ZONITID SNAILS FROM PACIFIC ISLANDS
PART 2

2. HAWAIIAN GENERA OF MICROCYSTINAE

BY

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INTRODUCTION

Part 1 of these studies includes the general discussion, with special reference to the Microcystinae, and the taxonomic description of those genera of this subfamily which do not reach the Hawaiian islands. This paper, which completes the Microcystinae, takes up three genera of Philonesiae—*Philonesia, Kaala,* and *Hiona*—which range from the Hawaiian islands through the Marquesas, Tuamotus and Society Islands to Rapa in the Austral Islands.

Under each species, the citation of localities from which material has been studied is arranged as follows:

1. Type island group (subdivisions of Fiji in parentheses; also synonyms, indicated by =): type island (natural subdivisions, islets, and districts of Hawaiian islands in parentheses; also synonyms as indicated): museum number of type specimen or lot when examined by me (followed in parentheses by number of type lot if type specimen has been segregated, or of other type lots if one contains the type), type habitat and locality (followed in parentheses by collector! and date), [localities not given by original author included in brackets]; after semicolon, other type material studied.

2. After first period, without repetition of island group or island, additional material from type island or district.

3. After successive periods, material studied from other island groups, islands, or recognized subdivisions, arranged as in 1.

Abbreviations used in the references to literature and in the citations of museum lots of specimens collected are listed in Part 1 (pp. 4-5).

Many characters of Philonesiae are confusingly divergent. While this readily permits their division into minor groups, generic division is peculiarly difficult because of the relative paucity of major gaps in these various lines of divarication. Thus, the subgenus *Fatuoa* of *Mendaña* confessedly approaches *Philonesia* fairly closely, and the isolated subgenus *Pitcairnia* of *Philonesia* has blade ectocones on its radular marginals as in *Mendaña.* Also, the hiatus between *Philonesia* and *Hiona* is lessened by *Kaala,* which combines the radula of the former with the shell of the latter.

Some rather startling convergent and contradictory tendencies make the phylogenetic relationships even more puzzling. For example, both *Philonesia*

and *Hiona* develop a left shell-lobe only in Hawaiian species; but, although the shells of *P. chamissoi* and *H. pilsbryi,* both from the island of Kauai, are at least superficially rather similar, *P. chamissoi* lacks and *H. pilsbryi* excessively develops this structure. Again, at opposite ends of its geographic distribution, the genus *Hiona* exhibits species with such strikingly similar shells as *H. orbis* and *H. exaequata,* while almost its extreme range of shell characters occurs in the group of closely related species from the Society Islands—in fact, from Tahiti alone.

With some misgivings, four genera are utilized. These are outlined in the following key (*Mendaña* was included in Part 1):

Key to the Genera of Philonesiae

A. Right shell-lobe absent or small (length much less than diameter of mantle collar in all preserved specimens); radular marginals with blade ectocones, usually prominent; shell dullish above, usually brightly colored or banded; columella usually with spiral cord (stronger when young); Marquesas:....genus **Mendaña** Baker.

AA. Right shell-lobe larger (extended length, even in preserved specimens, greater than diameter of mantle collar); radular marginals usually (excluding *Pitcairnia* from Tuamotu) without blade ectocones although sometimes multicuspid and, in *Hiona,* with blades becoming weakly serrate; shell usually thinner and more transparent (decidedly so and corneous or fuscous unicolor in Marquesas species); at least glossy or without trace of columellar cord (although sometimes developing external point in senile specimens);

B. Principal radular marginals with more than 2 cusps (rarely more than 2 marginals bicuspid); shell without columellar cord and usually with more conoid spire; Hawaiian, Marquesas, Tuamotu [Pitcairn, Mangareva, and (?) Makatea:] and Austral Islands [Rapa:]:.....genus **Philonesia** Sykes.

BB. Principal radular marginals tricuspid; shell with more domical spire (higher than in Oahu species of *Hiona*), with columellar cord (at least when young), polished and very translucent; Hawaiian islands: Oahu [Waianae Mts.]:.....genus **Kaala** Cooke, new.

BBB. Principal radular marginals bicuspid (although sometimes developing serrations on mesocone and even on blade) and usually more elongate; shell (often orbicular) with more domical spire or with deeper suture, polished and quite transparent or columella with spiral cord and thickening (stronger when young); Hawaiian, Marquesas, Tuamotu [Mangareva and (?) Pitcairn:], Society, and Austral Islands [Rapa:]:.....genus **Hiona** Cooke, new.

Genus PHILONESIA Sykes, 1900

Philonesia Sykes, 1900, Fauna Haw. 2: 280; type by original designation, *Microcystis baldwini* Ancey. Anatomy of *"Philonesia baldwini"* (loc. cit., 281, pl. 12, figs. 1-5), by Godwin-Austen, unidentifiable, but radula seems more like *Hiona.*

Piena Cooke, new subgenus, type *P. grandis,* new species.

Pitcairnia, new subgenus, type *P. pitcairnensis,* new species.

Kipua, new subgenus, type *P. chamissoi* (Pfeiffer), from Nounou Mountains (BBM. 81011).

Waihoua, new subgenus, type *P. kaliella,* new species.

Mauka, new subgenus, type *P. welchi,* new species.

Aa, new subgenus, type *P. waiheensis,* new species.

Haleakala, new subgenus, type *P. turgida diducta,* new subspecies.

Hiloaa, new subgenus, type *P. hiloi,* new species.

Oafatua, new subgenus, type *P. uapouae,* new species.

Nukupiena, new subgenus, type *P. ordinaria,* new species.

Nesarion, new subgenus, type *P. tenuissima,* new species.

Uafatua, new subgenus, type *P. helicarion,* new species.

Rapafila, new subgenus, type *P. zimmermani,* new species.

Philonesia is the largest genus of zonitids in eastern Oceania. The isolated subgenus *Pitcairnia,* with its *Microcystis*-like shell, might with almost equal reason be regarded as a distinct genus or even included in *Mendaña.* The shell in the subgenus *Kipua* is also remarkably similar to that in *Microcystis,* s.s. The fossil subgenus *Waihoua* bears some resemblance to the Hawaiian species of *"Kaliella."* The subgenus *Nesarion,* with its *Helicarion*-like shell, would traditionally be placed in a separate subfamily, but its section *Uafatua* (at least) has no anatomical features, even in its shell-lobe, that would warrant its separation from *Philonesia,* s.s. Peculiarly enough, the subgenus *Rapafila* seems to be more closely related to *Nesarion* than to the geographically closer *Pitcairnia.*

Key to Subgenera, Sections, and Some Minor Groups of Philonesia[1]

A. Radular marginals with distinct blade ectocones; shell very similar to *Microcystis,* appearing enamelled; Tuamotu: Pitcairn and Mangareva Islands:.....subgenus **Pitcairnia,** new.

AA. Radular marginals without distinct blade ectocones; shell duller (B) or thinner and smaller (BB);

B. Genitalia with large, wedge-shaped stimulator in atrium; penis far larger than prostate; shell fairly heavy, rather opaque (similar to *Microcystis*) with whitish varices, quite dull and large (3.5 wh. diam. more than 7 mm. or almost as high as broad); Hawaiian islands: Kauai:.....subgenus **Kipua,** new.

BB. Genitalia (so far as known) without such stimulator; shell thinner and usually smaller (3.5 wh. diam. less than 7 mm. or larger epidermal);

C. Shell sublenticular with heavy carina and prominent, angular growth-wrinkles that form costulae at their crests; Hawaiian islands: Hawaii (fossil):.....subgenus **Waihoua,** new.

CC. Shell with less pronounced growth-wrinkles and less prominent carina (or none);

D. Shell relatively heavier but smaller (3.5 wh. diam. less than 7 mm.);

[1] *Philonesia (?) pertenuis* (Gould) not included; from (?) Tuamotu: Makatea.

E. Mantle collar without left shell-lobe; shell[2] with relatively thinner epidermis and weaker minor growth-lines than in *P. turgida diducta*; Hawaiian and Marquesas Islands:.....subgenus **Philonesia,** s. s.

F. Epiphallic corona with few folds and usually as long as broad; Hawaiian islands: Kauai to Hawaii;

G. Penis little larger than prostate; penial atrium without lobe or extrinsic gland; shell with more gradual whorl-increase (excluding *P. hartmanni* and *P. glypha,* which have weaker spiral striae).....section **Philonesia,** s. s.

H. Shell dullish to glossy (Maui species with 4 wh. diam. less than 6 mm.); Hawaiian islands; Kauai to Hawaii.....**P. plicosa** group.

HH. Shell weakly (Maui species with 4 wh. diam. more than 6 mm.) to well polished (Oahu):.....typical group.

GG. Penis much larger than prostate; shell with apparently more rapid whorl-increase or with stronger spiral striae; Oahu:

I. Penial atrium without lobe or extrinsic gland[3].....section **Mauka,** new.

II. Penial atrium with sacculate lobe or whitish extrinsic gland.....section **Piena** Cooke, new.

FF. Epiphallic corona with more than 7 folds and broader than long; Marquesas:

J. Penial atrium without lobe; shell apparently not attaining diameter of 7.5 mm. (mainly much smaller); Fatuhiva, Hivaoa, Uapou, and Uahuka:.....section **Oafatua,** new.

JJ. Penial atrium with sacculate lobe; shell attaining a diameter of over 8 mm.; Nukuhiva:.....section **Nukupiena,** new.

EE. Mantle collar with at least a rudiment of left shell-lobe; Hawaiian islands: Molokai to Hawaii (excluding *P. turgida diducta,* which has heavy epidermis and sharp growth-lines):.....subgenus **Aa,** new.

K. Penis or atrium with a lobe; shell smaller (4 wh. diam. less than 6 mm.) or whorl-increase very rapid (*P. interjecta* from Lanai);

L. Penial atrium with a sacculate lobe; Molokai to Maui (*P. turgida diducta* also on Kauai, Oahu, and Hawaii):.....section **Haleakala,** new.

LL. Penis with basal lobe; Hawaii:.....section **Hiloaa,** new.

KK. Neither penis nor atrium with lobe; shell larger or with more gradual whorl-increase; Molokai to Hawaii:.....section **Aa,** s. s.

DD. Shell thin, highly polished, largely epidermal and bigger (3.5 wh. diam. over 7 mm.); Marquesas and Austral Islands (Rapa):

M. Shell *Helicarion*-like, with large, rounded, very rapidly increasing whorls; right shell-lobe moderately to much larger; Marquesas:.....subgenus **Nesarion,** new.

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[2] If following keys on basis of shell-characters and distribution, go to EE for species from Lanai, Maui, or Hawaii. Species of *Philonesia,* s.s. from these islands are also included [in brackets] in the keys to the sections of the subgenus *Aa.*

[3] Artificial key to species of both *Mauka* and *Piena* is given under section *Mauka.*

N. Mantle with left neck-lobe divided; shell larger or with stronger growth-wrinkles or with 3d whorl deflected downward; Uahuka, Uapou, and Fatuhiva:.....section **Uafatua,** new.

NN. Mantle with left neck-lobe undivided; shell small (3 wh. diam. less than 7.5 mm.), with extremely weak growth-lines and with last whorl not markedly deflected downward; Marquesas: Hivaoa and Tahuata:.....section **Nesarion,** s. s.

M. Shell lenticular, with angulate, less rapidly increasing whorls; post-uterine oviduct practically absent; Austral Islands: Rapa:..... .....subgenus **Rapafila,** new.

Philonesia (Pitcairnia) pitcairnensis, new species (pl. 18, figs. 10, 11[4]; pl. 22, figs. 1, 2).

Tuamotu: Pitcairn: BBM. 11322 (135125, dissected), on ferns, ti, etc., in damp valleys above village, north slope (Mang. Exped.! June 14, 1934).

Shell (pl. 18, figs. 10, 11) thin but with heavy epidermis, subglobose, bluntly but distinctly angulate on 3d whorl, becoming quite evenly rounded on 4th, with tumid base and deep, quite narrow foveola; dark brownish horn-color, sometimes more olive below, subtranslucent and quite polished [appears enameled, often with blisters and spots as if dirt had collected before it was dry]. Embryonic whorls 2¼; first smoothish, 2d assuming neanic sculpture. Later whorls with weak, low, irregular growth-wrinkles (7-8 major ones per mm. on 4th) and with minor spiral striae almost obsolete (injury spirals often present) above and below; suture lightly impressed and well overriding. Aperture narrowly lunate, evenly rounded; peristome about 30° to shell-axis, concave below; columella almost vertical, thin but rounded, concave and purplish-white; foveolar and parietal films dull whitish and fairly heavy.

Animal whitish with dark tentacles; tail longer than head; tail horn broad, not reaching tip of sole. Mantle collar with right shell-lobe (contracted) 4 times as long as its base; left mantle-lobe bipartite. Lung with some chalky-white anteriad and with narrow black lines either side of hindgut; 3.5 times as long as its base or 2.5 times length of kidney, which is 2¼ times as long as its base or 1.5 times length of pericardium. Hermaphroditic duct (pl. 22, fig. 1) moderately long; talon ovoid; carrefour small. Uterus with 2 eggs and 1 large embryo; post-uterine oviduct long; spermatheca long fusiform. Prostate small; vas deferens stout and not becoming much larger until epiphallic corona; penial retractor inserting on penial apex, corona and about an equal distance above last; penis large, slightly swollen apically. Penial prepuce very short and wide; atrium proper little longer; external opening close behind inferior tentacle. Jaw with decussating striae strongest near center; median lobe quite low and rounded. Radula (pl. 22, fig. 2) has rather elongate central, 9 laterals with small entocone becoming obsolete on last, and 48 marginals, of which first is bicuspid and principal ones tricuspid with few blade ectocones; 84 rows counted.

As regards color, *P. pitcairnensis* fits the description of *Helicopsis glandula* Beck fairly well, but *H. glandula* must be a much more depressed and polished shell and is tentatively included in the genus *Hiona*. Both *Philonesia pitcairnensis* and *P. mangarevae,* although first described in this paper, date from Part 1, in which they are figured (pl. 18, figs. 10, 11, 13-15).

[4] Plates 1-20 printed in Part 1.

KEY TO THE SPECIES OF THE SUBGENUS PITCAIRNIA

A. Shell less depressed, with more fornicate spire, with less rapid whorl-increase; mainly brownish; Pitcairn:

B. Shell smallest, becoming subglobose, with spiral striae almost obsolete; dark brownish horn-color, subtranslucent; radula with 46 marginals..... **P. pitcairnensis,** new species.

BB. Shell larger, with more depressed whorls, with slightly more visible spirals; usually lighter and commonly with 3 whitish bands, subopaque; radula with 90 marginals..... **P. filiceti** (Beck).

AA. Shell much depressed, with low conoid spire, with very rapid whorl-increase; subopaque yellowish with whitish subsutural band and two chestnut stripes; radula with 123 marginals; Mangareva:..... **P. mangarevae,** new species.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap..	diam. ap	1½	3.5 wh.	whs.
P. pitcairnensis								
type	5.68	137 (7.80)	129 (7.31)	58(3.32)	129(4.28)	2.75	2.5 (6.89)	4—
P. filiceti								
Beck	6	(9)	.....	(4)	(5)	.....	.....	4 (?)
(adamsi)	6	(11)	(10)	.....	.....	.....	.....	3.5
fig.	8.0	138(11)	.....	59(4.7)	132(6.2)	.....	.....	
(aurulenta)	5	(9)	(8)	.....	.....	.....	.....	4
BBM.135102	6.84	153(10.47)	140 (9.56)	59(4.05)	141(5.71)	3.39	3.1(10.47)	3.5
P. mangarevae								
type	6.33	179(11.33)	163(10.32)	62(3.95)	156(6.14)	2.60	4.1(10.55)	3.75—

Comparative Whorl-sizes

	1½	3 wh.	3.5 wh.	4 wh.	whs.	Index
P. pitcairnensis	2.75	.....	2.5 (6.89)	2.8 (7.82)	4—	137
P. filiceti	3.39	2.6 (8.89)	3.1(10.47)	3.7(12.5)?	3.5	153
P. mangarevae	2.60	3.3 (8.47)	4.1(10.55)	5.0(13.0)?	3¾	179

Philonesia (Pitcairnia) filiceti (Beck), (pl. 18, fig. 12; pl. 29, fig. 15; pl. 22, figs. 3, 4).

[*Nanina*] *Microcystis filiceti* Beck, 1837, Index: 2 (nude), Pitcairn. *Nanina filiceti* Beck, Nov. sp.: 3.

Helix adamsii Pfeiffer, 1845, Proc. Zool. Soc.: 66, in part, Pitcairn and Opara (=Rapa). *H. adamsi* Pfeiffer, Monogr. 3:33 [4:13-5:54-7:65]; Conch.-Cab. 2:318, pl. 129, figs. 1-6. *Nanina adamsi* Tryon, 1886, Manual 2:112, pl. 37, figs. 22-25.

Helix ornatella (Beck) Pfeiffer, 1847, Monogr. 1:32, in part; Conch.-Cab. 1:234, pl. 29, figs. 23-26. Pitcairn and Opara.

(?) *Microcystis aurulenta* "Beck" Mörch, 1852, Cat. Yoldi: 2 (nude), Pitcairn. (?) *Helix aurulenta* Pfeiffer, 1853, Monogr, 3:626 [4:13-5:54-7:65].

Tuamotu: Pitcairn: in ferns (Cuming!). BBM. 135102, dissected, on ferns, ti, etc., in damp valleys above Adamstown, north slope (Mang. Exped.! June 14, 1934).

"N[anina] testa convexa, nitida, lutea vel picea, fasciata, sutura alba; ultimo anfractu convexo, utrinque aequaliter declivi; apertura rotundato-subquadrata; columellae basi rectiuscula. M. *a.* 9. *b.* 6. *c.* 5. *d.* 4. *Hab.* in filicetis *Ins. Pitcairn. H. Cuming.* Testa orbiculato-convexa apice obtusa, tenuissime oblique striata, nitida. Anfractus quatuor, modice et regulariter accrescentes, convexiusculi, ad suturam paululum planulati, ultimus rotundatus, utrinque fere aequaliter arcuatus. Apertura subquadrato-rotundata absque, angulo antico, subtransversa. Columella basi recta, callo reflexo, albo, aucta. Variat colore picturaque, sutura tamen semper alba. Notabiliores varietates hae: . . . " (Beck).

Shell (pl. 18, fig. 12, pl. 29, fig. 15) similar to *P. pitcairnensis* but larger, solider, and usually more depressed (very variable in height), scarcely angulate on 3d whorl and evenly rounded on 4th, with less convex base and broader foveola; yellowish-olive to brownish, commonly with 3 whitish bands (subsutural, high supraperipheral and just subperipheral), often with darker and lighter varices and commonly with fine, whitish, spiral lines, scarcely translucent and less polished. Embryonic whorls dark horn-color, with much more distinct, very fine, spiral ridgelets. Later whorls more depressed, with stronger growth-wrinkles and slightly more visible spiral striae above; suture a little more impressed, less overriding but well margined. Aperture much more dilated transversely; peristome about 35° to shell-axis; columella slightly heavier; parietal film usually thinner.

Animal also similar. Right shell-lobe about 7 times as long as its base. Lung with pigment patches and line along hindgut; 4 times length of base or 2.5 times kidney length, which is about twice as long as its base or 1.5 pericardial length. Talon comma-shaped; carrefour somewhat larger; uterus with 4 eggs and 1 large embryo; spermatheca and post-uterine oviduct (pl. 22, fig. 3) relatively shorter. Vas deferens slenderer. Penial sheath slightly more inclusive; penial retractor inserted on loop of epiphallus and apex of penis; male organ considerably more elongate. Jaw thin. Radula (pl. 22, fig. 4) with less elongate central, 7 tricuspid laterals and 92 marginals, of which inner 2 are bicuspid and remainder usually develop several, small, stout ectocones.

Cuming seems to have mixed his Rapa specimens of *Microcystis ornatella* and his Pitcairn shells of *Philonesia filiceti,* but Beck's description applies to *P. filiceti,* which has a more rounded and larger 4th whorl and seems not to develop a 5th. However, the superficial resemblance between the two shells is amazing. Both are highly variable in coloration. I have not seen *Helix aurulenta* Pfeiffer, which would appear to have a more conoid spire, weaker columellar callus, smaller whorls, and weaker growth-lines. If it comes from Pitcairn, which is dubious, it may be founded on an aberrant shell of *P. filiceti,* but the description would fit *P. chamissoi* or *Hiona pilsbryi* even better.

Philonesia (Pitcairnia) mangarevae, new species (pl. 18, figs. 13-15; pl. 22, figs. 5, 6).

Tuamotu: Mangareva (Mangareva Islet): BBM. 11324 (135167, dis-

sected), on ti, *Plectronia,* and *Celastraceae,* medium damp shelf, alt. 1,000 ft., south cliff of Mokoto (Mang. Exped. ! June 7, 1934; BBM 135154-7, under shrubs, ditto (June 6, 1934).

Shell (pl. 18, figs. 13-15) similar to *P. filiceti* but with much more depressed whorls, with more conoid spire, with 3d whorl weakly but distinctly angulate and 4th scarcely so; clouded yellowish and subopaque above, shading into greenish horn-color and more translucent below, with similar whitish subsutural stripe, but with the other two bands narrow and bright chestnut. First embryonic whorl with more deeply incised growth-lines. Later whorls with suture less impressed. Aperture narrowly subtrapezoidal, much depressed but with rounded periphery; peristome 30° to shell-axis; columella sharper; foveolar and parietal films more sharply outlined.

Animal similar to *P. pitcairnensis* but only eyes pigmented; pearl-like excrescences often present; tail with prominent mid-dorsal groove and pyramidal tail-horn, which extends beyond tip of sole. Right shell-lobe 6 times as long as its base and longer than diameter of mantle collar. Lung with medium-sized chalky spots [becoming larger over stomach and forming solid band near apex]; 3 times length of base or 1¾ kidney length, which is 2¼ times as long as its base or 1.5 pericardial length. Hermaphroditic duct long; uterus not pregnant; spermatheca (pl. 22, fig. 6) shorter [more as in *P. filiceti*]. Penis shorter and stouter. Jaw thin, with very low median lobe. Radula (pl. 22, fig. 5) with less elongate central, 6 laterals, on last of which entocone is almost obsolete, and 123 marginals, which all have more than 2 cusps; 106 rows counted.

Philonesia (Kipua) chamissoi (Pfeiffer), (pl. 38, fig. 5; pl. 27, fig. 3; pl. 22, figs. 7, 8).

Helix chamissoi Pfeiffer, 1855, Proc. Zool. Soc.: 91, Sandwich Islands; 1859, Monogr. 4: 19 [5:60-7:74]. *Nanina chamissoi* Tryon, Manual 2: 116, pl. 38, figs. 74-76. Probably not *N. chamissoi* W. G. Binney, Ann. N.Y. Acad. Sci. 3: 85, pl. 17, fig. O, west Maui (Gulick!), radula.

(?) *Nanina cicercula* Gould (*Chamissonii* Pfeiffer) Schmeltz, 1869, Cat. Mus. Godeffroy IV: 70, Kawai [Kauai].

Hawaiian islands [Kauai:]. (Lihue): BBM. 20667, dissected by Cooke, valley, upper part of forest, Lihue (Cooke! March 10, 1910); BBM. 81011, dissected, mostly on *ohia ai,* second valley above chimney rock, west side of Nounou Mountains (Cooke and Dranga! Oct. 22, 1925); BBM. 20572, low in first valley south of gap, Kipu (Cooke! March 7, 1910). (Waimea): BBM. 48122, Kanalohuluhulu gate on flats, Helemanu Valley (Cooke! Aug. 12, 1919); BBM. 48452, dead leaves of *halapepe,* second valley Puukapele (Cooke! Aug. 22). (Koloa, Hanalei, and Kawaiha): BBM.

Shell (pl. 38, fig. 5; pl. 27, fig. 3) depressed, with low conoid spire, sharply and acutely angulate on 3d whorl, becoming more bluntly and obtusely so on 4th and often weakly so on 5th, with quite deep, moderately broad foveola; quite dull, horn-color, darker and more uniform near apex but developing numerous, opaque, whitish varices and often finer, spiral streaks above on later whorls (20667 with weak, brownish zone extending some distance above and slightly below periphery); base quite highly glossy, yellowish to brownish and more translucent. Embryonic whorls around 2, soon assuming extremely fine, but fairly sharp, very closely spaced, spiral striae, which separate low

ridgelets, and with growth-lines becoming stronger on last ¼ whorl. Later whorls with similarly fine but sharper and more distinct, spiral striae and with low, irregular but angular growth-wrinkles (2 major and 17-18 minor ones per mm. at end of 4th) above; base with spirals sharp near periphery but becoming obsolete near 1/3 distance toward columella and with much weaker growth-lines; suture moderately impressed, little overriding. Aperture broadly lunate, depressed, weakly to barely angulate at 80° to shell-axis; peristome about 25° to shell-axis, weakly concave below; columella lightly thickened, gradually and involutely reflected.

Animal colorless except slate tinge at tip of tail and dark tentacles. Right shell-lobe 7 times as long as its base; left shell-lap rather broad but without shell-lobe; left mantle-lobe deeply bipartite. Lung with some dark pigment behind mantle collar and with transverse rows of white blotches, which become confluent around hindgut and kidney, and often with numerous pearl-like excresences; 4 times as long as base or 3 times kidney length, which is twice its base or pericardial length. Ovotestis (pl. 22, fig. 8) consisting of 8 pyramidal groups of clavate alveoli, with quite short duct (GD)[5]; talon (GT) short clavate, bipartite; carrefour (X) obovoid; uterus (UT) containing 4 big eggs and 3 embryos; post-uterine (UZ) duct slender; spermatheca (S) sausage-shaped. Penial sheath (PS, only base shown) including epiphallus; corona (EC) elongate with 6 internal folds; penial retractor (PR) inserting on corona and penial apex and with branches to latter half of epiphallus (ED); penis (P) over twice as large as prostate (DG), internally (section P) with very high, heavy pilaster and numerous transverse plications throughout its length. Penial prepuce (YP) and atrium short but broad (partially everted in specimen figured), almost filled by a large, triangular, glandular stimulator-papilla (YD) on oviducal side. Jaw similar to that of *P. baldwini* but heavier, with broad, rounded, low to very low, median lobe. Radula (pl. 22, fig. 7) has 9 laterals, on which small entocone becomes obsolescent or absent on outer 1 or 2, and 49 marginals (Dr. Cooke found 48 to 57 in BBM. 20667), of which inner 2 to 4 are bicuspid and outer ones become multicuspid although rarely with blade-ectocones; 113 rows counted.

The shell of *P. chamissoi* looks very much like that in *Microcystis,* s. s. It is distinguished from the fossil *P. arenofunus,* which probably also belongs in the subgenus *Kipua,* in the following key:

A. Shell depressed, with low conoid spire; Kauai (widely distributed):.....
.....**P. chamissoi** (Pfeiffer).

AA. Shell turbinate, with high paraboloid spire; fossil; Kauai (east Koloa): Mahualepu.....**P. arenofunus,** new species.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	
P. chamissoi								
Pfeiffer	4.5	(9)	(7.7)	.....	.....	.....	.....	4½
BBM.20667	5.07	192 (9.75)	172 (8.70)	67(3.42)	154(5.27)	2.13	5.0(10.7)?	4.2
BBM.81011	5.55	187(10.40)	172 (9.55)	67(3.70)	146(5.39)	2.08	4.9(10.22)	4.5+
BBM.20572	5.88	181(10.67)	162 (9.51)	60(3.55)	153(5.44)	2.17	4.6 (9.98)	4 5/6+
P. arenofunus								
type	9.03	112(10.12)	104 (9.38)	43(3.85)	129(4.97)	2.18	3.7 (8.01)	5.7
paratype	9.18	115(10.58)	111(10.17)	46(4.20)	124(5.22)	2.11	3.9 (8.24)	5.8

[5] See explanation of plates.

Comparative Whorl-sizes

		3.5 wh.	4 wh.	4.5 wh.	5 wh.	5.5 wh.	Maxima	Index
P. chamissoi								
BBM. 20667	2.13	3.4(7.18)	4.2(9.00)	5.0(10.7)?	.....	.....	4.2	192
BBM. 81011	2.08	.....	4.1(8.49)	4.9(10.22)	.....	.....	4.5+	187
BBM. 20572	2.17	.....	3.8(8.28)	4.6 (9.98)	.....	.....	4⅝+	181
P. arenofunus								
type	2.18	.....	.....	3.7 (8.01)	4.0(8.78)	4.3 (9.48)	5.7	112
paratype	2.11	.....	.....	3.9 (8.24)	4.3(9.16)	4.8(10.08)	5.8	115

Philonesia (Kipua?) arenofunus, new species (pl. 27, figs. 1, 2).

Hawaiian islands: Kauai (east Koloa): BBM. 11326 (78025, 26), fossil, sand dunes close to and above west side of small bay, Aweoweonui, Mahaulepu (Cooke! Oct. 20, 1922).

Shell (pl. 27, figs. 1, 2) turbinate, with paraboloid spire, often very obtusely angulate on 5th whorl but becoming quite evenly rounded on 6th, with foveola moderately deep and broad; bleached and chalky (78026 retains faint, supraperipheral, dark zone). Embryonic whorls apparently about 2, sculptureless (eroded). Later whorls assuming low but quite pronounced coarse, major growth-wrinkles (2 per mm. on 6th), but not retaining spiral striae above; base smoother; suture well impressed. Aperture narrowly trapezoidal but with rounded periphery; peristome about 20° to shell-axis, weakly concave below; columella gradually and involutely reflected, convex and very heavily thickened internally and with thick foveolar callus.

Although much more elevated, this shell agrees most closely in texture with that of *P. chamissoi,* which also is sometimes banded. It appears to have been abundant.

Philonesia? (Waihoua) kaliella, new species (pl. 36, fig. 5).

Hawaiian islands: Hawaii (North Kona): BBM. 11327 (49720 and ANSP. 127982), inland of old branding pen along trail, Waihou, Puu Waawaa (A. Gouveia! July 11, 1919).

Shell (pl. 36, fig. 5) sublenticular, with heavy rounded carina and with moderately deep, quite narrow foveola; bleached and chalky (with reddish deposit), probably dull above and below. Embryonic whorls apparently about 1¾, usually with sculpture eroded (one young shell retains very fine, closely spaced, spiral striae, rather similar to those in *P. chamissoi*). Later whorls with heavy, angular growth-wrinkles (5-6 per mm. at end of 4th whorl), which form low costulae at their crests, which undulate carina, and which are surmounted by vestiges (mainly weathered away) of spiral striae similar to those on embryonic whorls above; base with similar, coarse growth-wrinkles dying out in foveola and with evidences of very fine, sharp, spiral striae; suture broadly and shallowly impressed, attached on carina or dropping slightly below it on 5th whorl. Aperture roughly trapezoidal, with strong carinal sulcus at 85° to shell-axis; peristome about 25° to shell-axis, weakly concave below; columella short and concave, gradually reflected and weakly thickened.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4 wh.	whs.
Type	2.61	206(5.37)	189(4.94)	60(1.57)	180(2.83)	1.53	3.5(5.28)	4+

P? kaliella is much more heavily sculptured than any other species of *Philonesia.* Dr. Cooke was of the opinion that it belonged in *"Kaliella"* but it is imperforate and one shell appeared to contain embryos. The specimen figured became loose at its suture; another shell was chosen as the type of the species because accurate measurement of the damaged one was impossible.

Philonesia (Philonesia?) kualii, new species (pl. 27, figs. 4, 5).

Hawaiian islands: Oahu (Koolau Range, Honolulu) : BBM. 43285, fossil, road cutting, one block below Kualii, Upper Manoa Road, Manoa (E. Girdler and Cooke! Oct. 25, 1916).

Shell (pl. 27, figs. 4, 5) obese lenticular, acutely angulate and weakly carinate (sulcate above and below on early 5th whorl but only below on 6th), with narrow, moderately deep foveola; bleached and chalky, dull above and smooth below. Embryonic whorls about 1¾, soon assuming very fine, but fairly sharp, closely spaced, spiral striae. Later whorls with mediocre, irregular growth-wrinkles (12-13 per mm. on 5th), crossed by spiral striae similar to embryonic ones above; base with much weaker growth-lines and considerably weaker spirals; suture barely impressed, mainly attached at angle. Aperture narrow, decidedly angulate at 75° to shell-axis; peristome 15° to shell-axis, weakly concave below; columella rather abruptly thickened and reflected so as to produce a rounded truncation on peristome.

P. kualii, named for Dr. Cooke's home, is much more angulate than any of the living species of the group of *P. plicosa,* and thus slightly resembles the much more heavily sculptured *P. kaliella.*

Key to Philonesia plicosa Group

A. Shell acutely angulate and narrowly carinate on 5th whorl; fossil; Hawaiian islands: Oahu (Koolau Range, Honolulu) : Manoa.....**P. kualii,** new species.

AA. Shell not carinate and rarely acutely angulate on 5th whorl;

B. Shell larger (4.5 wh. diam. 7.5 mm. or more) or with spiral striae very closely spaced (*P. cryptoportica*), usually attaining more than 4.5 whorls; Oahu:

C. Shell dullish, less depressed, obtusely to weakly angulate on 5th whorl;

D. Shell with weakly impressed, well-margined suture; (Koolau Range):

E. Shell with less closely spaced spiral striae and slightly more domical spire;

F. Shell more depressed (Index over 170) and heavier; southeast from Lanihuli.....**P. plicosa** (Ancey).

FF. Shell more elevated (Index under 160) and thinner, with more terete whorls; northwest from Kapalama Valley.....**P. striata,** new species.

EE. Shell with spiral striae so closely spaced as to require magnification of almost 100 diameters for their resolution (225 per mm.); spire conoid; southeast from Lanihuli.....**P. cryptoportica** (Gould).

DD. Shell with a little more impressed, narrowly margined suture (especially on embryonic whorls), with longer, less reflected columella; (Waianae Mts.): ..... **P. oahuensis** (Ancey).

G. Shell smaller, thinner, more elevated and more obtusely angulate than *P. plicosa*.....typical subspecies.

GG. Shell about as large as *P. plicosa* and typically intermediate in height.....subspecies **depressula** (Ancey).

CC. Shell quite glossy, most depressed, with more rapid whorl-increase and quite acutely angulate on 5th whorl; (Waianae Mts.):.....**P. mokuleiae,** new species.

BB. Shell smaller (4.5 wh. diam. 6.5 mm. or less in Oahu species), with spiral striae spaced much as in *P. plicosa,* rarely attaining 4.5 whorls;

H. Shell dullish, with well incised, spiral striae;

I. Shell with weak growth-lines below and without prominent ones on embryonic whorls;

J. Shell smaller (4 wh. diam. less than 5.5 mm.), weakly angulate (at most) on 5th whorl, with weaker growth-wrinkles above; spire slightly more domical; Oahu:

K. Shell more depressed, usually weakly angulate on 5th whorl.....**P. fallax,** new species.

L. Shell thinner, tan color, slightly more depressed (4 wh. diam. about 5.5 mm.); (southeastern Koolau Range):.....typical subspecies.

LL. Shell heavier, light horn-color, slightly higher (4 wh. diam. about 5.1 mm.); (Waianae Mts.):.....subspecies **popouwelae,** new.

KK. Shell much more elevated (4 wh. diam. 4.5 mm.; index 155); fossil (spirals obliterated); (Koolauloa): Waimanalo....**P. waimanaloi,** new species.

JJ. Shell larger (4 wh. diam. around 5.9 mm.), distinctly angulate on 5th whorl, with more prominent growth-wrinkles above; spire conoid; penial atrium quite short; Kauai:.....**P. kauaiensis,** new species.

II. Shell with well incised growth-lines below;

M. Embryonic whorls with fairly prominent, weakly arcuate growth-wrinkles; spire conoid; penial atrium fairly short and small; Hawaii:.....**P. cicercula** (Gould).

N. Shell more elevated [4.5 wh. diam. 155 (6.3 mm.)].....typical subspecies.

NN. Shell more depressed [4.5 wh. diam. 175 (7.0 mm.)], with later whorls lighter and slightly glossier.....subspecies **boettgeriana** (Ancey).

MM. Embryonic whorls with weak growth-wrinkles; later whorls typically with sharper sculpture; spire slightly orbicular; penial atrium large; Lanai:.....**P. maunalei,** new species.

HH. Shell decidedly glossy, with weaker spiral striae throughout and with gradually reflected columella; penial atrium almost as long as penis; west Maui:.....**P. decepta,** new species.

Comparative Whorl-sizes in the Philonesia plicosa group

	1½	3.5 wh.	4 wh.	4.5 wh.	5 wh.	Maxima	Index
P. kualii	1.73	2.9(4.94)	3.5(6.05)	4.1(7.07)	4.8(8.24)	5⅛	185
P. plicosa	1.78	.....	3.7(6.65)	4.3(7.74)	5.0(8.9)?	4.5—	188
form B	1.77	.....	3.8(6.78)	4.4(7.87)	5.1(9.0)?	4⅞—	188
form C	1.78	.....	3.9(6.89)	4.5(7.99)	5.2(9.3)?	4.8	173
P. striata	1.80	.....	.....	4.4(7.88)	5.0(9.08)	5.1	158
BBM. 11332	1.81	.....	3.8(6.82)	4.4(7.98)	5.0(9.1)?	4.8	153
P. cryptoportica	1.79	.....	3.7(6.70)	4.3(7.77)	5.0(8.9)?	4.5	172
BBM. 17672	1.83	.....	3.3(6.07)	3.9(7.08)	4.6(8.4)?	4.7	173
[USNM. 5474	1.37	3.0(4.16)	3.7(5.07)	4.4(6.0)?	.....	4.2	166]
P. oahuensis	1.90	.....	3.4(6.42)	3.9(7.47)	4.6(8.7)?	4.7—	166
P. o. depressula	2.07	.....	3.4(7.01)	3.9(8.07)	4.6(9.5)?	4.5	167
P. mokuleiae	1.81	.....	3.8(6.81)	4.6(8.29)	.....	4.5+	203
BBM. 41916	1.80	.....	.....	4.2(7.62)	5.0(8.9)?	4.9	192
P. fallax	1.56	2.9(4.59)	3.5(5.47)	4.2(6.5)?	.....	4¼	183
BBM. 47114	1.55	2.9(4.54)	3.5(5.41)	4.2(6.5)?	.....	4⅜—	176
P. f. popouwelae	1.48	2.8(4.21)	3.5(5.13)	4.2(6.2)?	.....	4¼	172
P. waimanaloi	1.43	.....	3.1(4.48)	3.6(5.14)	.....	4¾	155
P. cicercula, USNM.	1.48	.....	3.2(4.72)	3.7(5.42)	4.3(6.3)?	4⅝	160
ANSP. 1986	1.46	.....	.....	4.0(5.83)	4.4(6.50)	5+	158
BBM. 47097	1.46	.....	3.7(5.40)	4.3(6.3)?	.....	4.5—	155
P. c. boettgeriana	1.53	3.2(4.82)	3.8(5.83)	4.6(7.0)?	.....	4.3	180
P. kauaiensis	1.65	.....	3.6(5.92)	4.3(7.1)?	.....	4.5—	174
from type lot	1.76	2.8(4.95)	3.3(5.85)	3.9(6.9)?	.....	4.3	165
BBM. 81089	1.70	2.9(5.01)	3.5(5.95)	4.2(7.1)?	.....	4.2	164
P. maunalei	1.62	2.9(4.73)	3.5(5.65)	4.1(6.6)?	.....	4¼+	179
P. decepta	1.65	2.9(4.82)	3.5(5.83)	4.1(6.8)?	.....	4.3+	170

Dimensions in Oahu species of the Philonesia plicosa group

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	whs.
P. kualii								
type	4.59	185(8.48)	172(7.88)	63(2.91)	143(4.17)	1.73	4.1(7.07)	5⅛
P. plicosa								
Ancey	4.5	(8.75)	(7.67)	(3)	.....	.....	.....	4.5
BBM. 42175	4.03	188(7.57)	178(7.17)	64(2.56)	145(3.71)	1.78	4.3(7.74)	4.5—
BBM. 19679	4.64	188(8.74)	178(8.26)	60(2.76)	153(4.23)	1.77	4.4(7.87)	4⅞—
BBM. 40544	4.99	173(8.64)	162(8.08)	59(2.93)	145(4.24)	1.78	4.5(7.99)	4.8
P. striata								
type	5.78	158(9.13)	148(8.58)	62(3.60)	133(4.77)	1.80	4.4(7.88)	5.1
BBM. 11332	5.70	153(8.70)	144(8.22)	65(3.71)	120(4.46)	1.81	4.4(7.98)	4.8
P. cryptoportica								
Gould	4.23	?(6.35)	.....	.....	.....	.....	.....	5.5
type	4.52	172(7.77)	158(7.13)	66(2.97)	133(3.93)	1.79	4.3(7.77)	4.5
BBM. 11333 (Hiona sp?)	4.27	173(7.37)	165(7.06)	60(2.56)	146(3.74)	1.83	3.9(7.08)	4.7
Gould's fig.	.....	164	147	69	118	.....	.....	....
USNM. 5474	3.25	166(5.41)	153(4.98)	74(2.42)	117(2.82)	1.37	4.4(6.0)?	4.2
P. oahuensis								
Ancey	.....	(8.5)	(8)	(3)	.....	.....	.....	5¼
BBM. 16017	4.67	166(7.77)	156(7.30)	61(2.83)	139(3.93)	1.90	3.9(7.47)	4.7—
P. o. depressula								
Ancey	5.5	(9.5)	(8.25)	(3.5)	.....	.....	.....	5
BBM. 21901	4.82	167(8.07)	158(7.63)	64(3.07)	136(4.17)	2.07	3.9(8.07)	4.5
P. mokuleiae								
type	4.16	203(8.45)	188(7.65)	69(2.87)	152(4.35)	1.81	4.6(8.29)	4.5+
BBM. 41916	4.49	192(8.63)	179(8.03)	60(2.71)	156(4.24)	1.80	4.2(7.62)	4.9
P. fallax								
type	3.21	183(5.86)	170(5.47)	72(2.31)	136(3.15)	1.56	4.2(6.5)?	4¼
BBM. 47114	3.39	176(5.98)	165(5.58)	64(2.16)	140(3.03)	1.55	4.2(6.5)?	4⅜—
P. f. popouwelae								
type	3.19	172(5.47)	161(5.13)	68(2.16)	133(2.87)	1.48	4.2(6.2)?	4¼
P. waimanaloi								
type	3.53	155(5.47)	146(5.14)	56(1.96)	145(2.84)	1.43	3.6(5.14)	4¾

Philonesia (Philonesia) plicosa (Ancey), (pl. 38, fig. 2; pl. 27, figs. 6, 7; pl. 22, figs. 9, 10).

Microcystis plicosa Ancey, 1889, Bull. Soc. Malac. France **6**: 200.

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 18893 (Baldwin!); BBM. 56267 (Baldwin's original lot), Palolo. BBM. 35059, dissected, northwest subvalley, Palolo (Pilsbry and Cooke! March 12, 1913); BBM. 42175, dissected by Cooke, ridge Wailupe Valley (Spalding! Jan. 2, 1916); BBM. 40508, Manoa side, Palolo (A. Gouveia! Nov. 7, 1915). Form B (pl. 27, figs. 6, 7)—BBM. 19679, dissected, Wailupe (Spalding! Jan. 11, 1909); BBM. 33905, 54012, Kuliouou (Spalding! April 13, 1913; Oswald!

May 5, 1923); BBM. Maunalua to Nuuanu. Form C—BBM. 40544, dissected, east side, Wailupe (A. Gouveia! Nov. 21, 1915); BBM. 16221, Wailupe (Spalding! March 29, 1908); BBM., Waialae to Lanihuli. (Koolaupoko): BBM., Kailua.

Shell (pl. 38, fig. 2) much depressed (form C with higher, slightly more fornicate spire), sharply and acutely angulate when young, distinctly so on 4th whorl but becoming obtusely and even weakly so on 5th, with quite deep, moderately broad foveola; light tan color, quite dull, with silky finish and barely translucent above, but fairly glossy and translucent below. Embryonic whorls 1¾ to 2, soon assuming sharp, but very fine, closely spaced, spiral striae, which separate narrow, rounded convolutions. Later whorls with similar spirals and with fairly angular, although low major growth-wrinkles (16 per mm. on early 5th; less evident in forms B and C; and 19-20 per mm. in C) above; base with somewhat more widely spaced and slightly weaker spirals; suture lightly impressed, narrowly margined and attached at angle. Aperture lunate, moderately narrow, barely to scarcely angulate at about 80° to shell-axis; peristome 15° to shell-axis, just concave below; columella short, quite abruptly reflected and thickened, often developing a weak point on peristome (especially in senile shells).

Animal similar to *P. baldwini* but with less pigment on head. Mantle collar with dark and light spots; right shell-lobe about 6 times as long as its base; mantle-lobes lightly pigmented. Lung with extensive, coarse network of chalky-white; kidney 2.5 times as long as its base or 1.5 pericardial length. Uterus with 3 embryos (BBM. 35059) or with 1 smallish egg and 2 large embryos (19679); spermatheca stalked and containing 3 yellowish masses. Penial sheath including only first loop of epiphallus; corona (pl. 22, fig. 10) short and broad; penial retractor inserted on corona and penial apex, with branch to last loop of epiphallus; penis small. Penial prepuce short, with dorsal wall thickened. Jaw with low to quite prominent, rounded, median lobe. Radula (pl. 22, fig. 9) has 8 or 9 laterals (Cooke found 8-10 in BBM. 41275), on which small entocone disappears from outermost, and 33 to 42 (38-44 in 41275) shortish but fairly slender marginals, of which 0 to 2 are bicuspid and principal ones tricuspid; 93 to 96 rows counted.

Philonesia (Philonesia) striata, new species (pl. 27, figs. 14, 15).

Hawaiian islands: Oahu (Koolau Range, Waialua): BBM. 11331 (22673, dissected), terrestrial, inland and east of flat, south Opaeula (Helemano), Paalaa (Spalding and Cooke! May 14, 1910); BBM. 23535, Ahonui, Waianaeuka (Spalding! Nov. 12, 1911); BBM. 11332, dissected, alt. 1,250-1,300 ft., north bank of south Helemano, under sedges (Welch! July 10, 1935); BBM., Kawailoa to Kalaikoa. (Koolauloa): BBM., Koolauloa to Punaluu. (Ewa): BBM., Waiawa to Halawa. (Honolulu): BBM. 34786, Kamanaiki Valley, near top of ridge toward Kapalama, Kalihi (J. S. Emerson! Sept. 13, 1913); BBM. Moanalua to Kapalama.

Shell (pl. 27, figs. 14, 15) similar to *P. plicosa* but thinner and more elevated, obtusely angulate on 4th whorl and becoming almost evenly rounded by end of 5th, with more tumid base and narrower foveola (more as in *P. cryptoportica*); typically with reddish tinge, slightly more glossy and more translucent. Spiral striae even more deeply cut, with slightly coarser, interstitial convolutions on embryonic whorls; growth-wrinkles coarser (14-15 per mm. on 5th whorl) and about as prominent above; spirals more wavy on base. Aperture relatively smaller, slightly flattened above and otherwise evenly rounded; peristome less than 10° to shell-axis, weakly arcuate just below suture.

