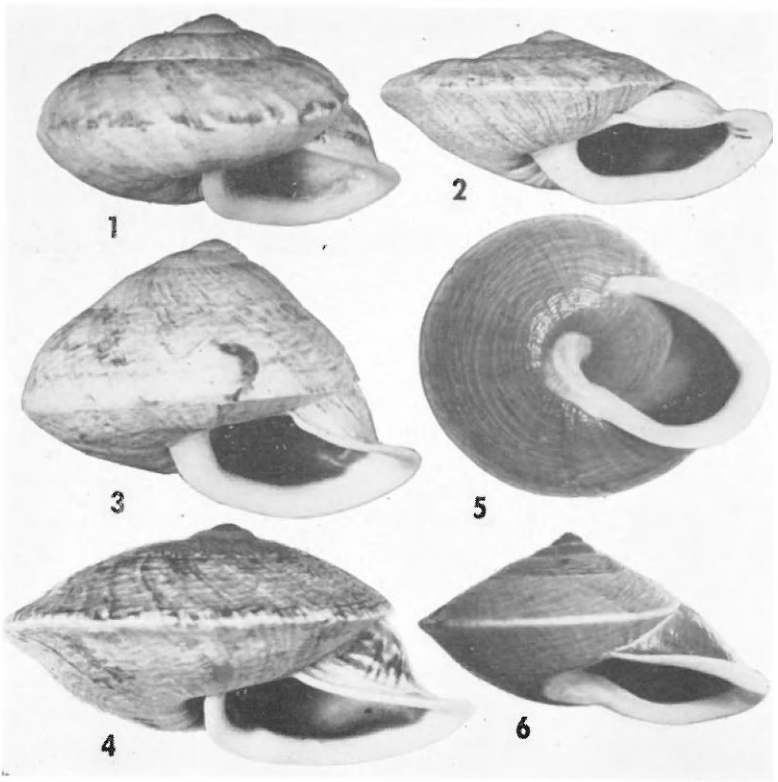

PLATE 2.

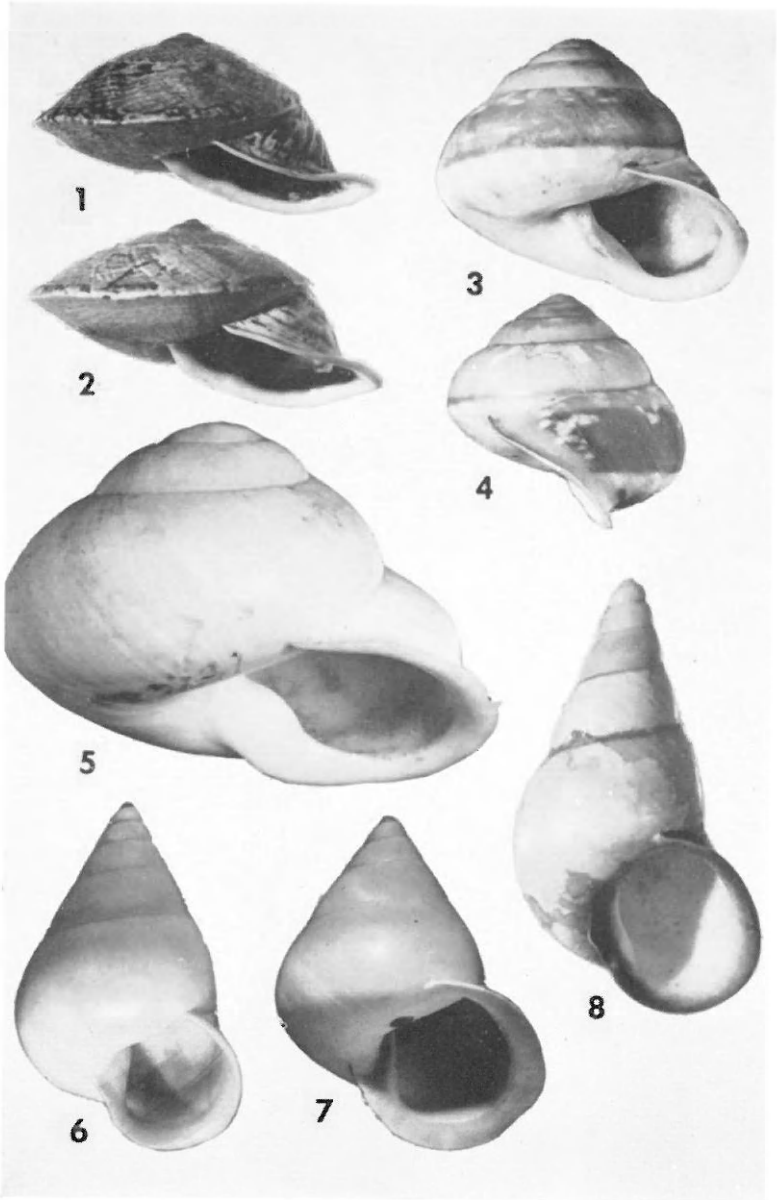

PLATE 3.