Animal also similar but with black spots on top of head. Right shell-lobe 7 times as long as its base and considerably longer than diameter of mantle collar. Lung with black spots behind mantle collar, along hindgut and around kidney, and with numerous, large, irregular white blotches; 5.5 times its base or 3.5 kidney length, which is 3 times its base. Uterus contains 1 egg and 2 embryos; spermatheca practically sessile (as in *P. fallax*). Penial sheath not reaching penial apex but attached to epiphallus. Jaw with low median lobe. Radula has 9 laterals and 45 to 47 marginals, with more 4-cusped than tricuspid teeth; 119 rows counted.

P. striata agrees closely with *P. plicosa* in its fine spiral striae but rarely exhibits such strong major growth-wrinkles and seems to be consistently more elevated. It is thus very similar in form to the more polished *P. baldwini,* with which it occurs.

Philonesia (Philonesia) cryptoportica (Gould), (pl. 38, fig. 3).

Helix cryptoportica Gould, 1846, Proc. Boston Soc. N. S. 2: 171 [20], in part; Pfeiffer, Monogr. 1: 39 [3:41-4:17-5:59-7:73]; Gould, Exped. Shells: 44, in part, but not fig. *Nanina cryptoportica* Tryon, Manual 2: 116.

Hawaiian islands: Oahu [Koolau Range, Honolulu]: NYSM. 233 (A 747 from Gould). BBM. 11333 (17672, dissected by Cooke and me), low down in Glen Ada, Nuuanu (Forbes and Cooke! Jan. 27, 1909); BBM. 42791, Waialae Iki (Forbes! Feb. 26, 1917); BBM. 10280, waterfall, Waialae Iki (J. C. Bridwell! April 8, 1917); BBM., Waialae to Lanihuli.

Shell (pl. 38, fig. 3) similar to *P. plicosa* but thinner and usually smaller, with more conoid spire and usually with more gradual whorl-increase, obtusely but quite sharply angulate on 5th whorl, with more tumid base and considerably narrower foveola. Spiral striae extremely fine and very closely spaced (225 per mm. on early 5th whorl, 165 per mm. near middle of 5th above), separating much more minute convolutions above and below (but with similar differences between the two surfaces). Later whorls with weak growth-wrinkles (11-12 per mm. on 5th) above. Aperture weakly but distinctly angulate; columella usually thinner, sometimes quite convex.

Animal also very similar but spermatheca more as in *P. striata.* Jaw with low median lobe. Radula with 8 laterals and 34 marginals (Cooke found 9 and 38), of which 2 to 4 are bicuspid; 109 rows counted.

Evidently at least 3 species are confused in Gould's descriptions and figures. USNM. 5474 contains a single shell which is almost certainly that figured in the U. S. Exploring Expedition shells. It has a distinct columellar fold, a perfectly rounded periphery, is nearest *Hiona verticillata* (Pease), although not that species, and perhaps came from the Society Islands. It certainly does not fit Gould's original description, which calls for an angulate shell without such a strong columellar fold. NYSM. 747a contains 2 smoothish shells, which are probably deformed examples of my *Philonesia ascendens.* NYSM. 747 consists of 5 shells, 4 of which have remains of the animal still wrapped around the columella; probably these remains (or the dirt on the columellae of the

others) formed the basis for Gould's peculiar description of that structure. The clean specimen in lot 747 is now chosen as the type (dimensions given), because the extremely fine and closely spaced spiral striae of this species make its identification most certain. Both *P. ascendens* and *P. cryptoportica* occur in Nuuanu Valley, but *P. cryptoportica* is more often terrestrial.

Philonesia (Philonesia) oahuensis (Ancey), (pl. 27, figs. 10, 11; pl. 22, figs. 11, 12).

Microcystis oahuensis Ancey, 1889, Bull. Soc. Malac. France 6: 202.

Hawaiian islands: Oahu [Waianae Mountains]: BBM. 18891 (Baldwin!). (Waialua): BBM. 16017, dissected, west of Leilehua (Spalding! Feb. 22, 1908).

Shell (pl. 27, figs. 10, 11) similar to *P. plicosa* but smaller, thinner and more elevated, with more gradual whorl-increase, more obtusely angulate, with shallower (moderately deep) basal foveola; somewhat glossy above and becoming almost polished near foveola. Embryonic whorls with less overriding suture. Later whorls more convex above, with slightly more closely spaced and considerably weaker, spiral striae and with much less evident growth-lines above; base with weaker and more wavy spirals; suture more impressed and more narrowly margined. Aperture relatively smaller, quite evenly rounded; peristome about 10° to shell-axis; columella longer, gradually to rather abruptly thickened but not noticeably reflected.

Animal also similar but with black line below pedal grooves and lighter one between them. Lung with wider black zone behind mantle collar; diaphragm darkly pigmented. Post-uterine oviduct (pl. 22, fig. 12) elongate; spermatheca with longer stalk. Penial sheath including all except tip of epiphallus. Penial prepuce slightly longer. Jaw with low median lobe. Radula (pl. 22, fig. 11) has 7 laterals, with entocone absent from last, and 38 marginals, of which 0 to 1 is bicuspid and 24 are usually tricuspid; 94 rows counted.

Philonesia (Philonesia) oahuensis depressula (Ancey), pl. 27, figs. 12, 13).

Microcystis oahuensis depressula Ancey, 1889, Bull. Soc. Malac. France 6: 203. *P. o. depressiuscula* Sykes, 1900, Fauna Haw. 2: 284.

Hawaiian islands: Oahu (Waianae Mountains, Waianae): BBM. 19108 (Baldwin!); BBM. 56270 (Baldwin's original lot), Waianae. (Ewa): BBM. 16591, Palehua (Spalding! May 31, 1908); BBM. 21901, small valley northwest of house, Palehua (Cooke! Nov. 24, 1912); BBM. 35856, valley north of house at foot of Robber Cave Gulley, Palehua (Cooke! March 7, 1914). (Waialua): BBM. 17179, upper part of valley, south of Ponds Ridge, back of Mokuleia (Cooke! Sept. 4, 1908).

Shell (pl. 27, figs. 12, 13) similar to typical *P. oahuensis* but larger at all stages and typically more depressed. Spiral striae on later whorls more widely spaced than in *P. plicosa*.

Philonesia(Philonesia) mokuleiae, new species (pl. 36, fig. 2).

Hawaiian islands: Oahu (Waianae Mountains, Waialua): BBM. 11336

(41916-8, dissected by Cooke and me), Mokuleia Valley (Spalding! May 28, 1916).

Shell (pl. 36, fig. 2) similar to *P. oahuensis,* but considerably more depressed, with more rapid whorl-increase (41916 with abnormal last whorl), quite acutely angulate on 5th whorl, with deeper foveola (more as in *P. plicosa*); much more glossy, thinner and more translucent. Embryonic whorls with weaker spiral striae. Later whorls more flattened above, with similar spaced but much weaker, spiral striae and with similarly weak growth-lines above; base with still weaker spirals. Aperture markedly angulate at 75° to shell-axis; peristome 15° to shell-axis; columella more abruptly reflected, usually ending in a definite point outside of peristome, at least in old shells.

Animal similar to *P. plicosa* but tip of tail pigmented. Lung with scattered, small, white spots, becoming confluent along hindgut, where fine dark lines also occur. Spermatheca as in *P. fallax* but slightly more elongate. Penial retractor mainly inserted on corona, which is twice as long as broad; penial sheath covering only half of penis proper. Jaw with extremely low median lobe. Radula has 8 laterals, with entocone obsolescent on last, and 43 (Cooke found 37 and 38) shortish marginals, of which 1 is bicuspid and 29 are usually tricuspid; 116 rows counted.

This species exhibits the most marked development of a tendency, quite common in the older shells of *Philonesia,* s. s., for the columella to become externally thickened and reflected at its basal end, so as often to form an abrupt point. It seems to be a secondary development and certainly is not homologous with the spiral fold or lamella, which tends to disappear with age, on the inside of the columella in many *Hiona* species.

Philonesia (Philonesia) fallax, new species (pl. 39, figs. 1, 2; pl. 22, figs. 13, 14).

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 11337 (47095, dissected), dry *ieie* and ti leaves, Waiomao Valley, Palolo (J. S. Emerson! Feb. 1, 1919); BBM. 40494, toward main Palolo Stream (Gouveia! Nov. 7, 1915); BBM. 24000, arboreal, valley A, Palolo (Cooke! July 18, 1912); BBM. Palolo to Pauoa. Form E—BBM. 47114, dissected, on dry ti leaves, below wire fence, Waialae Nui (Emerson! Feb. 8, 1919); BBM. 47107, ditto, on kukui trees; BBM. 49125, dissected, first clump of kukui trees inland from first valley on east side, Moanalua Valley (Gouveia! Nov. 9, 1919); BBM. 16570, opposite house, Luakaha, Nuuanu (Mesick and Cooke! May 31, 1908); BBM., Waialae to Kahuiki. (Ewa): BBM., Halawa, Waimalu. (Koolaupoko): BBM., Maunawili to Kahaluu.

Shell (pl. 39, figs. 1, 2) similar to *P. oahuensis* but considerably smaller, with less depressed whorls (especially in form E), sharply but rather obtusely angulate on 4th whorl, very obtusely and quite weakly so on 5th (40494 evenly rounded), with relatively broader foveola; very slightly more glossy, thinner and more translucent. Embryonic whorls 1⅞ to 2, with relatively coarser (actually subequal) spiral striae. Later whorls with similar spiral striae but with weaker growth-wrinkles (20 per mm. near end of 4th) above; base with very slightly weaker spirals; suture a little more impressed (considerably more so in form E). Aperture less depressed, obtusely angulate at 75° to shell-

axis or quite evenly rounded; peristome 15° to shell-axis (form E very weakly arcuate below suture); columella similarly reflected and thickened, often with quite evident truncation-point in old shells (usually less prominent in form E).

Animal similar to *P. plicosa* but with dark spot on tip of tail and more pigment on head. Mantle-lobes darker; right shell-lobe apparently somewhat shorter. Lung with large (BBM. 47114) or small (47095), irregular, white patches, which coalesce to form continuous white band on apical whorls. Uterus (pl. 22, fig. 14) containing 2 eggs and 3 embryos; spermatheca practically sessile. Penial sheath covering basal ⅔ of penis proper (47114) or including most of epiphallus as well (47095 and 49125) penis relatively large (somewhat bigger than prostate). Jaw with low and broad median lobe. Radula (pl. 22, fig. 13) has 8 laterals, with larger entocone becoming obsolescent on last, and 33 to 37 marginals, of which 0 to 2 are bicuspid and outer 12 have more than 3 cusps; 106 rows counted.

Philonesia (Philonesia) fallax popouwelae, new subspecies (pl. 29, figs. 1, 2).

Hawaiian islands: Oahu (Waianae Mountains, Ewa): BBM. 34852, dissected, terrestrial, head of middle valley, Popouwela (Spalding! Nov. 23, 1913); BBM. 35417, terrestrial, open head of valley, west of ridge, Popouwela (Cooke! Nov. 23, 1913).

Shell (pl. 29, figs. 1-2) very similar to *P. fallax* but slightly smaller and heavier, a little less angulate, with smaller foveola; pale horn-color but less translucent. Spiral striae slightly stronger above and considerably so below; growth-wrinkles a little more angular, accentuated and weakly arcuate just below suture. Aperture almost evenly rounded and more nearly transverse; columella heavier and much more widely reflected.

Animal also similar but right shell-lobe slenderer, 7 times as long as its base and longer than diameter of mantle collar. Lung with fewer white patches. Uterus with 2 eggs and 2 embryos; spermatheca slightly more elongate. Penial sheath retracted so as to cover less than half of penis proper. Radula has 40 marginals, of which 1 is bicuspid and 35 are usually tricuspid, although interspersed more commonly with 4-cusped teeth; 96 rows counted.

Philonesia (Philonesia?) waimanaloi, new species (pl. 29, figs. 3, 4).

Hawaiian islands: Oahu (Koolauloa): BBM. 11339 (40880), fossil, sand dunes along deep ditch, Waimanalo (Cooke! Feb. 15, 1914).

Shell (pl. 29, figs. 3, 4) similar to *P. fallax* but more elevated, with smaller, less rapidly increasing whorls, weakly and obtusely angulated at end of 4th whorl and becoming quite evenly rounded on 5th; bleached and chalky. Spiral sculpture obliterated. Growth-wrinkles and suture similar to form E. Columella heavier and more reflected, with fairly prominent, truncating point.

Philonesia waimanaloi may be only an extinct, lowland form of *P. fallax,* but its more globose form readily distinguishes it.

Philonesia (Philonesia) kauaiensis, new species (pl. 39, fig. 15; pl. 29, figs. 7, 8; pl. 23, figs. 1, 2).

Hawaiian islands: Kauai (Waimea): BBM. 11342 (48372, dissected), first valley below and slightly east of Puu Kapele (Cooke! Aug. 20, 1919); BBM. 48151, west side of Halemanu Valley (ditto, Aug. 12). Form D (pl.

29, fig. 7)—(Kawaiha) : BBM. 81089, dissected, terrestrial, on upper surface of dead pandanus leaves, first valley north of highest peak, northeast side of Nounou Mountains (Cooke and Dranga! Oct. 23, 1925). (Lihue) : BBM. 20638, pandanus clump below Kukaua, Kilohana Crater (Cooke! March 10, 1910) ; BBM. 36322, on shrubs and ferns, valley in front of house, Kilohana (Cooke! June 10, 1914).

Shell (pl. 39, fig. 15; pl. 27, fig. 8) similar to *P. cicercula* but larger, typically much more depressed (form D little less elevated), quite sharply angulate on 4th whorl and distinctly so on 5th, with slightly narrower and typically deeper foveola; color light to brownish (typical) horn-color, duller. Embryonic whorls with weak growth-lines (more as in *P. fallax*). Later whorls with finer growth-wrinkles (9-10 major and 18-19 minor per mm.) above, and with weaker growth-lines below. Aperture obtusely angulate at 80° to shell-axis; peristome about 25° to shell-axis, very weakly arcuate above; columella heavier, often much more reflected and rarely forming weak truncation-point.

Animal similar to *P. fallax* but only eyes pigmented. Right shell-lobe 4 to 6 times as long as its base. Lung with more confluent white patches and some dark pigment along hindgut; 4 times as long as its base and thrice length of kidney. Uterus containing 1 egg and 2 embryos or 1 of each. Insertion of penial retractor (pl. 23, fig. 1) less extensive; epiphallic corona more elongate. Jaw with weak to very weak median lobe, stronger when young. Radula (pl. 23, fig. 2) has 9 laterals, with entocone obsolescent or absent on last, and 37 or 38 marginals, of which 2 or 3 are biscuspid; 96 and 103 rows counted.

Philonesia kauaiensis is more or less intermediate between *P. fallax* and *P. cicercula* in sculpture. It is quite variable in height, even in lots from one locality.

Dimensions in Species of P. plicosa Group Outside of Oahu

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	whs.
P. kauaiensis								
type	4.03	174(6.99)	160(6.43)	64(2.56)	141(3.62)	1.65	4.3(7.1)?	4.5—
from type lot	3.96	165(6.54)	152(6.00)	63(2.49)	138(3.43)	1.76	4.0(7.0)?	4.3
BBM. 81089	3.81	164(6.23)	153(5.83)	64(2.42)	136(3.30)	1.70	4.2(7.1)?	4.2
P. cicercula								
Gould	3.81	(6.35)	.....	.....	.....	.....	.....	5
fig.	4.16	153(6.35)	136(5.67)	57(2.37)	139(3.30)	.....	.....	
USNM. 20948	3.42	160(5.49)	154(5.26)	66(2.26)	124(2.81)	1.48	3.7(5.42)	4⅝
ANSP. 1986	4.14	158(6.54)	148(6.13)	61(2.52)	129(3.24)	1.46	4.0(5.83)	5+
BBM. 47097	4.03	155(6.26)	142(5.73)	64(2.59)	128(3.32)	1.46	4.3(6.3)?	4.5—
P. c.boettgeriana								
Ancey	4	(7)	(6)	.....	.....	.....	.....	4.5
BBM. 44075	3.68	180(6.61)	163(5.99)	73(2.69)	133(3.57)	1.53	4.6(7.0)?	4.3
P. decepta								
type	3.87	170(6.58)	157(6.07)	66(2.56)	136(3.47)	1.65	4.1(6.8)?	4.3+
P. maunalei								
type	3.53	179(6.33)	165(5.83)	69(2.44)	132(3.21)	1.62	4.1(6.6)?	4¼+

Philonesia (Philonesia) cicercula (Gould), (pl. 39, figs. 3, 4; pl. 29, figs. 11, 12; pl. 23, figs. 3, 4).

Helix cicercula Gould, 1846, Proc. Boston Soc. N. H. 2: 171 [20]; Pfeiffer, Monogr. 1: 39 [3:41-4:20-5:60-7:74]; Gould, Exped. Shells: 43, pl. 5, fig. 73,*a-c*. *Nanina cicercula* Tryon, Manual 2: 116, pl. 38, figs. 71-73. Not *Helix cicercula* "Férussac" Pfeiffer, 1842, Symbolae 2: 71, nude (?); 1848, Monogr. 1: 337, vested in synonymy of *H. griseola* Pfeiffer.

Hawaiian islands: Hawaii: USNM. 20948 and ANSP. 1986 (Drayton, Brackenridge!); not NYSM.A-754. (North Kona): BBM. 47907, dissected, second ridge north of sheep-shearing shed, Puu Waawaa (A. Gouveia! Aug. 13, 1919); BBM. 48007, kukui tree, ridge above wire fence, Puu Waawaa (A. Gouveia! Aug. 27, 1919).

Shell (pl. 39, figs. 3, 4) similar to *P. fallax* but slightly smaller and considerably more elevated, with more conoid spire, obtusely and weakly angulate on 4th whorl and becoming evenly rounded on 5th, with deep and fairly broad foveola; light olive horn-colored, dullish above and lightly glossy below. Embryonic whorls more convex above, soon assuming low, but quite evident, weakly arcuate growth-wrinkles (often with epidermis eroded from their crests), crossed by quite deep, rather more widely spaced, spiral striae. Later whorls also with more evident growth-wrinkles (13-14 per mm. on late 4th) and deeper spiral striae above; base with fairly strong spirals, undulated by well incised growth-lines; suture fairly well (more) impressed. Aperture broader, evenly rounded; peristome about 20° to shell-axis; columella more gradually reflected and thickened.

Animal also similar but foot dark. Right shell-lobe broad (contracted) and pigmented basally; mantle-lobes dark. Lung with row of large white blotches, interspersed with black along hindgut, and very dark behind mantle collar; 4.5 times as long as base or thrice kidney length, which is about twice its base. Diaphragm with longitudinal streaks of dark pigment. Uterus with 1 egg and 4 embryos. Penial sheath covering ⅔ of penis proper and middle ⅓ of epiphallus; corona (pl. 23, fig. 4) more elongate; penis proper smaller than prostate. Radula (pl. 23, fig. 3) has 7 laterals, of which last lacks entocone, and 33 marginals, of which first 2 are bicuspid and next 13 tricuspid; 102 rows counted.

In his "Synonymia generum Heliceorum", Pfeiffer (1842) writes "[Helix] cicercula Fér. Mus. v. griseola." Since Pfeiffer uses "v." throughout these synonymies as if it indicated "valet" (signifies or means), Gould's name may be preoccupied, but is given the benefit of the doubt.

USNM. 20948 (pl. 29, fig. 12) and ANSP. 1986 (pl. 29, fig. 11) each contains a shell of *Philonesia cicercula*; the former fits Gould's figure more closely but the latter comes nearer his dimensions. The spiral striae in both specimens have become much weakened but the irregular thread-varices, that characterize this species, are still prominent. NYSM. 264 consists of smaller, smoother shells that more resemble *P. hiloi.*

Philonesia (Philonesia) cicercula boettgeriana (Ancey), (pl. 29, figs. 5, 6).

Microcystis cicercula boettgeriana Ancey, 1889, Bull. Soc. Malac. France 6: 206.

Hawaiian islands: Hawaii: BBM. 18913, Kona. (South Kona): BBM. 39681, dissected, alt. 3,700-4,200 ft., boundary of Keokea and Liilae (Thurston and White! Aug. 1915); BBM. 44075, alt. 3,000 ft., Kapua (A. Gouveia! Aug. 15, 1917).

Shell (pl. 29, figs. 5, 6) similar to *P. cicercula* but much more depressed, with more rapidly increasing whorls (and so larger); becoming light horn-color on later whorls and appearing slightly more glossy. Sculpture very similar.

Animal also similar but diaphragm unpigmented. Spermatheca more elongate. Penial sheath including epiphallus. Radula has 6 laterals and 32 marginals, of which 1 is bicuspid and 2 or 3 are tricuspid.

Philonesia (Philonesia) decepta, new species, (pl. 29, figs. 9, 10; pl. 23, figs. 6, 7).

Hawaiian islands: west Maui (Wailuku): BBM. 11345 (38944, dissected), valley in front of needle, between base and bridge, Iao Valley (Penhallow and Cooke! May 29, 1915).

Shell (pl. 29, figs. 9, 10) similar to *P. fallax* but slightly larger and a little less depressed, obtusely although quite sharply angulate on 4th whorl, weakly so on 5th, with more tumid base and narrower foveola; light horn-color, quite glossy (more so) above and still more so below. Embryonic whorls with somewhat weaker spiral striae. Later whorls with similarly spaced, but considerably more superficial, spiral striae and weaker growth-lines above; base with shallower, but almost equally sharp spirals. Aperture similar, weakly angulate at 75° to shell-axis; peristome about 10° to shell-axis; columella gradually reflected.

Animal also similar but right shell-lobe (contracted) pigmented externally; mantle-lobes dark. Uterus (pl. 23, fig. 7) with 3 eggs and 3 embryos; spermatheca more elongate, containing two fusiform masses. Penial sheath including all epiphallus; corona twice as long as broad; insertion of penial retractor less extensive; penis proper smaller than prostate. Penial prepuce and atrium together as large as penis proper; internally with a pilaster along left side. Jaw with very low (badly eroded) median lobe. Radula (pl. 23, fig. 6) has more elongate central and laterals, and 41 marginals, of which first is bicuspid and few are tricuspid; 89 rows counted.

P. decepta and *P. maunelei* form a rather distinct group with a large penial prepuce, approaching that in the genus *Kaala.*

Philonesia (Philonesia) maunalei, new species (pl. 39, figs. 5, 6; pl. 23, fig. 5).

Hawaiian islands: Lanai (northeast side): BBM. 11344 (34302, dissected), talus under kukui trees, Maunalei Gulch (Forbes! June 25, 1913); BBM. 20081, Mahana (Spalding! Oct. 28, 1909).

Shell (pl. 39, figs. 5, 6) similar to *P. fallax* in form and to *P. decepta* in size; fully as dull as *P. cicercula.* Embryonic whorls with stronger spiral striae than in *P. fallax.* Later whorls with sculpture similar to that in *P. cicercula* (more true of 20081), but typically with considerably sharper and more distinct growth-wrinkles (8 major and about 18 minor per mm. on 4th whorl), shortly arcuate below suture, and with more wavy and slightly more prominent, spiral striae above; base with quite sharply incised growth-lines. Suture, aperture, and columella similar to *P. decepta.*

Animal similar to *P. decepta*. Lung 3 times as long as base or 2.5 kidney length, which is twice its base. Spermatheca (pl. 23, fig. 5) more elongate. Penial prepuce considerably shorter but much more swollen.

Philonesia (Philonesia) perlucens (Ancey), (pl. 28, figs, 5, 6; pl. 23, fig. 8).

Microcystis perlucens Ancey, 1889, Bull. Soc. Malac. France 6: 207.

Hawaiian islands: east Maui (Makawao): BBM. 19109 (Baldwin!); BBM. 56279 (Baldwin's original lot), Makawao; ANSP. 66533, 67091 (from Baldwin, labeled *M. indefinita*). BBM. 56240, Ulupalakua (Baldwin!). (Hana): BBM. 48996, dissected, Kipahulu; BBM. 21624, inland at Nahiku (Forbes! Aug. 14, 1910); BBM. 21608, dissected, Pumulei (ditto). West Maui (Wailuku): BBM. 39006, dissected, above intake of upper ditch, Waihee (Cooke! June 1, 1915); BBM. 21283, right branch, Waikapu (Forbes! June 18, 1910).

Shell (pl. 28, figs. 5, 6) depressed (usually less so than Ancey's dimensions), with conoid spire, obtusely, often weakly angulate on 4th whorl and becoming almost evenly rounded on early 5th, with quite broad and deep basal foveola; light amber horn-color (39006 slightly darker), weakly polished above but more so below, almost transparent. Embryonic whorls almost 2, soon assuming very fine, closely spaced, spiral striae (much as in *P. decepta*). Later whorls with shallower, but fairly sharp, slightly more widely spaced, spiral striae and obscure growth-wrinkles (9 major per mm. on late 4th) above; base with considerably shallower spirals; suture moderately impressed, mediocrely margined. Aperture fairly broad, quite evenly rounded; peristome about 10° to shell-axis, weakly concave below; columella weakly thickened and rounded.

Animal similar to *P. plicosa* but tip of tail and top of head black. Right shell-lobe attenuate, 4 to 5 times as long as its base, which is dark externally; mantle-lobes and edge of mantle collar black. Lung with solid black band behind mantle collar, along hindgut and around kidney, and with small white dots anteriad, which become bigger and more distant over rest of surface. Apical whorls with much black pigment and diaphragm with longitudinal black streaks. Uterus with 3 eggs and 3 embryos. Penial sheath including epiphallus; corona (pl. 23, fig. 8) subconical, poorly limited apically; penial retractor arising near middle of uterus, with branches to middle of epiphallus; penis very little larger than prostate. Penial prepuce about as long as broad, with left side thickened internally. Jaw rather deep, with low, rounded, median lobe. Radula has 8 laterals with stronger entocone absent from last, and 39 marginals, of which 1 or 2 are bicuspid, about 29 usually tricuspid and outermost short, 99 rows counted.

The shell of *P. perlucens* resembles that of young *P. baldwini*, but has considerably stronger spiral striae.

Key to the Species of the Typical Group of Philonesia

A. Shell weakly polished above, similar in size and solidity to *P. baldwini* but apparparently not attaining 4.5 whorls: Hawaiian islands: Maui:.....**P. perlucens** (Ancey).

AA. Shell more polished above and below (with shallower spiral striae); Oahu:

B. Shell with less distinct, or more irregularly spaced growth-lines above; peristome scarcely arcuate above or below;

C. Shell thinner and more transparent, rarely attaining 4.5 whorls;

D. Shell depressed and more angulate, with slightly to considerably sharper spiral striae.....**P. hartmanni** (Ancey).

E. Shell typically more depressed and more angulate, quite well polished, but with sharper spiral striae; Waianae Mts.:.....subspecies **palehuae,** new.

EE. Shell more polished, with shallower spirals (becoming almost obsolescent, especially below); Koolau Range northwest from Kalihi:..... ..... typical subspecies.

DD. Shell with higher, less angulate whorls, more polished (slightly approaching *P. glypha* in sculpture); Koolau Range (Honolulu); Konahuanui .....**P. konahuanui,** new species.

CC. Shell heavier, less transparent, surpassing 4.5 whorls, well polished;

F. Shell with smaller, more depressed, and usually more angulate whorls; Koolau Range southeast from Lanihuli:.....**P. ascendens,** new species.

FF. Shell with larger, higher, and usually less angulate whorls; Koolau Range northwest from Kalihi:.....**P. baldwini** (Ancey).

BB. Shell with distinct, regularly spaced growth-lines above, depressed with large whorls; peristome (and growth-lines) weakly arcuate just below suture and on base; Koolau Range (Ewa): on backbone.....**P. glypha,** new species.

Dimensions in Group of Philonesia baldwini

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	whs.
P. perlucens								
Ancey	3.5	186(6.5)	164(5.75)	64(2.25)	.....	.....	.....	4¼
BBM. 48996	4.13	168(6.95)	155(6.42)	69(2.85)	125(3.57)	1.99	4.1(8.2)?	4+
BBM. 39006	4.28	166(7.12)	150(6.42)	67(2.85)	133(3.78)	1.86	4.1(7.6)?	4¼
P. h. palehuae								
type	3.77	207(7.82)	191(7.21)	72(2.70)	146(3.94)	1.67	4.8(8.1)?	4.5—
BBM. 17251	3.62	182(6.58)	167(6.05)	71(2.58)	131(3.39)	1.69	4.7(7.9)?	4+
P. hartmanni								
Ancey	3.5	200(7)	177(6.2)	64(2.25)	.....	.....	.....	4½
BBM. 11347	3.51	189(6.62)	174(6.11)	73(2.55)	129(3.29)	1.59	4.9(7.8)?	4⅞
BBM. 37334	3.77	190(7.17)	175(6.60)	69(2.61)	139(3.64)	1.58	4.8(7.6)?	4.4
BBM. 22657	3.10	200(6.19)	184(5.69)	75(2.33)	138(3.22)	1.56	4.8(7.5)?	4
P. ascendens								
type	4.33	199(8.17)	177(7.67)	66(2.84)	145(4.12)	1.69	4.6(7.74)	4.7
BBM. 53992	3.95	184(7.25)	166(6.56)	66(2.59)	148(3.83)	1.69	4.2(7.02)	4.6—
NYSM. 233	4.81	165(7.93)	157(7.54)	60(2.87)	139(3.98)	1.67	4.2(6.97)	5
P. konahuanui								
type	3.94	168(6.62)	153(6.02)	73(2.89)	121(3.51)	1.72	4.6(7.9)?	4+
P. baldwini								
Ancey	5.25	162(8.5)	148(7.75)	63(3.3)	.....	.....	.....	5
BBM. 23900	5.15	156(8.02)	145(7.47)	66(3.38)	121(4.08)	1.86	4.1(7.60)	4.7
BBM. 17461	5.79	142(8.21)	131(7.56)	63(3.62)	120(4.35)	1.87	4.0(7.56)	4¾
BBM. 23534	5.65	153(8.65)	144(8.11)	67(3.80)	120(4.54)	1.90	4.2(7.90)	4.8+
P. glypha								
type	4.16	183(7.62)	166(6.89)	76(3.15)	127(3.99)	1.97	4.6(9.1)?	4—

Comparative Whorl-sizes in Group of Philonesia baldwini

	1½	3.5 wh.	4 wh.	4.5 wh.	5 wh.	Maxima	Index
P. perlucens	1.99	2.9(5.78)	3.5(6.91)	4.1(8.2)?	.....	4+	168
BBM. 39006	1.86	2.9(5.41)	3.5(6.42)	4.1(7.6)?	.....	4¼	166
P. h. palehuae	1.67	3.2(5.40)	4.0(6.70)	4.8(8.0)?	.....	4.5—	207
BBM. 17251	1.69	3.1(5.32)	3.9(6.54)	4.7(7.9)?	.....	4+	182
P. hartmanni	1.59	3.3(5.19)	4.1(6.46)	4.9(7.8)?	.....	4⅛	189
BBM. 37334	1.58	3.2(5.04)	4.0(6.27)	4.8(7.6)?	.....	4.4	190
BBM. 22657	1.56	3.2(5.07)	4.0(6.19)	4.8(7.5)?	.....	4	200
P. ascendens	1.69	.....	3.9(6.60)	4.6(7.74)	5.3(9.0)?	4.7	199
BBM. 53992	1.69	.....	3.6(6.06)	4.2(7.02)	4.9(8.3)?	4.6—	184
NYSM. 233	1.67	.....	.....	4.2(6.97)	4.7(7.93)	5	165
P. konahuanui	1.72	3.1(5.28)	3.8(6.53)	4.6(7.9)?	.....	4+	168
P. baldwini	1.86	.....	3.5(6.46)	4.1(7.60)	4.8(8.8)?	4.7	156
BBM. 17461	1.87	.....	3.4(6.42)	4.0(7.56)	4.7(8.8)?	4¾	142
BBM. 23534	1.90	.....	3.6(6.77)	4.2(7.90)	4.9(9.3)?	4.8+	153
P. glypha	1.97	3.2(6.26)	3.9(7.7)?	4.6(9.1)?	.....	4—	183

Philonesia (Philonesia) hartmanni palehuae, new subspecies (pl. 39, figs. 7, 8).

Hawaiian islands: Oahu (Waianae Mountains, Ewa): BBM. 11346 (33053, dissected), damp "ferny" glen, southwest of house, Palehua (Cooke! Oct. 15, 1912); BBM. 16798, Palanui Valley, ditto (July 29, 1908). Waialua): form E: BBM. 17251, dissected, valley west of peak near northeast apex of Makua, Mokuleia (Cooke! Sept. 4, 1908).

Shell (pl. 39, figs. 7, 8) similar to *P. perlucens* but typically more depressed (17251 approaching typical *P. hartmanni*), with more rapidly increasing whorls, sharply and quite acutely angulate on late 4th whorl and distinctly so on 5th, with narrow and quite deep foveola; horn-color, quite well polished, thinner and quite transparent. Embryonic whorls with similar spirals. Later whorls flattened above, with slightly shallower, more closely spaced, wavy, spiral striae and with sharper growth-lines (14 per mm. on early 5th) above; base with more widely spaced spirals still quite distinct in high light; suture more weakly impressed. Aperture more narrowly lunate, distinctly angulate at 75° to shell-axis; peristome about 15° to shell-axis; columella quite abruptly reflected, with rounded truncation outside of peristome.

Animal similar to typical *P. hartmanni.* Lung with many small white spots, becoming confluent on apical whorls. Uterus containing 4 eggs and 3 embryos; spermatheca practically sessile. Penial sheath including most of epiphallus. Radula has 7, still more elongate laterals, and 32 marginals, of which 1 is bicuspid, 13 are usually tricuspid and outermost are more elongate; 97 rows counted.

Philonesia (Philonesia) hartmanni (Ancey), (pl. 30, figs. 1, 2; pl. 23, figs. 12, 13).

Microcystis hartmanni Ancey, 1889, Bull. Soc. Malac. France, **6**: 198.

Hawaiian islands: Oahu (Koolau Range, Waialua): BBM. 18889-90 (Baldwin!); BBM. 56269 (Baldwin's original lot), Kalaikoa, Waianaeuka.

BBM. 22657, dissected, climbing, inland and east of flat, South Opaeula (Helemano), Paalaa (Spalding and Cooke! May 14, 1910); BBM. 11347, dissected, on ferns, same locality (Welch and Baker! July, 1935); BBM. 22134, Helemano (Spalding! March 28, 1911); BBM. 37334, Kawaiiki Valley, Kawailoa (Spalding! Oct. 8, 1914); BBM., Wahiawa. (Koolauloa): BBM., Kaliuwaa. (Ewa): BBM., Waiau. (Honolulu): BBM., Moanalua, Kalihi.

Shell (pl. 30, figs. 1, 2) very similar to subspecies *palehuae*, but usually more obtusely angulate, typically less depressed; more polished. Later whorls less flattened above, with considerably shallower, often almost obsolescent, spiral striae and often with more regular growth-lines (12-13 per mm. on late 4th) above; base with spirals just visible in high light; suture slightly more impressed. Aperture more obtusely angulate to barely so.

Animal similar to *P. perlucens*. Right shell-lobe 3 or 4 times as long as base and longer than diameter of mantle collar. Lung 4 times as long as base and thrice kidney length, which is twice its base. Uterus with 2 eggs and 2 embryos; postuterine oviduct (pl. 23, fig. 12) shorter; spermatheca very short stalked. Penial sheath including most of penis and middle loop of epiphallus; corona well demarcated, about twice as long as broad. Penial prepuce shorter. Jaw with quite prominent, striated, median lobe. Radula has 7 or 8 more elongate (pl. 23, fig. 13) laterals, with entocone obsolescent on last, and 37 or 38 marginals, of which 0 to 2 are biscuspid and almost 14 tricuspid; 101 and 103 rows counted.

P. hartmanni is often found in the axils of large fern fronds and in moss on branches. Its shell is much smoother than that of *P. fallax*.

Philonesia (Philonesia) konahuanui, new species (pl. 30, figs. 3, 4).

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 11349 (42205, dissected), Konahuanui (A. Gouveia! Nov. 26, 1916); BBM. 17604, dissected, top ditto (Cooke! Dec. 21, 1908); BBM. 17732, ditto (Knudsen and Cooke! Feb. 3, 1909).

Shell (pl. 30, fig. 3, 4) similar to *P. hartmanni* but considerably more elevated and slightly heavier, quite sharply but obtusely angulate on early 4th whorl but becoming evenly rounded by early 5th, with smaller foveola; light greenish amber-color, more polished. Embryonic whorls similar. Later whorls with weaker spiral striae and more regularly spaced growth-wrinkles (14-15 per mm. on 4th) above; base with obsolescent spirals and with fairly distinct, shallow growth-lines; suture more distinctly impressed. Aperture broader and quite evenly rounded; peristome less than 10° to shell-axis; columella more as in *P. ascendens*.

Animal similar to *P. perlucens* but foot darker. Lung with small white dots. Uterus containing 2 eggs and 2 embryos, but with folds basally as if some had been recently extruded. Penial sheath retracted to basal third of penis; corona slightly longer than broad, well demarcated; penis smaller than prostate; penial prepuce short. Radula has 8 laterals, with entocone obsolescent on last 2, and 33 marginals, of which first 1 or 2 are bicuspid; 108 rows counted.

Philonesia (Philonesia) ascendens, new species (pl. 28, figs. 1, 2; pl. 23, fig. 11).

(?) *Helix cryptoportica* Gould, 1846, Proc. Boston Soc. N. H. 2: 171 [20], possibly in part.

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 11348 (43799), at waterfall, Waialae Iki (Bridwell! April 8, 1917); BBM. 53992, dissected, on *ohia ai,* small valley just above homestead road, east side of Palolo Valley (Oswald! April 23, 1923); BBM. 53994, on ground, half way up same valley. BBM., Palolo to Lanihi [Lanihuli?]. (Koolaupoko): Kahaluu. Hawaiian islands: Oahu: NYSM. 233 (A-747a, from Gould), two deformed shells (identity dubious).

Shell (pl. 28, figs. 1, 2) similar to *P. perlucens* but typically more depressed and attaining almost 5 whorls, quite acutely and sharply angulate on early 5th but becoming obtusely and bluntly so, with deeper foveola; intense amber color, well polished, fairly solid and translucent. Embryonic whorls 1¾ to 2, soon assuming similarly spaced but much weaker and shallower, spiral striae. Later whorls with very shallow and irregular spiral striae visible in high light (more as in *P. hartmanni*) and with very low, irregular growth-wrinkles above; base with extremely weak spirals; suture slightly more impressed but more widely margined. Aperture weakly angulate at about 80° to shell-axis, peristome about 10° to shell-axis; columella scarcely reflected but gradually expanded into heavy foveolar callus.

Animal similar to *P. perlucens* but tail less pigmented. Right shell-lobe large and heavy, 5 or 6 times as long as its base and longer than diameter of mantle collar; lung with row of black dots behind mantle collar and along hindgut, with some black spots over kidney, and with most of surface covered by white network or confluent coarse blotches, becoming almost continuous around kidney; 5 times as long as base or over thrice kidney length, which is thrice its base or twice pericardial length. Apical whorls with broad white band along sutural edge. Uterus with 5 eggs, 2 small and 2 large embryos. Penial sheath including most of epiphallus; corona (pl. 23, fig. 11) short; penis smaller than prostate. Jaw with very low median lobe. Radula has 9 laterals, with entocone obsolescent on last, and 41 marginals, of which 1 or 2 are bicuspid; 104 rows counted.

Gould's material (NYSM. 233) has already been discussed under *P. cryptoportica*; the smaller one of the two smooth specimens is nearest Gould's figure; both are deformed shells, in which the 5th whorl descends below the angulation of the 4th. The dimensions of one of the specimens is given under *P. ascendens.*

Philonesia (Philonesia) baldwini (Ancey), (pl. 37, figs. 1, 2; pl. 38, fig. 1; pl. 21, figs. 1-4, 17, 18).

Microcystis baldwini Ancey, 1889, Bull. Soc. Malac. France 6: 204, at least in part (not west Maui).

Hawaiian islands: Oahu (Koolau Range, Waialua): BBM. 18892 (Baldwin!); BBM. 56225 (Baldwin's original lot), South Opaeula (Helemano) Valley, Paalaa. BBM. 42197, dissected, above flat on ridge, Helemano (A. Gouveia! Nov. 12, 1916); BBM. 23900 (pl. 37, fig. 1), dissected by Cooke, Helemano (Spalding! May 30, 1912); BBM. 17461 (pl. 37, fig. 2), dissected,

Kalaikoa Valley, Waianaeuka (Spalding!); BBM. 23534 (pl. 38, fig. 1), dissected, Ahonui Valley, Waianaeuka (Spalding! Nov. 12, 1911); BBM., Kawailoa to Kalaikoa. (Koolauloa): BBM., Koolauloa, Laie and Kaliuwaa. (Koolaupoko): BBM., Waiahole. (Ewa): BBM., Waipio. (Honolulu): BBM., Kalihi.

Shell (pl. 37, figs. 1, 2; pl. 38, fig. 1) similar to *P. ascendens* but considerably more elevated, with much higher whorls, obtusely but quite sharply angulate near end of 4th whorl but becoming almost evenly rounded on 5th, with narrower and deeper foveola. Embryonic whorls larger. Later whorls with very similar sculpture above and below. Aperture more subcircular, evenly rounded; peristome almost vertical (less than 10° to shell-axis); columella longer, sometimes with weak, outside truncation.

Animal with tail narrow and considerably longer than head, with broad dark band below and narrower one between pedal grooves, with dark spots and 3 vague middorsal bands on top of head and sometimes with dark spots on sides of foot (pl. 21, fig. 18); top of tail (pl. 21, fig. 17) whitish, with broad middorsal groove; tail-horn short conical, but largely covering big, folded diamond-shaped foss; sole with very sharply demarcated median zone forming about ¼ total width. Mantle collar (pl. 21, fig. 4) with right shell-lobe (LR, very well extended for a preserved specimen) 8 times its base and 1⅛ times diameter of mantle collar, having dark spots on basal half of external surface; left shell-lap (L) fairly narrow and without shell-lobe; mantle-lobes darkly pigmented; anterior left one (MA) fairly long but not extensive and deeply divided from low posterior one (MP). Lung with broad black band and chalky spots behind mantle collar, extending into rows of black and white spots along hindgut; about 5 times as long as base or thrice length of kidney, which is attenuate anteriad and twice as long as its base or 1.6 times pericardial length. Apical whorls with a large black spot or band just above kidney and another shielding ends of ovotestis, and with chalky veins and some small patches. Diaphragm with much dark pigment.

Ovotestis consisting of 7 flattened, triangular groups of clavate, often branched alveoli, imbedded in basal 2/3 of apical lobe of liver; hermaphroditic duct (GD, pl. 21, fig. 1) moderate in length and often swollen in lower half; talon (GT) bipartite; albumen gland (GG) elongate. Uterus (UT) containing 4 or 5 large eggs and 3 to 5 embryos with well-formed shells; spermatheca (S) short ellipsoid and very short stalked. Penial sheath (PS; only base shown) covering penis proper (P) and a loop of vas deferens (ED) or also including all epiphallus (BBM. 23900); epiphallic corona (EC) subspherical with 5 longitudinal, internal, yellowish, glandular folds; penial retractor (PR) arising from diaphragm on right side of uterus opposite basal end of prostate (DG); penis proper (P) smaller than prostate and containing 2 pilasters (but smooth and capable of considerable elongation when exserted). Penial prepuce mediocre in size and without lobe or diverticulum; atrium proper (Y) short, opening about twice distance between pedal grooves above upper one and about same distance behind inferior right tentacle.

Jaw (pl. 21, fig. 3) shallow, with low, rounded, median lobe; externally engraved with fine, longitudinal striations and exhibiting stronger growth-wrinkles near its cutting edge. Buccal mass slightly longer than deep and deeper than broad. Salivary glands each roughly lanceolate; right one larger, extending more anteriad and about as long as buccal mass; free from each other anteriad but more closely attached posteriad above oesophagus; ducts about twice as long as glands. Radula (pl. 21, fig. 2) has subquadrate central, 10 shortish laterals (Cooke found 9 in some specimens of 23900 and 23534), which decrease in size and reduce smallish entocone until it is absent from last, and 46 marginals (Cooke counted 40 to 50), of which 1 to 3 of the innermost are bicuspid, principal ones are long but fairly broad and tricuspid, and outer ones are short with a variable number of cusps; 100 rows counted.

Free retractor system very similar to that of *Microcystis ornatella.* Nervous system also very much the same; cerebral ganglia lightly pigmented; on each side, the 2 anteroventral pedal nerves have a short common trunk and the 2 caudoventral pedal nerves also are given off together; only one larger, bifurcate posterolateral pedal is present on each side; and the anterior buccal nerves bifurcate almost immediately.

As already remarked, *P. baldwini* is very similar in form to but much more polished than *P. striata,* which often occurs in the same locality with it. This species is the type by original designation of the genus *Philonesia,* although Godwin-Austen's anatomical account was probably founded on some other form, since Sykes' material (Perkins!) came from outside the range of *P. baldwini.* Ancey's west Maui citation must also be an error.

Philonesia (Philonesia) glypha, new species (pl. 23, figs. 9, 10; Part 3, pl. 62, figs. 1, 2).

Hawaiian islands: Oahu (Koolau Range, Ewa): BBM. 11354 (49106, dissected), on *ieie* and shrubs, at backbone (crest of range), overlooking Keahiakahoe, ridge between Moanalua and Halawa Valleys (Gouveia! Oct. 19, 1919).

Shell (to be figured in next part) similar to *P. ascendens* but with larger whorls, sharply angulate on early 4th but becoming obtusely and weakly so near its end, with much smaller and considerably shallower foveola; greenish amber color, thinner and more transparent. Embryonic whorls soon assuming slightly sharper, spiral striae and low, but distinct, coarse growth-wrinkles. Later whorls with slightly sharper spiral striae (more as in *P. hartmanni*) and with quite regularly and distantly spaced, distinctly but shallowly impressed growth-lines (7 per mm. near middle of 4th) above; base with slightly more evident growth-lines; suture weakly (less) impressed. Aperture larger, scarcely angulate; peristome less than 10° to shell-axis, weakly arcuate just below suture and full width of base; columella well thickened and weakly convex.

Animal similar to *P. perlucens* but foot darker. Lung with large white blotches; 5 times as long as base or thrice kidney length, which is almost thrice its base or twice pericardial length. Uterus with 3 eggs and 3 embryos; post-uterine oviduct longer. Penial sheath (pl. 23, fig. 9) covering 2/3 of penis; corona short and demarcated; penial prepuce short. Radula has 34 marginals, of which 1 to 4 are bicuspid and outermost (pl. 23, fig. 10) are more elongate; 93 rows counted.

The regularly spaced, sharp growth-lines of *P. glypha* form its most distinguishing characteristic.

Philonesia (Mauka) welchi, new species (pl. 23, figs. 15, 16; Part 3, pl. 62, figs. 7, 8).

Hawaiian islands: Oahu (Koolau Range, Waialua): BBM. 11355 (21135, dissected), division ridge between Kalaikoa and Waikakalaua Valleys, Waianaeuka (Spalding! June 11, 1910). BBM., Kalaikoa to Kawailoa.

Shell (to be figured in part 3) thin, depressed, with conoid spire, quite sharply angular at beginning of 5th whorl, but becoming barely so near its end, with tumid base and narrow, deep foveola; light amber horn color, weakly polished above but more so below (much as in *P. perlucens*), fairly transparent. Embryonic whorls 1⅞ to 2,

soon assuming very fine, fairly sharp (worn in old shells), closely spaced, spiral striae (much as in *P. perlucens*). Later whorls with quite sharply cut, but very closely spaced (less so than in *P. cryptoportica*), wavy, spiral striae and with shallow, but quite distinct, irregularly spaced growth-lines (12 per mm. on 5th); base with spirals much blurred; suture weakly impressed and moderately margined. Aperture broadly lunate, practically evenly rounded; peristome 15° to shell-axis, weakly concave below; columella short and slender.

Animal similar to *P. baldwini* but foot dark except around visceral stalk. Right shell-lobe (contracted) short and heavy, 3 or 4 times its width. Lung black behind mantle collar, along hindgut and over kidney and with large, sparse, chalky blotches; 5.5 times as long as base or thrice kidney length, which is over thrice its base or twice pericardial length. Hermaphroditic duct (pl. 23, fig. 15) medium in length; uterus containing 6 eggs and 6 embryos. Penial sheath covering ¾ of penis or over very long epiphallus as well; corona longer than wide; insertion of penial retractor extending about 0.4 length of epiphallus; penis proper elongate (in another animal, about 3 times as long and much more slender than in one figured), about 3 times as large as prostate. Penial prepuce mediocre in length. Jaw with very low median lobe. Radula (pl. 23, fig. 16) has 8 laterals, with entocone obsolescent on last, and 43 marginals, of which 1 or 2 are bicuspid and about next 30 usually tricuspid; 101 rows counted.

This species is named for Dr. d'Alté Welch and is the type of the section *Mauka*. The following artificial key includes the species of the sections *Mauka* and *Piena*:

A. Shell with smaller whorls (4 wh. diam. less than 7 mm.);

B. Shell small and thin, apparently not greatly surpassing 6 mm. in diam., weakly angulate near end of 4th whorl and with very weak growth-lines; penis moderately long; atrium with sacculate lobe; (Koolau Range, Honolulu): Konahuanui to Lanihuli: ..... **P. (Piena) parva,** new species.

BB. Shell heavier (about as DD), attaining a diameter of over 8 mm., more sharply angulate on 4th whorl and with sharper growth-lines; penis very long;

C. Shell weakly polished above, with slightly higher spire, more irregularly spaced growth-lines (about 12 per mm.) and smaller whorls (4 wh. diam. about 6 mm.); atrium without gland; (Koolau Range, Honolulu); Kalaikoa to Kawailoa: ..... **P. (Mauka) welchi,** new species.

CC. Shell appearing more polished above, more depressed, with more regularly spaced growth-lines (about 16 per mm.) and larger whorls (4 wh. diam. about 6.5 mm.); atrium with whitish gland; (Waianae Mts., Ewa): ..... **P. (Piena) palawai,** new species.

AA. Shell with larger whorls (4 wh. diam. over 7 mm.) and low spire;

D. Shell heavier (usually darker in color) with slightly domical spire, weakly polished and attaining a diameter of over 9 mm.; penis rather elongate; atrium with sacculate diverticulum; (Koolau Range, Honolulu): eastward from Kapalama: ..... **P. (Piena) grandis,** new species.

DD. Shell thinner with conoid spire and apparently not attaining a diameter of 9 mm.; atrium without diverticulum;

E. Shell appearing more polished than *P. grandis;* penis short and stout; (Koolau Range, Koolauloa, and Honolulu): Laie to Punaluu and Konahuanui Ridge: ..... **P. (Mauka) polita,** new species.

EE. Shell less polished than *P. grandis*; penis quite elongate; (Waianae Mts., Ewa, and Waialua): in heads of valleys: ..... **P. (Mauka) similaris,** new species.

Dimensions in sections Mauka and Piena

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	whs.
P. welchi								
type	4.96	166(8.26)	153(7.60)	67(3.35)	127(4.24)	1.51	4.8(7.21)	4.9
P. polita								
type	4.60	189(8.69)	171(7.85)	70(3.23)	141(4.56)	1.87	4.7(8.8)?	4.4
BBM. 42712	4.53	190(8.62)	172(7.78)	73(3.29)	137(4.52)	1.82	4.9(8.9)?	4⅜
P. similaris								
type	4.49	189(8.48)	170(7.62)	69(3.11)	144(4.49)	1.71	5.1(8.7)?	4⅜
P. grandis								
type	4.59	186(8.56)	165(7.59)	72(3.32)	137(4.53)	1.90	4.7(8.9)?	4.2+
BBM. 37047	5.04	185(9.33)	172(8.65)	66(3.32)	143(4.74)	1.85	4.7(8.67)	4¾—
ditto	5.43	169(9.17)	160(8.66)	65(3.54)	131(4.65)	1.89	4.7(8.81)	4.7
BBM. 22762	5.10	189(9.67)	172(8.78)	71(3.63)	139(5.03)	1.78	5.0(8.90)	4.7
P. parva								
type	3.38	179(6.04)	162(5.49)	76(2.57)	127(3.26)	1.47	4.9(7.2)?	4—
P. palawai								
type	4.81	174(8.36)	159(7.64)	70(3.38)	132(4.46)	1.61	4.9(7.82)	4.7

Whorl-sizes in sections Mauka and Piena

	1½	3.5 wh.	4 wh.	4.5 wh.	5 wh.	Maxima	Index
P. welchi	1.51		4.0(6.04)	4.8(7.21)	5.6 (8.5)?	4.9	166
P. polita	1.87	3.2(5.90)	3.9(7.30)	4.7(8.8)?		4.4	189
BBM. 42712	1.82	3.3(5.94)	4.0(7.34)	4.9(8.9)?		4⅜	190
P. similaris	1.71	3.4(5.84)	4.2(7.21)	5.1(8.7)?		4⅜	189
P. grandis	1.90	3.2(6.17)	4.0(7.66)	4.7(8.9)?		4.2+	186
BBM. 37047	1.85		3.9(7.19)	4.7(8.67)	5.5(10.2)?	4¾—	185
	1.89		4.0(7.55)	4.7(8.81)	5.5(10.4)?	4.7	169
BBM. 22762	1.78		4.3(7.57)	5.0(8.90)	5.9(10.5)?	4.7	189
P. parva	1.47	3.4(4.97)	4.2(6.1)?	4.9(7.2)?		4—	179
P. palawai	1.61		4.0(6.47)	4.9(7.82)	5.8 (9.3)?	4.7	174

Philonesia (Mauka) polita, new species (pl. 31, figs. 1, 2; pl. 23, fig. 14).

Hawaiian islands: Oahu (Koolau Range, Koolauloa): BBM. 11356 (24963, dissected), first banana clump inland, Kaliuwaa, Kaluanui (Cooke! Oct. 1, 1912); BBM., Laie to Punaluu. (Honolulu): BBM. 42712, Konahuanui Ridge (Bridwell! Feb., 1917).

Shell (pl. 31, figs. 1, 2) similar to *P. welchi,* but larger and more depressed, more acutely but less sharply angulate on late 4th whorl, becoming almost evenly rounded near middle of 5th, with slightly larger basal foveola; varying from light to dark amber color, appearing more polished. Later whorls with similar spiral striae but with weaker growth-wrinkles (14-15 per mm. on late 4th) above.

Animal also similar. Lung with more white blotches; 5 times as long as base or 2¾ times kidney length, which is over 3 times its base or twice pericardial length. Uterus containing 3 eggs; spermatheca (pl. 23, fig. 14) practically sessile. Epiphallic corona shorter; penis proper short and very stout (in 4 animals dissected). Radula has 50 marginals, of which 3 or 4 are bicuspid and about 35 usually tricuspid; 104 rows counted.

The relative shortness and exceeding obesity of the penis, observed in *Philonesia polita,* may be partially due to contraction.

Philonesia (Mauka) similaris, new species (pl. 31, figs. 3, 4).

Hawaiian islands: Oahu (Waianae Mountains, Ewa-Waianae): BBM. 11357 (22728, dissected), first gap, Green Peak (Palikea) (Spalding! May 21, 1911). (Ewa): BBM. 35415, arboreal, open head of valley west of ridge, Popouwela (Cooke! Nov. 23, 1913).

Shell (pl. 31, figs. 3, 4) similar to *P. polita* but with less depressed whorls and slightly more domical spire, sharply angulate near middle of 4th whorl, becoming weakly so near middle of 5th, with slightly broader foveola; considerably less polished (less so than in *P. welchi*). Later whorls with less closely spaced (as in *P. perlucens*), stronger, wavy, spiral striae and with growth-lines more distinct (11-12 per mm. on late 4th) above; base with similar to but weaker spirals than upper surface; suture very weakly impressed (less so). Aperture very weakly angulate at about 75° to shell-axis; peristome about 25° to shell-axis.

Animal similar to *P. welchi* but dark only on top of head and at the tip of tail. Right shell-lobe about 5 times as long as its base, which is dark externally. Lung 4.5 times as long as base or 3.5 times kidney length, which is 2.5 times its base or 1.5 pericardial length. Uterus containing 4 eggs and 5 embryos; spermatheca with shorter stalk.

Philonesia (Piena) grandis, new species (pl. 37, fig. 4; pl. 31, figs. 5, 6; pl. 23, figs. 18, 19).

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 11358 (17601, ANSP. 130485, dissected by Cooke), top of Konahuanui (Cooke! Dec. 21, 1908); BBM. 41313, Maunakope, Kalihi (Spalding! Jan. 30, 1916). BBM., Lanihuli and Kapalama. Form A (pl. 31, figs. 5, 6)—BBM. 37047, dissected. Niu Valley (Spalding! Sept. 20, 1914); BBM. 22762, Kuliouou Valley (Spalding! June 18, 1911); BBM. 40524, Kalihi Valley (Gouveia! Nov. 14, 1915). BBM., Kealakei and Palolo.

Shell (pl. 37, fig. 4) moderately solid, big, depressed, with weakly domical spire; angulate when young, becoming weakly so near end of 4th whorl and evenly rounded by middle of 5th; with rounded base and fairly broad, quite deep foveola; darkish amber corneous in color, weakly polished above and more so below, translucent. Embryonic whorls 1¾ to 2, soon assuming very fine, sharp, closely spaced, spiral striae (stronger than in *P. welchi*). Later whorls with spirals and growth-lines (10-11 per mm. on 5th whorl) similar to but slightly stronger than in *P. welchi*; suture moderately impressed and narrowly margined. Aperture rather broad, evenly rounded; peristome about 20° to

shell-axis, weakly concave below; columella shortly thickened and reflected, sometimes developing external truncation in old shells.

Animal similar to *P. baldwini* but foot dark except on the tip of tail and around visceral stalk. Right shell-lobe heavy, 3 or 4 times as long as its base; mantle-lobes dark. Lung with sparse, very large, white blotches along hindgut, becoming confluent over kidney; 4 to 5 times as long as base or 2.5 to 3 times kidney length, which is 2 to 2.5 times its base or 1.5 or more times pericardial length. Hermaphroditic duct (pl. 23, fig. 18) long; uterus containing 2 eggs and 2 embryos; spermatheca fusiform with short stalk. Penial sheath including epiphallus; penis quite elongate, over twice as large as prostate. Penial prepuce about as long as broad, giving off from its dorsal side a flattened sac, which is thick-walled on its adjacent side and thin-walled on opposite one. Jaw with weak median lobe. Radula (pl. 23, fig. 19) has 7 or 8 (BBM. 17601) to 10 (37047) laterals, with prominent entocone reduced or absent on last, and 42 to 45 (Cooke found 38 and 39 in BBM. 17601), of which 1 to 4 are bicuspid, about 3 tricuspid and outermost short; 97 rows counted.

The typical form is paedogenetoid; that is, in some localities, *P. grandis* does not appear to attain the larger whorl-sizes which constitute form A.

Philonesia (Piena) parva, new species (pl. 37, fig. 5; pl. 23, fig. 17).

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 11359 (17603, ANSP. 130487, dissected by Cooke), top of Konahuanui (Cooke! Dec. 21, 1908); BBM. 20148, dissected, Konahuanui (Crampton, Spalding, Waterhouse, and Cooke! Nov. 28, 1909); BBM. 15730, dissected, ridge between Manoa and Nuuanu Valleys (Bartsch and Cooke! Oct. 28, 1907). BBM., Kapalama.

Shell (pl. 37, fig. 5) very similar in form and size to *P. hartmanni,* but with more tumid base and shallower foveola, and with sculpture more as in *P. grandis*; suture slightly more impressed than in either; sharply angulate on early 4th whorl but becoming weakly so near its end; light horn-color, very thin and transparent. Later whorls with very weak and quite closely spaced growth-lines (17-18 per mm. on 4th whorl). Aperture more as in *P. grandis*; columella short and weakly thickened.

Animal (broken) similar to *P. grandis* but dark pigment less extensive. Lung with considerable dark color and small white spots. Diaphragm dark. Spermatheca (pl. 23, fig. 17) shorter. Penial sheath including most of shorter epiphallus; corona about twice as long as broad; penis proper less elongate. Penial prepuce with shorter, more swollen sac. Radula has 6 laterals (Cooke found 7) with entocone obsolescent on last, and 42 marginals (Cooke counted 47 and 48); 102 rows counted.

Philonesia (Piena) palawai, new species (pl. 31, figs. 7, 8; pl. 24, fig. 1).

Hawaiian islands: Oahu (Waianae Mountains, Ewa): BBM. 11360 (59390, dissected, 59388), second valley east of Green Peak, south Palawai Valley (Cooke! Aug. 23, 1922).

Shell (pl. 31, figs. 7, 8) similar to *P. grandis* but smaller and thinner, with more conoid spire, sharply angulate near end of 4th whorl but becoming less so on 5th; with more tumid base and narrower foveola; light amber horn-color. Later whorls with more sharply cut, closely spaced growth-lines (16 per mm. on 5th whorl). Aperture more depressed, barely angulate.

Animal also similar but pigment more diffuse. Right shell-lobe 7 times as long as its base and equalling diameter of mantle collar, pigmented externally; mantle-lobes dark. Lung with dark pigment behind mantle collar, along hindgut and around kidney, and with sparse white blotches. Apical whorls with black along suture and with white blotches becoming continuous near apex. Uterus with 4 eggs and 4 embryos; post-uterine oviduct much longer; spermatheca (pl. 24, fig. 1) elongate fusiform. Penial sheath covering most of penis and apical half of epiphallus; penis long and slender. Atrium proper with a sacculate, white gland, almost as large as the sac in *P. parva,* on dorsal side. Jaw with fairly prominent median lobe. Radula has 9 laterals, with entocone absent from last, and 32 marginals, of which 1 is bicuspid and about 21 are tricuspid; 99 rows counted.

Philonesia (Haleakala) turgida (Ancey), (pl. 36, fig. 3; pl. 24, fig. 4).

Microcystis turgida Ancey, 1890, Bull. Soc. Malac. France **7**: 339; Sykes, Proc. Malac. Soc. 3: 275, pl. 13, figs. 5-7.

Hawaiian islands: east Maui (Makawao): BBM. 18905 (Baldwin!); BBM. 56280 (Baldwin's original lot), Makawao. BBM. 38440, dissected by Cooke, under lichens on trees, Ukulele (Cooke! May 25, 1915).

Shell (pl. 36, fig. 3) turbinate with somewhat conoid spire, weakly and obtusely angled near middle of 4th whorl and becoming evenly rounded on 5th; base tumid with deep, quite narrow foveola; brownish corneous, with thick epidermis, rather glossy above and more so below, thin and translucent. Embryonic whorls 1⅞, soon assuming sharp, fine, spiral striae and low, but distinct, rounded growth-wrinkles. Later whorls with sharply engraved, fine, rather widely but irregularly spaced, spiral striae, which separate spiral wrinkles that are crossed by very fine, sharp, minor growth-lines and weak major growth-wrinkles (19-20 per mm. on early 5th) above and with sharp but wavy spiral striae and much weaker minor growth-lines below; suture mediocrely impressed and narrowly margined. Aperture subcircular; peristome about 25° to shell-axis, weakly arcuate above and concave below; columella narrowly and gradually reflected and thickened.

Animal (according to Dr. Cooke's notes) very similar to subspecies *diducta.* Right and left shell-lobes slate-color (latter visible in 18 out of 22 animals examined). Uterus with 2 eggs and 1 or 2 embryos. Jaw (pl. 24, fig. 4) deep, with distinct median lobe. Radula has 8 or 9 laterals, and 31 to 38 marginals, of which 2 or 3 are bicuspid.

The typical form of *P. turgida,* which is more elevated than subspecies *diducta* even when young, appears to be relatively limited in distribution. The species of the section *Haleakala* (subgenus *Aa*) are distinguished from each other and from the somewhat similar species of *Philonesia,* s. s. from Lanai and Maui, in the following key:

A. Shell with thicker (usually darker) epidermis and sharp, fine, minor growth-lines that bead interspaces between spiral striae above; usually with 4th and 5th whorls more evenly rounded; Kauai to Hawaii: ..... **P. turgida** (Ancey).

B. Shell more elevated, subglobose turbinate; east Maui: ..... typical subspecies.

BB. Shell about half again as broad as high; distribution of species: ..... subspecies **diducta,** new.

AA. Shell with thinner (usually paler) epidermis and with very much weaker, minor growth-lines (major growth-wrinkles may be stronger);

C. Shell smaller than and about as glossy as *P. turgida* (with slightly weaker spiral striae); west Maui: ..... **P. hahakeae,** new species.

CC. Shell about as large as or larger than *P. turgida;*

D. Shell with very weak growth-lines on base;

E. With more gradual whorl-increase, either considerably smaller or much less polished;

F. About size of *P. turgida* but almost polished above and certainly so below; west Maui: ..... **P. guavarum,** new species.

FF. Slightly larger than *P. turgida* and more depressed, glossy to dullish, with sharp spiral striae:

G. Shell dullish, with more closely spaced, spiral striae, becoming almost evenly rounded on 5th whorl; east Maui: ..... **P. indefinita** (Ancey).

GG. Shell about as glossy as *P. hahakeae,* weakly angulate on early 5th whorl; Molokai: ..... **P. pusilla,** new species.

EE. Shell with much more rapid whorl-increase and so becoming about as large as species of *Aa,* s. s., quite polished; Lanai: ..... **P. interjecta,** new species.

[DD. Shell with quite sharp growth-lines on base, slightly larger (4 wh. diam. about 5.75 mm.) than E; penial prepuce large but without lobe (*Philonesia,* s. s.);

H. Shell almost as glossy as and angulate like *P. pusilla;* Lanai: ..... **P. maunalei,** new species.

HH. Shell decidedly glossy, almost polished; west Maui: ..... **P. decepta,** new species.]

Dimensions in section Haleakala

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4 wh.	whs.
P. turgida								
Ancey	4.3	128(5.5)	111(4.75)	(2.5)	.....	.....	.....	5
BBM. 38440	4.23	127(5.37)	119(5.01)	58(2.47)	117(2.89)	1.44	3.2(4.61)	4.5—
P. t. diducta								
type	3.28	147(4.81)	133(4.36)	59(1.94)	132(2.56)	1.47	3.1(4.56)	4⅛
BBM. 39218	2.99	163(4.86)	146(4.36)	70(2.09)	125(2.61)	1.50	3.2(4.8)?	3.8
BBM. 23962	3.32	155(5.14)	142(4.72)	62(2.07)	134(2.78)	1.45	3.5(5.10)	4+
BBM. 44322	3.18	148(4.69)	135(4.30)	65(2.05)	125(2.56)	1.48	3.2(4.69)	4
P. hahakeae								
type	3.37	153(5.14)	147(4.95)	67(2.27)	119(2.71)	1.29	3.5(4.48)	4.5
P. guavarum								
type	3.30	162(5.33)	151(5.07)	62(2.06)	140(2.88)	1.44	3.5(4.98)	4.3—
P. indefinita								
Ancey	3.75	160(6)	151(5.7)	53(2)	.....	.....	.....	5
BBM. 38551	3.50	170(5.96)	158(5.52)	66(2.31)	135(3.11)	1.59	3.3(5.21)	4.4
P. pusilla								
type	3.65	169(6.16)	154(5.60)	66(2.40)	132(3.17)	1.57	3.5(5.47)	4.3
P. interjecta								
type	3.14	200(6.28)	184(5.78)	74(2.31)	144(3.33)	1.54	4.1(6.3)?	4—
BBM. 34421	3.83	171(6.55)	156(5.98)	67(2.57)	139(3.58)	1.56	4.0(6.26)	4.2—

Comparative whorl-sizes in subgenus Aa

	1½	3 wh.	3.5 wh.	4 wh.	4.5 wh.	Maxima	Index
P. turgida	1.44			3.2(4.61)	3.7(5.39)	4.5—	127
P. t. diducta	1.47		2.7(3.92)	3.1(4.56)	3.6(5.3)?	4⅛	147
Hawaii	1.50	2.3(3.46)	2.8(4.22)	3.2(4.8)?		3.8	163
Oahu	1.45		2.9(4.24)	3.5(5.10)	4.0(5.8)?	4+	155
Kauai	1.48		2.7(4.00)	3.2(4.69)	3.7(5.5)?	4	148
P. hahakeae	1.29			3.5(4.48)	4.0(5.14)	4.5	153
P. guavarum	1.44		3.0(4.26)	3.5(4.98)	4.0(5.7)?	4.3—	162
P. indefinita	1.59		2.8(4.45)	3.3(5.21)	3.8(6.1)?	4.4	170
P. pusilla	1.57		2.9(4.58)	3.5(5.47)	4.1(6.4)?	4.3	169
P. interjecta	1.54		3.4(5.19)	4.1(6.3)?	4.8(7.4)?	4—	200
BBM. 34421	1.56		3.3(5.19)	4.0(6.26)	4.7(7.3)?	4.2—	171
P. hiloi	1.45		3.0(4.30)	3.5(5.13)	4.1(5.9)?	4—	165
BBM. 88169	1.52		2.9(4.34)	3.5(5.3)?	4.1(6.2)?	3⅝	163
NYSM. 264	1.45			3.5(5.08)	4.1(6.0)?	4.5—	162
P. piihonuae	1.50		2.9(4.33)	3.5(5.2)?	4.1(6.1)?	3⅝	161
P. abeillei	1.74		3.1(5.37)	3.7(6.51)	4.3(7.5)?	4⅛	175
P. waiheensis	1.70		3.1(5.33)	3.8(6.47)	4.4(7.5)?	4.3	175
P. mapulehuae	1.87		3.0(5.59)	3.6(6.75)	4.2(7.9)?	4.1—	168
BBM. 24101	1.89		3.1(5.81)	3.7(6.93)	4.3(8.1)?	4.2	173
BBM. 46982	1.92		2.7(5.28)	3.2(6.12)	3.8(7.3)?	4.3	156
P. gouveiana	1.80		3.0(5.41)	3.6(6.55)	4.2(7.6)?	4.1	181
P. sericans	1.72		3.2(5.51)	3.9(6.68)	4.5(7.7)?	4.1	180

Philonesia (Haleakala) turgida diducta, new subspecies (pl. 30, figs. 7, 8; pl. 24, figs. 2, 3).

Hawaiian islands: east Maui (Makawao): BBM. 11362 (49550), above eucalyptus grove, Polipoli (Cooke! April 30, 1920); BBM. 11437, dissected, under bark and among lichens on *lehua* trees, below eucalyptus grove, alt. 5,000 ft., near Polipoli (Baker! June 7, 1935). West Maui (Lahaina): BBM. 20987, just above camp, Maunahooma (Cooke! May 19, 1910). Hawaii (South Hilo): BBM. 39210, *kipuka* on right of trail to Haleloulu, Piihonua; BBM. 39218, *kipuka* opposite Haleloulu, Piihonua (both Forbes! June 4, 1915). Lanai: BBM. 20024, Lanaihale (Spalding! Oct. 18, 1909); BBM. 34498, valley, Kaiholena (Forbes! June 10, 1913). Molokai (east): BBM. 33724, on dead *lehua* leaves, forest back of 2d *redfieldi* colony, Kamalo (Pilsbry and Cooke! Jan. 29, 1913); BBM. 36557, under lichens on dead tree, head of Kahapakai fork of Waihii, Kalamaula, alt. 2,200 ft. (Cooke! Aug. 12, 1914); BBM. 47724, on rocks and herbage between 600 foot pali and camp of refuge, Mapulehu Valley (C. F. Mant! June 27, 1919). Oahu (Koolau Range, Honolulu): BBM. 23962, dissected, inside of bowl, east side of Tantalus (Cooke! July 11, 1912); BBM. 17401, Pauoa side of bowl trail, Tantalus (Cooke! Oct. 4, 1908). Waianae Mountains, (Ewa): BBM. 35419, arboreal on lichens, open head of valley, west side of ridge, Popouwela

(Cooke! Nov. 23, 1913). Kauai (Waimea): BBM. 44322, dissected, near and above Halemanu, west side of Waimea drainage basin (Forbes! July 8, 1918); BBM. 48265, dissected, under lichens on *aalii* shrubs, just below Manalohuluhulu gate, east side of Halemanu Valley (Cooke! Aug. 16, 1919).

Shell (pl. 30, figs. 7, 8) similar to *P. turgida* but much more depressed, with broader and shallower foveola; often with lighter varices and so less translucent. Later whorls with more prominent growth-wrinkles above; typically with 5th whorl dropping below periphery of 4th. Columella shorter.

Animal similar to *P. waiheensis* but dark pigment more extensive and intense, especially below and between pedal grooves, on tail and on top of head. Right shell-lobe (contracted) about 4 times as long as its base; left shell-lobe very small and about as long as its base; mantle-lobes black. Lung black for some distance behind mantle collar and along hindgut, with small, quite evenly spaced, chalky-white spots; over 3 or 4 times as long as its base or over twice kidney length, which is about 2.5 times its base or 1.5 pericardial length. Apical whorls black, with chalky spots becoming confluent along sutural edge. Hermaphroditic duct (pl. 24, fig. 3) long and stout. Uterus containing 2 eggs and 1 embryo (BBM. 11437), 1 egg and 3 embryos (48265) or 3 embryos (23962); post-uterine oviduct fairly long; spermatheca large, sausage-shaped and practically sessile. Penial sheath including most of epiphallus; corona about twice as long as wide but poorly demarcated apically; penis proper about 1.5 times as large as prostate. Penial prepuce quite short; atrium proper with a small flattened sac from its dorsal side (similar to that in *P. parva*). Jaw deep, with weak (BBM. 11437) to quite large (48265) median lobe. Radula (pl. 24, fig. 2) has squarish central, 7 or 8 laterals (Cooke in 36557, 35419 and 17401 found 8 or 9), with small entocone becoming obsolete on last; and 24 broadish marginals (Cooke counted 19 to 32), of which 1 or 2 are bicuspid and about 12 tricuspid; 102 rows counted.

Although the lots of this subspecies show considerable variation, I can make out no very definite geographic races. Young shells of typical *P. turgida* are more depressed than the larger specimens, but the bigger shells of the subspecies *diducta* could not become as elevated as the typical form. Perhaps the peculiar habitat where it is usually found, under lichens and in moss on trees in the cloud zones, has some connection with its wide distribution.

Philonesia (Haleakala) hahakeae, new species (pl. 30, figs. 11, 12).

Hawaiian islands: west Maui (Lahaina): BBM. 11449 (20961, dissected), Hahakea (Cooke! May 18, 1910). (Wailuku): BBM.

Shell (pl. 30, figs. 11, 12) similar to *P. turgida diducta* but with smaller whorls, slightly more depressed, sharply although obtusely angulate on 4th whorl and distinctly so on 5th; light horn-colored, with thinner epidermis, and so appearing more translucent Later whorls with spiral striae slightly weaker and minor growth-lines much less distinct; suture more distinctly margined; 5th whorl not dropping below 4th. Aperture barely angulate at 75° and peristome 20° to shell-axis.

Animal also similar. Lung with numerous, larger, white spots; almost 5 times as long as its base or over thrice kidney length. Diaphragm dark. Jaw with quite prominent median lobe. Radula has 9 laterals, with entocone obsolescent on outer 2, and 32 marginals, of which 2 or 3 are bicuspid and about 10 tricuspid; 98 rows counted.

Philonesia (Haleakala) guavarum, new species (pl. 30, figs. 9, 10).

Hawaiian islands: west Maui (Wailuku): BBM. 11363 (38994, dissected), on guava, site of old camp below intake of upper ditch, Waihee (Cooke! June 1, 1915). (Lahaina): BBM. 36005. Kahoolawe: ANSP. 108860, fossils, Schooner Bay (Pilsbry and Cooke! 1913).

Shell (pl. 30, figs. 9, 10) similar to *P. turgida diducta* but slightly more depressed, a little more distinctly angulate near middle of 4th whorl; light horn-colored, thin, quite transparent and almost polished above and certainly so below. Later whorls with spiral striae and minor growth-lines very much weaker (more as in *P. decepta*), but with similar major growth-wrinkles (22-23 per mm. on late 4th). Aperture more depressed but scarcely angulate; peristome about 20° to shell-axis.

Animal also similar. Lung with sparse, larger white dots; 4.5 times as long as base or thrice length of kidney. Uterus containing 1 egg and 2 embryos; penial sheath just including corona. Radula has 7 laterals, with reduced entocone on last, and 24 marginals, of which 1 is bicuspid and about 6 are tricuspid; 99 rows counted.

Philonesia (Haleakala) indefinita (Ancey), (pl. 30, figs. 13, 14; pl. 24, fig. 6).

Microcystis indefinita Ancey, 1889, Bull. Soc. Malac. France **6**: 203.

Hawaiian islands: east Maui (Makawao): BBM. 18904 (Baldwin!); BBM. 56279 (Baldwin's original lot; mostly *P. perlucens*), Makawao. BBM. 38551, dissected, gulch just south of house, Cornwall ranch, Kula (Cooke! June 26, 1915). Form G (smaller and more glossy)—(Hana): BBM. 38534, dissected, on *ohia ai* leaves, arboreal, Alalele (Cooke! May 27, 1915). (?) Kahoolawe: ANSP., fossil, beach, Eben Lows Bay (Pilsbry! 1913).

Shell (pl. 30, figs. 13, 14) similar to *P. hahakeae* but considerably larger, distinctly although obtusely angulate on 4th whorl but becoming almost evenly rounded on 5th; tan horn-colored, weakly glossy above and little more so below, translucent. Later whorls with somewhat sharper, closely spaced, spiral striae (as in *P. oahuensis*) and distinct major growth-wrinkles (16-17 per mm. on early 5th); suture slightly more impressed. Aperture almost evenly rounded; peristome 25° to shell-axis; columella short, abruptly reflected.

Animal similar to *P. turgida diducta* but only dark on top of head and sometimes on tip of tail. Left shell-lobe small. Lung sparsely spotted with larger, white ovals; 5.5 times as long as base or over 4 times kidney length. Ovotestis consisting of 7 conoid groups of clavate alveoli; duct shorter. Uterus containing 7 eggs and embryos; post-uterine oviduct (pl. 24, fig. 6) shorter; spermatheca lanceolate with short stalk. Penial sheath only covering half of penis proper. Atrium longer, with coarsely lobulate sac. Radula has 9 laterals, with entocone obsolescent on last, and 31 marginals, of which 3 to 5 are bicuspid and about 14 tricuspid; 102 rows counted.

Ancey founded this species on a shell sorted out from a lot of *P. perlucens,* and Baldwin, who sent him the material, seems to have utilized *P. indefinita* for all his original lot, which almost entirely consisted of the larger and smoother species. I at first identified *P. decepta* with Ancey's species, but that west Maui shell seems to be too large.

Philonesia (Haleakala) pusilla, new species (pl. 39, figs. 11, 12; pl. 24, fig. 5).

Hawaiian islands: Molokai (east): BBM. 11364 (38194, dissected), terrestrial or on ferns and shrubs, under *ieie* clump, east Myers Lake, Kalamaula (Cooke! March 10, 1915); BBM. 41551, arboreal and terrestrial, fern bank, east of cabin across stream, Kamoku, Kaunakakai (Cooke! March 11, 1916).

Shell (pl. 39, figs. 11, 12) similar to *P. indefinita* but with rapider whorl-increase, still weakly angulate near middle of 5th whorl; more glossy (like *P. hahakeae*) and translucent. Embryonic whorls 1⅞, soon assuming closely spaced spiral striae. Later whorls with shallower, slightly more widely spaced, spiral striae above and decidedly weaker spirals and growth-wrinkles below. Aperture scarcely angulate; peristome 20° to shell-axis; columella gradually and narrowly thickened and reflected.

Animal similar to *P. turgida diducta* but dark pigment less extensive (as in *P. indefinita*). Right shell-lobe as long as width of mantle collar; left shell-lobe small. Lung 4.5 times as long as base or 2.5 kidney length, which is thrice its base. Post-uterine oviduct (pl. 24, fig. 5) shorter and stouter; spermatheca as in *P. indefinita.* Penial sheath including all epiphallus; penis proper not much larger than prostate. Radula has 7 laterals, with entocone absent from last, and 32 marginals, of which 1 is bicuspid and 14 are usually tricuspid; 81 rows counted.

Philonesia (Haleakala) interjecta, new species (pl. 28, figs. 3, 4).

Hawaiian islands: Lanai: BBM. 11365 (34279, dissected), eastern end from base camp, Captain Sowles' house (June 1, 1913). Form A—BBM. 34421, dissected, right hand side, middle of ridge, Kaiholena (June 12, 1913); BBM. 45464, Lanai (Sept. 17, 1918, all Forbes!). Form B—BBM. 19993, dissected, Kaiholena (Oct. 14, 1909; Spalding!).

Shell (pl. 28, figs. 3, 4) similar to *P. pusilla* but with much more rapid whorl-increase, typically much more depressed (forms A and B intermediate in height), becoming considerably larger, quite sharply angulate to end of 4th whorl; amber colored (form A greenish), quite polished, thin and transparent. Later whorls with much weaker, more widely spaced spiral striae (more as in *P. guavarum*) and weak growth-wrinkles (13-14 per mm. on 4th); suture less impressed. Aperture angulate at 75° to shell-axis; columella barely thickened.

Animal also very similar to *P. pusilla.* Lung with sparse, large, white blotches; 4 times as long as base or 2.5 kidney length, which is 2.5 times its base. Uterus containing 1 large embryo. Radula has 7 laterals, with entocone obsolescent on last, and 48 marginals, of which 1 is bicuspid and 8 to 10 are tricuspid; rows not counted.

Philonesia (Hiloaa) hiloi, new species (pl. 29, figs. 13, 14; pl. 24, figs. 7, 8).

P. cicercula Gould, 1846, Proc. Boston Soc. N. H. 2: 171 [20], apparently in part.

Hawaiian islands: Hawaii (South Hilo): BBM. 11371 (23257, dissected), on trunks of trees, ferns and dead *ieie* leaves, *ohia ai,* and kukui forest, 4 miles out along Olaa road from Hilo (Cooke! Oct. 10, 1911). (Puna): BBM. 88169, dissected, on foliage of tree, dense wet forest, alt. 2,800 ft., upper Olaa (Gifford! June 1928). (Kau): BBM., Kilauea. Hawaii: NYSM. 264 (A-754, from Gould)?

Shell (pl. 29, figs. 13, 14) depressed suborbicular, obtusely but sharply angulate at beginning of 4th whorl but becoming almost evenly rounded near its end; base rounded with fairly broad and moderately deep foveola; light amber horn-color, thin, quite transparent and rather polished (more so below). Embryonic whorls 1⅞, soon assuming weak but fairly distinct, fine, spiral striae. Later whorls with weak, wavy, spiral striae and indistinct growth-wrinkles (about 20 per mm. on 4th) above and still weaker sculpture below; suture moderately impressed, quite widely margined. Aperture depressed but rounded; peristome 15° to shell-axis, weakly concave below; columella abruptly reflected and thickened.

Animal similar to *P. waiheensis* or darker. Left shell-lobe about ¾ as long as posterior left mantle-lobe. Lung with few, large, white blotches. Diaphragm dark. Uterus containing 2 embryos (1 egg and 2 embryos in BBM. 88169); spermatheca (pl. 24, fig. 7) without definite stalk. Penial sheath including half of epiphallus; corona relatively large; penis proper with a heavy internal pilaster and with a white, glandular, subspherical, basal lobe (PL, smaller in 88169). Jaw with extremely low median lobe. Radula (pl. 24, fig. 8) has elongate central, 8 (6 in 88169) elongate laterals, with minute entocone only on inner 2 or 3, and 35 marginals, of which 1 or 2 are bicuspid and about 19 (13 in 88169) tricuspid; 81 rows counted (in 88169).

As indicated already, Gould's specimens of *P. cicercula* in the NYSM. seemed closer to *P. hiloi,* although I did not directly compare them with BBM. examples of *P. hiloi.* The species of the section *Hiloaa* (subgenus *Aa*) are compared to each other and with *P. cicercula* in the following key:

A. Shell depressed subdomical, rather polished, with weak spiral striae.....
.....**P. hiloi,** new species.

AA. Shell with more conoid spire, mediocrely glossy above, with sharp spiral striae.....**P. piihonuae,** new species.

[AAA. Shell nearer AA in gloss, but with stronger growth-wrinkles above, especially on embryonic whorls.....**P.** (s. s.) **cicercula** (Gould).]

Dimensions in the section Hiloaa

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4 wh.	whs.
P. hiloi								
type	3.11	165(5.12)	150(4.68)	70(2.19)	124(2.72)	1.45	3.5(5.1)?	4—
BBM. 88169	2.78	163(4.54)	148(4.12)	72(2.01)	120(2.41)	1.52	3.5(5.3)?	3⅝
NYSM. 264	3.65	162(5.90)	147(5.36)	64(2.33)	133(3.10)	1.45	3.5(5.08)	4.5—
P. piihonuae								
type	2.79	161(4.50)	145(4.05)	70(1.96)	122(2.40)	1.50	3.5(5.2)?	3⅝

Philonesia (Hiloaa) piihonuae, new species (pl. 30, figs. 5, 6; pl. 24, fig. 9).

Hawaiian islands: Hawaii (South Hilo): BBM. 11491, dissected, *kipuka* 4, Piihonua (Forbes! June 4, 1915).

Shell (pl. 30, figs. 5, 6) with conoid spire, sharply although obtusely angulate at 3⅝ whorls, with tumid base and deep, rather narrow foveola; tan color, mediocrely glossy above but more so below, translucent. Embryonic whorls 1¾, soon assuming sharp and distinct, but very fine and closely spaced, spiral striae. Later whorls with spiral striae

similar to those of *P. cryptoportica,* but with slightly stronger growth-wrinkles (10 per mm. on early 4th whorl); suture moderately impressed and margined. Aperture angulate at about 80° to shell-axis; peristome 20° to shell-axis, weakly concave below; columella short, narrowly reflected.

Animal similar to *P. hiloi.* Left shell-lobe 3 times as long as its base and 2/3 as long as right one (contracted). Lung rather evenly powdered with white; 3.5 times as long as base or twice kidney length, which is thrice its base. Uterus containing 2 eggs. Penial sheath including more of epiphallus; corona (pl. 24, fig. 9) smaller; penis with smaller basal lobe. Radula has 6 laterals, with stronger entocone becoming obsolescent on last; marginals and rows not countable, but only 1 marginal bicuspid.

Only one shell of this distinct little species has been seen; it probably attains a larger size.

Philonesia (Aa) abeillei (Ancey), (pl. 28, figs. 7, 8; pl. 24, fig. 10).

Microcystis abeillei Ancey, 1889, Bull. Soc. Malac. France 6: 199.

Hawaiian islands: Molokai [east]: BBM. 18901. BBM. 41717, dissected, under ferns and loose stone, near bottom of big gulch along trail on west side, Kawela (Judd and Cooke! March 13, 1916); BBM. 34943, first deep valley of upper Kamalo Plateau, just east of Kamalo Hill (Pilsbry and Cooke! Jan. 29, 1913).

Shell (pl. 28, figs. 7, 8) depressed, with low, conoid spire, sharply but obtusely angulate on 4th whorl and distinctly so on early 5th; base almost tumid with narrow, moderately deep foveola; horn-colored, rather highly glossy above and more so below, almost transparent. Embryonic whorls almost 2, soon assuming fine, fairly sharp, spiral striae. Later whorls with fine, wavy, rather sharp but shallow, spiral striae, crossing weak, irregular growth-wrinkles above; base with partially erased spirals and more evident growth-wrinkles; suture lightly impressed and well margined. Aperture broad but depressed, weakly and very obtusely angulate at 75° to shell-axis; peristome 15° to shell-axis, arcuately straightened near foveola; columella short, with broadly reflected callus.

Animal similar to *P. waiheensis.* Shell and mantle-lobes dark. Lung with black line behind mantle collar, lines along hindgut and some dark pigment around kidney, and with numerous, small, white dots; 4 times as long as base or 2.5 kidney length. Apical whorls with some dark pigment and sparse chalky spots. Hermaphroditic duct long. Uterus containing 1 egg and 2 embryos; spermatheca (pl. 24, fig. 10) with far shorter stalk. Penial sheath covering all longer epiphallus; penis proper 3 times as long as prostate and relatively slender. Jaw with low median lobe. Radula has 8 laterals, of which last loses entocone, and 45 marginals, of which 1 to 5 are bicuspid and about 24 tricuspid; more than 82 rows.

The large penis of *P. abeillei* is a peculiar feature. The species of the section *Aa,* s. s. are compared with each other and with *P.* (s. s.) *perlucens* in the following key:

A. Shell with suture lightly impressed and whorls more flattened above; with low spire and almost tumid base; rather highly glossy; penis elongate, much larger than prostate; Molokai (east): ..... **P. abeillei** (Ancey).

AA. Shell with suture better impressed and whorls more convex above; penis shorter, little larger than prostate;

B. Shell with less tumid base, relatively prominent spire and irregularly spaced growth-lines;

C. Shell with about size and gloss of *P. abeillei,* but with slightly more rapid whorl-increase; west Maui: ..... **P. waiheensis,** new species.

CC. Shell slightly larger and considerably less glossy; Molokai (east): ..... **P. mapulehuae,** new species.

[CCC. Shell quite polished and straw-colored; Maui: ..... **P.** (s. s.) **perlucens** (Ancey).]

BB. Shell with more tumid base, relatively less prominent spire and regularly and quite closely spaced growth-lines; Hawaii:

D. Shell quite polished above with obsolescent spiral striae and distinct growth-lines ..... **P. gouveiana,** new species.

DD. Shell dullish, with very close spiral striae obscuring growth-lines..... **P. sericans** (Ancey).

Dimensions in section Aa, s. s.

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4 wh.	whs.
P. abeillei								
Ancey	4.5	171(7.7)	162(7.3)	60(2.7)	.....	.....	.....	5
BBM. 41717	3.90	175(6.83)	157(6.12)	73(2.83)	131(3.70)	1.74	3.7(6.51)	4⅛
P. waiheensis								
type	4.10	175(7.18)	161(6.59)	65(2.68)	142(3.80)	1.70	3.8(6.47)	4.3
P. mapulehuae								
type	4.10	168(6.89)	153(6.28)	65(2.68)	134(3.58)	1.87	3.6(6.75)	4.1—
BBM. 24101	4.38	173(7.57)	156(6.85)	68(2.97)	131(3.88)	1.89	3.7(6.93)	4.2
BBM. 46982	4.40	156(6.87)	143(6.29)	60(2.63)	139(3.65)	1.92	3.2(6.12)	4.3
P. gouveiana								
type	3.73	181(6.76)	161(6.02)	69(2.59)	133(3.45)	1.80	3.6(6.55)	4.1
P. sericans								
Ancey	4.25	177(7.33)	153(6.5)	.....	.....	.....	.....	4.5
fig.	4.0	183(7.33)	158(6.3)	80(3.2)	120(3.85)	.....	.....	
BBM. 88155	3.88	180(7.00)	159(6.15)	77(3.01)	122(3.66)	1.72	3.9(6.68)	4.1

Philonesia (Aa) waiheensis, new species (pl: 24, fig. 13; Part 3, pl. 62, figs. 4, 5).

Hawaiian islands: west Maui (Wailuku): BBM. 11368 (38997, dissected), on guava, site of old camp below intake of upper ditch, Waihee (Cooke! June 1, 1915); BBM. 21282, right branch Waikapu (Forbes! June 18, 1910). (Lahaina): BBM.

Shell (to be figured in Part 3) similar to *P. mapulehuae* but slightly smaller, with more rapid whorl-increase; light horn-colored, quite highly glossy above and more so below, thin and transparent. Later whorls slightly less convex above, with similar growth-wrinkles but with weaker spiral striae (about as in *P. abeillei*). Aperture more flattened above but scarcely angulate.

Animal light with black spot at base of tail-horn and dark on top of head. Right shell-lobe (contracted) 4 times as long as its base and half as long as diameter of mantle collar; left shell-lobe small but evident; mantle-lobes pigmented. Lung with little black spots behind mantle collar and sometimes along hindgut, and with very sparse, chalky spots; 4.5 times as long as base or thrice kidney length, which is over twice its base or 1.5 times pericardial length. Diaphragm sometimes pigmented but usually not. Apical whorls with large white blotches. Hermaphroditic duct (pl. 24, fig. 13) mediocre in length; talon comma-shaped, bipartite. Uterus containing 1 egg and 3 embryos; post-uterine oviduct moderately long and tapering basally; spermatheca short fusiform with subequal stalk. Penial sheath very heavy, covering short epiphallus; corona about twice as long as broad; penial retractor arising near base of uterus and mainly inserting on penial apex but with branch to epiphallus above corona; penis proper tapering apically, almost as large as prostate. Penial prepuce quite short; atrium without sac. Jaw with marked, broad, rounded, median lobe. Radula very similar to that of *P. sericans* but has 9 laterals; 100 rows counted.

Philonesia (Aa) mapulehuae, new species (pl. 28, figs. 9, 10).

Hawaiian islands: east Molokai: BBM. 11369 (47726, dissected), upper forest of *ieie,* ferns, etc., Wailua ridge (C. F. Mant! June 30, 1919); BBM. 24346, high forest, Puukolekole-Pelekunu (Cooke and Ah Tim! Aug. 3, 1912); BBM. 24101, dissected, high up on ridge, Kaluaaha (Hitchcock and Forbes! July 26, 1912); BBM. 45681 above entrance to tunnel, Puu Nea (Cooke! Dec. 7, 1918). (?) BBM. 46982, dissected, Puu Kaeo (Cooke! Feb. 18, 1919).

Shell (pl. 28, figs. 9, 10) similar to *P. abeillei* but slightly larger, with higher spire, bluntly angulate on early 4th whorl and barely so on early 5th; base less tumid with deep and moderately narrow foveola; glossy above and more so below. Later whorls with decidedly sharper spiral striae and slightly more distinct growth-wrinkles; suture less lightly impressed and sinking slightly below angle between 5th and 4th whorls. Aperture almost evenly rounded; peristome concave below; columella gradually reflected, with smaller callus.

Animal similar to *P. waiheensis.* Left shell-lobe not always observed. Lung with small white dots anteriad and medium sized, very sparse ones posteriad; 5 times as long as its base. Diaphragm with short, longitudinal, black streaks. Uterus with 2 eggs and 3 embryos; spermatheca with stouter stalk. Penial sheath including epiphallus or not. Jaw with low median lobe. Radula has 8 laterals, with entocone obsolescent on last, and 42 marginals, of which 1 is bicuspid and about 25 are tricuspid; 93 rows counted.