EXPLANATION OF PLATES 1-3.

PLATE 1.

Fig. 1: *Papustyla pulcherrima* (Rensch). Drabui Village, Manus Island, Admiralty Islands. M.C.Z. 181020 (1.12x)

Fig. 2: *Papustyla chancei* (Cox). Bismarcks. Paratype, M.C.Z. 94950 (1.27x).

Fig. 3: *Papustyla chancei* (Cox). Wide Bay, New Britain, M.C.Z. 83868 (1x).

Fig. 4: *Papustyla xanthochila* (Pfeiffer). Buin, Bougainville Island, Solomon Islands. M.C.Z. 216201 (1.1x).

Fig. 5: *Papustyla lilium* (Fulton). Sasamango River, Choiseul Island, Solomon Islands. M.C.Z. 181143 (about nat. size).

Fig. 6: *Papustyla nonnepommeraniae* (I. & B. Rensch). Matlip, Wide Bay, New Britain, Bismarck Archipelago. Paratype, M.C.Z. 83855 (1x).

Fig. 7: *Papustyla fergusoni* (H. Adams). New Britain. From the Proc. Zool. Soc, London 1872, pl. 42, fig. 14 (1.28x).

Fig. 8: *Papuina schneideri* I. & B. Rensch. Mope, New Britain, Paratype. M.C.Z. 225205 (1.11x). (= *P. fergusoni* H. Adams).

Fig. 9: *Papustyla hindei* (Cox). Lower Mewoulou River, New Britain. M.C.Z. 235652 (1x).

Fig. 10: *Papustyla hindei* (Cox). Wide Bay, New Britain. M.C.Z. 83867 (about nat. size).

PLATE 2.

Fig. 1: *Meliobba popondetta* Clench & Turner. Popondetta, about 12 miles South-West of Buna, Papua. Holotype, Australian Museum C. 62376 (about 1.3x).

Fig. 2: *Meliobba lintschuana* (Kobelt). Hollandia, Dutch New Guinea. M.C.Z. 216896 (about 1.4x).

Fig. 3: *Meliobba mcmichaeli* Clench & Turner. Hollandia, Dutch New Guinea. Holotype, Australian Museum C. 62377 (about 1.5x).

Fig. 4: *Meliobba goldiei* (Brazier). Near Port Moresby, New Guinea. M.C.Z. 109291 (about 1.1x).

Fig. 5-6: *Meliobba shafferyi* Iredale. Mt. Alexander, Mossman, Queensland, Australia. Holotype, Australian Museum C. 62206 (about nat. size).

PLATE 3.

Fig. 1: *Helix (Obba) oxystoma* E. A. Smith. D'Entrecasteaux Island (error, probably from near Port Moresby, New Guinea). Holotype, British Museum (Nat. Hist.) 83.1.6.1 (nat. size). (= *M. goldiei* Brazier).

Fig. 2: The same, paratype 83.1.6.2 (nat. size).

Fig. 3: *Papuina buehleri* Rensch. Tungon, Manus Island, Admiralty Archipelago. Paratype, Basel Museum 39249 (1.2x).

Fig. 4: *Forcartia buehleri* (Rensch). Pundrau, Manus Island, Admiralty Archipelago. Bishop Museum 188867 (1.2x).

Fig. 5: *Forcartia globula* (Rensch). Pileto Island, Cape Merkus, New Britain. M.C.Z. 187688 (2.23x).

Fig. 6: *Helix xanthochila* Pfeiffer. Solomon Islands. Holotype, British Museum (Nat. His.), (nat. size).

Fig. 7: *Papuina lilium* Fulton. (Solomon Islands). Holotype, British Museum (Nat. Hist.) 1905.10.23.88. (about nat. size).

Fig. 8: *Cochlostyla hindei* Cox. New Britain. Holotype, Australian Museum C. 62674 (1.5x).