The single shell in BBM. 46982 is much more elevated, but may possibly be a deformed shell of *P. mapulehuae,* with which its anatomy agrees.

Philonesia (Aa) gouveiana, new species (pl. 39, figs. 9, 10; pl. 24, figs. 11, 12).

Hawaiian islands: Hawaii (South Kona): BBM. 11367 (44090, dissected), alt. 6,000 ft., Honomalino (A. Gouveia! July 15, 1917); BBM. 44075, alt. 3,000 ft., Kapua (ditto). (South Hilo): BBM. 39229, *kipuka* 4, Piihonua (Forbes! June 4, 1915). (Puna): BBM. 39189, dissected, *kipuka* in 1855 flow, Olaa (Forbes! June 3, 1915). (Kau, North Kona): BBM.

Shell (pl. 39, figs. 9, 10) similar to *P. abeillei* in form but weakly angulate on early 4th whorl and almost evenly rounded on 5th; base somewhat less tumid, with quite broad and deep foveola; light amber colored, rather well polished and quite transparent, embryonic whorls assuming very weak spiral striae. Later whorls more convex above, with obsolescent spiral striae and shallowly but sharply engraved, narrowly spaced (14-15 per mm. on 4th) major growth-lines above and almost obsolete spirals and weaker growth-lines below; suture broadly impressed and margined. Aperture evenly rounded; peristome 20° to shell-axis, concave below; columella gradually but well thickened.

Animal similar to *P. sericans*. Lung with distinct white spots above mantle collar but with very sparse ones elsewhere; apical whorls with big, sparse, white blotches. Uterus containing 1 egg and 2 embryos; spermatheca (pl. 24, fig. 12) with short stalk. Penial sheath including 0.6 of penis proper and tip of epiphallus; corona, penial retractor and penis more as in *P. waiheensis*. Radula has more elongate central and laterals (pl. 24, fig. 11) and 36 marginals, of which 2 are bicuspid and 17 usually tricuspid; 96 rows counted.

P. gouveiana is named for A. Gouveia, the collector of the type lot. It bears a certain resemblance to *Hiona rufobrunnea,* but the latter has deeper sutures, less rapid whorl-increase and more evenly rounded whorls.

Philonesia (Aa) sericans (Ancey), (pl. 28, figs. 13, 14; pl. 24, figs. 14, 15).

Microcystis sericans Ancey, 1889, Proc. Malac. Soc. 3: 268, pl. 12, fig. 5.

Hawaiian islands: Hawaii (Puna): BBM. 18914, Olaa. BBM. 88155, dissected, wet forest, alt. 3,700-3,800 ft., upper Olaa (W. M. Gifford! June, 1928); BBM. 33965, about 1¼ miles above Glenwood (Pilsbry, Thaanum, and Cooke! March 2, 1913). (Kau, South Kona and South Kohala): BBM.

Shell (pl. 28, figs. 13, 14) similar to *P. gouveiana* but with more tumid base and narrower foveola; light tan color, dullish above and glossy below, translucent. Embryonic and later whorls with fine and closely spaced but fairly sharp spiral striae which render growth-lines less evident above; base with slightly more blurred spirals. Aperture still more evenly rounded; peristome about 10° to shell-axis; columella gradually reflected and well thickened.

Animal similar to *P. waiheensis* but also with black band below pedal grooves and weak line between them. Right shell-lobe dark externally, 5 or 6 times as long as its base or equal to diameter of mantle collar; left shell-lobe very broad at base and about 1/3 as long as right. Lung 5 times as long as its base. Diaphragm streaked. Uterus containing 3 eggs and 3 embryos; post-uterine oviduct (pl. 24, fig. 15) shorter and slenderer; spermatheca sausage shaped with tapered apex. Penial sheath including most of epiphallus; corona 3 times as long as broad; penial retractor arising 2/3 distance up uterus; penis proper about ¼ larger than prostate. Jaw with very low median lobe. Radula (pl. 24, fig. 14) has 8 laterals, with entocone obsolescent on last, and 44 marginals, of which 1 is bicuspid and remainder vary in number of cusps; 99 rows counted.

Philonesia (Oafatua) lenta (Garrett), (pl. 32, figs. 7, 8; pl. 24, figs. 17, 18).

Microcystis lenta Garrett, 1887, Bull. Soc. Malac. France 4: 5.

Marquesas: Hivaoa (= Dominique): BBM. 3897, under damp dead leaves (Garrett!). Tahuata: BBM. 99747-8, dissected, on ferns and shrubs, damp valley, 3 miles inland, alt. 2,000 ft., Ivaivaiti (P. Ent. Surv.! June 28, 1930).

Shell (pl. 32, figs. 7, 8) lenticular, sharply and acutely angulate, almost carinate, with narrow, deep foveola; light amber color, with silky gloss above and below.

Embryonic whorls 1⅝ to 1¾; first with sharply cut, well impressed, spiral lines (45 visible near end), becoming more numerous on 2d. Later whorls with weak low irregular growth-wrinkles (16-17 per mm. on 4th) and with wavy, sharply and quite deeply cut, well-spaced, spiral lines above; base with similar but slightly weaker, more closely spaced, spiral striae and with fairly distinct growth-wrinkles; suture mediocrely impressed and attached at angle. Aperture narrow, sharply angulate at 75° to shell-axis; peristome 35° to shell-axis, weakly concave below. Columella shortly thickened and reflected, often so abruptly as to form a pointed truncation on outer side of peristome.

Animal similar to *P. baldwini* but mainly light colored, with some pigment on tip of tail and on top of head, where it forms 3 very dilute, middorsal stripes; tail compressed. Mantle collar and mantle lobes edged with dark pigment. Lung with chalky spots; 6 times as long as base or 4 times kidney length, which is thrice its base or almost twice pericardial length. Uterus (pl. 24, fig. 17) containing 2 eggs and 2 embryos; post-uterine oviduct gradually tapering and long; spermatheca long, slender and apparently subsessile. Penial sheath covering 2/3 of penis proper, attached to epiphallus; corona very short and broad, with more numerous internal folds; penis proper smaller than prostate; penial retractor arising below middle of uterus. Penial prepuce and atrium short. Jaw with low median lobe. Radula (pl. 24, fig. 18) has slightly broader central, 7 tricuspid laterals, and 31 marginals, of which 1 or 2 are bicuspid and 18 usually tricuspid; more than 72 rows.

The section *Oafatua* does not differ very strikingly from *Philonesia,* s. s. but is discussed after the subgenus *Aa* in order to keep the Hawaiian and the Marquesan species each in continuous series.

Key to the species of Oafatua

A. Penis not much larger than prostate; shell not subdiscoid (markedly angulate if much depressed)

B. Shell distinctly angulate, at least on 3d whorl, more or less glossy, with pronounced spiral striae and weakly overriding suture.....typical group

C. Shell acutely and sharply angulate, even on 4th whorl;

D. Shell lenticular, with deepest spiral striae; Hivaoa and Tahuata:..... .....**P. lenta** (Garrett).

DD. Shell with higher, more dome-shaped spire, somewhat more glossy; Fatuhiva:.....**P. fatuhivae,** new species.

CC. Shell obtusely angulate on 3d whorl, becoming bluntly or barely so on 4th;

E. Shell slightly larger, sublenticular, with slightly more conoid spire, bluntly angulate even at aperture and about as glossy as *P. fatuhivae*; Uapou: .....**P. uapouae,** new species.

EE. Shell about size of *P. lenta,* depressed domical, more sharply but less distinctly angulate on 3d whorl, with aperture almost evenly rounded and with more closely spaced stronger spiral striae; Uahuka:..... .....**P. uahukae,** new species.

BB. Shell scarcely angulate on 3d whorl and becoming evenly rounded, with distinctly overriding suture and either smaller or more polished; Hivaoa:..... .....**P. pura** group.

F. Shell smallest, with spiral striae much as in *P. uahukae*.....**P. micra,** new species.

FF. Shell largest, well polished.....**P. pura** (Garrett).

AA. Penis 5 or 6 times as long as prostate; shell subdiscoid, becoming evenly rounded (as in BB) and rather well polished; Hivaoa:.....**P. contigua** (Garrett)

Dimensions in section Oafatua

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	3.5 wh.	whs.
P. lenta								
Garrett	2	(5)	.....	.....	.....	.....	.....	4-4.5
BBM. 99747	2.55	215(5.49)	200(5.11)	67(1.72)	162(2.79)	1.75	2.9(5.15)	3.7
P. fatuhivae								
type	3.47	169(5.86)	159(5.51)	55(1.89)	161(3.05)	1.83	2.7(4.87)	4.2+
P. uapouae								
type	3.31	186(6.16)	170(5.64)	63(2.10)	156(3.27)	2.01	2.8(5.69)	3.7+
P. uahukae								
type	3.41	174(5.92)	162(5.51)	63(2.16)	141(3.05)	1.95	2.6(5.16)	4—
P. micra								
type	2.20	169(3.72)	140(3.09)	70(1.55)	116(1.80)	1.25	2.8(3.47)	3.7
P. contigua								
Garrett	3	(5.5)	.....	.....	.....	.....	.....	4.5
BBM. 94790	3.13?	192(6.01)	175(5.49)	74(2.30)	129(2.97)	1.67?	3.1(5.21)	3.9?
BBM. 11450	1.80	221(3.99)	199(3.58)	82(1.47)	143(2.10)	1.67	.....	2.8
P. pura								
Garrett	4	(6)	.....	.....	.....	.....	.....	4
ANSP. 83207	4.73	148(7.01)	138(6.51)	67(3.17)	113(3.59)	1.96	3.0(5.97)	4—

Comparative whorl-sizes in section Oafatua

	1½	3 wh.	3.5 wh.	4 wh.	Maxima	Index
P. lenta	1.75	2.5(4.33)	2.9(5.15)	3.3(5.8)?	3.7	215
P. fatuhivae	1.83	.....	2.7(4.87)	3.0(5.55)	4.2+	169
P. uapouae	2.01	2.4(4.73)	2.8(5.69)	3.2(6.4)?	3.7+	186
P. uahukae	1.95	.....	2.6(5.16)	3.0(5.9)?	4—	174
P. micra	1.25	2.3(2.85)	2.8(3.47)	3.2(4.0)?	3.7	169
P. contigua	1.67?	2.5(4.10)	3.1(5.21)	3.7(6.2)?	3.9?	192
P. pura	1.96	2.4(4.7)?	3.0(5.97)	3.6(7.1)?	4—	148
P? pertenuis	1.22	2.4(2.98)	3.0(3.69)	3.7(4.5)?	3¾+	156

Philonesia (Oafatua) fatuhivae, new species (pl. 40, figs. 1-3).

Marquesas: Fatuhiva: BBM. 11372 (100013-4, dissected) on shrubs and tree trunks, damp valley, 3 miles inland, alt. 2,150 ft., Tepapaohivapu (P. Ent. Surv.! Aug. 25, 1930).

Shell (pl. 40, figs. 1-3) similar to *P. lenta* but with higher, more domical spire, sharply but less acutely angulate, with more convex base and deeper foveola. Embryonic whorls of type shell with injury at 1⅝ whorls. Spiral striae sharply cut but distinctly shallower

throughout; growth-wrinkles similar (13-14 per mm. on 4th whorl). Aperture broader and more obtusely angulate, at 90° to shell-axis; peristome about 25° to shell-axis; columella more thickened but less prominently reflected.

Animal also similar but with pigment around edge of sole. Mantle collar paler. Lung with some white behind mantle collar and a few spots along hindgut. Uterus with 4 eggs and 4 embryos. Corona with 7 folds visible. Radula has 38 marginals, of which none is bicuspid and more are 4-cusped; 98 rows counted.

Philonesia (Oafatua) uapouae, new species (pl. 32, figs. 9, 10).

Marquesas: Uapou: BBM. 11373 (98369, dissected), on large rocks, damp valley, alt. 600 ft., Hakahetau Valley trail (P. Ent. Surv.! Dec. 11, 1929); BBM. 98399-400, on *kiekie,* medium damp ridge of Teavatuhai, 3.5 miles inland, alt. 3,000 ft., Hakahetau (ditto).

Shell (pl. 32, figs. 9, 10) similar to *P. lenta* but larger, sublenticular (higher), with slightly more conoid spire, more obtusely angulate on 3d whorl and becoming bluntly so on 4th, with shallow foveola; lighter horn-color, more glossy. Spiral striae weaker (more as in *P. fatuhivae*). Aperture broader, weakly angulate at 80° to shell-axis; peristome about 30° to shell-axis; columella more thickened but with similar abrupt reflection.

Animal also similar but darker and with distinct line between pedal grooves.Mantle-lobes darker. Lung with some dark pigment behind mantle collar and along hindgut and with 3 or 4 large irregular white blotches; 5 times as long as base or thrice kidney length, which is over twice its base or 1.5 pericardial length. Uterus containing 2 eggs and 3 (BBM. 98399) or 4 (98369) embryos; post-uterine oviduct shorter (more as in *P. plicosa*); spermatheca stouter, subcylindrical. Penial sheath covering all epiphallus (98639) or only corona (98399). Jaw with median lobe almost obsolete. Radula has 7 laterals, and 38 marginals, of which 2 are bicuspid and about 28 tricuspid; 97 rows counted.

Philonesia (Oafatua) uahukae, new species (pl. 32, figs. 11, 12).

Marquesas: Uahuka: BBM. 11374 (104917, dissected), on ferns and shrubs, dry hillside, alt. 1,700 ft., Penauhane Valley (P. Ent. Surv.! Feb. 26, 1931).

Shell (pl. 32, figs. 11, 12) similar to *P. lenta* but with subdomical spire, much more obtusely angulated (3d whorl more sharply but more obtusely so than in *P. uapouae*), with less narrow foveola; slightly more glossy, especially below. Spiral striae slightly weaker, especially on embryonic whorls, much more closely spaced (55 visible at end of 1st whorl and becoming more numerous and closer on later ones) both above and below; growth-lines weak (15 per mm. on 3d whorl). Aperture broader and almost evenly rounded; peristome 25° to shell-axis; columella much more heavily calloused, so that reflection is less evident and foveola appears shallower.

Animal similar to *P. uapouae.* Eggs and embryos not counted. Penial sheath only over half of penis proper. Radula has broader (subquadrate) central, 8 laterals, and 34 marginals, of which 1 is bicuspid; 96 rows counted.

Philonesia (Oafatua) micra, new species (pl. 32, figs. 5, 6; pl. 24, fig. 16).

Marquesas: Hivaoa: BBM. 11375 (104634), on ground under dead leaves, ridge, alt. 3,860 ft., Mount Temetiu (Dec. 27, 1930); BBM. 94881, dissected, on ferns and shrubs, damp hillside, along trail, alt. 3,300-3,600 ft.,

north-northwest of summit of Mount Temetiu, Teipunui (March, 1929; both P. Ent. Surv.!).

Shell (pl. 32, figs. 5, 6) similar to *P. lenta* but much smaller and relatively higher, with slightly more conoid spire, scarcely angulate on 3d whorl and evenly rounded on 4th, with relatively broader, deeper and more truncate foveola; little more glossy. Spiral striae more closely spaced, especially on embryonic whorls (more as in *P. uahukae*; suture less impressed and distinctly overriding. Aperture broader, less depressed and evenly rounded; peristome (broken in type) about 10° to shell-axis; columella with heavier foveolar callus.

Animal similar to *P. uapouae*. Right shell-lobe (contracted) about 2.5 times as long as broad base, externally pigmented. Lung 3.5 times as long as base or 2.5 kidney length, which is over twice its base. Uterus containing 3 eggs and 2 embryos; spermatheca (pl. 24, fig. 16) thickest near middle of length. Penial sheath extending beyond corona. Radula has 6 laterals, and 35 marginals, of which 1 is bicuspid and about 27 are tricuspid; 96 rows counted.

P. micra is the smallest known species of *Philonesia.*

Philonesia (Oafatua) pura (Garrett), (pl. 27, figs. 8, 9).

Microcystis pura Garrett, 1887, Bull. Soc. Malac. France **4**: 5.

Marquesas: Hivaoa (= Dominique): BBM. 3904, on decomposing vegetation, ravines in mountains (Garrett!). BBM. 98634, dissected, on ferns and shrubs, damp valley 2.5 miles inland, alt. 3,300 ft., Mount Temetiu (P. Ent. Surv.! Dec. 12, 1929); BBM. 94623, on ferns and shrubs, damp hillside, alt. 3,300-3,600 ft., northeast slope of Mount Temetiu (May 27); BBM. 104692, on ferns and shrubs, damp ridge, alt. 3,900 ft., Mount Temetiu (Dec. 30, 1930. Marquesas: ANSP. 83207 (C. D. Voy!).

Shell (pl. 27, figs. 8, 9) similar to *P. contigua* but larger, with subdomical spire and moderately (less) deep foveola; amber color (bleached in BBM. lots), well polished. Embryonic whorls with faint spiral striae. Later whorls with much weaker spirals and very weak, fine growth-lines above; base with spiral striae just visible under high light; suture well overriding (more as in *P. micra.*) Aperture relatively larger and less depressed; peristome 10° to shell-axis, very weakly arcuate near foveola; columella with quite heavy, foveolar callus.

Animal similar to *P. uapouae* but darker. Right shell-lobe black externally. Lung with considerable dark pigment and long white spots. Eggs and embryos not counted. Spermatheca markedly swollen apically. Jaw with slightly stronger lobe. Radula has more elongate central (about as in *P. hiloi*), 8 laterals, and 39 marginals, of which 1 is bicuspid; 91 rows counted.

In whorl-increase and polish, *P. pura* somewhat approaches the subgenus *Nesarion.*

Philonesia (Oafatua) contigua (Garrett), (pl. 32, figs. 13-15; pl. 24, fig. 19).

Microcystis contigua Garrett, 1887, Bull. Soc. Malac. France **4**: 6.

Marquesas: Hivaoa (= Dominique): BBM. 4400, under rotten wood and dead leaves (type lot). BBM. 94790, dissected, on ferns and shrubs, medium damp ridge, alt. 2,500-3,620 ft., Mount Temetiu, July 24, 1929; BBM. 11450,

on ferns and shrubs, hillside, alt. 3,300-3,600 ft., Teipunui, north-northwest of Mount Temetiu (both lots P. Ent. Surv.! 1929); BBM. 94570, on ferns and shrubs, medium damp hillside, alt. 2,600 ft., south slopes of Mount Ootua (Mumford! March 24, 1929).

Shell (pl. 32, figs. 13-15) similar to *P. micra* but larger and subdiscoid; much more glossy, almost polished. Embryonic whorls with similar but somewhat weaker, spiral striae. Later whorls with more widely spaced, very much weaker, but fairly sharp, spiral striae and weak, quite regular growth-lines (12 per mm. on 4th) above and below; suture slightly more impressed and less overriding. Peristome about 15° to shell-axis.

Animal similar to *P. uapouae*. Right shell-lobe pigmented on both sides. Diaphragm pigmented. Uterus containing 5 very small eggs and 4 embryos; spermatheca (pl. 24, fig. 19) irregularly swollen. Penial sheath including most of epiphallus; penis proper 5 or 6 times as long as prostate and markedly swollen apically. Jaw with weak median lobe. Radula has central much like *P. lenta,* 8 laterals, and 41 marginals, of which 0 or 1 is bicuspid and 32 are usually tricuspid; 106 rows counted.

The shell of *P. contigua* is more or less intermediate in polish and size between those of *P. micra* and *P. pura.* The very large penis is more like that in *Mauka* or in *Fatuoa* (genus *Mendaña*).

Philonesia (Nukupiena) ordinaria, new species (pl. 40, figs. 14, 15; pl. 24, fig. 20).

Marquesas: Nukuhiva: BBM. 11320 (95944, dissected; also 95938), on ferns and shrubs, cloud zone, alt. 3,485 ft., Tunoa Ridge, Pukoko (Oct. 22). BBM. 96116, dissected, 96114, on shrubs, damp ridge, alt. 3,900 ft., Oomu (Nov. 13; all lots P. Ent. Surv.! 1929).

Shell (pl. 40, figs. 14, 15) moderately depressed with subconoid spire, weakly angulate on 4th whorl but becoming barely so at 4⅝, with fairly tumid base and quite narrow, deep foveola; greenish horn-color, tinged with amber toward apex, quite polished and transparent. Embryonic whorls almost 2, soon assuming very weak, spiral striae (only occasionally and irregularly visible in high light). Later whorls with weak, rather closely spaced growth-lines and obsolescent spiral striae (sometimes with a few stronger ones, such as are caused by injuries) above and with spirals just visible on base; suture moderately impressed. Aperture quite evenly rounded; peristome about 20° to shell-axis, concave below; columella rather abruptly thickened, almost straight at 4⅛ whorls, concave at 4⅝ (no very young shells examined).

Animal similar to *P. baldwini* but with end of tail and top of head black (latter with 2 light middorsal stripes). Mantle-lobes tipped with black. Lung with few, small, black dots and large white ones (becoming confluent on sutural side of apical whorls); 4 times as long as base or 2.5 times kidney length, which is thrice its base or almost twice pericardial length. Uterus (pl. 24, fig. 20) with 4 (BBM. 95944) to 1 (96116), ellipsoid eggs and 2 embryos; spermatheca sausage shaped with attenuate apex, almost sessile. Penial sheath including all epiphallus; corona short and broad; penis proper almost twice as large as prostate. Penial prepuce (atrium) with a large, lenticular, externally flocculate, thin-walled sac, opening broadly into its dorsal side. Jaw quite heavily thickened at low rounded median lobe. Radula (similar to that in *P. lenta*) has 8 laterals, and 52 (BBM. 96116) to 59 (95944) marginals, of which 1 is bicuspid and 38 to 45 are usually tricuspid; 96 rows counted.

The genitalia of the section *Nukupiena* (subgenus *Philonesia,* s. s.) appear to be at least as close to those of *Piena* as to those of *Oafatua.* The following key separates its two species:

A. Shell moderately depressed, with smaller whorls.....**P. ordinaria,** new species.

AA. Shell much more elevated, with larger whorls.....**P. inflata,** new species.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	whs.
P. ordinaria type	5.39	165(8.90)	153(8.25)	67(3.61)	130(4.70)	4⅝—
P. inflata type	6.08	136(8.26)	126(7.65)	63(3.86)	119(4.59)	4+

Comparative whorl-sizes

	1½	3.5 wh.	4 wh.	4.5 wh.	whs.	Index
P. ordinaria	1.96	3.0(5.8)?	3.6(7.01)	4.3(8.48)	4⅝—	165
P. inflata	2.26	3.0(6.67)	3.6(8.14)	4.3(9.7)?	4+	136

Philonesia (Nukupiena) inflata, new species (pl. 28, figs. 11, 12; pl. 25, fig. 5).

Marquesas: Nukuhiva: BBM. 11321 (95982-5, dissected), on shrubs, damp ridge, alt. 3,500-4,000 ft., Ooumu (P. Ent. Surv.! Nov. 11, 1929).

Shell (pl. 28, figs. 11, 12) similar to *P. ordinaria* but thinner and much more elevated, with larger whorls, a little more angulate on early 4th whorl but becoming barely so near end, with more tumid base and deeper foveola; light greenish horn-color, tinged with fuscous at apex, more transparent. Later whorls with more injury spirals above. Aperture higher, slightly flattened above periphery; columella slenderer, almost straight at 3.5 whorls and concave at 4.

Animal also similar but coloration lighter. Lung with numerous, elliptical, white blotches. Uterus with 3 eggs and 3 embryos. Atrial sac (pl. 25, fig. 5) less extensive. Jaw with very low median lobe. Radula has 7 laterals, and 76 marginals, of which 58 are usually tricuspid (although first 3 often have bifid or trifid mesocones and others may add a cusp; 109 rows counted.

The whorl-increase of the shell in *P. inflata* is considerably greater than in *P. ordinaria,* but a larger proportion of it takes place vertically.

Philonesia (Uafatua) fusca (Pease), (pl. 31, figs. 9, 10; pl. 25, figs. 1-3).

Vitrina fusca Pease, 1868, Am. Jour. Conch. **4**: 155, pl. 12, fig. 6; Pfeiffer, Monogr. **7**: 26; Tryon, Manual **1**: 158, pl. 35, figs. 6-8.

Vitrina subviridis Pease, 1868: 154, pl. 12, fig. 5, Marquesas; Pfeiffer, Monogr. **7**: 26; Tryon, Manual **1**: 158, figs. 3-5.

Helicarion succineus "Mousson" Garrett, 1887, Bull. Soc. Malac. France 4: 3, in synonymy.

Marquesas: [Uahuka]: ANSP. 49270 (*Vitrina fusca*); ANSP. 49269 (*V. subviridis*). BBM. 3321 (Garrett!). BBM. 95490, dissected, on shrubs, damp ridge, alt. 2,350 ft., crest of north range, south-southwest of Katohau Bay (P. Ent. Surv.! Sept. 24, 1929); BBM. 95493, form *subviridis,* same locality.

Shell (pl. 31, figs. 9, 10) vitrinoid, largely epidermal, evenly rounded at periphery, with narrow, deeply impressed, incomplete foveola; dark olive (*fusca*) or light greenish (*subviridis*) horn-color, often darker above than below and commonly with vague, supraperipheral and subsutural bands of deeper color, polished and transparent. Embryonic whorls 1.6, soon assuming weakly impressed fine spiral striae and later developing coarse, but low growth-wrinkles. Later whorls with very superficial, weak growth-wrinkles and obsolescent spiral striae above and below; suture lightly impressed, well overriding. Aperture subcircularly lunate; peristome about 20° to shell-axis, weakly arcuate above, concave below; columella thin and sharp.

Animal similar to *P. baldwini* but with sides of foot and top of head black; dorsum of tail flattened and colorless, with deep narrow black dorsomedian groove. Right shell-lobe (LR, pl. 25, fig. 3) not much larger; umbilical lobe small and close to heart; left mantle-lobes (MA and MP) deeply divided (as usual in *Philonesia*). Lung with black band behind mantle collar and much black pigment along hindgut and around kidney, and with a few chalky spots along pericardium and pulmonary vein; border along hindgut over twice as long as base of lung or twice length of kidney, which is attenuate anteriad, 3 times as long as its base and 2.5 times pericardial length; opposite border very short. Ovotestis consisting of 5 conical groups of clavate alveoli; uterus (pl. 25, fig. 1) relatively short, containing 2 eggs and 2 embryos; post-uterine oviduct almost as long as uterus; spermatheca sessile, sausage shaped. Prostate relatively elongate; penial sheath including about half of epiphallus; corona short and broad, internally with more and nodulate folds; penial retractor inserting widely near penial apex (also attached to epiphallus); penis proper stout, about 1.5 times bulk of prostate. Penial prepuce and atrium short, opening slightly behind and between inferior and ocular tentacles. Jaw with weak to very weak median lobe. Radula (pl. 25, fig. 2) has rather wide central, 10 laterals, with smallish but persistent entocones, and 49 marginals with more prominently raised blades, of which 2 are usually bicuspid, next 17 are usually tricuspid, and outermost are short and broad; 112 rows counted.

The *"fusca"* and *"subviridis"* color-forms occur in other species of this group.

The *Helicarion*-like shell and relatively short lung are about the only reasons for the separation of *Nesarion* (especially the section *Uafatua*) as a subgenus. Peculiarly enough, the right shell-lobe of *Philonesia fusca* does not appear to be relatively much larger than in some species of *Philonesia,* s. s. and the genitalia of *Uafatua* present no striking differences except the relatively short uterus. These rather surprising anatomical similarities helped to convince me that *Helicarion*-like shells have arisen in many divergent lines of the Helicarionidae, are not necessarily indicative of any great amount of differentiation, and certainly do not mean that the species or groups which develop them are closely related to each other.

The species of the section *Uafatua* are outlined in the following key:

A. Shell diam. (3 wh.) about 10.5 mm., growth-lines extremely weak, whorls depressed, spire low; Uahuka:.....**P. fusca** (Pease).

AA. Shell diam. less than 8 mm.;

B. Growth-lines not so very weak; whorls more depressed and spire higher than in *P. fusca*; Uapou:.....**P. helicarion,** new species.

BB. Growth-lines extremely weak; last whorl deflected downward so aperture is more oblique; spire low; Fatuhiva:.....**P. obliqua,** new species.

Dimensions in subgenus Nesarion

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	3 wh.	whs.
P. fusca								
Pease	7	(10)	.....	.....	.....	.....	.....	4 [3]
BBM. 95490	7.32	147(10.75)	127(9.28)	80(5.84)	108(6.32)	3.58	3.0(10.58)	3+
P. helicarion								
type	4.91	151 (7.40)	134(6.58)	77(3.78)	109(4.10)	1.99	3.0 (6.00)	3.4
P. obliqua								
type	5.84	137 (8.00)	114(6.64)	82(4.80)	98(4.72)	2.33	3.2 (7.53)	3.1
P. tenuissima								
type	3.86	146 (5.64)	123(4.74)	82(3.15)	109(3.43)	1.72	3.5 (5.95)	3—
P. t. obesior								
type	5.38	134 (7.18)	112(6.00)	77(4.15)	101(4.18)	1.96	3.0 (5.95)	3.3
P. t. tahuatae								
type	5.38	138 (7.43)	121(6.49)	76(4.11)	99(4.07)	1.79	3.9 (7.06)	3⅛

Philonesia (Uafatua) helicarion, new species (pl. 40, figs. 4-6; pl. 25, fig. 4).

Marquesas: Uapou: BBM. 11376 (98355, dissected), on ferns and shrubs, medium to damp valley, alt. 2,000-2,800 ft., Hakahetau Valley (P. Ent. Surv.! Dec. 8, 1929).

Shell (pl. 40, figs. 4-6) similar to *P. fusca* but much smaller, with more depressed whorls; typically darkish horn-color but usually paler; even thinner. Embryonic whorls 1½, with slightly sharper, spiral striae but finer growth-wrinkles. Later whorls with considerably more distinct (but weak) growth-wrinkles and more evident, fine, spiral striae above and below; suture less lightly impressed but well overriding. Peristome a little more arcuate above.

Animal also similar but foot brownish and spotted. Shell-lobe and mantle lappets dark externally. Lung with black spots along hindgut. Eggs and embryos not counted; post-uterine oviduct (pl. 25, fig. 4) shorter. Penial sheath including all epiphallus; corona apparently more elongate but not sharply demarcated apically; penis proper more elongate and relatively larger. Jaw with somewhat more distinct median lobe. Radula has slightly more elongate central, 9 laterals, and 52 marginals, of which 2 or 3 are bicuspid and about 42 tricuspid; 95 rows counted.

Philonesia (Uafatua) obliqua, new species (pl. 31, figs. 13, 14).

Marquesas: Fatuhiva: BBM. 11377 (100007, dissected), on shrubs and tree trunks, damp valley, over 3 miles inland, alt. 2,150 ft., Tepapaohivapu (P. Ent. Surv.! Aug. 25, 1930).

Shell (pl. 31, figs. 13, 14) similar to *P. helicarion* but considerably larger, with more rapidly increasing whorls deflected downward so as to produce a higher shell with lower spire, with broader, less impressed, more incomplete foveola; light greenish horn-color, often with darker suture, more polished. Later whorls with much weaker growth-wrinkles but with little weaker spiral striae. Aperture considerably broader, but deflected downward.

Animal similar to *P. fusca* but more lightly pigmented, especially on sides of foot. Right shell-lobe relatively broader. Lung with or without few large black blotches; about 1 2/3 as long as kidney, which is 2.5 times as long as its base or 1 2/3 pericardial length. Uterus containing 3 eggs and 3 embryos; other genitalia very similar to those of *P. helicarion* but epiphallar corona short. Jaw and radula as in *P. helicarion,* but centrals and 8 laterals still more elongate; 53 marginals present, of which 2 to 4 are bicuspid and 38 usually tricuspid; 111 rows counted.

Philonesia (Nesarion) tenuissima, new species (pl. 31, figs, 11-12; pl. 25, figs. 6-8).

Marquesas: Hivaoa: BBM. 11378 (94550, dissected), on ferns and shrubs, medium damp hillside, alt. 3,600 ft., north slope of Mount Temetiu (Mumford! March 24, 1929); BBM. 94869, alt. 3,100 ft., Ponaohumu (P. Ent. Surv.! Aug. 3, 1929); BBM. 104715-6, alt. 3,900 ft., Mount Temetiu (Dec. 31); BBM. 94813, alt. 2,770, Kopaafaa (Aug. 2, 1929); BBM. 94879, alt. 3,300-3,600, Teipunui; BBM. 94835, alt. 3,000-3,200, Tepuna (Aug. 3, 1929); BBM. 98768-9, alt. 3,800 ft., Matauuna (March 3, 1929).

Shell (pl. 31, figs. 11, 12) similar to *P. helicarion* but thinner and more fragile, with whorls so rapidly increasing in height that foveola is almost lacking; typically light greenish horn-color but intergrading with dark amber shells; more polished and more transparent. Embryonic whorls with slightly weaker (very weak), fine spiral striae. Later whorls with extremely shallow growth-lines and with slightly more obsolete spiral striae (although often with some injury spirals) above; base with weak and diffuse spirals; suture less impressed (more as in *P. fusca*).

Animal similar to *P. fusca* but considerably darker in color. Mantle collar (pl. 25, fig. 6) with very broad right shell-lobe (LR) and mantle-lobes (MR and ML) black; left mantle-lobe (ML) undivided although with anterior end enlarged. Lung jet black; about 1.5 times as long as kidney, which is thrice as long as its base or 2¼ pericardial length. Eggs and embryos not counted; post-uterine oviduct and spermatheca (pl. 25, fig. 7) shorter. Penial sheath including epiphallic corona; penis proper 3 or 4 times as large as prostate. Radula (pl. 25, fig. 8) has much more elongate central, 10 elongate laterals, with entocone becoming obsolescent on last, and 72 marginals, of which inner 4 are often bicuspid; 108 rows counted.

P. tenuissima is the only species recognized in the section *Nesarion,* s. s., but the three very distinct subspecies are defined in the following key:

A. Shell with depressed whorls; penis relatively short and stout; Hivaoa: type locality Mount Temetiu.....typical subspecies.

AA. Shell with more obese whorls; penis elongate;

B. Shell polished, with larger embryonic whorls than typical form; Hivaoa: type locality Mount Ootua .....subspecies **obesior,** new.

BB. Shell with slightly stronger spiral striae; whorl-increase more rapid; Tahuata: .....subspecies **tahuatae,** new.

Philonesia (Nesarion) tenuissima obesior, new subspecies (pl. 40, figs. 12, 13).

Marquesas: Hivaoa: BBM. 11379 (94598, dissected), alt. 3,000 ft., summit Mount Ootua (E. P. Mumford! May 10, 1929); BBM. 115683, on *Weinmannia* and *Metrosideros,* damp place, alt. 2,820 ft., Kaava Ridge (P. Ent. Surv.! June 1, 1932).

Shell (pl. 40, figs. 12, 13) similar to typical *P. tenuissima* but with higher whorls; typically greenish horn-color tinged with amber but occuring in both dark and light forms. Embryonic whorls larger; 2d with weaker spiral striae. Suture slightly more impressed (less so than in *P. helicarion*), becoming dark-colored on 4th whorl. Aperture higher and more oblique (somewhat approaching that of *P. obliqua*).

Animal similar to typical subspecies but very much paler in color throughout. Post-uterine oviduct and spermatheca longer. Penial sheath including most of epiphallus; corona somewhat more elongate; penis proper about 5 times as long as prostate and similar to that of *P. contigua* in shape. Radula has 9 laterals, and 67 marginals, of which first is often bicuspid; 98 rows counted.

Philonesia (Nesarion) tenuissima tahuatae, new subspecies (pl. 31, fig. 15).

Marquesas: Tahuata: BBM. 11380 (99744), on ferns and shrubs, damp valley, 3 miles inland, alt. 2,000 ft., Ivaivaiti (P. Ent. Surv.! June 28, 1930).

Shell (pl. 31, fig. 15) similar to typical *P. tenuissima* but with more rapid whorl-increase and so becoming larger; typically yellowish horn-color, less polished and less transparent. Embryonic whorls with slightly stronger spiral striae. Later whorls larger with sharper spiral striae (more as in *P. helicarion*). Aperture becoming still higher but appearing less oblique than in subspecies *obesior.*

Philonesia (Rapafila) zimmermani, new species (pl. 40, figs. 7-9; pl. 25, figs. 9, 10).

Austral Islands: Rapa (northwest): BBM. 11383 (135315), on ferns, shrubs, tree trunks and *Freycinetia,* alt. 1,500-1,800 ft., damp east ridge of Mount Perahu (Mangarevan Exped.! July 21, 1934); BBM. 135380, dissected, alt. 1,200-1,600 ft. (July 28, 1934).

Shell (pl. 40, figs. 7-9) lenticular, with carina demarcated by weak concavities, with convex base and narrow, deep foveola; light greenish horn-color; thin and transparent, largely epidermal, highly glossy above and more so below. Embryonic whorls 2 to 2.4; first soon assuming coarse rounded growth-wrinkles and very fine but quite sharply impressed spiral lines; 2d developing neanic sculpture. Later whorls with fairly regular, low but sharply cut, major growth-wrinkles (8-9 per mm. at end of 3d), decussated by impressed, major, spiral lines like those caused by injuries (20 on 4th) as well as fine minor ones above; base more polished with spirals blurred; suture weakly impressed, assuming fine chestnut line near middle of 3d whorl and narrowly overriding. Aperture

quite broad, sharply angulate at 80° to shell-axis; peristome 15° to shell-axis, very weakly arcuate near foveola; columella short, steeply inclined, weakly thickened and rounded.

Animal similar to *P. baldwini* but with row of spots between pedal grooves and little pigment below; dark brown above (red when alive), becoming lighter on top of head and with broad white band along large dorsomedian groove of tail. Right shell-lobe long (similar to that of *P. fusca*). Lung dark behind mantle collar and along hindgut, with numerous chalky dots; dimensions not noted. Ovotestis (pl. 25, fig. 10) consisting of 4 or 5 masses of branched alveoli; hermaphroditic duct extremely long; uterus (not full) containing 2 large eggs and 1 embryo; post-uterine oviduct barely represented; spermatheca shorter, with stalk and ellipsoid sac subequal in length. Penial sheath including epiphallic corona, which is about twice as long as broad with very few internal folds (not shown in figure); penis proper little larger than prostate; atrium very short, opening little behind right inferior tentacle. Jaw with low, but broad and distinct, rounded median lobe. Radula (pl. 25, fig. 9) has subquadrate central, 6 tricuspid laterals, and 32 marginals, of which 1 to 3 are bicuspid and few tricuspid (2d sometimes 4-cusped); 81 rows counted.

P. zimmermani is named for Elwood C. Zimmerman, who was the entomologist on the Mangarevan Expedition. The species and subspecies of the subgenus *Rapafila* are outlined in the following key:

A. Shell acutely angulate, with deep, narrow foveola; highly glossy with sharp sculpture ..... **P. zimmermani,** new species.

B. Shell lenticular, subcarinate, larger, with about 20 major spirals decussated by growth-wrinkles above; Mt. Perahu: ..... typical subspecies.

BB. Shell higher, scarcely carinate, smaller, without major spirals although with sharp minor ones; near Mt. Tautautu ..... subspecies **tautautui,** new.

AA. Shell more obtusely angulate, with broader, shallower foveola; more polished with weaker sculpture ..... **P. tenuior,** new species.

C. Shell smallest, suborbicular, with stronger spirals and growth-wrinkles; Karapo Rahi Islet: ..... subspecies **karaporahi,** new.

CC. Shell subdiscoid, larger and highly polished; Mt. Perahu: ..... typical subspecies.

Comparative whorl-sizes in subgenera Nesarion and Rapafila

	1½	3 wh.	3.5 wh.	4 wh.	Maxima	Index
P. fusca	3.58	3.0(10.58)	4.0(14.3)?	.....	3+	147
P. helicarion	1.99	3.0 (6.00)	4.0 (7.9)?	.....	3.4	151
P. obliqua	2.33	3.2 (7.53)	4.3(10.0)?	.....	3.1	137
P. tenuissima	1.72	3.5 (5.95)	4.5 (7.8)?	.....	3—	146
P. t. obesior	1.96	3.0 (5.95)	4.0 (7.8)?	.....	3.3	134
P. t. tahuatae	1.79	3.9 (7.06)	.....	.....	3⅛	138
P. zimmermani	2.75	.....	3.5 (9.64)	4.3(11.8)?	3.5	224
P. z. tautautui	2.51	2.6 (6.42)	3.2 (8.04)	4.0(10.0)?	3.6	183
P. tenuior	2.45	.....	3.5 (8.47)	4.3(10.5)?	3.9+	223
P. t. karaporahi	2.11	2.8 (5.91)	3.6 (7.5)?	4.4 (9.3)?	3.4+	191

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	3.5 wh.	whs
P. zimmermani type	4.31	224 (9.64)	204(8.78)	72(3.12)	168(5.24)	2.75	3.5(9.64)	3½
P. z. tautautui type	4.52	183 (8.25)	168(7.60)	72(3.26)	138(4.49)	2.51	3.2(8.04)	3.6
P. tenuior type	4.56	223(10.16)	201(9.19)	75(3.41)	160(5.45)	2.45	3.5(8.47)	3.9+
P. t. karaporahi type	3.88	191 (7.41)	171(6.62)	77(2.99)	138(4.12)	2.11	3.6(7.5)?	3.4+

Philonesia (Rapafila) zimmermani tautautui, new subspecies (pl. 32, figs. 1-2).

Austral Islands: Rapa (south): BBM. 143282, dissected, on ferns and shrubs, damp hillside, alt. 750 ft., northwest of Mount Tautautu (Mangarevan Exped.! July 25, 1934).

Shell (pl. 32, figs. 1, 2) similar to *P. zimmermani* but smaller, more elevated and so appearing to have less rapid whorl-increase, acutely angulate but barely carinate, with more tumid base; light olive horn-color and more glossy above. Later whorls practically without major spirals but with similar growth-wrinkles and with even sharper minor spiral lines. Aperture weakly angulate.

Philonesia (Rapafila) tenuior, new species (pl. 40, figs. 10, 11; pl. 25, figs. 11, 12).

Austral Islands: Rapa (northwest): BBM. 11381 (135408), on ferns, shrubs, tree trunks, and *Freycinetia,* alt. 1,600-1,800 ft., damp east ridge of Mount Perahu; BBM. 135379, dissected, alt. 1,200-1,800 ft. (Mangarevan Exped.! July 28, 1934).

Shell (pl. 40, figs. 10, 11) similar to *P. zimmermani* but smaller (attaining larger whorl-sizes), more discoid, rather obtusely but sharply angulate, with moderately broad, shallower foveola; light yellowish-green horn-color, well polished, with heavier epidermis. Embryonic whorls 2⅞ to 2⅜; first with similar sculpture. Later whorls very smooth, but with extremely fine spiral striae and superficial growth-lines above; base with obsolescent spiral lines; suture slightly more impressed, assuming similar chestnut line. Aperture barely angulate; peristome almost straight below; columella more inclined, with stronger foveolar callus.

Animal also similar but with rows of dark spots above and below pedal grooves; head dark with 3 dorsomedian black lines. Right shell-lobe (contracted) triangular. Lung with black, transverse flammulations along hindgut. Ovotestis with 6 groups of alveoli and smaller duct (pl. 25, fig. 11); uterus containing 3 small eggs and 2 large embryos; spermatheca slenderer. Penial sheath folded around base of penis but attached to epiphallus; penis proper somewhat larger. Jaw with extremely low, rounded, median lobe. Radula (pl. 25, fig. 12) has slightly more elongate central, 10 laterals, with smaller entocone absent from last, and 51 marginals, of which 1 is bicuspid, about 21 are tricuspid and outermost are short; 102 rows counted.

Philonesia (Rapafila) tenuior karaporahi, new subspecies (pl. 32, figs. 3, 4).

Austral Islands: Rapa (south): BBM. 11382 (144495-6, dissected), medium dry hillside, Karapo Rahi Islet (Mangarevan Exped.! July 18).

Shell (pl. 32, figs. 3, 4) similar to *P. tenuior* but smaller (only lesser whorl-sizes known), somewhat more elevated and more obtusely angulate; less polished. Later whorls with more distinct growth-wrinkles (7-8 per mm. near end of 3d and considerably sharper minor spiral striae above and below (weaker than in *P. zimmermani*).

Although the subspecies of *P. zimmermani* and *P. tenuior* are somewhat intermediate between the two typical forms, the gap between the two species still remains wide enough.

Philonesia (?) pertenuis (Gould), (pl. 30, fig. 15).

Helix pertenuis Gould, 1846, Proc. Boston Soc. N. H. **2**: 172 [20]; Pfeiffer, Monogr. **1**: 38 [3:40-4:17-5:58-7:71]; Gould, Exped. Shells; 45, pl. 5, fig. 60,*a-c* (poor). *Nanina pertenuis* Tryon, Manual **2**: 116, pl. 38, figs. 65-67 (copied). *Microcystis pertenuis* Cooke, 1934, BBM. Occ. Papers **10** (11):4 (not found by Emory or Mrs. Wilder!).

Tuamotu: Makatea (= Aurora): USNM. 5462 (Couthouy!).

Shell (pl. 30, fig. 15) evidently not full grown, with rapidly deepening whorls, becoming obtusely angulate on 4th whorl; base tumid with narrow, quite deep foveola; dullish and fairly heavy. Later whorls with sharp spiral striae above and fairly strong ones below; suture quite well impressed. Aperture large, weakly angulate at 70° to shell-axis; columella heavily callused, but without spiral fold.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	3.5 wh.	whs.
Gould	2.54	(3.2)	.....	.....	.....	.....	.....	4.5
fig.	1.85	173(3.2)	169(3.12)	80(1.48)	107(1.58)	.....	.....	
USNM. 5462	2.64	156(4.11)	140(3.69)	77(2.03)	111(2.25)	1.22	3.0(3.69)	3¾+

The USNM. shell fits Gould's description fairly well but has fewer whorls; it bears slight resemblance to the figure in the U. S. Exploring Expedition shells, which is much too depressed. It looks more like a *Philonesia* than anything else, but is smaller than any except *P. micra.* It has not been found by subsequent collectors, and all the other species of the Philonesiae are known to occur only on the higher, volcanic islands.

Genus KAALA Cooke, new

Kaala Cooke, new genus; type *K. subrutila* (Mighels) from Kaala (BBM. 36606).

Kaala subrutila (Mighels), (pl. 41, fig. 2; pl. 28, fig. 15; pl. 21, figs. 5, 6).

Helix subrutila Mighels, 1845, Proc. Boston Soc. N. H. **2**: 19 (at least in part); Pfeiffer, Monogr. **1**: 39 [3:41-4: 17-5: 59-7: 73]. *Microcystis subrutila* Ancey, 1889, Bull. Soc. Malac. France **6**: 208 (not identified).

Hawaiian islands: Oahu [Waianae Mountains, Waialua]. BBM. 54192, dissected, on dried fern stalks, just below top of east ridge near spring, Kaala (Oswald! May 5, 1923); BBM. 36606, dissected by Cooke, Haleauau, east slope of Kaala (Spalding! Aug. 14, 1914).

Shell (pl. 41, fig. 2) solid, with almost domical spire, distinctly angulate on 3d whorl, weakly so on 4th and scarcely so on 5th; base rounded, with deep moderately wide foveola; amber horn-color above, becoming lighter and more greenish below and on 5th whorl; polished and very translucent. Embryonic whorls 2⅛ to 2⅜, soon assuming fine and faint spiral striae (often partially erased in old shells). Later whorls with fairly sharp, rather closely spaced growth-lines and weak spiral striae; base with weaker spirals; suture moderately impressed. Aperture somewhat depressed but rounded at periphery; peristome about 10° to shell-axis, concave below. Columella truncated by a sharp, short, spiral lamella at 2.5 whorls, with a heavier, more rounded cord at 3.2 whorls (pl. 28, fig. 15) and evenly thickened and rounded, but markedly although obliquely truncate at 4.5 whorls.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	whs.
Mighels	.....	(7.6-10.15)	.....	.....	.....	5
BBM. 36606	6.30	169(10.63)	163(10.25)	65(4.09)	129(5.26)	4.6

Comparative whorl-sizes

	1½	3.5 wh.	4 wh.	4.5 wh.	5 wh.
BBM. 36606	2.69	2.9 (7.8)?	3.4 (9.05)	3.9(10.38)	4.4(11.8)?

Animal similar to *Philonesia baldwini*; foot dark, especially below and between pedal grooves and on head and tail. Right shell-lobe long triangular, 4 or 5 times as long as its base, dark externally; left shell-lobe absent; mantle-lobes dark, left one deeply bipartite. Lung with considerable black pigment, especially behind mantle collar and around edges of organs or almost colorless (BBM. 36606), with numerous or few (36606), white spots of various sizes; 3 1/3 times as long as its base or thrice length of kidney, which is 1.5 times as long as its base or length of pericardium. Hermaphroditic duct (GD; pl. 21, fig. 6) moderately long; uterus (UT, not filled) containing 5 small eggs and 1 embryo (2 embryos in one specimen of 36606; several large eggs in another); post-uterine oviduct moderate in length. Penial sheath including half of epiphallus; corona (EC) over 1/3 as large as penis proper and about as broad as long; penial retractor (PR) arising near right side of uterus opposite its middle (lower in 36606) and inserting just below middle (ED) of epiphallus and on penial apex; penis proper (P) short and stout, about as large as prostate (DG), with irregular internal folds. Penial prepuce (YP) greatly swollen, fully as large as penis proper, with thickened walls on left side but without diverticulum or sac; atrium proper (Y) short, opening

near base of right inferior tentacle. Jaw with quite low and rounded, but distinct, median lobe, and with quite sharp longitudinal and growth striations. Radula (pl. 21, fig. 5) has slightly elongate central, 9 laterals (9-11 in 36606) with smallish entocone lost from last, and 45 marginals (47-52 in 36606), of which 0 to 2 are strictly bicuspid and about 22 are usually tricuspid; 104 rows counted.

The identification of *Kaala subrutila* with Mighels' brief description is confessedly somewhat dubious; *Hiona pilsbryi,* for example, would fit it almost equally well. Considering his diagnosis to cover several species, the present one is selected.

The genus *Kaala,* of which *K. subrutila* is the only known species, combines a shell that would place it in *Hiona* with an animal (especially the radula) more like that in *Philonesia.* Its very large penial prepuce, especially as compared to the size of the penis proper, is its most distinctive feature and somewhat resembles the condition in some species of *Lamprocystis.*

Genus HIONA Cooke, new

Hiona Cooke, new genus, type *H. plœtyla* (Ancey) from back of Mokuleia [BBM. 17213].

Neutra new subgenus, type *H. lymaniana* (Ancey) from Konahuanui [BBM. 16655].

Uapuneutra, new subgenus, type *H. cookeana,* new species.

Insulorbis, new subgenus, type *H. monticola,* new species.

Minororbis, new subgenus, type *H. cultrata* (Gould) from Aorai trail [BBM. 145375].

Opara, new subgenus, type *H. orbis* (Beck) from Mount Perahu [BBM. 135305].

Aukena, new subgenus, type *H. tridentata,* new species.

Hionarion, new subgenus, type *H. pilsbryi,* new species.

Hionella, new subgenus, type *H. rufobrunnea* (Ancey) from Olaa [BBM. 39573].

Nesocyclus, new subgenus, type *H. exaequata* (Gould) from Wailua Valley [BBM. 81357].

The genus *Hiona,* as used here, is mainly distinguished by the slender bicuspid principal marginals of its radulae. It may possibly be polyphyletic, but the hiatus between it and *Philonesia* seems greater than the gaps between its various subgenera. Of the last, *Insulorbis* is, on the basis of its anatomy, especially in its peculiar epiphallic corona, one of the most isolated and compact groups, but the diversity of its conchologic differentiation approaches that of the entire genus. *Neutra* and *Opara* seem quite closely related anatomically, although the shell of the former is most like that of *Philonesia* while that of *Opara* closely parallels the extreme development in *Hiona,* s. s. From

its geographic location, the subfossil *Aukena* may be related to either *Insulorbis* or *Opara,* but parietal and basal teeth are not developed in any other group of Microcystinae. *Hionarion* and *Hiona,* s. s. agree in the development of a left shell-lobe, but the former produces, in *H. wahiawae,* an almost *Helicarion*-like shell while the latter tends to develop a columellar lamella and a closely coiled shell.

As may be noted from the above discussion, I am inclined to consider the *Philonesia*-like shells as usually the most primitive, and to regard the development of a columellar cord or lamella as a constantly recurrent tendency in the genus, and, in fact, throughout the Microcystinae. If so, these folds must be coenogenetic characters, since, in these genera, and in some other zonitoid groups (*Paravitrea* and *Pilsbryna*), similar complications of the shell are usually strongest in the younger shells and tend to disappear in the older specimens. Possibly, in these snails with continuous growth, the armature of the aperture and last whorl may offer protection against enemies, but restrict, to some degree, the functioning of the ripe genitalia.

Key to the subgenera of the genus Hiona

A. Shell without parietal or basal armature at any stage of growth;

B. Mantle without left shell-lobe; penial atrium without diverticulum; Hawaiian islands [Oahu: *Neutra,* s. s. with weakly truncate columella] and from Marquesas to Society and Austral Islands (Rapa):

C. Slender part of epiphallus entering apex of corona; penial retractor inserting above and below corona; shell either larger or more discoid;

D. Inner laterals of radula with weak entocones; outermost marginals multicuspid; shell with rapid whorl-increase and without subcolumellar plate; diam. (4 wh.) more than 10 mm.; Hawaiian and Marquesas islands: Oahu (Koolau Range) and Uapou: ..... subgenus **Neutra,** new.

DD. Inner radular laterals with strong entocones; all marginals fundamentally bicuspid but outermost with major cusps multifid; shell subdiscoid with gradual whorl-increase and subcollumellar plate (adnate lamella); diam. (6 wh.) about 10 mm.; Tubuai (Rapa): ..... subgenus **Opara,** new.

CC. Slender part of epiphallus entering below coronal apex, on which penial retractor attaches; shell smaller than D and less discoid than DD, with or without subcolumellar plate; Society [also (?) Tuamotu and Marquesas?] Islands: ..... subgenus **Insulorbis,** new.

BB. Mantle edge with left shell-lobe (not always visible in *H. perkinsi,* which has atrial diverticulum); Hawaii (Oahu species with columellar lamella or plate):

E. Both shell-lobes large; penial atrium not markedly swollen; shell with quite rapid whorl-increase and with simple columella in postembryonic stages; diam. (4 wh.) about 10 mm.; Kauai: ..... subgenus **Hionarion,** new.

EE. Left shell-lobe small; shell usually with gradual to medium whorl-increase (excluding *H. milolii*) and with columellar plate, lamella or truncation until near maximum whorl-size (excluding *Hionella* from Molokai to Hawaii:); diam. (4 wh.) less than 8 mm.; Kauai to Hawaii, Hawaiian islands:.... .....subgenus **Hiona,** s. s.

AA. Shell with parietal and basal lamellae at 4.7 whorls [absent at 5+]; columella (basal angle) with steeply inclined spiral ridge; subfossil; Tuamotu: Mangareva.....subgenus **Aukena,** new.

Hiona (Neutra) lymaniana (Ancey), (pl. 37, fig. 3; pl. 25, figs. 16-18).

Microcystis lymanniana Ancey, 1893, Mem. Soc. Zool. France **6**: 329. *Philonesia lymanniana* Sykes, 1899, Fauna Haw. **2**: 284. *P. lymaniana* Caum, 1928, BBM. Bull. **56**: 63.

Hawaiian islands: Oahu (Koolau Range, Honolulu): BBM. 18888 (type), Waialae Valley (Lyman!). BBM. 16655, dissected (also by Cooke), Konahuanui (Spalding! June 21, 1908); BBM. 13226, near top of Konahuanui (Cooke! Aug. 6, 1905); BBM. 17600, top Konahuanui (Cooke! Dec. 21, 1908). BBM. lots, Lanihuli. (Koolauloa); ANSP. 128056, ridge above Kahana (Pilsbry! Aug. 5, 1920).

Shell (pl. 37, fig. 3) large, with quite domical spire, strongly angulate in embryo, weakly angular on 5th whorl, with narrow and shallow foveola; darkish brown to brownish olive, quite polished and translucent above, well polished and transparent below. Embryonic whorls around 1¾, with fine weak spiral striae. Later whorls with weak, closely spaced but quite regular and distinct growth-lines (10 per mm. on last) and with spirals just visible above and almost erased (only sporadically visible in high light) below. Aperture fairly broad, slightly oblique, almost evenly rounded; peristome about 15° to shell-axis and almost straight below. Columella with a low, steeply inclined, spiral cord (like pl. 11, fig. 9) in embryo; heavy, white, rounded and weakly truncate below at 4.2 whorls [at 3 whorls, sometimes quite sharply truncate (128056)].

Animal similar to *H. platyla* but slightly darker on top of head and tip of tail. Mantle collar blackish with white flecks; right shell-lobe 4 or 5 times as long as its relatively broader, pigmented base and about equalling diameter of mantle collar; left shell-lobe absent; mantle-lobes densely pigmented. Lung with numerous small chalky spots; 4.5 times as long as base or 2.6 times kidney length, which is almost thrice its base or twice pericardial length. Uterus containing 1 or 2 eggs and 2 embryos (not pregnant in pl. 25, fig. 17); spermatheca longer. Penial sheath including all epiphallus or folded around base of penis (Cooke's dissection); penial retractor arising near posterior margin of diaphragm and connecting to a loop of epiphallus; corona slightly longer than broad; penis proper over 3 times as long as prostate. Penial prepuce moderate in length, with two internal pilasters. Jaw with broadly rounded but conspicuous median lobe. Radula (pl. 25, figs. 16, 18) has subquadrate central, 9 shortish laterals (Cooke counted 9 to 11), with very small entocone usually disappearing from last, and 47 (Cooke found 48-54) less elongate marginals, of which 16 to 18 (Cooke got 23-31) are bicuspid; 105 rows counted.

Since the collector's name is actually Lyman, the original spelling, *M. lymanniana,* is evidently a *lapsus menti,* and Caum's apparently unconscious correction is accepted. *H. lymaniana* is the largest species of Microcystinae in the Hawaiian islands, although *H. wahiawae* is bigger at 3.5 whorls. No other

specimens as bulky as the type have been collected, but, as may be seen from the table of comparative whorl-sizes, the difference is simply a matter of the number of whorls attained.

The following key briefly defines the two monotypic sections of the subgenus *Neutra*:

A. Radula with about 50 marginals, of which 16-31 are bicuspid but only moderately elongate; shell with less rapidly increasing but more whorls; Hawaii: Oahu (Koolau Range):.....section **Neutra,** s. s.; **H. lymaniana** (Ancey).

AA. Radula with around 94 marginals, of which 28-40 are long, very slender and bicuspid; shell with more rapidly increasing but fewer whorls, glossy, with quite sharp spirals above; Marquesas; Uapou:.....
.....section **Uapuneutra,** new; **H. cookeana,** new species.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	3.5 wh.	whs.
H. lymaniana								
Ancey	7	186(13)	157(11)	79(5.5)	.....	.....	.....	5
BBM. 16655	6.53	171(11.15)	157(10.25)	72(4.70)	125(5.85)	2.56	3.4 (8.79)	4.2
H. cookeana								
type	6.70	196(13.15)	172(11.53)	70(4.67)	158(7.37)	3.44	3.9(13.4)?	3.5—
largest	7.26	198(14.35)	178(12.97)	70(5.07)	156(7.93)	3.07	4.4(13.37)	3.7

Comparative whorl-sizes in subgenera Neutra and Hionarion

	1½	3 wh.	3.5 wh.	4 wh.	5 wh.		
H. cookeana	3.44	3.0(10.48)	3.9(13.38)	4.6(15.8)?	.....	3.5—	196
	3.07	3.3(10.16)	4.4(13.37)	5.2(15.9)?	.....	3.7	198
H. lymaniana	2.56	.....	3.4 (8.79)	4.1(10.49)	5.3(13.6)?	4.2	171
H. pilsbryi	2.16	.....	3.7 (8.00)	4.5 (9.71)	5.8(12.5)?	4.3	181
H. wahiawae	2.55	2.7 (6.98)	3.5 (8.81)	4.2(10.7)?	.....	3.5	147

Hiona (Uapuneutra) cookeana, new species (pl. 42, figs. 13-15; pl. 25, figs. 13-15).

Marquesas: Uapou: BBM. 11384 (98479-84, dissected), on ferns and shrubs, damp ridge, ¾ mile inland, alt. 2,500-3,000 ft., Hakahetau Valley (P. Ent. Surv.! Dec. 27, 1929).

Shell (pl. 42, figs. 13-15) sublenticular with rapid whorl-increase, strongly angulate as embryo, distinctly angulate on 4th whorl; basal foveola narrow and shallow; horn-colored (sometimes slightly greenish), fairly polished and translucent above, well so below. Embryonic whorls around 1¾, rapidly increasing with wide sutural overlap (largest shell with mended apex), with extremely fine, but quite sharp and distinct, spiral striae (about as in *H. platyla*). Later whorls with spirals similar to embryonic ones and with weak but fairly distinct growth-wrinkles (6 per mm. on last) above; base

more polished with fainter spirals; suture lightly impressed and widely overriding. Aperture broadly trapezoidal, almost transverse, obtusely angulate; peristome about 30° to shell-axis, almost straight below. Columella straight or slightly convex in embryo; sharp and concave at 3.7 whorls, with wide white foveolar callus.

Animal similar to *H. lymaniana* but foot whitish with some black spots on side and behind ommatophores on head; tail-horn semicircular above large fossule. Right shell-lobe broad, 2.5 times as long as its base and light colored; right mantle-lobe edged with darker. Lung with ring of white blotches behind mantle collar and larger ones more posteriad (becoming confluent on apical whorls); 4 times as long as base or 2.5 kidney length, which is 2.5 times its base or 1.5 pericardial length. Uterus containing 3 eggs and 2 embryos; post-uterine oviduct (pl. 25, fig. 15) longer; spermatheca short-stalked. Penial sheath including all epiphallus; corona shorter than broad; penis proper relatively somewhat smaller; penial prepuce short. Radula (pl. 25, figs. 13, 14) has elongate central, 11 rather narrow, tricuspid laterals, and 94 marginals with slender blades, of which 28 to 40 are bicuspid; 109 rows counted.

H. cookeana is the largest species in the genus and presents the most rapidly increasing sutural spiral, although its actual whorl-increase is more gradual than those in the subgenus *Hionarion*. Its closest relative appears to be *H. lymaniana,* but the section *Uapuneutra* is an isolated one, taxonomically as well as geographically.

Hiona (Insulorbis) monticola, new species (pl. 42, figs. 1, 2; pl. 26, figs. 4, 4*a*.)

Society Islands: Tahiti: BBM. 11501 (142033-7, dissected), in moss on trees, top of ridge, alt. 4,700-5,500 ft., Aorai Trail (Mangarevan Exped.! Sept. 14, 1934); BBM. 145240-1, more depressed, on ridge along Aorai Trail, alt. 5,600-6,300 ft. (Sept. 15); BBM. 87038, dissected, on ferns and shrubs, 15 miles inland, alt. 2,000-4,000 ft., on Orohena Peak, Papenoo Valley (MacDaniels! May 14, 1927).

Shell (pl. 42, figs. 1, 2), thin, depressed, angulate when young, barely so at 3⅝ whorls, with rather narrow, fairly deep foveola; amber horn-color, well polished above and below. Embryonic whorls almost 2¼, with extremely fine, almost obsolete, spiral striae and with very weak growth-lines. Later whorls with similar spirals and with growth-lines superficial but quite sharp (7 per mm. on 4th) above; base with little weaker spirals (wavy and just visible under high light); suture lightly but distinctly impressed. Aperture about 75° to shell-axis, just evenly rounded; peristome 20°-25° to shell-axis, scarcely arcuate below. Columella rounded concave, even in embryo, not very heavily calloused.

Animal similar to *H. platyla,* but darker, with considerable pigment on top of head and tail and on sides of foot; with short, conical tail-horn above large fossule. Mantle collar dark; right shell-lobe 6 times as long as its base and longer than diameter of mantle collar (more contracted in BBM. 87038). Lung with black spot behind mantle collar and lines along hindgut; 2.5 times as long as kidney, which is 3.5 times as long as its base. Diaphragm with considerable pigment; apical whorls with black sutural band. Uterus (pl. 26, fig. 4) broad and short, containing 1 large egg and 2 (87038) or 3 (142033) embryos; post-uterine oviduct longer; spermatheca with poorly demarcated stalk. Penial sheath black, including corona; penial retractor black, arising considerably above base of uterus and inserting on apex of corona, which receives slender part of epiphallus laterally and contains 4 or 5 folds (vaguely visible exter-

nally); penis proper about twice as large as prostate (more elongate in 87038) and containing 3 pilasters. Penial prepuce short. Jaw with low and rounded median lobe. Radula (pl. 26, fig. 4, *a*) has subquadrate central, 8 laterals with entocone obsolescent on last, and 46 or 47 fundamentally bicuspid marginals, of which inner 19 (87038) to 21 (142033) are strictly bicuspid (ectocone farther back in 142033) and remainder are similar to outer ones of *H. orbis*; 94 (87038) and 103 (142033) rows counted.

H. monticola is the type of the subgenus *Insulorbis*:

Key to sections and species of subgenus Insulorbis

A. Columella, in post-embryonic stages, concave and rounded [in embryo, with at most a steeply inclined spiral thread]; Society Islands.....section **Insulorbis,** s. s.

B. Shell thinner, without pallid varices;

C. Shell thinnest, angulate on 4th whorl, with narrower sutural overlap and with stronger spiral striae; Tahiti:

D. Shell largest (4 wh. diam. near 10 mm.), more depressed, amber-horn and more polished; embryonic columella like adult.....**H. monticola,** new species.

DD. Shell smaller (4 wh. diam. near 7 mm.), slightly higher (like CC), pale greenish-horn, with slightly stronger spiral striae; embryonic columella with low spiral thread.....**H. aorai,** new species.

CC. Shell relatively heavier, with smallest whorls (4 wh. diam. about 6 mm.), evenly rounded at end of 3d whorl, with broad sutural overlap, dark horn-color, with weakest sculpture; embryonic columella with slight spiral swelling; Huahine:.....**H. huahinei,** new species.

BB. Shell heavier, with pallid varices; embryonic columella like adult; Tahiti:
.....**H. radians** (Pfeiffer).

E. Shell dark horn-color and smaller (like DD).....typical subspecies.

EE. Shell straw-color and larger (4 wh. diam. about 8.5 mm.).....
.....subspecies **pohaitarae,** new.

AA. Columella, in post-embryonic stages, retaining a plate or callus adnate to basal wall [in embryo, with a heavy lamelloid thickening].....section **Minororbis,** new.

F. Columella, at 4 to 4.5 whorls, with thinnish or weakly demarcated plate;

G. Shell with distinctly higher spire than *H. orbis*; Society Islands:

H. Columella with plate weakly demarcated near peristome (more sharply so inside);

I. Shell largest (4.5 wh. diam. near 10 mm.), with whitish line-varices; Tahaa:.....**H. scalpta** (Garrett).

II. Shell smallest (4.5 wh. diam. under 4.5 mm.), with much depressed and most gradually increasing whorls; Moorea:....**H. angustivoluta** (Garrett).

HH. Columella with plate well demarcated at peristome; shell with 4.5 wh. diam, about 6 mm.; Moorea:.....**H. verticillata** (Pease).

GG. Shell with spire not much higher than in *H. orbis*; umbilical region subincrassate; otherwise as in HH; Tuamotu: Pitcairn (?): .....**H. glandula** (Beck).

FF. Columella, at 4 to 4.5 whorls, with heavy, well-outlined plate;

J. Shell not known to surpass 5 whorls; Society Islands: Tahiti:

K. Shell unicolor.....**H. cultrata** (Gould).

KK. Shell with dilute red band above angle; said to have more rapid whorl-increase.....**H. marici** (Ancey).

JJ. Shell with weakish plate at 5.5 whorls, and with higher spire than *H. cultrata;* Marquesas (?): .....**H. callifera** (Pfeiffer).

Dimensions in the subgenus Insulorbis

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4 wh.	whs.
H. monticola								
type	4.64	181 (8.41)	163(7.58)	70(3.24)	137(4.45)	2.48	4.0(9.9)?	3.5+
BBM.145240	4.80	194 (9.30)	.....	78(3.74)	136(5.07)	.....	.....	3 5/8
H. aorai								
type	3.70	173 (6.39)	157(5.82)	68(2.52)	133(3.35)	1.92	3.6(6.9)?	3.8
H. huahinei								
type	4.16	171 (7.13)	155(6.46)	67(2.78)	127(3.52)	1.68	3.5(5.96)	4 ½
H. radians								
Pfeiffer	4	(9)	(8)	.....	.....	.....	.....	4 ½
fig.	5.05	178 (9)	.....	65(3.3)	145(4.8)	.....	.....	
BBM. 86973	4.85	171 (8.31)	151(7.30)	70(3.38)	133(4.50)	1.84	3.9(7.26)	4 ¼
H. r. pohaitarae								
type	5.43	170 (9.23)	151(8.20)	68(3.63)	138(4.99)	2.25	3.8(8.57)	4.2—
H. scalpta								
Garrett	6	167(10)	.....	.....	.....	.....	.....	5
type	5.73	166 (9.49)	152(8.72)	71(4.05)	117(4.74)	2.29	3.4(7.75)	4.6
H. angustivoluta								
Garrett	2.5	(4.5)	(4)	.....	.....	.....	.....	5.5-6
type	2.39	203 (4.86)	189(4.53)	61(1.46)	153(2.24)	1.28	3.1(4.0)?	5.1—
H. verticillata								
Pease	4	(6)	.....	.....	.....	.....	.....	5
ANSP.49285	3.20	181 (5.80)	165(5.29)	71(2.27)	130(2.95)	1.56	3.4(5.24)	4.3
H. glandula								
Beck	3	(5)	.....	(2.5)	(3.5)	.....	.....	4
(brunnea)	3.3	(5.6)	.....	.....	.....	.....	.....	4 ½
Pfeiffer fig.	3.55	169 (6)	.....	85(3.1)	107(3.2)	.....	.....	4 ½
H. cultrata								
Gould	2.55	(5.7)	.....	.....	.....	.....	.....	5
fig.	3.15	181 (5.7)	160(5.05)	70(2.2)	143(3.15)	.....	.....	
ANSP. 1954	3.88	162 (6.28)	151(5.84)	70(2.70)	122(3.28)	1.52	3.4(5.10)	4.7—
BBM.145375	3.16	177 (5.58)	161(5.10)	71(2.25)	124(2.79)	1.50	3.3(4.91)	4 3/8
NYSM. 250	4.47	154 (6.90)	146(6.52)	69(3.10)	118(3.64)	1.78	3.8(6.76)	4+
H. marici								
Ancey	3.25	169 (5.5)	.....	62(2)	.....	.....	.....	4½
H. callifera								
Pfeiffer	3	(7)	(6)	.....	.....	.....	.....	5 ½
fig.	3.91	179 (7)	.....	61(2.40)	140(3.35)	.....	.....	

Comparative whorl-sizes in subgenera Insulorbis, Opara, and Aukena

	1½	3 wh.	3½ wh.	4 wh.	5 wh.	6 wh.	Maxima	Index
H. monticola	2.48	2.7(6.58)	3.3(8.29)	4.0(9.9)?	.....	.....	3.5+	181
H. aorai	1.92	2.4(4.65)	3.0(5.75)	3.6(6.9)?	.....	.....	3.8	173
H. huahinei	1.68	.....	2.9(4.9)?	3.5(5.96)	4.8 (8.1)?	.....	4.5	171
H. radians	1.84	.....	3.2(5.97)	3.9(7.26)	5.1 (9.4)?	.....	4¼	171
H. r. pohaitarae	2.25	.....	3.1(7.07)	3.8(8.57)	5.0(11.3)?	.....	4.2—	170
H. scalpta	2.29	.....	.....	3.4(7.75)	4.5(10.3)?	.....	4.6	166
H. angustivoluta	1.28	.....	.....	3.1(4.0)?	3.7 (4.78)	5.2(6.7)?	5.1—	203
H. verticillata	1.56	.....	2.8(4.32)	3.4(5.24)	4.5 (7.0)?	.....	4.3	181
H. cultrata	1.52	.....	.....	3.4(5.10)	4.4 (6.7)?	.....	4.7—	162
BBM. 145375	1.50	.....	2.8(4.13)	3.3(4.91)	4.3 (6.5)?	.....	4⅜	177
NYSM. 250	1.78	.....	3.1(5.61)	3.8(6.76)	4.8 (8.5)	.....	4+	154
H. orbis	1.46	.....	.....	.....	4.9 (7.14)	6.6(9.6)?	5.5+	255
	1.60	.....	.....	.....	4.4 (7.07)	5.9(9.5)?	5	250
H. tridentata	1.60	.....	.....	.....	3.4 (5.51)	.....	5+	165
	1.60	.....	.....	2.6(4.12)	3.3 (5.3)?	.....	4.7	158

Hiona (Insulorbis) aorai, new species (pl. 33, figs. 5, 6; pl. 26, figs. 5, 6).

Society Islands: Tahiti: BBM. 11386 (142040-2, dissected), in moss on trees, alt. 4,700-5,500 ft., Aorai Trail; BBM. 145367, valley west of trail, alt. 6,000 ft.; BBM. 145921, along trail, alt. 5,500-5,600 (Mangarevan Exped.! Sept. 14, 15, 1934).

Shell (pl. 33, figs. 5, 6) similar to *H. monticola* but smaller and less depressed (suborbicular), with 3d whorl strongly angulate and 4th weakly so; pale greenish horn with white blotches (effect of alcohol?), fairly polished, more so below. Embryonic whorls around 1⅞, with slightly stronger spiral striae. Later whorls also with somewhat sharper spirals (much as in *H. exaequata*); suture mediocrely impressed, narrowly marginate. Aperture barely angulate; peristome about 15° to shell-axis. Columella long, very slightly convex, with narrow, scarcely truncating, steeply inclined, spiral thread in embryo; thin and concave at 3 whorls.

Animal also similar. Mantle collar with black dots. Lung colorless; 2.6 times as long as kidney which is thrice as long as its base. Uterus containing 1 egg and 2 embryos; post-uterine oviduct (pl. 26, fig. 6) relatively longer; spermatheca enlarged apically. Penis considerably stouter; atrium somewhat longer; opening thrice pedal groove interspace behind inferior tentacle and twice same above upper groove. Penial retractor arising near base of uterus. Radula with more elongate central (pl. 26, fig. 5) and more than 34 marginals, of which 19 are biscuspid but usually have minutely serrate margins and remainder have subdivided ectocone; 93 rows counted.

In addition to the material on which *H. aorai* is founded, BBM. 145518 and part of 145367, both from the Aorai Trail, seem to represent a variety with larger whorls. Probably future collections in the Society Islands will considerably increase the number of *Hiona* species.

Hiona (Insulorbis) huahinei, new species (pl. 33, figs. 7, 8; pl. 26, fig. 8).

Microcystis verticillata "Pease" Garrett, 1884, Jour. ANSP. 9: 19, in part, including pl. 2, fig. 31,*a,b*. *Nanina verticillata* Tryon, Manual 2: 113, pl. 38, figs. 28-30 (at least figs.). Not *Helix verticillata* Pease (1868) as now restricted.

(?) *Nanina cicercula* Gould, var. Schmeltz, 1874, Cat. Mus. Godeffroy V: 91, Huahine?

Society Islands: Huahine: ANSP. 49287 (BBM. 3188) (Garrett!); also shells from ANSP. 49323, 49284, 49286 (see *H. verticillata*).

Shell (pl. 33, figs. 7, 8) superficially similar to *H. verticillata,* but larger, with slightly more conoid spire, practically evenly rounded at 2¾ whorls, with a little more convex base and narrower foveola; darker horn-color and more polished. Embryonic whorls almost 2. Later whorls with obsolescent spiral striae above and just visible on base (shells far from fresh); suture more widely overriding. Aperture quite narrowly lunate, evenly rounded; peristome about 10° to shell-axis and scarcely arcuate below. Columella in embryo with weak, steeply inclined, spiral swelling (hardly a thread); at 4.5 whorls heavy, but evenly rounded and scarcely truncate.

Animal (dried in) dark, especially below and between pedal grooves. Right shell-lobe elongate. Uterus containing embryos. Jaw with very weak median lobe. Radula similar to that of *H. monticola,* but has 7 or 8 laterals, of which last may lack entocone, and 50 to 59 very elongate marginals (pl. 26, fig. 8), of which inner are bicuspid, some intermediate ones are almost unicuspid and outermost have distinct ectocone and serrate mesocone; more than 105 rows.

H. huahinei was evidently included in *H. verticillata* by both Pease and Garrett, but the latter noted the differences. Schmeltz did not describe his "variety" of *Philonesia cicercula.*

Hiona (Insulorbis) radians (Pfeiffer), (pl. 34, figs. 1, 2; pl. 25, fig. 19).

Helix radians Pfeiffer, 1853, Proc. Zool. Soc. 1851: 252; Monogr. 3: 39 [4:17-5:58-7:70]; Conch.-Cab. II: 395, pl. 144, figs. 22, 23. *Nanina radians* Tryon, Manual 2:115, pl. 38, figs. 51, 52.

Society Islands: Tahiti. BBM. 86973-4, dissected, on ferns and shrubs, damp valley and sides of Orohena Peak, 15-20 miles inland, alt. 500-2,000 ft., Papenoo Valley (L. H. MacDaniels! May 12, 1927).

Shell (pl. 34, figs. 1, 2) similar to *H. monticola,* but smaller and relatively heavier, quite distinctly but not sharply angulate in embryo and barely angulate on early 5th whorl, with fairly narrow and rather shallow foveola; quite dark horn-color, with irregular, but conspicuous, pallid varices, quite polished, translucent. Embryonic whorls with slightly stronger spiral striae (more as in *H. aorai*). Later whorls with very fine spirals crossing weak growth-wrinkles (8-9 per mm. distinct on late 4th); base with spirals still easily visible; suture mediocre. Aperture quite evenly rounded; peristome about 15° to shell-axis. Columella white, more heavily calloused and subangular (concave even in embryo).

Animal (very hard and stiff) similar to *H. radians pohaitarae* but darker. Uterus with 2 embryos. Radula (pl. 25, fig. 19) similar to that of *H. monticola* but has narrower central, 7 broader, tricuspid laterals, and more than 36 marginals, of which 19 are strictly

bicuspid and considerably more elongate (approaching those of *H. huahinei*); more than 73 rows.

Hiona (Insulorbis) radians pohaitarae, new subspecies (pl. 42, fig. 3; pl. 34, fig. 4; pl. 26, fig. 7).

Society Islands: Tahiti: BBM. 142253, dissected, medium damp hillside, alt. 3,500 ft., Taohiri camp, Pohaitara Valley (Mangarevan Exped.! Sept. 12, 1934).

Shell (pl. 42, fig. 3; pl. 34, fig. 4) similar to *H. radians* but considerably larger (approaching size of *H. monticola*), with broader, moderately deep foveola; straw-colored (bleached?) with whitish varices. Embryonic whorls larger. Later whorls with slightly stronger spirals; suture more lightly impressed.

Animal similar to *H. monticola.* Lung 4.5 times as long as base or 2 2/3 kidney length, which is 1 2/3 times its base or pericardial length. Uterus more elongate, containing 2 eggs and 6 embryos of varying sizes; post-uterine oviduct shorter; spermatheca (pl. 26, fig. 7) with apical half enlarged and containing a membranous sac. Penial retractor arising 2/3 distance up right side of uterus; penis proper relatively more elongate. Radula not studied.

Hiona (Minororbis?) scalpta (Garrett), (pl. 33, figs. 3, 4).

(?) *Nanina subcircula* W. G. Binney, 1875, Proc. ANSP. **27**: 248, pl. 20, fig. 1 (radula, apparently *Hiona*), Raiatea (Garrett!); Ann. N. Y. Lyc. Acad. Sci. **3**: 85, pl. 2, fig. A.

Microcystis scalpta Garrett, 1884, Jour. ANSP. **9**:21, pl. 2, fig. 30, *a,b.*

Nanina tahaensis Tryon, 1886, Manual **2**: 115, pl. 38, figs. 56-58, substitute for *"N. scalpta;"* not *N. scalpta* Martens (1877)=*Erepta scalpta* (Mart.).

Society Islands: Tahaa (east): ANSP. 49289 (ANSP. 49290; BBM. 4960), beneath stones, rotten wood and under heaps of decaying leaves, Haamene Valley (Garrett!).

Shell (pl. 33, figs. 3, 4) suborbicular, fairly heavy, obsoletely angular on early 4th whorl, evenly rounded on 5th, with deep quite broad foveola; fulvous horn-color, minutely dotted and with very irregular and sparse, whitish, linear varices (little more than etched growth-lines), very glossy above and polished below, subpellucid. Embryonic whorls almost 2. Later whorls with growth-wrinkles and spiral striae exceedingly obscure (probably more distinct when fresh); suture lightly impressed and widely overriding. Aperture fairly broad, evenly rounded; peristome margined with reddish, 15° to shell-axis, quite weakly arcuate below. Columella (no very young shells seen) short and thickened, continued along basal wall by a low white callus, which is poorly demarcated peripherally near peristome but higher and quite sharply outlined ¼ to ½ whorl back (visible through base).

As already indicated, Binney probably confused Garrett's specimens of some *Hiona* from Raiatea with material from Rarotonga, which Garrett had labeled *"Nanina subcicercula"* (nude in 1875). His radular figures are not accurate enough for the identification of any species.

The type lot of *H. scalpta* contains two shells; the one measured (taken as type) looks more like Garrett's figure, but the other has almost 4¾ whorls and thus more nearly approaches his dimensions. This species looks quite a little like *H. radians,* but besides the columellar plate, has much narrower, less numerous, whitish lines and a much less depressed 5th whorl.

Hiona (Minororbis?) angustivoluta (Garrett), (pl. 33, figs. 1, 2).

Microcystis angustivoluta Garrett, 1884, Jour. ANSP. **9**: 20, pl. 2, fig. 34, *a-b*. *Nanina angustivoluta* Tryon, Manual **2**: 117, pl. 39, figs. 83-85.

Society Islands: Moorea: ANSP. 49297, labeled "types, jour. A.N.S. IX" (BBM. 1627), under damp, rotten wood, northeast part (Garrett!).

Shell (pl. 33, figs. 1, 2) suborbicular with domical spire and much depressed, gradually increasing whorls, distinctly angulate at 4 whorls but almost evenly rounded at 5, with broad, quite deep foveola; pale amber-color, polished and translucent. Embryonic whorls about 2. Later whorls with sculpture apparently similar to that of *H. cultrata;* suture very lightly impressed, overriding. Aperture depressed, narrowly lunate, evenly rounded; peristome about 10° to shell-axis and weakly arcuate below. Columella very oblique, at 4 whorls (youngest seen) with plate-like thickening poorly defined near peristome but apparently better demarcated ¼ whorl back; at 5+ whorls, with low callus.

Hiona (Minororbis) verticillata (Pease), (pl. 33, figs. 10, 11).

Helix verticillata Pease, 1864, Proc. Zool. Soc.: 675, noted by Carpenter in synonymy of *"branea* Ant., teste H. Cuming," otherwise nude.

Nanina verticillata Pease, 1868, Am. Jour. Conch. **3**: 228, Moorea. *Helix verticillata* Pfeiffer, Monogr. **7**: 66. *Microcystis verticillata* Garrett, Jour. ANSP. **9** (1884): 19, in part (*H. huahinei* figured); (?) Garrett, Bull. Soc. Malac. France **4**: 7, Marquesas: Hivaoa (= Dominique).

Society Islands: Moorea: beneath moist rotting wood and among decaying leaves, north part (Garrett!). From Pease, all labeled "Tahiti": ANSP. 1955 and (including young *H. huahinei*) ANSP. 49284 and 49286. Directly from Garrett: BBM. 2848 (labeled *Microcystis brunnea* Ant.); ANSP. 49285 (labeled Moorea); ANSP. 49323 (including *H. huahinei*), labeled "types, Jour. A.N.S IX."

Shell (pl. 33, figs. 10, 11) similar to *H. cultrata,* but with more depressed whorls, obsoletely angulate at onset of 4th but evenly rounded beyond, with considerably more flattened base and broad (much broader) foveola; light horn-color. Suture slightly more impressed. Peristome about 10° to shell-axis, weakly (less) arcuate below. Columella, in embryo, with lamella that is not as heavy as that in *H. cultrata* at 4.5 whorls; at 4.3 whorls, with adnate plate, which, although low (about twice as thick as edge of peristome) is sharply demarcated peripherally.

The first use of this name may well be disregarded, although *"branea"* can hardly be anything but *Helix brunnea* and, as discussed under *Hiona glandula,* Cuming may have been right. Garrett's report of *Hiona verticillata* from the Marquesas seems dubious.

Hiona? (Minororbis?) glandula (Beck).

Helicopsis glandula Beck, 1837, Index: 2 (nude); Nov. sp.: 2.

Helix brunnea Anton, 1839, Verz.: 35, South America; Pfeiffer, Monogr. 1: 33, Pitcairn (Cuming!) [3:34, 626-4:14-5:54-7:66]; Conch.-Cab. I: 235, pl. 22, figs. 27-29. *Nanina brunnea* Tryon, Manual 2: 113, pl. 38, fig. 50.

Tuamotu: Pitcairn: (H. Cuming!).

"H. testa fulvo fulvofusca, lucida; spira convexiuscula obtusa; anfractibus quatuor, laevigatis. M. *a.* 5 *b.* 3. *c.* 3½. *d.* 2½. In frondibus filicum *Ins. Pitcairn* oceani pacifici legit *H. Cuming,* conchyliorum celeberrimus investigator. Habitus omnino *Helicellae succineae*; tenuis, fragilis et adeo laevigata, ut striolae incrementi, admodum superficiales, vix ope lentis indagentur. Ultimus anfractus supra modice, infra sat convexus, centrum versus subito coarctatus. Testa epidermide tecta ex olivaceo in rufo-fulvum colorem vergit; peritrematis margine intus angustissimo rufo; columellae indumentum griseum" (Beck).

Helicopsis with fulvo-fuscous shell; spire rather convex and obtuse; whorls 4, smoothed. Appearance altogether like *Zonitoides nitidus* (Müller); thin, fragile and very much smoothed, so that growth-striolae, truly superficial, require diligent search with help of a lens. Shell covered by epidermis which inclines from olivaceous toward rufo-fulvous color; interior of peristome very narrowly margined with rufous; columella coated with grayish blue.

Pfeiffer states that the umbilical region of this species is subincrassate. From the descriptions, I am inclined to suspect that Cuming was correct when he put *H. verticillata* in the synonymy of *H. brunnea,* perhaps with a suspicion as to the true habitat of his own specimens. However, Pfeiffer's figures show a lower spire (more like that of *H. orbis*) than do any Moorea shells I have seen. Although the habitat is dubious, some species of *Hiona* might be expected to occur on Pitcairn Island.

Hiona (Minororbis) cultrata (Gould), (pl. 33, figs. 12-15; pl. 26, figs. 9, 10).

Helix cultrata Gould, 1846, Proc. Boston Soc. N.H. 2: 172 [20], Taheiti [Tahiti] and Eimeo [Moorea]; Pfeiffer, Monogr. 1: 37 [3:40-4:17-5:58-7:71]; Gould, Exped. Shells: 46, pl. 4, fig. 59, *a-c. Nanina cultrata* Bland and W. G. Binney, Am. Jour. Conch. 7:189, radula; Tryon, Manual 2: 125, pl. 41, figs. 48-50.

Society Islands: Tahiti: USNM. 20953; ANSP. 1954 (A. D. Brown collection, marked S= from Smithsonian Institution, (Couthouy!). BBM. 145375-6, dissected, on ferns, shrubs, tree trunks and dead leaves, damp valley, alt. 6,000 ft., west of Aorai Trail (Mangarevan Exped.! Sept. 15, 1934). Not NYSM. 250 (A-782, "Gould type").

Shell (pl. 33, figs. 13-15) orbicular with whorls somewhat flattened above, sharply angulate when young, fairly so at 4⅜ whorls, with narrow and quite deep basal foveola; amber horn-color, quite polished and translucent. Embryonic whorls 1⅞ to 2, with superficial and very fine, but fairly distinct, spiral wrinklets and with rather distinct but low growth-wrinkles. Later whorls with similar sculpture, with major growth-lines (13-15

per mm. on 5th) quite sharply cut; base with growth-lines weakened but with spirals fairly distinct; suture weakly impressed, well marginate. Aperture moderately narrow, quite oblique (about 70° to shell-axis); peristome almost vertical (less than 10° to shell-axis), fairly arcuate (less so than in *H. orbis*) below. Columella short and heavy; in embryo (pl. 33, fig. 12) with strong, quite steeply inclined, spiral lamella; at 4.7 whorls, with very heavy (thickest in *Hiona*), angulate callus (lamella) adnate to basal wall and about ½ whorl in length.

Animal similar to *H. monticola*. Mantle-lobes black; right shell-lobe unpigmented, 4.5 times as long as its base or (contracted) 0.8 diameter of mantle collar. Lung broken; with black pigment along hindgut. Genitalia above posterior edge of diaphragm lost; uterus (pl. 26, fig. 10) more elongate, containing 5 eggs and 5 embryos; spermatheca longer, with ball-shaped apex. Penial retractor arising to right of uterus at level of lowest embryo; penis proper smaller than prostate. Atrial opening as far above upper pedal groove as upper is from lower; close behind inferior tentacle. Jaw with practically no median lobe. Radula (pl. 26, fig. 9) has 5 tricuspid laterals, and 35 apparently more slender, fundamentally biscuspid marginals, of which 6 to 13 are strictly so and remainder change as in *H. orbis*; more than 77 rows.

The USNM. and ANSP. lots from Gould each contains a single shell of *H. cultrata*; both are more elevated than the figure in the U. S. Exploring Expedition shells, but the former is smaller and thus comes nearer Gould's dimensions. Formerly, the USNM. lot also contained a shell and an embryo of *H. monticola* or some closely related form. The one NYSM. shell has a weaker columellar fold and is a young specimen of a much larger species, near *H. scalpta* (Garrett). The true *H. cultrata* is only known to occur on Tahiti, but possibly one or both of the other species in the Gould material did come from Moorea.

Hiona (Minororbis) marici (Ancey).

Microcystis marici Ancey, 1889, Le Naturaliste **11**: 246.

Society Islands: Tahiti: (Marie!). I have not seen this species. Is *"marici"* a misspelling or an attempted latinization of Marie's name?

Hiona (Minororbis?) callifera (Pfeiffer).

Helix callifera Pfeiffer, 1850, Zeitschr. Malak. **7**: 68; Monogr. **3**: 34 [**4**:15-**5**:55-**7**:66]; Conch.-Cab. II: 310, pl. 127, figs. 13-16. *Nanina callifera* Tryon, Manual **2**: 114, pl. 38, figs. 33, 34.

Marquesas: (sic). About the only character that separates this species from *H. cultrata* is its very dubious locality; however, no specimens of the latter which equal *H. callifera* in whorl-size or height of spire have been reported.

Hiona (Opara) orbis (Beck), (pl. 42, figs. 4-6; pl. 33, fig. 9; pl. 26, figs. 1-3).

Helicopsis orbis Beck, 1837, Index: 2 (nude); Nov. sp.: 2. *Helix orbis* Pfeiffer, Monogr. **1**: 32 [**3**:35-**4**:15-**5**:55-**7**:68]; Conch.-Cab. I: 234, pl. 30, figs. 8-10. *Nanina orbis* Tryon, Manual **2**: 114, pl. 38, fig. 31,

Helix planulata Anton, 1839, Verz.: 35, Concepcion, Chile (sic); not of Férussac (1821).

Austral Islands: Rapa (= Opara): (Cuming!). BBM. 135305, dissected, alt. 1,200-1,500 ft., eastern ridge of Mount Perahu (Mangarevan Exped.! July 21, 1934); BBM. lots from many localities.

"H. testa complanata, olivacea, nitidissima, anfractibus 6½ planulatis, subtilissime striolatis, ultimo ad angulum rotundato, infra convexo. M. *a* 10; *b* 4; *c* 3; *d* 3. In vegetabilibus succulentis *Ins. Opara.* oceani pacifici legit *H. Cuming.* Species elegans, forma depressa, fere discoidali anfractibusque numerosis, amplitudine lente accrescentibus insignis. Anfractus supra planulati, sutura impressa distincti, tenuiter et eleganter marginati, striis incrementi subtilibus, rectiusculis, radiantibus exsculpti; ultimo anfractus pars superior planulata cum inferiore multo convexiori angulo rotandato jungitur; haec inferior pars, latere planulata, centrum versus eo modo coarctatur, ut testam primo intuitu perforatam crederes. Apertura ad columellam valde angustata, peritremate semiobovato, tenuissimo. Testa epidermide induta unicolor olivacea." (Beck).

Shell (pl. 42, figs. 4-6) very thin (largely epidermal), subdiscoidal, flattened above, angulate when young but sharply rounded at 5.5 whorls, with broad and shallow basal foveola; light amber to greenish horn-color, polished and transparent. Embryonic whorls around 2¼, with extremely fine, quite weak spiral striae and weak growth-wrinkles; sutural overlap often wide but variable. Later whorls with weaker spirals, slightly stronger growth-wrinkles and less oblique, radiating cracks (possibly due to drying) above; base with stronger, very arcuate growth-wrinkles and obscure spirals; suture sharply but shallowly impressed. Aperture narrow, almost horizontally truncate above, very oblique (about 60° to shell-axis) and sharply rounded at (high) periphery; peristome practically vertical but markedly arcuate below. Columella of embryonic shell (pl. 33, fig. 9) short and almost vertical, with a heavy, rounded, spiral cord in basal angle, tapering out toward peristome. Columella of older shell very oblique (almost horizontal), strongly thickened and continued on base by an adnate plate (much thinner than in *H. cultrata*), that is slightly upcurved at its outer edge, begins 0.5 whorl back, attains greatest strength ¼ whorl back and reaches to within 15° of peristome.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	5.5 wh.	whs.
Beck	4	(10)	.....	(3)	(3)	.....	.....	6.5
Pfeiffer	3.5	(9.3)	(8.7)	.....	.....	.....	.....	5-6
Pfeiffer, fig.	4.8	194 (9.3)	.....	.....	.....	.....	.....	
BBM. 135305	3.29	255 (8.39)	234(7.69)	85(2.79)	142(3.96)	1.46	5.7(8.39)	5.5+
	2.83	250 (7.07)	233(6.59)	81(2.30)	154(3.54)	1.60	5.2(8.3)?	5
BBM. 135335	4.12	229 (9.43)	.....	80(3.28)	131(4.31)	.....	.....	6—(?)

Animal similar to *H. platyla* but foot whitish; tentacles black. Mantle collar (pl. 26, fig. 1) and lobes light colored; right shell-lobe (LR) 4 or 5 times as long as its base and about equal to diameter of mantle collar; left shell-lobe absent; umbilical lobe (LU) broad but short; right mantle-lobe less extensive. Lung pale; 4.5 times as long as base or 2 2/3 kidney length, which is thrice its base or twice pericardial length. Ovotestis (pl. 26, fig. 3) consisting of 7 or 8 conical groups of few, long clavate, often bifid alveoli and extending almost to apex of liver; hermaphroditic duct quite long. Uterus elongate, containing a series of embryos when pregnant (with 4 eggs in figure); spermatheca with stalk poorly demarcated. Penial sheath including ⅛ of epiphallus; penial retractor with attachment to last loop of epiphallus; corona slightly longer than wide, with 2 or 3 internal folds; penis proper about twice as long as prostate. Penial prepuce quite long; atrial

opening shortly behind inferior tentacle. Salivary glands lanceolate, each 1/3 longer than buccal mass; right one more anteriad; ducts about as long as glands. Jaw deep, with fairly prominent, rounded median lobe. Radula (pl. 26, fig. 2) has subquadrate central, 5 elongate, tricuspid laterals, and 38 fundamentally bicuspid marginals, of which outer 25 at first develop mesoconal serrations and finally split up ectocone as well; 91 rows counted.

The adnate plate on the columella and base of the shell of *H. orbis* can only be seen through the aperture when the shell is tilted. It is distinctly visible through the transparent base and probably accounts for Beck's remark that the shell appears perforate when first viewed. None of the shells measured quite attains the size or number of whorls given by Beck; the comparative whorl-sizes are included in the table for *Insulorbis*.

Hiona? (Aukena) tridentata, new species (pl. 34, figs. 10-15).

Tuamotu: Mangareva (Aukena Islet): BBM. 138682, two subfossil shells (Mangarevan Exped.! 1934).

Shell (pl. 34, figs. 10-15) conoid-orbicular, quite distinctly angulate on 4th whorl and weakly so at end of 5th, with broad shallow foveola; polished white (subfossil). Embryonic whorls 1¾ to almost 1⅞, with fairly distinct fine spiral striae. Later whorls with similar spirals and rather distinct growth-lines above; base with radiating growth-lines (as in *Glyphyalus*) and weaker spirals; suture sharply but shallowly impressed. Aperture rather narrowly lunate, about 70° to shell-axis; peristome about 10° to shell-axis, weakly arcuate below. Columella very heavy, quite oblique, with steeply inclined, spiral ridge in basal angle (like upturned edge of an adnate lamella). Shell of 4.7 whorls (pl. 34, figs. 13-15) also with parietal lamella, that starts at least ½ whorl back, is highest about ⅛ whorl back and extends almost to level of peristome; and with a short basal lamella opposite highest part of parietal one [both lacking at 5+ whorls; pl. 34, figs. 10-12].

Dimensions

alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	5 wh.	whs.
3.35	165(5.52)	153(5.14)	61(2.03)	133(2.70)	1.60	3.4(5.51)	5+
3.10	158(4.90)	149(4.62)	67(2.09)	118(2.47)	1.60	3.3(5.3)?	4.7

Aukena differs from the other groups included in *Hiona* at least as much as *Pilsbryna* does from *Paravitrea,* in which case somewhat similar conchologic differences are not accompanied by any great malacologic differentiation. The addition of parietal and basal lamellae to the shell certainly warrants generic separation, but I do not like to erect a new genus on the basis of a single specimen. Although the two supplemental lamellae in the smaller of the type shells certainly appear to be normal developments, the larger type does not differ widely from the shell of a *Hiona.* The comparative whorl-sizes are given in the table for *Insulorbis.*

Hiona (Hionarion) pilsbryi, new species (pl. 38, fig. 4; pl. 26, figs. 13-15).

Hawaiian islands: Kauai (Koloa): BBM. 11387 (36281, dissected by Cooke), on shrubs, dam-swamp, Wahiawa (Cooke! June 13, 1914); (east Hanalei): 80329, dissected, under stones, on ferns, shrubs, and dead lantana, small valley and hillside, alt. 900 ft., southwest of Waipahi (Cooke and Dranga! Oct. 16, 1925); (Lihue): BBM. 20701, valley directly back of stables, Kipu (Cooke! March 11, 1910).

Shell (pl. 38, fig. 4) like *H. lymaniana* but more depressed, markedly angulate when young (3.5 wh.) but becoming weakly to fairly (20701) so on 5th whorl, with deeper basal foveola; light horn-color (80329 with vague to distinct reddish horn band just above periphery), slightly more polished. Embryonic whorls with sharper spirals (more as on last whorl of *H. cookeana*). Later whorls with considerably weaker and more irregular growth-wrinkles and similar (very weak) spirals above; suture fairly impressed (more so than in *H. lymaniana*). Aperture narrower and almost transverse, barely angulate; peristome about 20° to shell-axis. Columella with steeply inclined spiral thread at 3.5 whorls; rounded, moderately thickened, attenuate below and narrowly reflected over foveola at 4.3.

Animal similar to *H. platyla.* Mantle-lobes (pl. 26, fig. 13) larger, lightly pigmented; right shell-lobe (LR) somewhat larger, dark at base; left shell-lobe (LL) much larger, over 2/3 as long as right one; umbilical lobe (LU) large. Lung with few large chalky spots; 4 times as long as base or over twice kidney length, which is thrice its base or 2¼ times pericardial length. Hermaphroditic duct about as long as remainder of genitalia; uterus (pl. 26, fig. 15) containing 3 eggs and 2 embryos; post-uterine oviduct much longer; spermatheca almost sessile. Penial sheath including all epiphallus, which receives small branches from penial retractor; corona subspherical. Atrium relatively somewhat larger. Jaw with prominent growth-lines; median lobe very low or absent. Radula (pl. 26, fig. 14) has relatively short mesocone on central, 7 laterals (Cooke gives 10 and 11) with entocones almost obsolete, even on innermost, and 80 marginals (Cooke found 77-81), of which about 20 commonly have 2 subequal cusps and remainder add more ectocones; 107 rows counted.

The shell of *H. pilsbryi* superficially somewhat resembles that of *Philonesia chamissoi,* but is far more polished, has more rapid whorl-increase, lacks whitish varices and develops the spiral color zone (usually absent) above its periphery. The differences in soft parts are much greater and indicate that *Hiona pilsbryi* is actually closely related to *H. lymaniana,* which has an even more similar, although larger, darker and more elevated shell.

Possibly the subfossil *Philonesia arenofunus* also belongs in this subgenus of *Hiona,* but it seems closer to *P. chamissoi.* The two living species included in *Hionarion* are separated in the following key (comparative whorl-sizes included in table for *Neutra*):

A. Shell suborbicular, weakly angulate, pale horn-color (or with reddish supraperipheral band) and well polished: shell-lobes of mantle fairly narrow; radular laterals with vestigial entocones; bicuspid marginals not extremely elongate..... **H. pilsbryi,** new species.

AA. Shell almost *Helicarion*-like, evenly rounded, brownish corn-color and glossy; shell-lobes broad; radular laterals with distinct entocones; bicuspid marginals long and slender..... **H. wahiawae,** new species.

Dimensions

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap	1½	4 wh.	whs.
H. pilsbryi type	5.99	181(10.86)	166(9.97)	67(4.03)	138(5.57)	2.16	4.5 (9.71)	4.3
H. wahiawae type	5.71	147 (8.39)	132(7.51)	87(4.97)	100(4.98)	2.55	4.2(10.7)?	3.4

Hiona (Hionarion) wahiawae, new species (pl. 34, figs. 6, 7; pl. 26, figs. 11, 12).

Hawaiian islands: Kauai (Koloa): BBM. 17500, back of Wahiawa (C. S. Dole!); BBM. 36282, dissected, on dead leaves, dam-swamp, Wahiawa (Cooke! June 13, 1914).

Shell (pl. 34, figs. 6, 7) almost *Helicarion*-like but fairly heavy, with low spire, weakly angulate at 2.5, evenly rounded at 3 whorls, with very convex base, which is narrowly and quite deeply impressed (not forming foveola); brownish horn-color, glossy above and slightly brighter below. Embryonic whorls 1¾, with very fine, but sharp and distinct, spiral wrinklets and striae. Later whorls with growth-lines (18-19 per mm. on 4th) slightly more distinct than in *H. pilsbryi* and with sharply cut, although very fine spiral striae above; base with more undulate but quite distinct spirals; suture about as in *H. pilsbryi.* Aperture large, subcircular; peristome (broken) would be about as in *H. pilsbryi.* Columella concave, rounded and not at all truncate (only 2 shells seen: type with 3.5+ whorls broken back to 3.4, and 36282 with about 2.5 whorls).

Animal (young) similar to *H. pilsbryi*; foot pale; top of head dark. Shell-lobes similar in length but much broader, darkly pigmented and pebbled externally; right one 1/3 and left one ½ as broad as long. Lung with brown line behind mantle collar and with small white spots; 3 times as long as base or twice kidney length, which is thrice its base or twice pericardial length. Uterus not pregnant. Epiphallic corona (pl. 26, fig. 12) about 1.5 times as long as broad and poorly demarcated apically; penial prepuce apparently larger; atrium immature. Jaw with fairly distinct median lobe. Radula (pl. 26, fig. 11) has relatively small and narrow central, 8 tricuspid laterals, and 32 marginals, of which 20 to 22 are elongate and bicuspid (ectocone smaller than mesocone, as in *H. platyla*); more than 78 rows.

The last whorl of *H. wahiawae* is relatively large and *Helicarion*-like. When fully expanded, the shell-lobes must cover much of the shell. Probably, *H. wahiawae* is at least sectionally distinct from *H. pilsbryi,* but its anatomy, so far as this can be ascertained from a single, half-grown animal, seems rather similar. Its radula, peculiarly enough, is more like that of *Hiona,* s. s.

Hiona (Hionella) rufobrunnea (Ancey), (pl. 39, figs. 13, 14; pl. 26, figs. 16-18).

Microcystis rufobrunnea Ancey, 1904, Proc. Malac. Soc. **6**: 119.

Hawaiian islands: Hawaii (Puna): BBM. 18915 (type lot), Olaa (Thaanum!). BBM. 39573, dissected, under rock and cut wood, 29 miles past Peter Lee's house, Olaa (Thurston! July 1915. (South Hilo): BBM. 39277, large *kipuka* between Hilo and Kilauea trails from Humuula, alt. 5,000 ft.,

flow of 1855 (Forbes! June 9, 1915); also Kaiwiki. (Kau): BBM. lot from Kapuna. (South Kona): BBM. 44183, about ¾ mile south of 1917 flow, Kapua (Gouveia! Aug. 21, 1917).

Shell (pl. 39, figs. 13, 14) depressed turbinate, sharply angulate as embryo, quite distinctly so at 4 whorls, but almost evenly rounded at 4.5, with narrow shallow foveola; rufous horn-color, polished and translucent. Embryonic whorls 1¾ to 1⅞, with weak spiral striae. Later whorls arched above (as in *H. meineckei*), with weak growth-lines (11 per mm. on 5th) above and with spirals just visible above and below; suture quite deeply impressed. Aperture rather broadly lunate, evenly rounded; peristome about 15° to shell-axis and scarcely arcuate below. Columella straight in embryo, thickened and rounded at 4.5 whorls.

Animal similar to *H. platyla* but foot paler, with some dark pigment toward tip of tail. Left shell-lobe 3 times as long as its base. Lung with dark zone behind mantle collar and with small chalky dots; kidney 4 times as long as its base and 2¼ times pericardial length. Hermaphroditic duct longer than remainder of genitalia and strongly swollen in lower half; uterus (pl. 26, fig. 18) shorter, containing 1 egg and 2 embryos; spermatheca short and subsessile. Penial sheath including only half of penis proper; corona longer than broad. Penial atrium with a small sac opening broadly into its dorsal side. Radula (pl. 26, figs. 16, 17) with more elongate central, 8 more elongate laterals (6 in a young specimen, BBM. 44090), with entocone becoming obsolescent on last, and 35 marginals (26 in 44090), of which 14 are commonly bicuspid and remainder develop serrate mesocone and add ectocones; more than 82 rows.

Although the shell of *H. rufobrunnea* lacks the columellar lamella, it has rounded, well-polished whorls somewhat as in the section *Nesocyclus*. It has already been compared to *Philonesia gouveiana*. The species and subspecies included in the section *Hionella* (subgenus *Hiona*, s. s.) are defined in the following key:

A. Penial atrium and diverticulum smaller; left shell-lobe distinct; shell rufous, more polished and with well impressed suture; 5th whorl almost evenly rounded; embryonic (and later) columella straight and terete; southern Hawaii: ..... **H. rufobrunnea** (Ancey).

AA. Penial atrium and diverticulum large; left shell-lobe small or not observed; shell horn-color, glossy to lightly polished, with less impressed suture; 5th whorl fairly angulate; embryonic columella truncated by very heavy, short spiral cord; Molokai, Lanai, and Maui: ..... *H. perkinsi* group.

B. Shell larger (5 wh. diam. over 7 mm.), with growth-wrinkles becoming weaker; left shell-lobe usually not observed ..... **H. perkinsi** (Sykes).

C. Shell more polished, with more gradual whorl-increase; columellar truncation strong at 4.5 whorls; Lanai: ..... typical subspecies.

CC. Shell glossy, with more rapid whorl-increase; columellar truncation oblique and weaker at 4 whorls; west Maui: ..... subspecies **maunahoomae,** new.

CCC. Shell glossy, with most rapid whorl-increase; columellar truncation practically obsolete at 4 whorls (youngest observed); embryonic whorls a little smaller; eastern Molokai: ..... subspecies **poholuae,** new.

BB. Shell smaller (5 wh. diam. about 6 mm.), with growth-wrinkles becoming slightly stronger; left shell-lobe small but distinct; eastern Molokai: ..... **H. subdola,** new species.

Dimensions in section Hionella

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4½ wh.	whs.
H. rufobrunnea								
Ancey	4.75	145(7)	137(6.5)	63(3)	.....	.....	.....	5-5¼
BBM. 39573	3.98	159(6.31)	147(5.83)	65(2.58)	124(3.19)	1.66	3.8(6.4)?	4.5—
H. perkinsi								
Sykes	3.5	(6.5)	(6)	(2.5)	.....	.....	.....	4.5-5
fig.	3.4	191(6.5)	181(6.15)	69(2.35)	132(3.1)	.....	.....	
BBM. 20109	3.19	191(6.10)	172(5.49)	73(2.32)	135(3.14)	1.71	3.8(6.4)?	4.3
BBM. 34278	4.36	164(7.16)	157(6.85)	59(2.57)	142(3.65)	1.69	3.7(6.28)	5+
H. p. maunahoomae								
type	3.76	171(6.43)	156(5.85)	70(2.63)	130(3.42)	1.63	4.0(6.5)?	4.5—
H. p. poholuae								
type	3.77	170(6.41)	157(5.92)	66(2.47)	134(3.31)	1.53	4.1(6.31)	4.7—
H. subdola								
type	3.19	186(5.92)	170(5.42)	68(2.18)	137(2.99)	1.30	4.0(5.21)	4.9+

Hiona (Hionella) perkinsi (Sykes), (pl. 41, fig. 4; pl. 35, figs. 7-9; pl. 21, figs. 15, 16).

Macrochlamys perkinsi Sykes, 1896, Proc. Malac. Soc. 2: 126. *Philonesia perkinsi* Sykes, Fauna Haw. 2: 284, pl. 11, figs. 41, 42.

Hawaiian islands: Lanai: (Perkins!); BBM. 57679 (from type lot). BBM. 20109, dissected by Cooke, Kaiholena Gulch (Spalding! Oct. 27, 1909); BBM. 34278, eastern end from Captain Sowles' house (Forbes! June 1, 1913); BBM. 34419, dissected, right-hand side, middle of ridge, Kaiholena (Forbes! June 12); BBM. 45508, dissected (Forbes! Sept. 17, 1918); BBM. 57828, Kaiholena Gulch.

Shell (pl. 41, fig. 4; pl. 35, figs. 7, 8) suborbicular (sometimes largest shells with higher, domical spire: 34278, pl. 35, fig. 7), sharply angulate when young, distinctly so at end of 4th whorl becoming only fairly so on 5th; basal foveola narrow and mediocre; fairly pronounced horn-color, very glossy above, quite polished below and rather transparent. Embryonic whorls around 1⅞, with quite sharp fine spiral striae (somewhat as in *H. platyla*) and fairly sharp growth-lines. Later whorls with considerably weaker spirals and weak growth-lines (10-11 per mm. on 5th whorl) above, and with still weaker spirals below; suture lightly impressed and rather narrowly overriding. Aperture of medium breadth, almost evenly rounded, about 75° to shell-axis; peristome scarcely arcuate below, about 10° to shell-axis. Columella of embryo (pl. 35, fig. 9) with a very heavy fold adnate for some distance to both basal and parietal walls but becoming free below near peristome; at 4.3 whorls (pl. 35, fig. 8) longer with low broad cord, distinctly truncating below and not adnate to peristome; at 5+ whorls, only weakly convex and not distinctly truncated.

Animal similar to *H. rufobrunnea*, but foot darkly pigmented except on top of tail (BBM. 20109 pale below pedal grooves). Mantle-lobes heavily or lightly (20109) pigmented; right shell-lobe pigmented at base; left shell-lobe very small (34119) or apparently wanting. Lung with few small black blotches or lines behind mantle collar and along hindgut, and sometimes with white spots near kidney; 4 times as long as base 2.5 times kidney length, which is twice its base or 1.5 times pericardial length. Herma-

phroditic duct (pl. 21, fig. 16) fairly long and swollen in lower half; uterus containing 1 egg and 3 embryos; post-uterine oviduct longer and stouter; spermatheca very much longer and gradually swollen near tip. Penial sheath (shown in outline) including 2/3 of penis proper. Penial prepuce considerably larger, externally with a flattened, whitish sac, and internally with a rounded boss on right wall. Jaw with quite low median lobe. Radula (pl. 21, fig. 15) has 6 laterals, with entocone obsolescent on last, and 36 marginals (Cooke found 26-34 in 20109), of which around 18 are bicuspid; 85 rows counted.

Despite its columellar fold, *H. perkinsi* is, in many ways, closer to *Philonesia* (especially the subgenus *Aa*) than is *H. rufobrunnea.* Some of the shells almost appear to be hybrids between *Hiona* and *Philonesia.* In addition, the soft parts are mainly from older collections, some of which have been soaked in alkali in order to facilitate cleaning. Perhaps a left shell-fold is present, but usually it is not visible. All the forms of the *Hiona perkinsi* group need further study from living or fresh material.

Hiona (Hionella) perkinsi maunahoomae, new subspecies (pl. 35, figs. 1, 2).

Hawaiian islands: west Maui (Lahaina): 11389 (21042, dissected), also 21023, high above camp, Maunahooma (Cooke! May, 20, 1910).

Shell (pl. 35, figs. 1, 2) similar to *H. perkinsi* but more elevated (at corresponding whorl-sizes), with slightly more rapid whorl-increase and deeper foveola; less glossy. Later whorls with stronger spiral striae (about as in *H. platyla*) above; suture slightly more impressed. Aperture a little broader, just angulate at 4.5 whorls. Columella in embryo with columellar fold much as in 4-whorled *H. perkinsi;* with much weaker cord at all subsequent stages and very obliquely truncated at 4.5 whorls.

Animal similar but penial prepuce with longer sac.

Hiona (Hionella) perkinsi poholuae, new subspecies (pl. 35, figs. 3, 4).

Hawaiian islands: Molokai (eastern): BBM. 11390 (35177, dissected) on ground, from pocket, east of ridge, just below swamp, Poholua, Kalamaula (Gifford and Cooke! Oct. 27, 1913).

Shell (pl. 35, figs. 3, 4) similar to subspecies *maunahoomae* but with very slightly more rapid whorl-increase, weakly angulate at 4.5 whorls, with shallower basal foveola, and still less glossy. Later whorls with slightly sharper spiral striae and growth-lines (9 per mm. on 5th) above. Aperture just evenly rounded. Columella almost straight, with practically obsolete truncation at 4 whorls (youngest seen).

Animal similar to typical subspecies; no left shell-lobe observed. Lung with black pigment behind mantle collar and along hindgut, and with small white dots; kidney thrice as long as its base or twice pericardial length. Uterus not pregnant. Penial prepuce has larger sac with more truncate apex. Jaw with low or distinct median lobe. Radula has 5 or 6 tricuspid laterals and 30 marginals, of which about 13 are bicuspid; 81 rows counted.

H. perkinsi poholuae may turn out to be a form of the next species, but, from the present material, looks more like subspecies *maunahoomae* than anything else.

Hiona (Hionella) subdola, new species (pl. 35, figs. 5, 6; pl. 26, figs. 19, 20).

Hawaiian islands: Molokai (eastern): BBM. 11391 (33624, dissected, also

by Cooke), ANSP. 108624, pipeline above spring, Kalihi, Kaunakakai (Pilsbry and Cooke! Jan. 26, 1913).

Shell (pl. 35, figs. 5, 6) similar to depressed *H. perkinsi,* but smaller at all stages, with shallower basal foveola. Embryonic whorls 1¾ to 1⅞, with slightly weaker sculpture. Later whorls with slightly sharper spiral striae (more as in *H. perkinsi maunahoomae,* although shell appears more glossy) and growth-lines above. Columella at 4 whorls with considerably weaker cord and truncation (slightly stronger than in *maunahoomae*); near 5, thickened and rounded but concave.

Animal similar to *H. rufobrunnea* but sides of head pigmented. Right shell-lobe pigmented only at base; left shell-lobe small but distinct. Lung with dark pigment behind mantle collar and along hindgut and with large white spots. Uterus containing 3 embryos; spermatheca (pl. 26, fig. 19) apically swollen. Penial sheath including over half of epiphallus or only 2/3 of penis proper. Atrial sac slightly more constricted basally. Jaw with low, rounded median lobe. Radula (pl. 26, fig. 20) has broader central, 6 broader, tricuspid laterals, and 29 marginals, of which about 11 are strictly bicuspid; rows not counted.

Hiona subdola may also connect up with the *H. perkinsi* series, but seems fairly distinct.

Hiona (Hiona) megodonta, new species (pl. 41, fig. 3; pl. 21, fig. 10).

Hawaiian islands: Oahu (Waianae Mountains, Waialua): BBM. 11392 (17632, dissected by Cooke and me), east slopes of Kaala (Haleauau) (Spalding! Jan. 3, 1909); BBM. 36745, ANSP. 108292, same place (Thaanum! March 1913). Other BBM. lots from Kaala and Pukaloa.

Shell (pl. 41, fig. 3) orbicular-lenticular, sharply angulate when young and distinctly so at 5.2 whorls, with narrow, moderately impressed foveola; tan color, with silky finish above and below. Embryonic whorls around 1⅞, with very sharp and quite distinct, fine spiral striae. Later whorls with superficial, but sharply cut growth-wrinkles (10 per mm. on late 5th) above and with even sharper spirals than embryonic ones above and nearly as sharp below; suture lightly impressed and narrowly overriding. Aperture narrowly lunate, about 70° to shell-axis and distinctly angulate; peristome 20° to shell-axis and arcuate near columella (to about 1/3 width of base). Columella oblique and very heavy, continued by a stout plate that curves toward horizontal and forms sharp free lamella (remarkably like that in *Lamprocystis excrescens*).

Animal similar to *H. platyla* but more lightly pigmented near pedal grooves and around middorsal groove of tail. Shell and mantle lobes paler; left shell-lobe relatively broader; 1.5 times as long as its base. Lung almost colorless, although sometimes with minute white dots behind mantle collar and along hindgut; 3.5 times length of kidney, which is 2.5 times its base. Uterus (pregnancy not advanced) containing 4 eggs; spermatheca (pl. 21, fig. 10) with even less distinct sac. Penial sheath including all epiphallus; corona slightly longer than broad; penis proper smaller than prostate. Radula has 6 tricuspid laterals (Cooke found 5 and 7), and 35 laterals (30 and 33 counted by Cooke), of which about 25 are bicuspid (although mesocone develops serrations on outer ones) and 10 add more ectocones; 83 rows counted.

The following key outlines the sections of the subgenus *Hiona,* s.s. and the species of the typical section:

A. Penial atrium with diverticulum; mantle with small (or no?) left shell-lobe; shell with or without truncate columellar thickening or cord; Molokai, Lanai, Maui and Hawaii: .....section **Hionella,** new.

AA. Penial atrium without distinct diverticulum; mantle with more prominent left shell-lobe; columella with evident lamella or adnate plate;

B. Penial atrium not markedly swollen; shell glossy (when fresh), with sharp, fine spiral striae above; Oahu:.....section **Hiona,** s. s.

C. Columella with heavy lamella free for some distance; shell smaller (4.5 wh. diam. 5.5 mm.), more elevated, more closely coiled and with silky finish (spiral striae sharper): (Waianae Mts., Waialua):.....**H. megodonta,** new species.

CC. Columella with thinner plate fused to base; shell larger, more depressed and more glossy:

D. Shell smaller (4.5 wh. diam. 8 mm.), more depressed and distinctly angulate; (Waianae Mts., and Koolau Range, Waialua):.....**H. platyla** (Ancey).

DD. Shell larger (4.5 wh. diam. 9 mm.), more elevated and weakly angulate; subfossil; (Koolau side, Ewa): Waimano.....**H. waimanoi,** new species.

BB. Penial atrium swollen; shell more polished, with weaker spirals above; Kauai:.....section **Nesocyclus,** new.

Dimensions in section Hiona, s. s.

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	4.5 wh.	whs.
H. megodonta type	3.43	182(6.26)	174(5.98)	63(2.16)	143(3.10)	1.50	3.6(5.34)	5.2
H. platyla								
Ancey	2.25	257(6)	231(5.2)	.....	.....	.....	.....	4
BBM. 17213	3.16	266(8.42)	249(7.87)	71(2.25)	160(3.59)	1.88	4.3(8.01)	4.7
H. waimanoi type	3.43	236(8.10)	220(7.54)	76(2.62)	145(3.81)	2.15	4.1(8.9)?	4¼

Comparative whorl-sizes in subgenus Hiona, s. s.

	1½	4 wh.	4½ wh.	5 wh.	6 wh.	6½ wh.	Maxima	Index
H. rufobrunnea	1.66	3.3(5.44)	3.8(6.4)?	4.3(7.1)?	.....	.....	4.5—	159
H. perkinsi	1.71	3.2(5.42)	3.8(6.4)?	.....	.....	.....	4.3	191
	1.69	.....	3.7(6.28)	4.2(7.13)	.....	.....	5+	164
H. p. maunahoomae	1.63	3.4(5.52)	4.0(6.5)?	4.5(7.4)?	.....	.....	4.5—	171
H. p. poholuae	1.53	3.5(5.40)	4.1(6.31)	4.7(7.2)?	.....	.....	4.7—	170
H. subdola	1.30	3.4(4.43)	4.0(5.21)	4.6(6.0)?	.....	.....	5—	186
H. megodonta	1.50	.....	3.6(5.34)	4.0(6.01)	.....	.....	5.2	182
H. platyla	1.88	3.7(7.0)?	4.3(8.01)	4.8(9.1)?	.....	.....	4.7	266
H. waimanoi	2.15	3.5(7.54)	4.1(8.9)?	4.6(9.9)?	.....	.....	4¼	236
H. milolii	1.43	.....	5.0(7.15)	5.8(8.35)	.....	.....	5.1	208
H. exaequata	1.23	.....	.....	.....	6.1(7.49)	7.0(8.6)?	6.3+	217
BBM. 81357	1.28	.....	.....	.....	5.1(6.5)?	5.8(7.43)	7—	225
BBM. 81151	1.26	.....	.....	.....	6.0(7.54)	6.9(8.72)	6½	234
H. e. waimeae	1.36	.....	.....	4.7(6.41)	6.2(8.4)?	.....	5¾	195
BBM. 48449	1.45	.....	3.5(5.12)	4.1(5.92)	5.6(8.1)?	.....	5.3	213
H. kipui	1.35	.....	.....	3.8(5.1)?	5.3(7.20)	6.0(8.1)?	6.1	225
	1.30	.....	.....	.....	5.5(7.16)	6.2(8.12)	6.6	227
H. meineckei	1.26	.....	.....	4.8(6.0)?	6.6(8.35)	.....	6.1	201

Hiona (Hiona) platyla (Ancey), (pl. 41, fig. 1; pl. 35, fig. 12; pl. 21, figs. 7-9).

Microcystis platyla Ancey, 1889, Bull. Soc. Malac. France **6**: 196; Sykes, Proc. Malac. Soc. **3**: 275, pl. 13, figs. 13-15.

Hawaiian islands: Oahu (Waianae Mountains, Waianae): BBM. 18894 (type); BBM. 56274 (Baldwin's original lot), Waianae. (Waialua): BBM. 17213, dissected (also by Cooke), lower part of valley, south of Ponds Ridge, back of Mokuleia (Cooke! Sept. 6, 1908). (Ewa): BBM. 37284, dissected, north side of head of Kanehoa Valley [North Huliwai Gulch] (Spalding! Oct. 16, 1914). (Waialua, Koolau Range): BBM. lot (young) from south side of Opaeula Gulch.

Shell (pl. 41, fig. 1) similar to *Hiona megodonta* but larger and much more depressed, more acutely angulate, with broad, quite deep foveola; horn-color, glossy above and more so below. Embryonic whorls almost flat above and with slightly weaker spirals. Later whorls with somewhat weaker growth-wrinkles (12-13 per mm. on 5th) and spiral striae above; basal spirals still stronger than on apical side of *H. orbis*. Aperture more sharply angulate (than in *H. megodonta*); peristome 10° to shell-axis, arcuate to about 0.5 base from columella. Columella in embryonic shells (pl. 35, fig. 12) with a rounded spiral cord at its base; at 4.7 whorls, very oblique, with adnate plate, similar to but heavier than in *H. orbis* and extending to peristome.

Animal similar to *Philonesia baldwini*; pigmented below and between pedal grooves, on top of head and on tip of tail; caudal horn prominent. Mantle collar (pl. 21, fig. 8) narrow; shell and mantle-lobes pigmented externally; right shell-lobe (LR) longer than diameter of mantle collar and slender (often more contracted); left shell-lobe (LL) much shorter, little over twice as long as its base; right mantle-lobe (MR) moderately large; anterior left mantle-lobe (MA) extensive but short, deeply separated from low posterior one. Lung almost colorless with narrow lines of dark pigment behind mantle collar and along hindgut; over 5 times as long as base or thrice kidney length, which is thrice its base or twice pericardial length. Hermaphroditic duct (pl. 21, fig. 7) mediocre in length; uterus containing 1 to 3 developing eggs and 3 embryos (UE) with shells; post-uterine oviduct rather short; spermatheca with slightly swollen sac and subequal stalk. Penial sheath including over half of epiphallus; penial retractor arising from diaphragm near right side of uterus and inserting above and below corona; epiphallic corona broader than long with 6 internal folds; penis proper somewhat larger than prostate, containing a large pilaster. Penial prepuce small; atrium proper short, opening near base of inferior tentacle. Jaw with very low median lobe. Radula (pl. 21, fig. 9) has subquadrate central, 5 tricuspid laterals, and 32 marginals (Cooke found 30-36), of which about 14 are slender, with long mesocone extending far beyond small ectocone, and remainder slowly adding ectocones; 81 rows counted.

The genus *Hiona,* of which *H. platyla* is the type, includes species which have been placed in *Microcystina* Mörch by some students. According to Godwin-Austen's account [1882, Mol. Brit. India pt. 1, p. 11, pl. 3, figs. 1-7], the type of that group, *M. rinkii* (Mörch) from the Nicobar Islands, has a dart-sac, although his figure of that structure is not very convincing. However, the reflected columella of *Microcystina* appears to develop a sinuous reflection over the perforation, instead of an internal lamella. In any case, the Nicobar Islands are closer to the geographic range of *Lamprocystis* and

such a hurdling of *Microcystina* into the central Pacific islands would be almost unbelievable.

Hiona (Hiona?) waimanoi, new species (pl. 34, figs. 8, 9).

Hawaiian islands: Oahu (Ewa, Koolau side): BBM. 11394 (51925, subfossil), Waimano, (Cooke!).

Shell (pl. 34, figs. 8, 9) very similar to *Hiona platyla* but larger and less flattened above, considerably less angulate (weakly so on 5th whorl); bleached and appearing more polished. Spiral and growth-sculpture apparently similar but worn. Aperture weakly angulate; peristome about 20° to shell-axis; columellar plate much the same.

H. waimanoi must be very closely related to *H. platyla* and may be only an extinct lowland form of that species, but, because of its worn condition, looks much like *H. milolii* from Kauai.

Hiona (Nesocyclus) milolii, new species (pl. 35, figs. 13, 14).

Hawaiian islands: Kauai (northwest Waimea): BBM. 11395 (48349, dissected), under logs, Milolii Valley (Cooke! Aug. 19, 1919).

Shell (pl. 35, figs. 13, 14) similar to *Hiona platyla* but with higher, more conoid spire, angulate when young, quite weakly so at 5 whorls, with deeper basal foveola; paler horn-color, much more polished. Embryonic whorls with considerably weaker, very fine spiral striae. Later whorls with moderate growth-lines and weak spirals (stronger than in *H. orbis*). Aperture slightly broader, less angulate; peristome about 20° to shell-axis, less arcuate below. Columella with heavier plate.

Animal similar to *H. exaequata* but darker on head and tail. Mantle-lobes darker; right shell-lobe (contracted) 3 times as long as its base. Lung with black lines behind mantle collar and along hindgut; 5 times as long as base or thrice kidney length, which is 2.5 times its base or twice pericardial length. Apical whorls with black pigment. Embryos not counted; apical half of spermatheca swollen by a membranous sac with yellowish contents. Epiphallic corona not quite twice as long as broad and receiving fewer branches from penial retractor. Radula has 7 similar laterals, and 45 marginals, of which about 15 are bicuspid; 91 rows counted.

Although *Hiona milolii* is evidently a *Nesocyclus* with more rapid whorl-increase, it resembles the typical group of *Hiona* in form of shell.

Key to Species and Subspecies of Section Nesocyclus

A. Shell with whorls flattened above, with lightly impressed suture; principal radular marginals subequally bicuspid;

B. Shell with more rapid whorl-increase; similar to *H. platyla* but larger (5 wh. diam. over 8 mm.) and much more polished; (northwest Waimea): Milolii Valley..... **H. milolii,** new species.

BB. Shell with very gradual whorl-increase and low spire;

C. With fairly distinct growth-wrinkles, with 6th and 7th whorls weakly to barely angulate..... **H. exaequata** (Gould).

D. With larger and less whorls (5.5 wh. diam. 7.5 mm.); (Waimea):..... .....subspecies **waimeae,** new.

DD. With smaller and more whorls (6-6.5 wh. diam. 7.5 mm.); (northern Lihue): Wailua Valley.....typical subspecies.

CC. Shell with sharp growth-wrinkles above; 7th whorl distinctly angulate; size like DD; (Koloa-Lihue): around Mt. Haupu.....**H. kipui,** new species.

AA. Shell with whorls arched above, with more deeply impressed suture; large (6 wh. diam. over 8 mm.) and polished; principal marginals with mesocone accentuated and with some almost unicuspid; (western Hanalei): Waiahuakua..... .....**H. meineckei,** new species.

Dimensions in section Nesocyclus

	alt.	maj. diam.	min. diam.	alt. ap.	diam. ap.	1½	6 wh.	whs.
H. milolii								
type	4.12	208(8.58)	192(7.92)	72(2.95)	144(4.24)	1.43	.....	5.1
H. exaequata								
Gould	3.8	234(8.9)	.....	.....	.....	.....	.....	7
fig.	3.7	241(8.9)	.....	84(3.1)	139(4.3)	.....	.....	
(disculus)	3	233(7)	(6)	.....	.....	.....	.....	6
Reeve. fig.	2.84	247(7)	.....	91(2.58)	143(3.69)	.....	.....	
NYSM. 259	3.88	217(8.44)	203(7.89)	78(3.01)	117(3.51)	1.23	6.1(7.49)	6.3+
BBM. 81357	3.75	225(8.42)	210(7.86)	81(3.05)	128(3.91)	1.28	5.1(6.5)?	7—
BBM. 81151	3.73	234(8.72)	215(8.02)	80(2.97)	129(3.84)	1.26	6.0(7.54)	6½
H. e. waimeae								
type	4.07	195(7.92)	182(7.41)	77(3.14)	118(3.71)	1.36	6.2(8.4)?	5¾
BBM. 48449	3.08	213(6.57)	197(6.06)	77(2.36)	133(3.13)	1.45	5.7(8.3)?	5.3
H. kipui								
type	3.32	225(7.46)	206(6.85)	75(2.48)	136(3.37)	1.35	5.3(7.20)	6.1
larger	3.71	227(8.41)	211(7.84)	79(2.93)	134(3.91)	1.30	5.5(7.16)	6.6
H. meineckei								
type	4.27	201(8.60)	190(8.10)	79(3.39)	113(3.84)	1.26	6.6(8.35)	6.1

Hiona (Nesocyclus) exaequata (Gould), (pl. 42, figs. 7-9; pl. 35, fig. 15; pl. 21, figs. 11, 12).

Helix exaequata Gould, 1846, Proc. Boston Soc. N. H. 2:171 [19], Kauai; Pfeiffer, Monogr. 1:193 [3:35-4:15-5:55-7:68] Gould, Exped. Shells: 47, pl. 5, figs. 61, *a-c*. *Nanina exaequata* Tryon, Manual 2: 114, pl. 38, figs. 40-42.

Helix disculus Pfeiffer, 1850, Zeitschr. Malak. 7:68, Sandwich Islands; not Deshayes (1850).

Helix obtusangula Pfeiffer, 1851, same: 153, substitute for preceding. *H. exaequata* Reeve, Conch. Icon.: pl. 111, fig. 627; Pfeiffer, Conch.-Cab. II: 309, pl. 127, figs. 21-23 (very poor).

Hawaiian islands: Kauai [north Lihue]: [Wailua Valley], NYSM. 259 (A-748, Gould types), USNM. 5463 (in part), (Couthouy!). BBM. 81151

(pl. 42, figs. 7-9), crawling on ground in rain, ditch trail, near intake, south branch of North Fork of Wailua River (Oct. 26); BBM. 81357 (pl. 35, fig. 15), dissected, on ground, native forest on ditch trail crossing Waikoko at intake, South fork of Wailua River (Oct. 29; both lots Cooke and Dranga! 1925).

Shell (pl. 42, figs. 7-9; pl. 35, fig. 15) similar to *Hiona orbis* but heavier (less epidermal), usually with more gradual whorl-increase (but sutural spiral variable in both species), less sharply flattened above, angulate when young but barely so on 7th whorl, with broad deep basal foveola; light or dark horn-color. Embryonic whorls around 2, with slightly sharper spiral striae. Later whorls with fairly (considerably more) distinct growth-lines above and below and with spirals a little stronger, especially below (weaker than in *H. milolii*); suture a little more impressed. Aperture not truncate above, evenly rounded; peristome about 10° to shell-axis and almost as arcuate below. Columella with similar plate, but reaching to peristome (in large shells, more extensively dissolved from behind and less sharply limited laterally).

Animal similar to *H. platyla*, but with dark pigment more restricted to vicinity of pedal grooves and distinct dorsomedian caudal groove. Mantle-lobes dark; right shell-lobe 9 to 12 times as long as its base. Lung with black along hindgut and with few white spots; 4 times as long as kidney. Hermaphroditic duct (pl. 21, fig. 11) rather short; uterus long and slender, containing 3 small eggs, 3 large ones and 5 embryos with shells; post-uterine oviduct somewhat longer, subsacculate near base; spermatheca only slightly enlarged in apical half. Prostate elongate; penial sheath including corona, which is very slender and elongate and contains 4 longitudinal folds; penial retractor inserting on corona and penial apex; penis proper somewhat smaller than prostate, with 2 large internal pilasters. Penial prepuce relatively larger, swollen, with opaque white wall on left side, that internally forms a glandular pocket between forks of larger penial pilaster. Jaw with slightly stronger median lobe. Radula (pl. 21, fig. 12) has central with shorter mesocone, 8 tricuspid laterals, and 30 marginals, of which 12 have shorter mesocone and one more nearly subequal ectocone; 82 rows counted.

Dr. Cooke has decided that Gould's Kauai species came from near where the old trail crossed Wailua Valley, and the study of the type lots of *Hiona exaequata* confirms his judgment. NYSM. 259 contains a number of specimens; the largest is quite like BBM. 81151 (pl. 42, figs. 7-9) and is taken as the type; some of the others are closer to BBM. 81357 (pl. 35, fig. 15), which has more rapid whorl-increase. USNM. 5463 contains the base of a broken shell that appears to have been a smaller specimen of this species, possibly that figured in the U. S. Exploring Expedition shells, and a larger specimen of a very different shell (casually examined, it looked like my *H. pilsbryi*). So far as may be ascertained from descriptions and figures, Pfeiffer's later name was also founded on the typical subspecies.

Hiona (Nesocyclus) exaequata waimeae, new subspecies (pl. 35, figs. 10, 11).

Hawaiian islands: Kauai (north Waimea): BBM. 11396 (48091), on ground, west side of Halemanu Valley (Cooke! Aug. 11, 1919); BBM. 48449, dead leaves of *halapepe,* 2d valley below Puu Kapele (Cooke! Aug. 22); BBM. 16746, ANSP. 130479, dissected by Cooke, Kawaikoi; BBM. 58576, just west of branch to Kawaikoi Stream, Kumuwela to Wainiha Pali (Smith,

Davis, and Neal! Sept. 11, 1921). (Waimea): BBM. 86086, Olokele Canyon (not typical).

Shell (pl. 35, figs. 10, 11) similar to *H. exaequata* but with larger whorls, slightly higher spire (excluding 86096) and deeper foveola; thinner and slightly more polished. About 15 growth-lines per mm. on last whorl.

Hiona exaequata waimeae somewhat approaches *H. milolii.*

Hiona (Nesocyclus) kipui, new species (pl. 41, fig. 5).

Hawaiian islands: Kauai (Lihue): BBM. 11397 (17836, dissected by Cooke), above cliffs, front of Haupu (Dole and Cooke! March 5, 1909). (Koloa-Lihue): BBM. 81449, dissected, top of peak Haupu (Cooke and Dranga! Oct. 31, 1925).

Shell (pl. 41, fig. 5) similar to *H. exaequata* but more flattened above and distinctly angulate at 6.6 whorls; light horn-colored, less polished above. Later whorls with much stronger, sharp, angular growth-wrinkles (10 per mm. on 7th) above; but base similar. Aperture angulate; peristome slightly less arcuate below.

Animal also very similar. Right shell-lobe 6 or 7 times as long as its base; left shell-lobe 3 times. Lung with or without black lines; 7 times as long as base or 4 times kidney length, which is twice its base. Uterus containing 9 developing eggs and 2 embryos (with room for more). Epiphallic corona about 4 times as long as broad. Radula has 7 laterals, and 38 marginals (Cooke found 37 and 38), of which 15 to 19 are bicuspid; 82 rows counted.

Hiona kipui is very similar to *H. exaequata* in form, but its stronger sculpture and more marked angulation give it a decidedly rougher appearance.

Hiona (Nesocyclus) meineckei, new species (pl. 42, figs. 10, 11; pl. 21, figs. 13, 14).

Hawaiian islands: Kauai (west Hanalei): BBM. 11398 (88392, dissected), northeast of big waterfall, Waiahuakua (W. H. Meinecke! Aug. 2, 1926).

Shell (pl. 42, figs. 10, 11) similar to *H. exaequata,* but with somewhat more rapid whorl-increase, much higher whorls and deeper foveola; light straw-color, more polished. Later whorls arched above, with considerably weaker growth-wrinkles (about as in *H. milolii*); suture deeply impressed. Aperture more evenly rounded (and so appearing more oblique); peristome less arcuate below; columella a little less obliquely inclined (base more convex).

Animal also similar but darker on head and tail. Lung colorless. Uterus not pregnant; spermatheca (pl. 21, fig. 13) with short stalk and elongate sac, which contains a body with membranous walls and brownish contents. Penial sheath including all epiphallus; corona shorter (more as in *H. milolii*). Penial prepuce much less swollen. Jaw with almost no median lobe. Radula (pl. 21, fig. 14), with more elongate mesocones throughout, has 6 laterals, of which last lacks entocone, and 28 marginals, of which 16 bicuspid ones are very slender (more as in *H. platyla*) and some of them are almost unicuspid; more than 63 rows.

Hiona meineckei, perhaps the handsomest species of the subgenus *Hiona,* s. s., is named for its discoverer. The marginals of its radula are more nearly unicuspid than in any other species of the Philonesiae.

CORRECTIONS TO PART 1

Page 4. Line 15. Change "In separate paragraphs" to After successive periods.

Page 11. DD in key. Change "imperforate" to perforate.

Page 19. Line 27. Dr. Cooke informs me that Matai is a locality on Atiu Island.

Page 22. Second heading. Change to **Liardetia (Liardetia) samoensis** (Mousson). Mr. A. S. Kennard has kindly called to my attention that *Helix striolata* Pease, 1860, is clearly preoccupied by that of C. Pfeiffer, 1828, Naturg. deutsch. L. u. S.-moll. III :28.

Page 23. Line 24. See note for page 19.

Page 34. Line 26. Change "subgenus" in fifth line of key to section "*Mendaña* s. s."

Page 42. Line 7. Replace line by heading: **Mendaña (Uanuka) marquesana** (Pease). (pl. 10, figs. 2-3; pl. 4, figs. 18-19).

Page 44. Line 11. Change Oimea to Aimoa.

Page 47. Line 10. Change Orohenu to Orohena. Line 16. See note for p. 19.

Page 57. Line 12. Change "*Helicomalix*" to *Helicolimax*.

Page 90. Line 1. Change first semicolon to period and insert Tinian: before "BBM. 76971."

Page 99. Pl. 13, fig. 2. Change "(*Cnesticystis*)" to (*Facorhina?*).

Page 102. Pl. 19, fig. 12. See note for p. 99.

EXPLANATION OF PLATES

The scales for plates 36, 37, 38, and 41 represent lengths of 5 mm. [drawn by Miss Helen Winchester for Cooke]; those of plates 39, 40, and 42 indicate 2 mm. [these and plates 32-35, exclusive of embryonic shells, drawn by Mr. E. C. Tinkham]; those of outline figures of shells (plates 27 to 35), animals, mantle collars, pallial complexes, genitalia, and nervous systems 1 mm.; those for outlines and lines of radular half rows and for jaws 0.1 mm. (100 microns); and those for individual radular teeth 10 microns (0.01 mm.). The following symbols are used throughout the paper:

A: anus or anal nerve. AC: acoustic nerve.

B: lateral buccal nerve. BA: anterior buccal nerve. BC: buccal connective. BR: buccal retractor or nerve.

C: caudal or columellar nerve. CF: caudal foss. CH: caudal horn. CS: middorsal sulcus or groove.

D: vas deferens. DG: prostatic gland. DS: seminal duct (prostatic part).

E: epiphallus. EC: epiphallic corona. ED: slender part (?) of epiphallus. EF: flagellum or apical calc-sac. ER: retractor caecum of epiphallus.

F: foot. FA: anterolateral pedal nerve. FG: pedal gland (opening). FL: mediolateral or lateral pedal nerve. FP: posterolateral pedal nerve. FS: pedal grooves,

G: gonad (ovotestis). GD: hermaphroditic duct. GG: albumen gland. GT: talon.

H: heart or pericardium. HG: hindgut. HK: renopericardial pore. HV: principal pulmonary vein.

I: intestinal nerve.

J: jaw (mouth). JN: labial nerve.

K: kidney. KD: ureter. KO: renal orifice. KX: external ureteric opening.

L: left shell-lap. LD: right shell-lap. LK: urinary chamber. LL: left shell-lobe. LP: pneumostome. LR: right shell-lobe. LU: umbilical shell-lobe.

M: left pallial nerve. MA: anterior left mantle-lappet. MC: mantle collar. MG: mantle glands. ML: left mantle-lobe. MP: posterior left mantle-lappet. MR: right mantle-lappet. MW: attachment of mantle collar to visceral stalk and diaphragm.

N: nuchal nerve. NF: frontal nerve. NM: right pallial nerve. NS: subcerebral nerve.

O: oesophageal nerve. OA: anterior oesophageal nerve.

P: penis or penial nerve. PA: penial appendix (apical). PC: penial caecum or lobe (apical). PD: penial dart, stimulator or their sacs. PE: epiphallic branch of penis. PG: dart glands. PL: penial lobe or diverticulum (lateral or basal). PP: penial stimulator papilla or pilaster. PR: penial retractor. PS: penial sheath. PV: verge or penial papilla proper, through which epiphallus opens.

R: radular central tooth. RN: odontophoral nerve.

S: spermatheca. SR: spermathecal ligament. SS: spermathecal stalk.

T: right half of radular transverse row (outline or line); also tentacle. TE: ommatophore or its nerves. TR: tentacular retractors or their nerves. TV: inferior tentacle or its nerve.

U: oviduct as a whole. UE: embryos. UG: glandular sheath on free oviduct. UT: uterus. UO: eggs. UV: free oviduct. UZ: post-uterine oviduct.

V: vagina. VA: anteroventral pedal nerve. VG: vaginal gland. VL: medioventral pedal nerve. VP: posteroventral pedal nerve. VS: visceral stalk or peduncle.

X: carrefour. XL: lobe or sac of carrefour.

Y: atrium. YD: atrial stimulator. YG: atrial gland. YL: atrial lobe or diverticulum. YO: atrial opening. YP: penial prepuce (atrial outgrowth).

Z: liver.

Plate 21. Philonesia, Kaala, and Hiona

Figs. 1-4; 17, 18. *Philonesia (Philonesia) baldwini* (Ancey), BBM. 42197 (figs.1-3) and BBM. 23900 (figs. 17, 18 and 1-P): 1. Dissected genitalia (ovotestis and penial sheath omitted); also (P) transverse section of penis near its base (drawn by Cooke). 2. Radula; central with 1st lateral, 9th to 11th, 13th and 14th, 26th, and 44th and 45th teeth; also (T) outline of half row with widths of central and blocks of 10 teeth indicated. 3. Jaw. 4. Mantle collar, with right shell-lobe deflected outward and left mantle-lobes and tip of right turned inward. 17, 18. Dorsal and lateral views of tail (drawn by Cooke).

Figs. 5, 6. *Kaala subrutila* (Mighels), BBM. 54192: 5. Radula; central with 1st lateral, 15th and 16th, 41st and 52d teeth; also (T) outline of half row with widths of central and blocks of 9 teeth indicated. 6. Dissected genitalia (ovotestis and penial sheath omitted; uterus not full).

Figs. 7-9. *Hiona (Hiona) platyla* (Ancey), BBM. 17213: 7. Dissected genitalia (ovotestis and penial sheath omitted); also (drawn by Cooke) P, transverse section of penis 1/3 its length below apex, and P′, section same distance above its base. 8. Mantle collar with shell-lobes deflected outward and mantle-lobes inward. 9. Radula; central with 1st lateral, 5th with 6th, 9th and 22d teeth; also (T) outline of half row with widths of central and blocks of 5 teeth indicated.

Fig. 10. *Hiona (Hiona) megodonta,* new species, BBM. 17632: Penis (sheath omitted) and ends of female genitalia.

Figs. 11, 12. *H. (Nesocyclus) exaequata* (Gould), BBM. 81357: 11. Dissected genitalia (ovotestis and penial sheath omitted). 12. Radula; central with 1st lateral, 13th and 41st teeth.

Figs. 13, 14. *Hiona (Nesocyclus) meineckei,* new species, BBM. 88392: 13. Penis (sheath omitted) and ends of female organs. 14. Radula; central with 1st lateral, 15th and 29th teeth.

Figs. 15, 16. *H. (Hionella) perkinsi* (Sykes), BBM. 45508: 15. Radula; central with 1st lateral, 15th and 28th teeth. 16. Dissected genitalia (ovotestis omitted, and penial sheath only outlined).

Figs. 17, 18. *P. (Philonesia) baldwini* (Ancey), BBM. 23900: see fig. 1.

Plate 22. Philonesia

Figs. 1, 2. *Philonesia (Pitcairnia) pitcairnensis,* new species, BBM. 135125: 1. Dissected genitalia (ovotestis omitted). 2. Radula; central with 1st lateral, 9th to 11th, 16th, and 28th teeth; also (T) outline of half row with widths of central and blocks of 9 teeth indicated.

Figs. 3, 4. *Philonesia (Pitcairnia) filiceti* (Beck), BBM. 135102: 3. Penis (sheath omitted) and ends of female organs. 4. Radula; central with 1st lateral, and 32d teeth (same scale as fig. 2).

Figs. 5, 6. *Philonesia (Pitcairnia) mangarevae,* new species, BBM. 135167: 5. Radula; central with 1st lateral, 6th and 7th, 22d, and 105th teeth; also (T) line of half row with widths of central and blocks of 6 teeth indicated. 6. Penis and ends of non-pregnant female organs (same scale as fig. 1).

Figs. 7, 8. *Philonesia (Kipua) chamissoi* (Pfeiffer), BBM. 81011: 7. Radula; central with 1st lateral, 9th and 10th, 22d, 41st, and 51st teeth; also (T) outline of half row with widths of central and blocks of 9 teeth indicated. 8. Dissected genitalia (penial sheath omitted) with atrial stimulator (YD) partially everted; also (P) section through upper half of penis and (YP) through base of penial prepuce, drawn by Cooke from another animal (BBM. 20667).

Figs. 9, 10. *Philonesia (Philonesia) plicosa* (Ancey), BBM. 35059: 9. Radula; central with 1st lateral, 15th and 42d teeth; also (T) outline of half row with widths of central and blocks of 9 teeth indicated. 10. Penis and ends of female organs.

Figs. 11, 12. *Philonesia (Philonesia) oahuensis* (Ancey), BBM. 16017: 11. Radula; central with 1st lateral, 11th and 12th, and 37th teeth. 12. Penis (sheath omitted) and ends of female genitalia.

Figs. 13, 14. *Philonesia (Philonesia) fallax,* new species, BBM. 47114: 13. Radula (same scale as fig. 11); central with 1st lateral, 11th and 31st teeth. 14. Dissected genitalia (ovotestis omitted).

Plate 23. Philonesia

Figs. 1, 2. *Philonesia (Philonesia) kauaiensis,* new species, BBM. 48372: 1. Penis (sheath omitted) and ends of female genitalia. 2. Radula; central with 1st lateral, 16th, and 45th teeth.

Figs. 3, 4. *Philonesia (Philonesia) cicercula* (Gould), BBM. 47907: 3. Radula; central with 1st lateral, and 13th teeth. 4. Penis and ends of female genitalia (scale as in fig. 1).

Fig. 5. *Philonesia (Philonesia) maunalei,* new species, BBM. 34302: Penis (sheath omitted) and ends of female organs.

Figs. 6, 7. *Philonesia (Philonesia) decepta,* new species, BBM. 38944: 6. Radula (same scale as fig. 3); central with 1st lateral, 14th and 15th, and 42d and 43rd teeth; also (T) outline of half row with widths of central and blocks of 8 teeth indicated. 7. Dissected genitalia (ovotestis and penial sheath omitted).

Fig. 8. *Philonesia (Philonesia) perlucens* (Ancey), BBM. 48996: Penis (sheath omitted) and ends of female organs (half post-uterine oviduct omitted).

Figs. 9, 10. *Philonesia (Philonesia) glypha,* new species, BBM. 49106: 9. Penis, etc., as in fig. 8 (same scale). 10. Radula; 38th tooth.

Fig. 11. *Philonesia (Philonesia) ascendens,* new species, BBM. 53992: Penis sheath (sheath omitted) and ends of female organs.

Figs. 12, 13. *Philonesia (Philonesia) hartmanni* (Ancey), BBM. 11347: 12. Penis (sheath omitted) and ends of female organs. 13. Radula; central with 1st lateral.

Fig. 14. *Philonesia (Mauka) polita,* new species, BBM. 24963: Penis (sheath omitted) and ends of female organs (same scale as fig. 15).

Figs. 15, 16. *Philonesia (Mauka) welchi,* new species, BBM. 21135: 15. Dissected genitalia (ovotestis and penial sheath omitted). 16. Radula; central with 1st lateral, 12th, and 49th teeth.

Fig. 17. *Philonesia (Piena) parva,* new species, BBM. 20148: Dorsal view of penis (sheath omitted) and ends of female organs.

Figs. 18, 19. *Philonesia (Piena) grandis,* new species, BBM. 37047: 18. Dissected genitalia (ovotestis and penial sheath omitted). Fig. 19. Radula; central with 1st lateral, 15th and 16th, 29th and 47th teeth.

Plate 24. Philonesia

Fig. 1. *Philonesia (Piena) palawai,* new species, BBM. 59390: Penis (sheath omitted) and ends of female genitalia (post-uterine oviduct omitted).

Figs. 2, 3. *Philonesia (Haleakala) turgida diducta,* new subspecies, BBM. 11437: 2. Radula; central and 1st lateral, 8th and 9th, 13th and 14th, and 25th teeth; also (T) outline of half row with widths of central and blocks of 8 teeth indicated. 3. Dissected genitalia (ovotestis and penial sheath omitted).

Fig. 4. *Philonesia (Haleakala) turgida* (Ancey), BBM. 38440: Jaw (drawn by Cooke).

Fig. 5. *Philonesia (Haleakala) pusilla,* new species, BBM. 38194: Penis (sheath omitted) and ends of female organs (same scale as fig. 3).

Fig. 6. *Philonesia (Haleakala) indefinita* (Ancey), BBM. 38551: Penis and ends of female organs (same scale as fig. 3).

Figs. 7, 8. *Philonesia (Hiloaa) hiloi,* new species, BBM. 23257: 7. Penis (sheath omitted) and ends of female organs. 8. Radula; central and 1st lateral, 15th and 40th teeth.

Fig. 9. *Philonesia (Hiloaa) piihonuae,* new species, BBM. 11491: Penis (sheath omitted) and ends of female organs (same scale as fig. 3).

Fig. 10. *Philonesia (Aa) abeillei* (Ancey), BBM. 41717: Penis (sheath omitted) and ends of female genitalia.

Figs. 11, 12. *Philonesia (Aa) gouveiana,* new species: 11. Radula; central with 1st lateral (BBM. 39189; same scale as fig. 8). 12. Penis and ends of female organs (BBM. 44090; same scale as fig. 13).

Fig. 13. *Philonesia (Aa) waiheensis,* new species, BBM. 38997: Dissected genitalia (ovotestis and penial sheath omitted; same scale as fig. 12).

Figs. 14, 15. *Philonesia (Aa) sericans* (Ancey), BBM. 88155: 14. Radula; central and 1st lateral, 14th and 15th, and 47th and 48th teeth; also (T) outline of half row with widths of central and blocks of 8 teeth indicated. 15. Penis (sheath omitted) and ends of female organs.

Fig. 16. *P. (Oafatua) micra,* new species, BBM. 94881: Penis (sheath omitted) and ends of female organs.

Figs. 17, 18. *Philonesia (Oafatua) lenta* (Garrett), BBM. 99747: 17. Dissected genitalia (ovotestis and penial sheath omitted). 18. Radula; central and 1st lateral, 16th and 17th, and 29th and 30th teeth; also (T) outline of half row with widths of central and blocks of 7 teeth indicated.

Fig. 19. *Philonesia (Oafatua) contigua* (Garrett), BBM. 94790: Penis (sheath omitted) and ends of female genitalia.

Fig. 20. *Philonesia (Nukupiena) ordinaria,* new species, BBM. 95944: Dissected genitalia (ovotestis and penial sheath omitted),

Plate 25. Philonesia and Hiona

Figs. 1-3. *Philonesia (Uafatua) fusca* (Pease), BBM. 95490: 1. Dissected genitalia (ovotestis and penial sheath omitted) in same position as in plate 1, figure 4. 2. Radula; central with 1st lateral, 10th to 13th, 23d and 55th teeth; also (T) outline of half row with widths of central and blocks of 10 teeth indicated. 3. Internal view of pallial complex, with right mantle-lobe (MR) turned inward and left ones outward.

Fig. 4. *Philonesia (Uafatua) helicarion,* new species, BBM. 98355: Penis (sheath and half of retractor omitted) with ends of female genitalia (same scale as fig. 5).

Fig. 5. *Philonesia (Nukupiena) inflata,* new species, BBM. 95982: Penis (sheath omitted) and ends of female organs, viewed from dorsal surface (same scale as fig. 4).

Figs. 6-8. *Philonesia (Nesarion) tenuissima,* new species, BBM. 94550: 6. Mantle collar with right shell-lobe (LR) deflected outward and with left mantle-lobe and tip of

right (MR) one turned inward. 7. Penis (sheath omitted) and ends of female organs. 8. Radula; central with 1st lateral and 20th teeth.

Figs. 9, 10. *Philonesia (Rapafila) zimmermani,* new species, BBM. 135380: 9. Radula; central with 1st lateral and 6th to 8th teeth. 10. Dissected genitalia (penial sheath omitted).

Figs. 11, 12. *Philonesia (Rapafila) tenuior,* new species, BBM. 135379: 11. Dissected genitalia (ovotestis omitted). 12. Radula; central with 1st lateral, 21st, 45th, and 57th teeth; also (T) outline of half row with widths of central and blocks of 10 teeth indicated.

Figs. 13-15. *Hiona (Uapuneutra) cookeana,* new species, BBM. 98479: 13, 14. Radula; central with 1st lateral, 28th and 29th, 51st and 52d, and 86th teeth. 15. Penis (sheath omitted) and ends of female organs.

Figs. 16-18. *Hiona (Neutra) lymaniana* (Ancey), BBM. 16655: 16, 18. Radula; central with 1st lateral, 8th to 10th, 16th, 27th and 28th, and 43d and 44th teeth; also (16-T) outline of half row with widths of central and blocks of 9 teeth indicated. 17. Dissected genitalia (not pregnant; ovotestis and penial sheath omitted; same scale as fig. 15).

Fig. 19. *Hiona (Insulorbis) radians* (Pfeiffer), BBM. 86973: Radula; central with 1st lateral.

Plate 26. Hiona

Figs. 1-3. *Hiona (Opara) orbis* (Beck), BBM. 135305: 1. Mantle collar, with shell lobe deflected outward and mantle-lobes inward. 2. Radula; central with 1st lateral, 5th to 7th, 19th and 32d teeth; also (T) outline of half row with widths of central and blocks of 5 teeth indicated. 3. Dissected genitalia (uterus not fully pregnant; penial sheath omitted).

Figs. 4, 4,*a*. *Hiona (Insulorbis) monticola,* new species: 4. Dissected genitalia (ovotestis and penial sheath omitted), BBM. 142033. 4, *a*. Radula, BBM. 87038; central with 1st lateral, 13th, 26th, 38th, and 50th teeth; also (T) outline of half row with widths of central and blocks of 8 teeth indicated.

Figs. 5, 6. *Hiona (Insulorbis) aorai,* new species, BBM. 142041: 5. Radula; central with 1st lateral. 6. Penis (sheath omitted) and ends of female genitalia.

Fig. 7. *Hiona (Insulorbis) radians pohaitarae,* new subspecies, BBM. 142253: Penis (sheath omitted) and ends of female organs.

Fig. 8. *Hiona (Insulorbis) huahinei,* new species, BBM. 3188: Radula; 12th and 60th teeth.

Figs. 9, 10. *Hiona (Minororbis) cultrata* (Gould), BBM. 145375: 9. Radula; central with 1st lateral, 7th and 21st teeth; also (T) outline of half row with widths of central and blocks of 5 teeth indicated. 10. Dissected genitalia (penial sheath and all organs above posterior edge of diaphragm omitted).

Figs. 11, 12. *Hiona (Hionarion) wahiawae,* new species, BBM. 36282: 11. Radula; central with 1st lateral, 16th, and 33d and 34th teeth. 12. Penis (sheath omitted) and ends of female organs.

Figs. 13-15. *Hiona (Hionarion) pilsbryi,* new species, BBM. 80329: 13. Mantle collar with shell-lobes deflected outward and left mantle-lobes and tip of right one (MR) turned inward. 14. Radula; central with 1st lateral, 28th and 29th, and 65th teeth. 15. Dissected genitalia (ovotestis, most of hermaphroditic duct and penial sheath omitted).

Figs. 16-18. *Hiona (Hionella) rufobrunnea* (Ancey), BBM. 39573: 16, 17. Radula; central and 1st lateral, 12th and 24th teeth. 18. Dissected genitalia (as in fig. 15).

Figs. 19, 20. *Hiona (Hionella) subdola,* new species, BBM. 33624: 19. Penis (sheath omitted) and ends of female organs. 20. Radula; central and 1st lateral.

Plate 27. Philonesia

Figs. 1, 2. *Philonesia (Kipua?) arenofunus,* new species, BBM. 11326: Apical and frontal outlines of type shell.

Fig. 3. *Philonesia (Kipua) chamissoi* (Pfeiffer), BBM. 81011: Apical outline of shell with over 4.5 whorls.

Figs. 4, 5. *Philonesia (Philonesia) kualii,* new species, BBM. 43285: Apical and frontal (same scale as fig. 6) outlines of type shell.

Figs. 6, 7. *Philonesia (Philonesia) plicosa* (Ancey), form B, BBM. 19679: Frontal and apical outlines of shell.

Figs. 8, 9. *Philonesia (Oafatua) pura* (Garrett), ANSP. 83207: Apical and frontal outlines of shell.

Figs. 10, 11. *Philonesia (Philonesia) oahuensis* (Ancey), BBM. 16017: Apical and frontal (same scale as fig. 13) outlines of shell.

Figs. 12, 13. *Philonesia (Philonesia) oahuensis depressula* (Ancey), BBM. 21901: Apical and frontal outlines of shell.

Figs. 14, 15. *Philonesia (Philonesia) striata,* new species, BBM. 11331: Apical and frontal outlines of type shell.

Plate 28. Philonesia and Kaala

Figs. 1, 2. *Philonesia (Philonesia) ascendens,* new species, BBM. 11348: Frontal and apical outlines of type shell.

Figs. 3, 4. *Philonesia (Haleakala) interjecta,* new species, BBM. 11365: Apical and frontal outlines of type shell.

Figs. 5, 6. *Philonesia (Philonesia) perlucens* (Ancey), BBM. 48996: Frontal and apical outlines of shell.

Figs. 7, 8. *Philonesia (Aa) abeillei* (Ancey), BBM. 41717: Frontal and apical outlines of shell.

Figs. 9, 10. *Philonesia (Aa) mapulehuae,* new species, BBM. 11369: Apical and frontal (same scale as fig. 13) outlines of type shell.

Figs. 11, 12. *Philonesia (Nukupiena) inflata,* new species, BBM. 11321: Frontal and apical outlines of type shell.

Figs. 13, 14. *Philonesia (Aa) sericans* (Ancey), BBM. 88155: Frontal and apical outlines of shell.

Fig. 15. *Kaala subrutila* (Mighels), BBM. 36606: Tilted frontal outline of shell of 3.2 whorls.

Plate 29. Philonesia

Figs. 1, 2. *Philonesia (Philonesia) fallax popouwelae,* new subspecies, BBM. 34852: Frontal and apical outlines of type shell.

Figs. 3, 4. *Philonesia (Philonesia) waimanaloi,* new species, BBM. 11339: Apical and frontal (same scale as fig. 1) outlines of type shell.

Figs. 5, 6. *Philonesia (Philonesia) cicercula boettgeriana* (Ancey), BBM. 44075: Frontal and apical outlines of a shell.

Figs. 7, 8. *Philonesia (Philonesia) kauaiensis,* new species: 7. BBM. 81089; frontal outline of a shell (same scale as fig. 5). 8. BBM. 11342; apical outline of type shell.

Figs. 9, 10. *Philonesia (Philonesia) decepta,* new species, BBM. 11345: Apical and frontal outlines of type shell.

Figs. 11, 12. *Philonesia (Philonesia) cicercula* (Gould): 11. ANSP. 1986, frontal outline of a shell of over 5 whorls, probably from type lot. 12. USNM. 20948, ditto of a shell from type lot with 4.6 whorls.

Figs. 13, 14. *Philonesia (Hiloaa) hiloi,* new species, BBM. 11371: Frontal and apical outlines of type shell.

Fig. 15. *Philonesia (Pitcairnia) filiceti* (Beck), BBM. 135102: Apical outline of a shell.

Plate 30. Philonesia

Figs. 1, 2. *Philonesia (Philonesia) hartmanni* (Ancey), BBM. 11347: Frontal (same scale as fig. 4) and apical outlines of a shell.

Figs. 3, 4. *Philonesia (Philonesia) konahuanui,* new species, BBM. 11349: Apical and frontal outlines of type shell.

Figs. 5, 6. *Philonesia (Hiloaa) piihonuae,* new species, BBM. 11491: Frontal and apical outlines of type shell.

Figs. 7, 8. *Philonesia (Haleakala) turgida diducta,* new subspecies, BBM. 11362: Frontal and apical outlines of type shell.

Figs. 9, 10. *Philonesia (Haleakala) guavarum,* new species, BBM. 11363: Apical and frontal outlines of type shell.

Figs. 11, 12. *Philonesia (Haleakala) hahakeae,* new species, BBM. 11449: Frontal (same scale as fig. 10) and apical outlines of type shell.

Figs. 13, 14. *Philonesia (Haleakala) indefinita* (Ancey), BBM. 38551: Frontal and apical outlines of a shell.

Fig. 15. *Philonesia (?) pertenuis* (Gould), USNM. 5462: Frontal outline of type shell.

Plate 31. Philonesia

Figs. 1, 2. *Philonesia (Mauka) polita,* new species, BBM. 11356: Frontal and apical outlines of type shell.

Figs. 3, 4. *Philonesia (Mauka) similaris,* new species, BBM. 11357: Apical and frontal (same scale as fig. 1) outlines of type shell.

Figs. 5, 6. *Philonesia (Piena) grandis,* new species, form A, BBM. 37047: Frontal and apical outlines of a shell with almost 4¾ whorls.

Figs. 7, 8. *Philonesia (Piena) palawai,* new species, BBM. 11360: Apical and frontal (same scale as fig. 1) outlines of type shell.

Figs. 9, 10. *Philonesia (Uafatua) fusca* (Pease), BBM. 95490: Frontal and apical outlines of a shell.

Figs. 11, 12. *Philonesia (Nesarion) tenuissima,* new species, BBM. 11378: Frontal and apical outlines of type shell.

Figs. 13, 14. *Philonesia (Uafatua) obliqua,* new species, BBM. 11377: Frontal (same scale as fig. 11) and apical outlines of type shell.

Fig. 15. *Philonesia (Nesarion) tenuissima tahuatae,* new subspecies, BBM. 11380: Frontal outline of type shell (same scale as fig. 11).

Plate 32. Philonesia

Figs. 1, 2. *Philonesia (Rapafila) zimmermani tautautui,* new subspecies, BBM. 143282: Apical and frontal outlines of type shell.

Figs. 3, 4. *Philonesia (Rapafila) tenuior karaporahi,* new subspecies, BBM. 11382: Apical and frontal (same scale as fig. 2) outlines of type shell.

Figs. 5, 6. *Philonesia (Oafatua) micra,* new species, BBM. 11375: Frontal and apical outlines of type shell.

Figs. 7, 8. *Philonesia (Oafatua) lenta* (Garrett), BBM. 99747: Apical and frontal (same scale as fig. 12) outlines of a shell from Tahuata.

Figs. 9, 10. *Philonesia (Oafatua) uapouae,* new species, BBM. 11373: Apical and frontal (same scale as fig. 12) outlines of type shell.

Figs. 11, 12. *Philonesia (Oafatua) uahukae,* new species, BBM. 11374: Apical and frontal outlines of type shell.

Figs. 13-15. *Philonesia (Oafatua) contigua* (Garrett): 13. BBM. 11450, apical outlines of a small specimen. 14, 15. BBM. 94790, frontal (same scale as fig. 12) and apical outlines of a large shell (break in apex not shown); both lots from Hivaoa.

Plate 33. Hiona

Figs. 1, 2. *Hiona (Minororbis) angustivoluta* (Garrett), ANSP. 49297: Frontal and apical outlines of type shell.

Figs. 3, 4. *Hiona (Minororbis) scalpta* (Garrett), ANSP. 49289: Apical and frontal outlines of type shell.

Figs. 5, 6. *Hiona (Insulorbis) aorai,* new species, BBM. 11386: Frontal and apical outlines of type shell.

Figs. 7, 8. *Hiona (Insulorbis) huahinei,* new species, ANSP. 49287: Frontal and apical outlines of type shell.

Fig. 9. *Hiona (Opara) orbis* (Beck), BBM. 154548: Frontal outline of embryonic shell of 1⅝ whorls.

Figs. 10, 11. *Hiona (Minororbis) verticillata* (Pease), ANSP. 49285: Apical and frontal (same scale as fig. 13) outlines of a shell from Garrett.

Figs. 12-15. *Hiona (Minororbis) cultrata* (Gould), BBM. 145375: 12. Frontal outline of embryonic whorl of 1⅝ whorls. 13-15. Frontal, apical and basal outlines of shell.

Plate 34. Hiona, Orpiella, and Trochomorpha

Figs. 1, 2. *Hiona (Insulorbis) radians* (Pfeiffer), BBM. 86973: Frontal and apical outlines of a shell.

Fig. 3. *Orpiella (Irenella) pfeifferi* (Philippi), BBM. 94384: Frontal outlines of shell from Viti Levu.

Fig. 4. *Hiona (Insulorbis) radians pohaitarae,* new subspecies, BBM. 142253: Apical outlines of type shell.

Fig. 5. *Trochomorpha tentoriolum* (Gould), ANSP. 1935: Frontal outlines of type (?) shell.

Figs. 6, 7. *Hiona (Hionarion) wahiawae,* new species, BBM. 17500: Frontal (same scale as fig. 1) and apical outlines of type shell.

Figs. 8, 9. *Hiona (Hiona) waimanoi,* new species, BBM. 11394: Apical and frontal (same scale as fig. 1) outlines of type shell.

Figs. 10-15. *Hiona (Aukena) tridentata,* new species, BBM. 138682: 10-12. Apical frontal (same scale as fig. 13) and basal outlines of larger of two type shells, 13-15. Frontal, apical and tilted outlines of smaller shell.

Plate 35. Hiona

Figs. 1, 2. *Hiona (Hionella) perkinsi maunahoomae,* new subspecies, BBM. 11389: Frontal and apical outlines of type shell.

Figs. 3, 4. *Hiona (Hionella) perkinsi poholuae,* new subspecies, BBM. 11390: Apical and frontal (same scale as fig. 1) outlines of type shell.

Figs. 5, 6. *Hiona (Hionella) subdola,* new species, BBM. 11391: Frontal (same scale as fig. 1) and apical outlines of type shell.

Figs. 7-9. *Hiona (Hionella) perkinsi* (Sykes): 7. Frontal outlines of shell of over 5 whorls, BBM. 34278. 8. Tilted outlines of shell of 4.3 whorls, BBM. 20109. 9. Frontal outlines of embryonic shell of 2 whorls, BBM. 45508.

Figs. 10, 11. *Hiona (Nesocyclus) exaequata waimeae,* new subspecies, BBM. 11396: Apical and frontal outlines of type shell.

Fig. 12. *Hiona (Hiona) platyla* (Ancey), BBM. 37284: Frontal outlines of embryonic shell with over 1.7 whorls.

Figs. 13, 14. *Hiona (Nesocyclus) milolii,* new species, BBM. 11395: Frontal and apical outlines of type shell.

Fig. 15. *Hiona (Nesocyclus) exaequata* (Gould), BBM. 81357: Apical view of shell with slightly more rapid whorl-increase than in typical form.

Plate 36. Lamprocystis, Philonesia, and Euconulus

Fig. 1. *Lamprocystis (Guamia) misella* (Férussac), BBM. 75148: Apical, frontal, and basal views of shell with 5.2 whorls.

Fig. 2. *Philonesia (Philonesia) mokuleiae,* new species, BBM. 11336: Apical, frontal, and basal views of type shell, with over 4.5 whorls.

Fig. 3. *Philonesia (Haleakala) turgida* (Ancey), BBM. 38440: Apical, frontal, and basal views of shell with almost 4.5 whorls.

Fig. 4. *Euconulus thaanumi* (Ancey), BBM. 39572: Apical, frontal and basal views of shell with 5⅛ whorls.

Fig. 5. *Philonesia (Waihoua) kaliella,* new species, BBM. 49720: Apical, frontal, and basal views of a shell from type lot (not the type).

Plate 37. Philonesia and Hiona

Figs. 1, 2. *Philonesia (Philonesia) baldwini* (Ancey): 1. BBM. 23900; apical, frontal, and basal views of a typical shell with 4.7 whorls. 2. BBM. 17461; same views of a shell of 4¾ whorls.

Fig. 3. *Hiona (Neutra) lymaniana* (Ancey), BBM. 16655: Apical, frontal, and basal views of a shell with 4.2 whorls.

Fig. 4. *Philonesia (Piena) grandis,* new species, BBM. 11358: Apical, frontal, and basal views of type shell, with over 4.2 whorls.

Fig. 5. *Philonesia (Piena) parva,* new species, BBM. 11359: Apical, frontal, and basal views of type shell, with almost 4 whorls.

Plate 38. Philonesia and Hiona

Fig. 1. *Philonesia (Philonesia) baldwini* (Ancey), BBM. 23534: Apical, frontal, and basal views of a shell with over 4.8 whorls.

Fig. 2. *Philonesia (Philonesia) plicosa* (Ancey), BBM. 42175: Apical, frontal, and basal views of a typical shell with almost 4.5 whorls.

Fig. 3. *Philonesia (Philonesia) cryptoportica* (Gould), BBM. 17672: Apical, frontal, and basal views of a shell with 4.7 whorls.

Fig. 4. *Hiona (Hionarion) pilsbryi,* new species, BBM. 11387: Apical, frontal, and basal views of type shell, with 4.3 whorls.

Fig. 5. *Philonesia (Kipua) chamissoi* (Pfeiffer), BBM. 20667: Apical, frontal, and basal views of shell with 4.2 whorls.

Plate 39. Philonesia and Hiona

Figs. 1, 2. *Philonesia (Philonesia) fallax,* new species, BBM. 11337: Frontal and apical views of type shell.

Figs. 3, 4. *Philonesia (Philonesia) cicercula* (Gould), BBM. 47097: Frontal and apical views of shell.

Figs. 5, 6. *Philonesia (Philonesia) maunalei,* new species, BBM. 11344: Frontal and apical views of type shell.

Figs. 7, 8. *Philonesia (Philonesia) hartmanni palehuae,* new subspecies, BBM. 11346: Apical and frontal views of type shell.

Figs. 9, 10. *Philonesia (Aa) gouveiana,* new species, BBM, 11367: Apical and frontal views of type shell.

Figs. 11, 12. *Philonesia (Haleakala) pusilla,* new species, BBM. 11364: Apical and frontal views of type shell.

Figs. 13, 14. *Hiona (Hionella) rufobrunnea* (Ancey), BBM. 39573: Apical and frontal views of a shell.

Fig. 15. *Philonesia (Philonesia) kauaiensis,* new species, BBM. 11342: Frontal view of type shell.

Plate 40. Philonesia

Figs. 1-3. *Philonesia (Oafatua) fatuhivae,* new species, BBM. 11372: Apical, frontal, and basal views of type shell.

Figs. 4-6. *Philonesia (Uafatua) helicarion,* new species, BBM. 11376: Apical, frontal, and basal views of type shell.

Figs. 7-9. *Philonesia (Rapafila) zimmermani,* new species, BBM. 11383: Apical, frontal, and basal views of type shell.

Figs. 10, 11. *Philonesia (Rapafila) temior,* new species, BBM. 11381: Apical and frontal views of type shell.

Figs. 12, 13. *Philonesia (Nesarion) tenuissima obesior,* new subspecies, BBM. 11379: Apical and frontal views of type shell.

Figs. 14, 15. *Philonesia (Nukupiena) ordinaria,* new species, BBM. 11320: Apical and frontal views of type shell.

Plate 41. Hiona and Kaala

Fig. 1. *Hiona (Hiona) platyla* (Ancey), BBM. 17213: Apical, frontal, and basal views of a shell with 4.7 whorls.

Fig. 2. *Kaala subrutila* (Mighels), BBM. 36606: Apical, frontal, and basal views of a shell with 4.6 whorls.

Fig. 3. *Hiona (Hiona) megodonta,* new species, BBM. 11392: Apical, frontal, and basal views of type shell, with 5.2 whorls.

Fig. 4. *Hiona (Hionella) perkinsi* (Sykes), BBM. 20109: Apical, frontal, and basal views of a shell with 4.3 whorls.

Fig. 5. *Hiona (Nesocyclus) kipui,* new species, BBM. 11397: Apical, frontal, and basal views of type shell, with 6.1 whorls.

PLATE 42. HIONA AND ORPIELLA

Figs. 1, 2. *Hiona (Insulorbis) monticola,* new species, BBM. 11501: Apical and frontal views of type shell.

Fig. 3. *Hiona (Insulorbis) radians pohaitarae,* new subspecies, BBM. 142253: Frontal view of type shell.

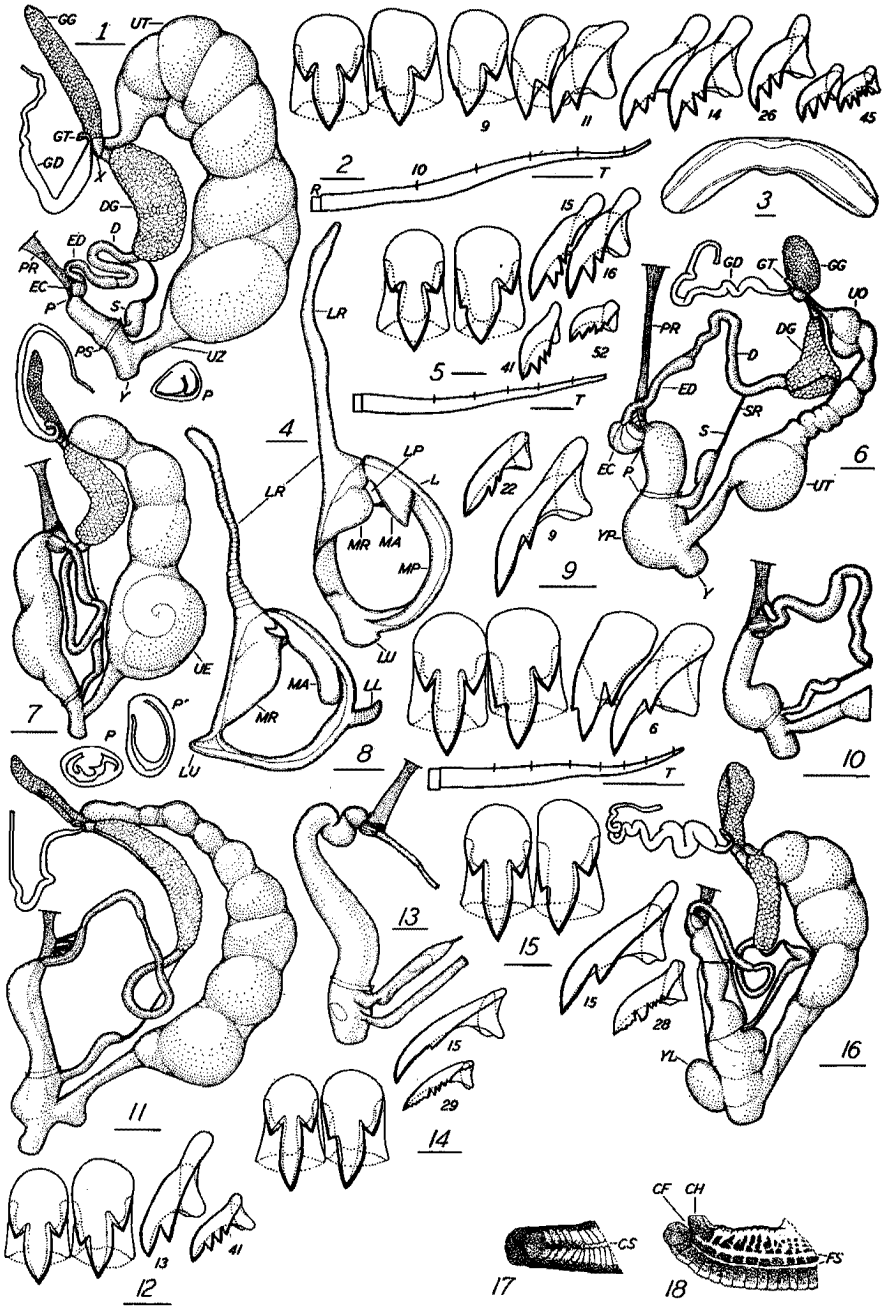
Figs. 4-6. *Hiona (Opara) orbis* (Beck), BBM. 135305: Apical, frontal, and basal views of a shell.

Figs. 7-9. *Hiona (Nesocyclus) exaequata* (Gould), BBM. 81151: Apical, frontal, and basal views of a typical shell.

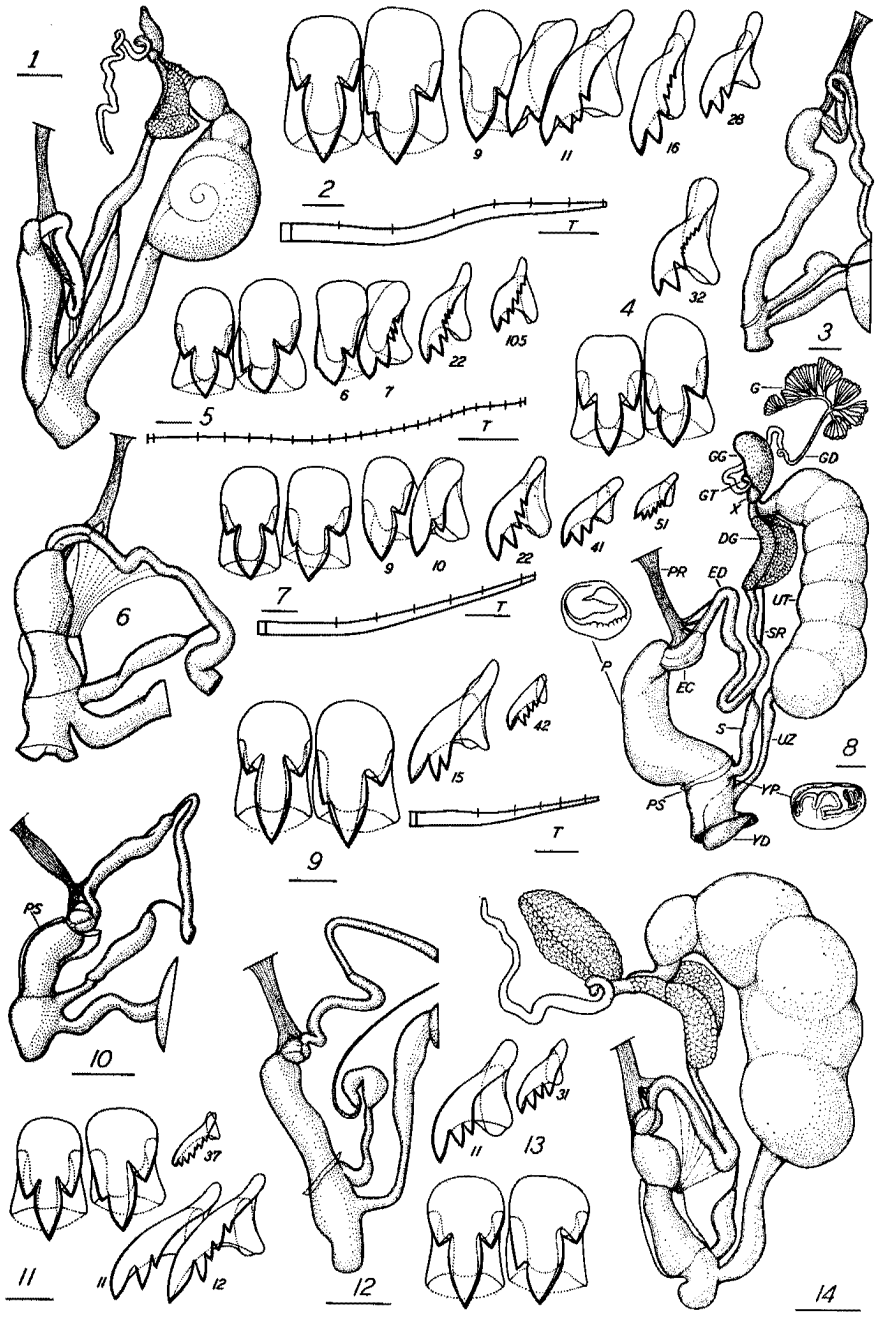
Figs. 10, 11. *Hiona (Nesocyclus) meineckei,* new species, BBM. 11398: Apical and frontal views of type shell.

Fig. 12. *Orpiella (Fijia) macgillivrayi* (Gude), BBM. 77040: Frontal view of a shell with 5.3 whorls.

Figs. 13-15. *Hiona (Uapuneutra) cookeana,* new species, BBM. 11384: Apical, frontal, and basal views of type shell.



PHILONESIA, KAALA, AND HIONA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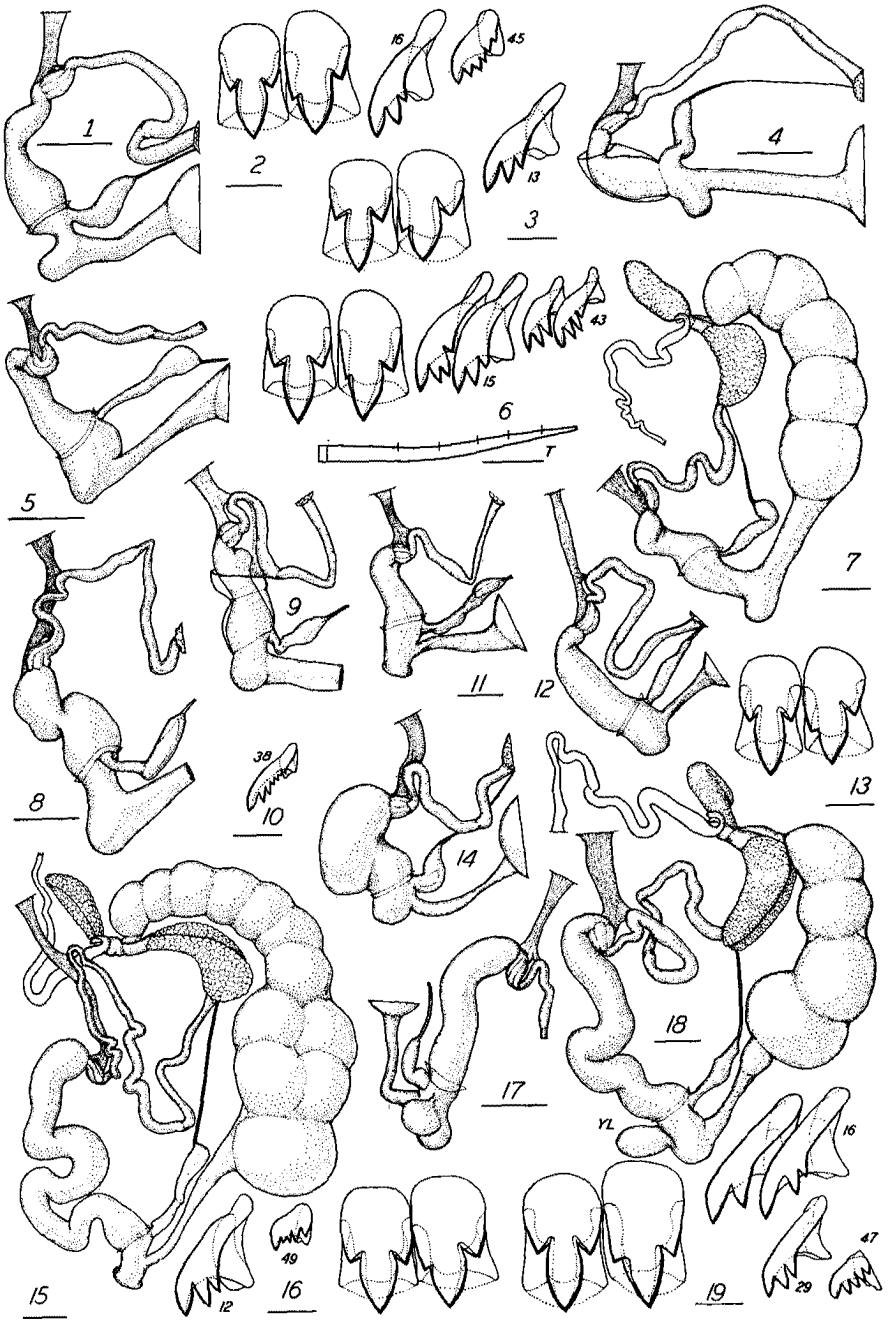
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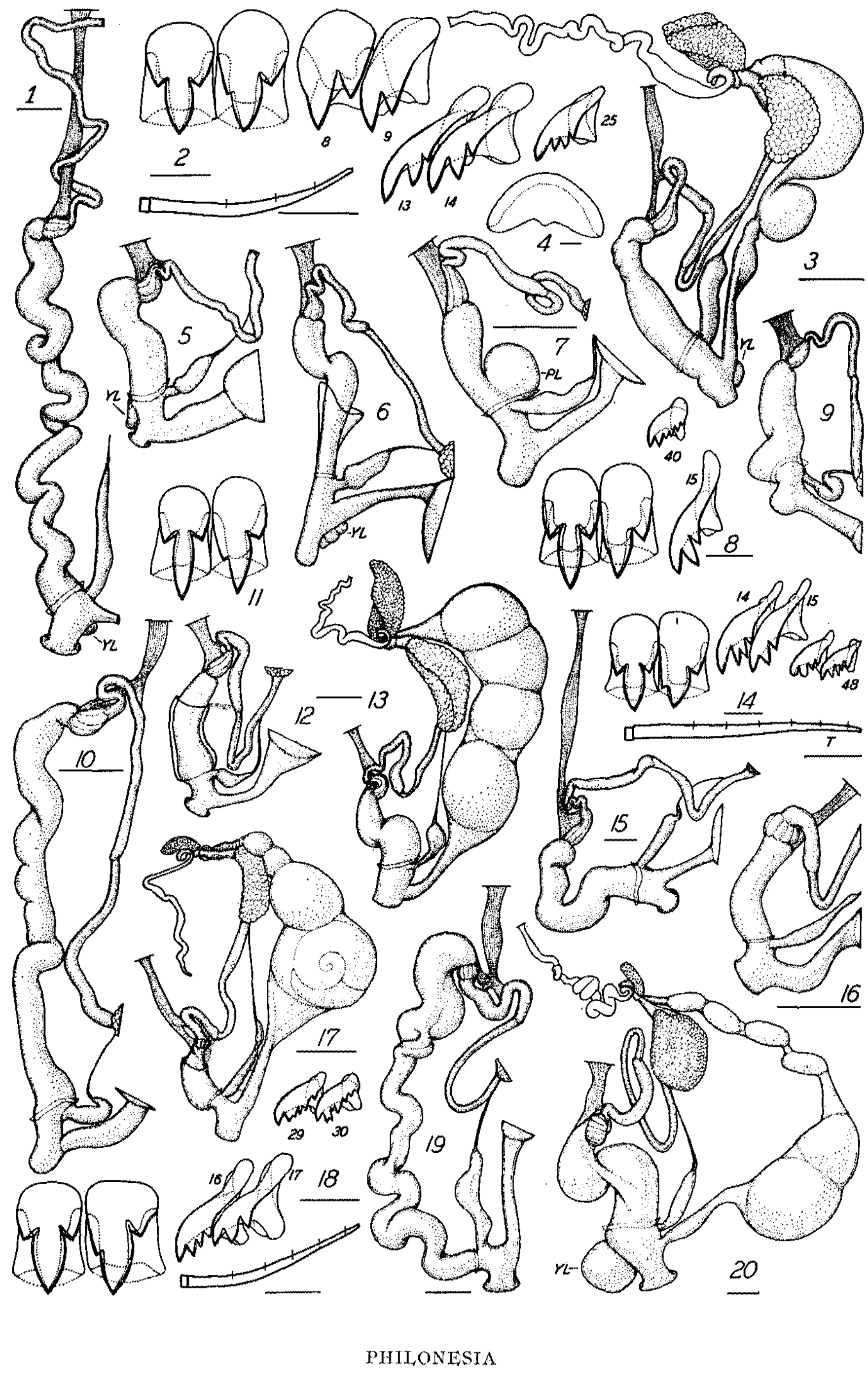
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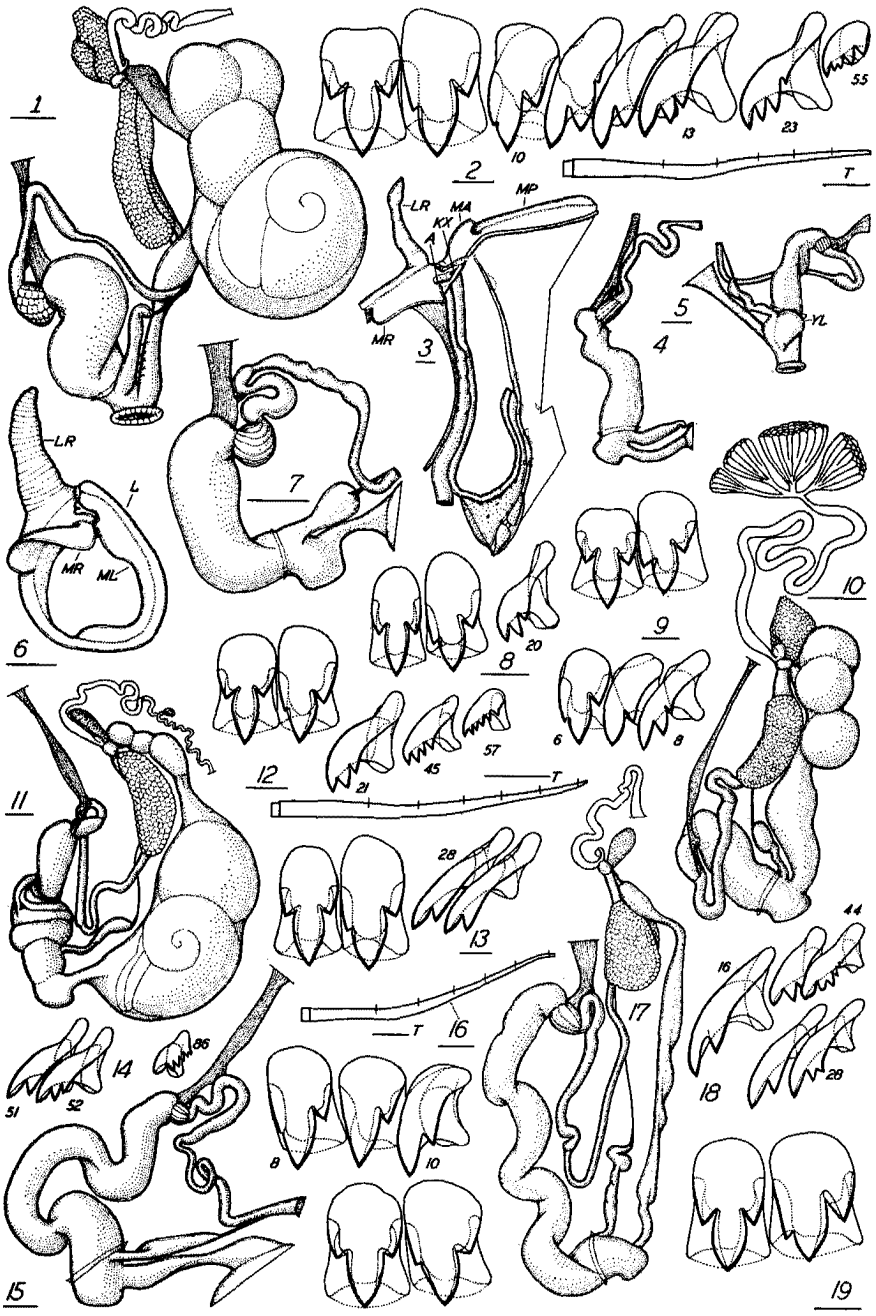
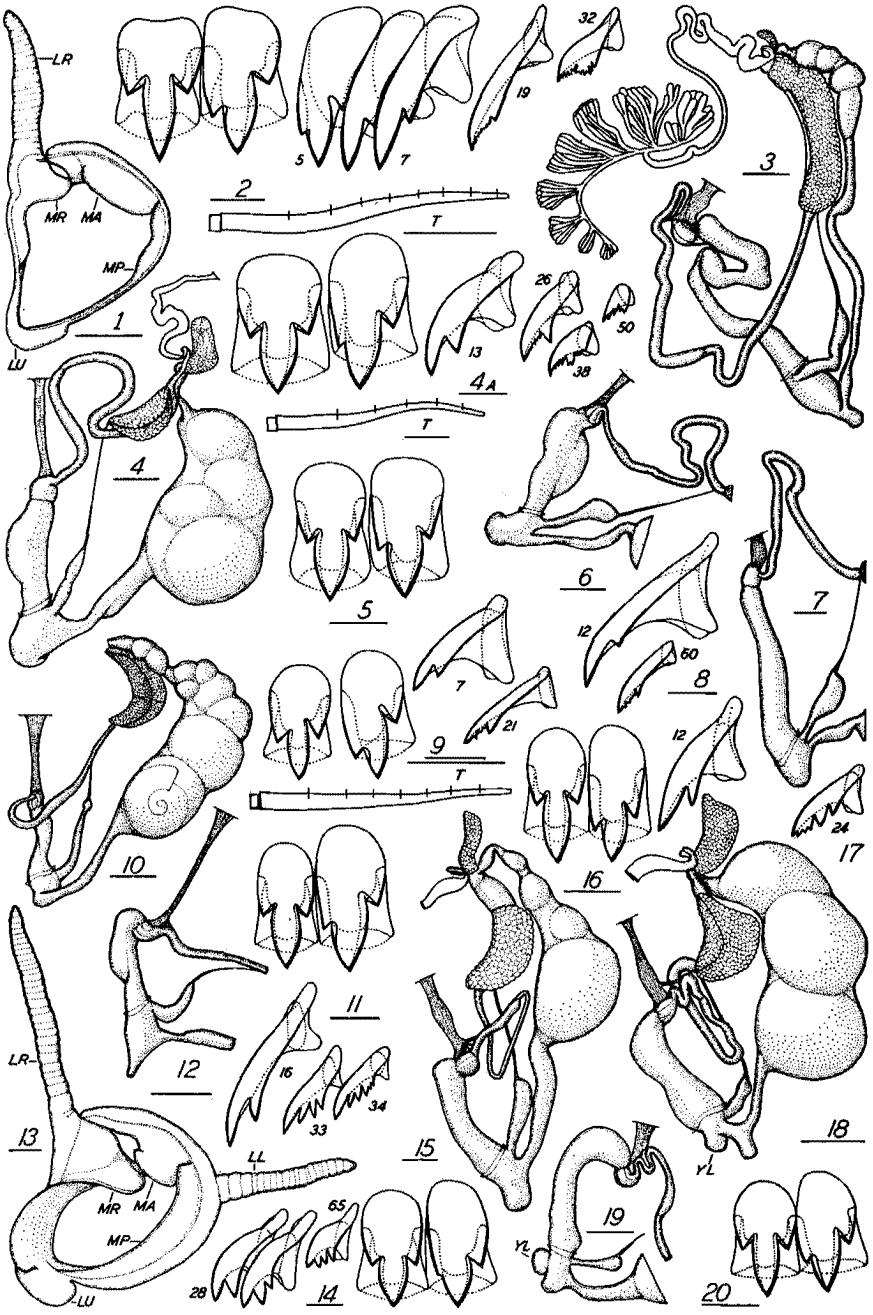


PHILONESIA AND HIONA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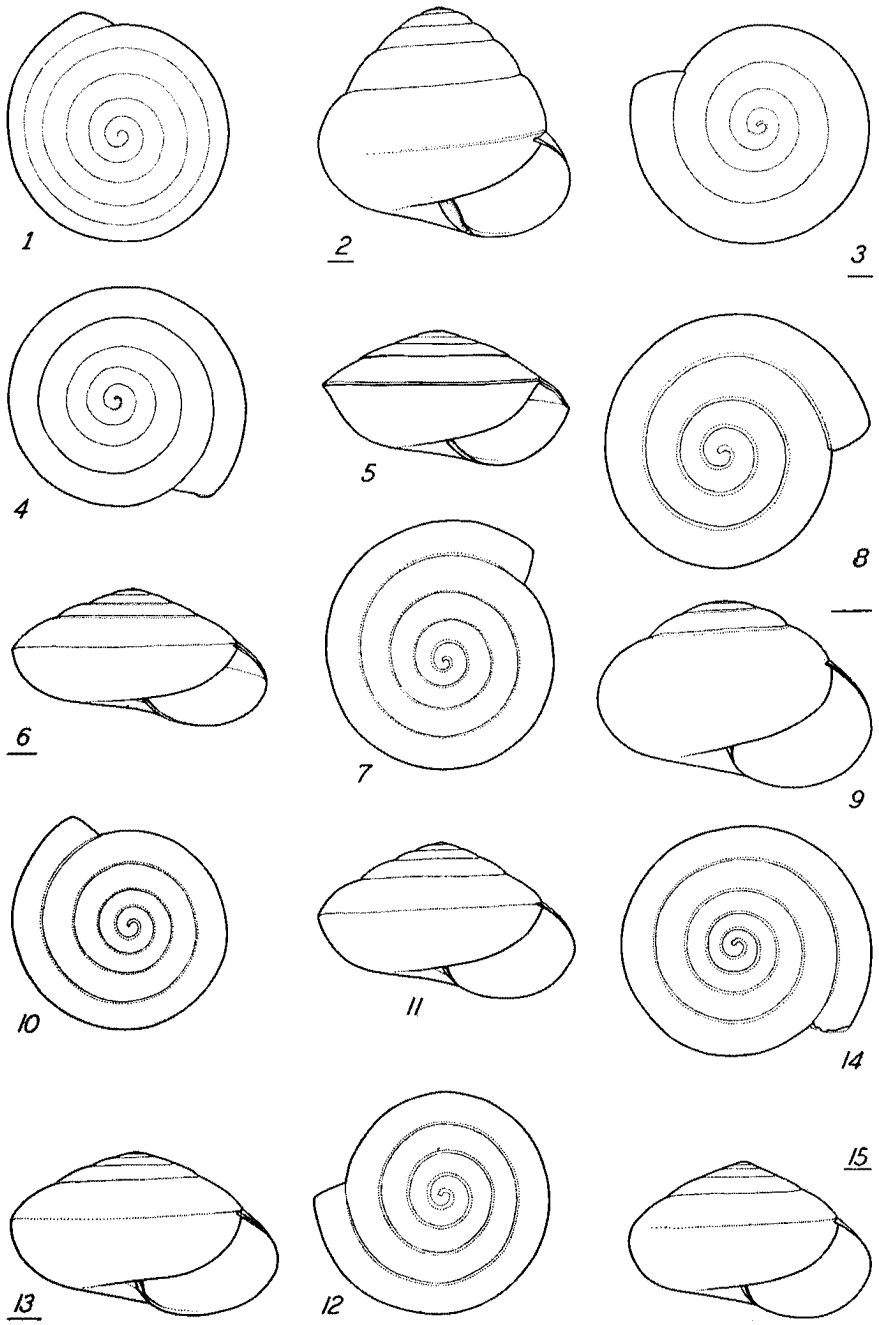
HIONA



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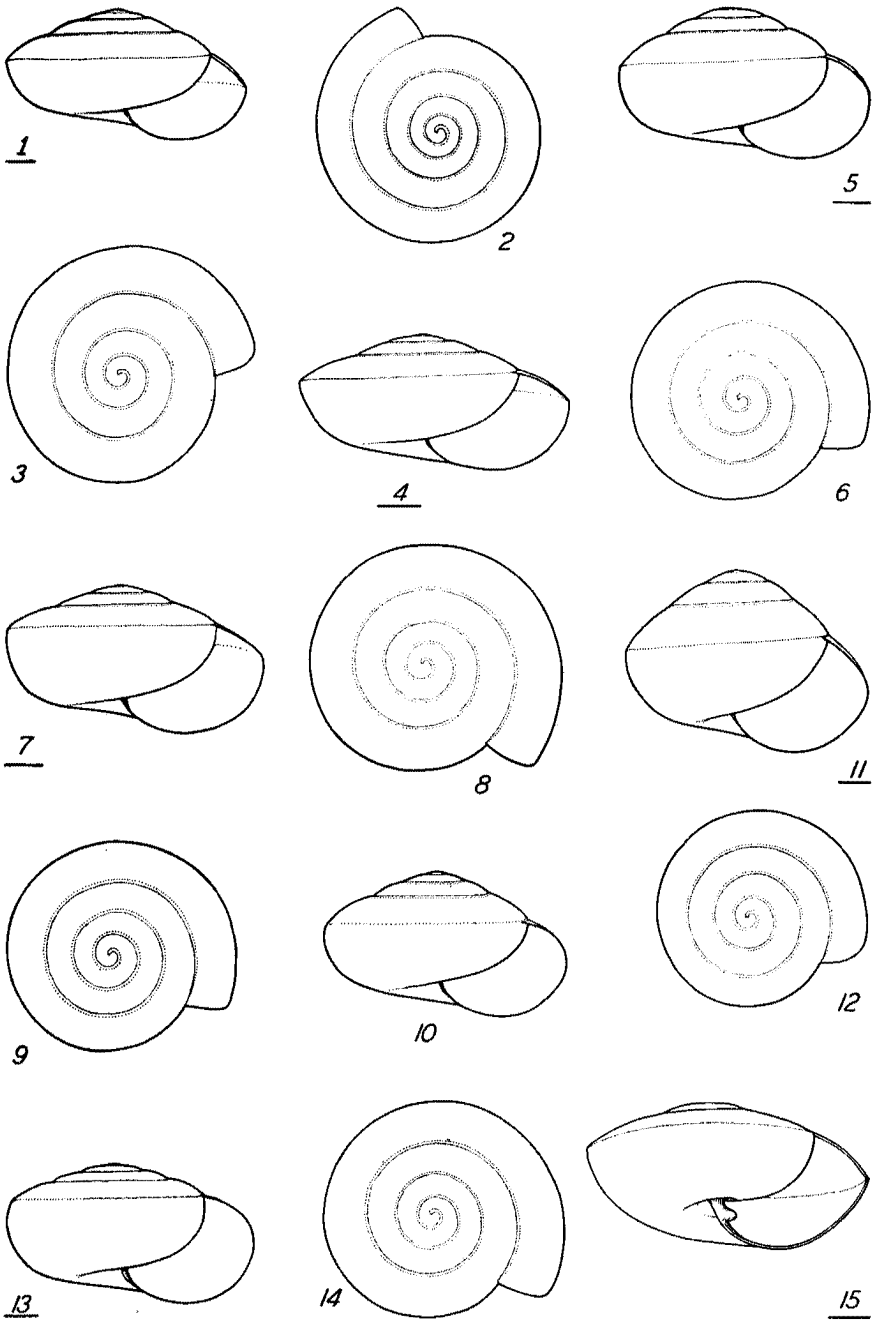
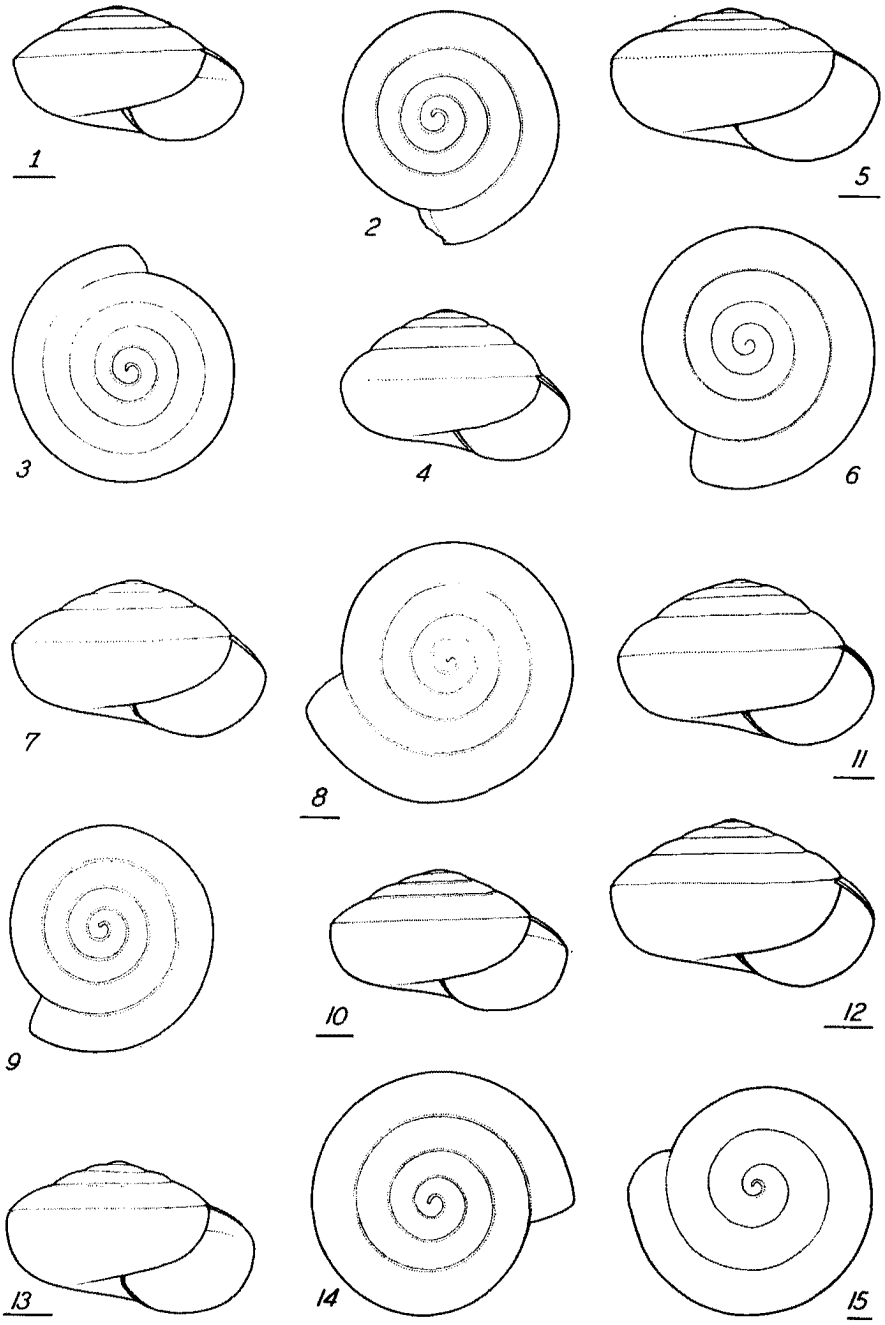


PHILONESIA AND KAALA



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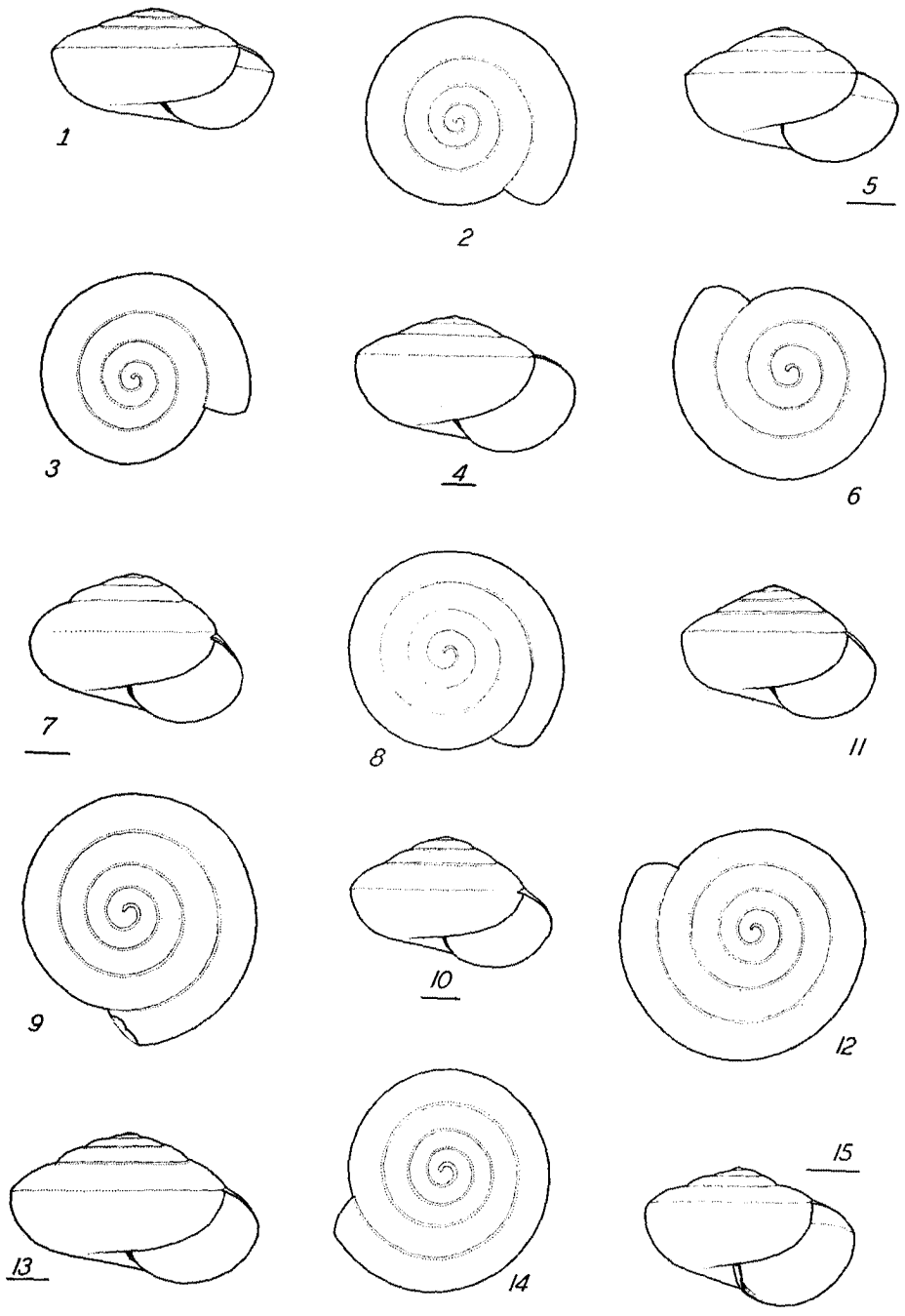

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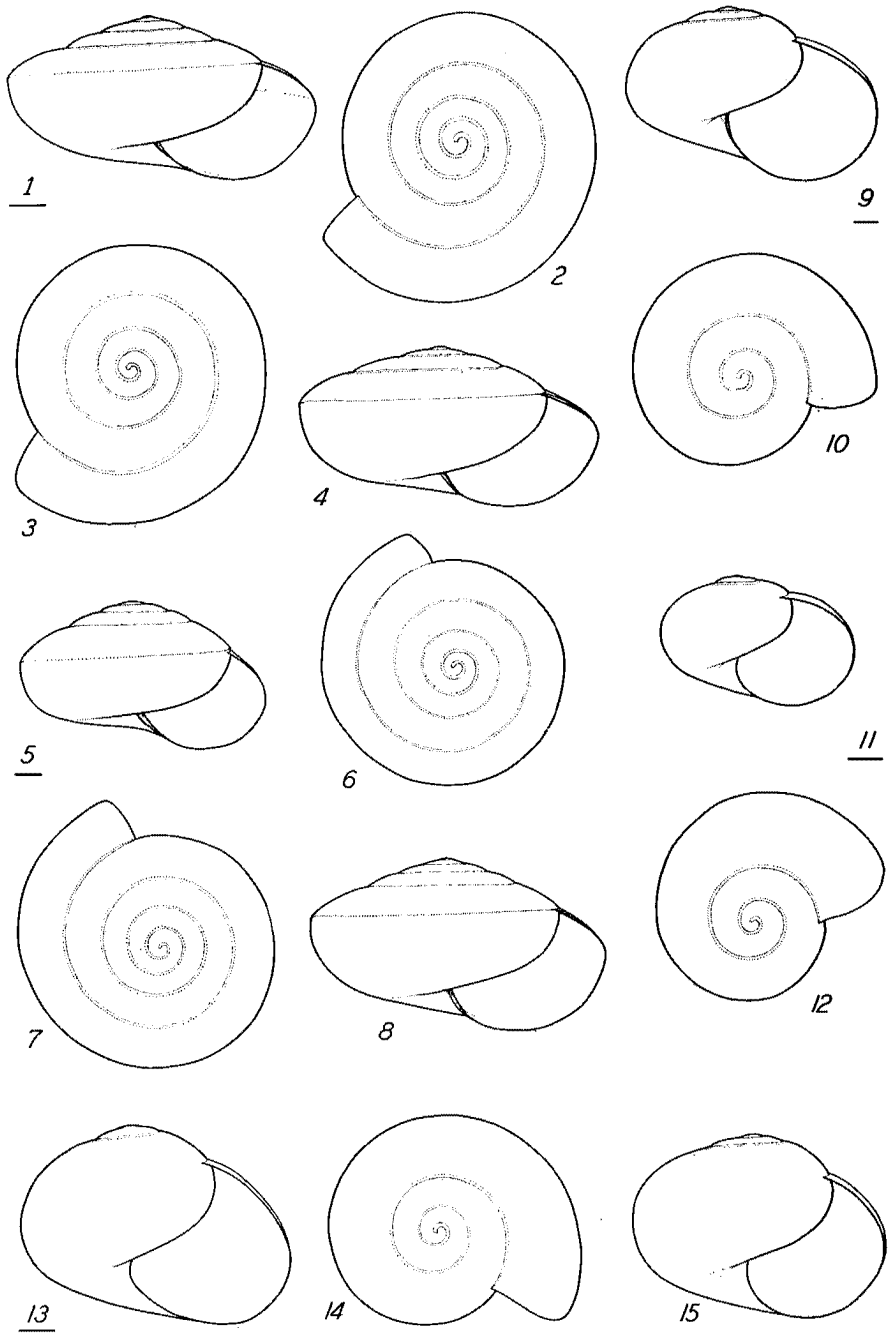

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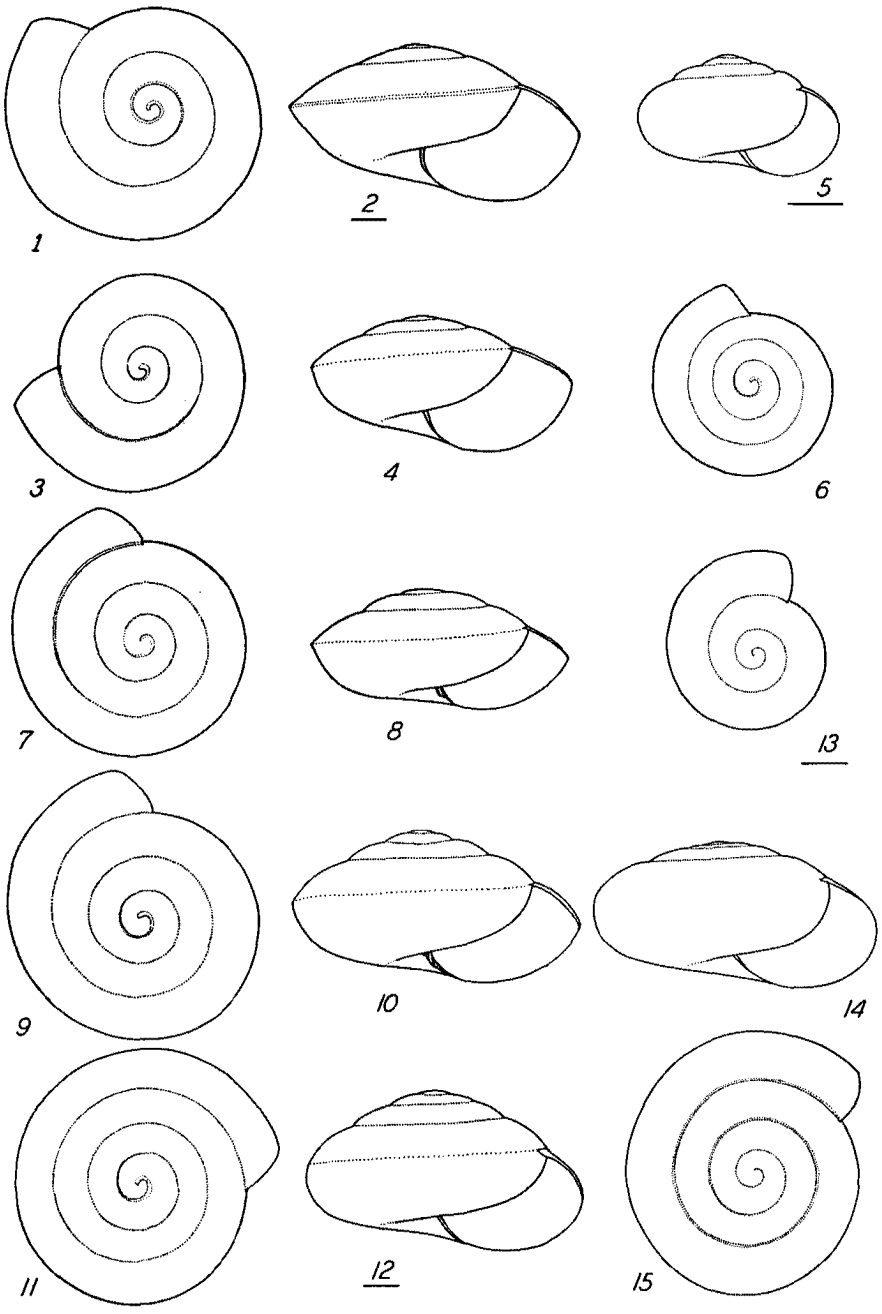

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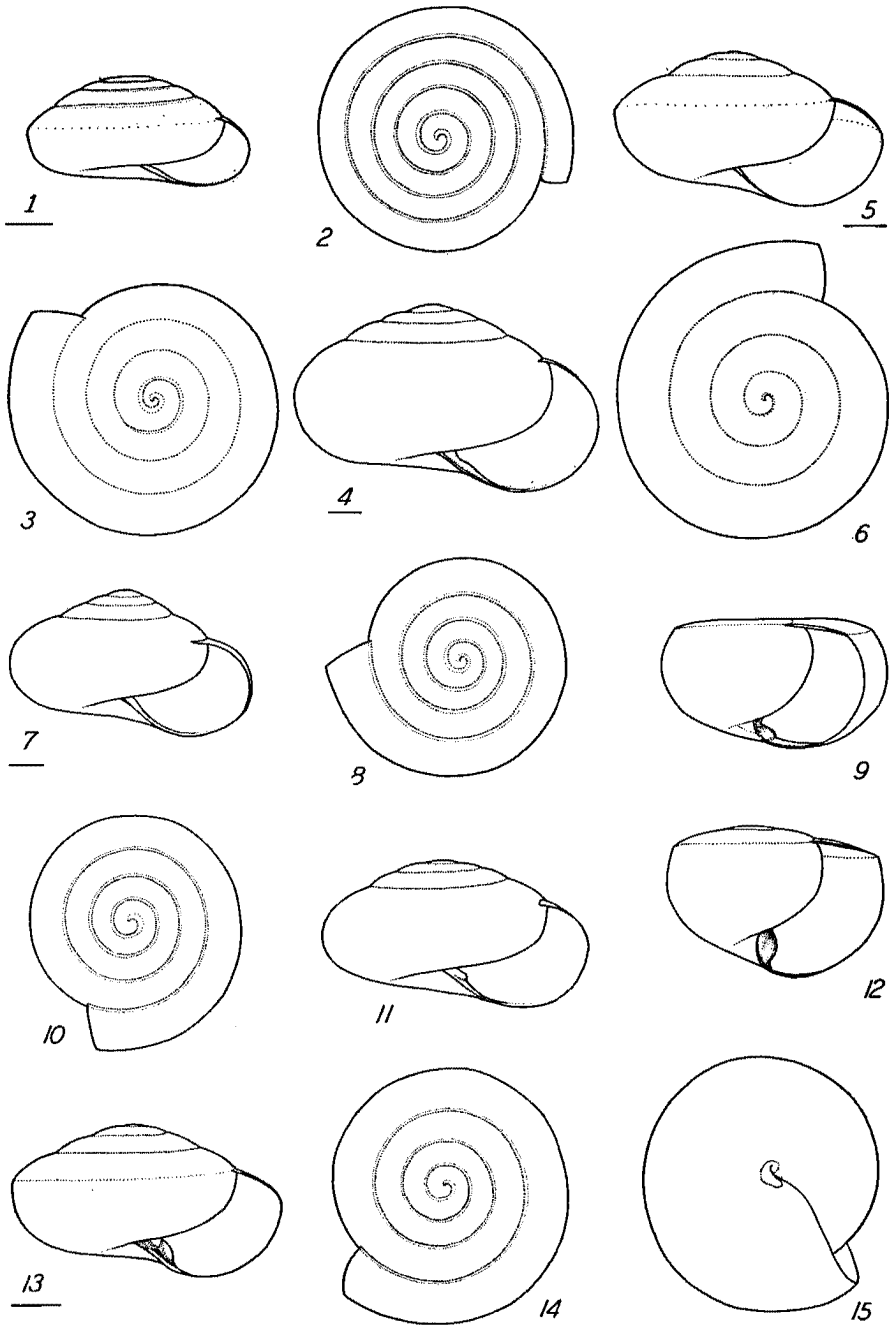
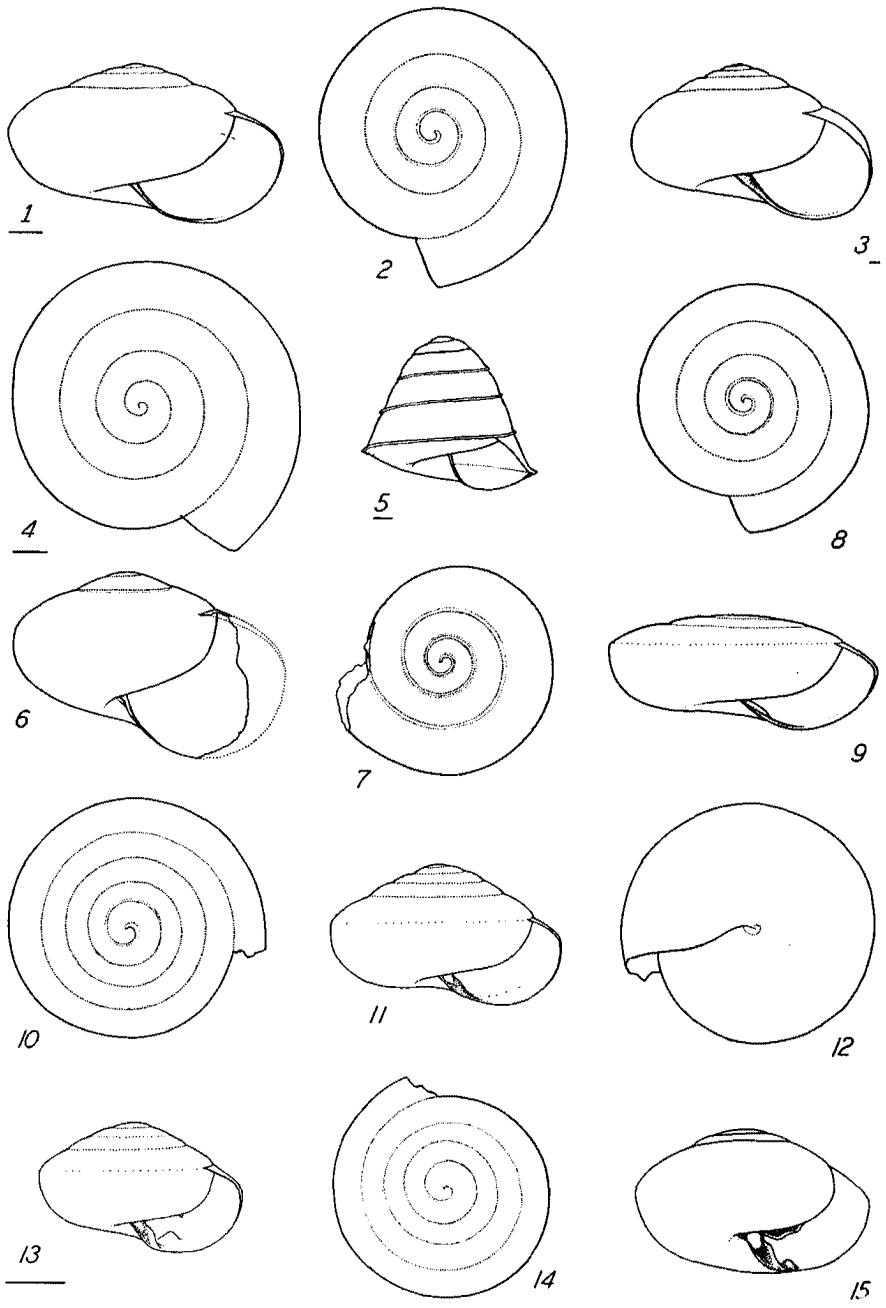
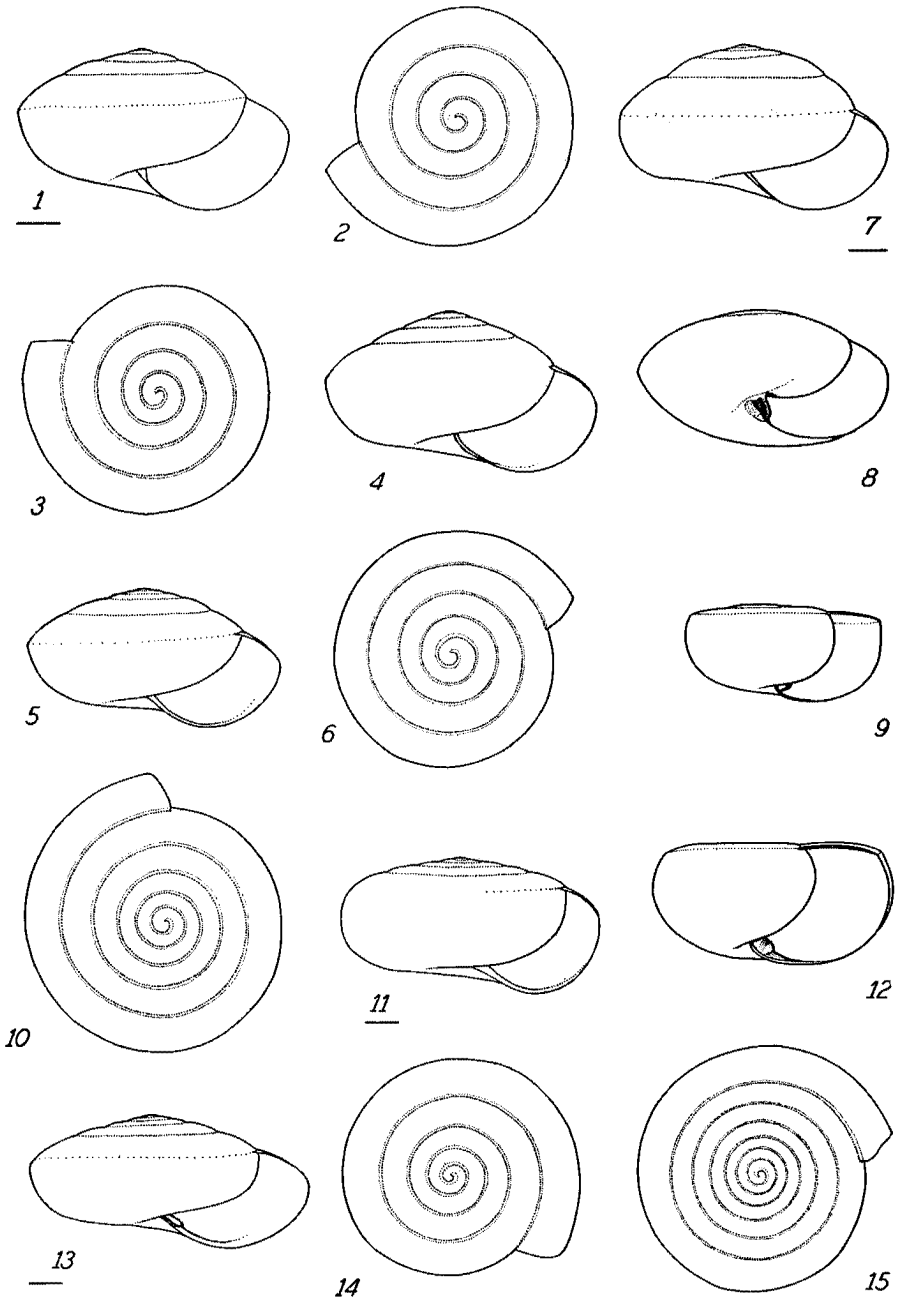


HIONA



HIONA, ORPIELLA, AND TROCHOMORPHA



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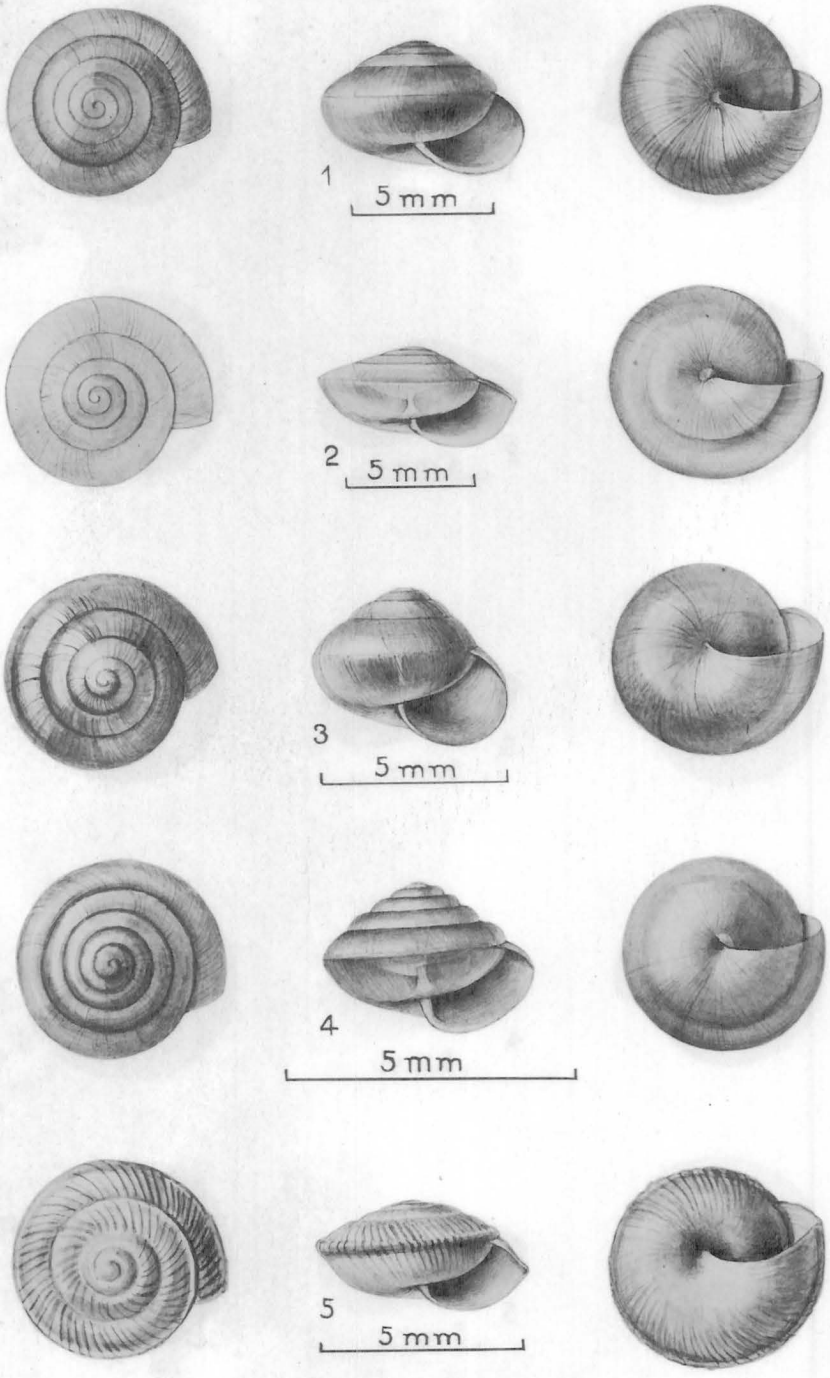
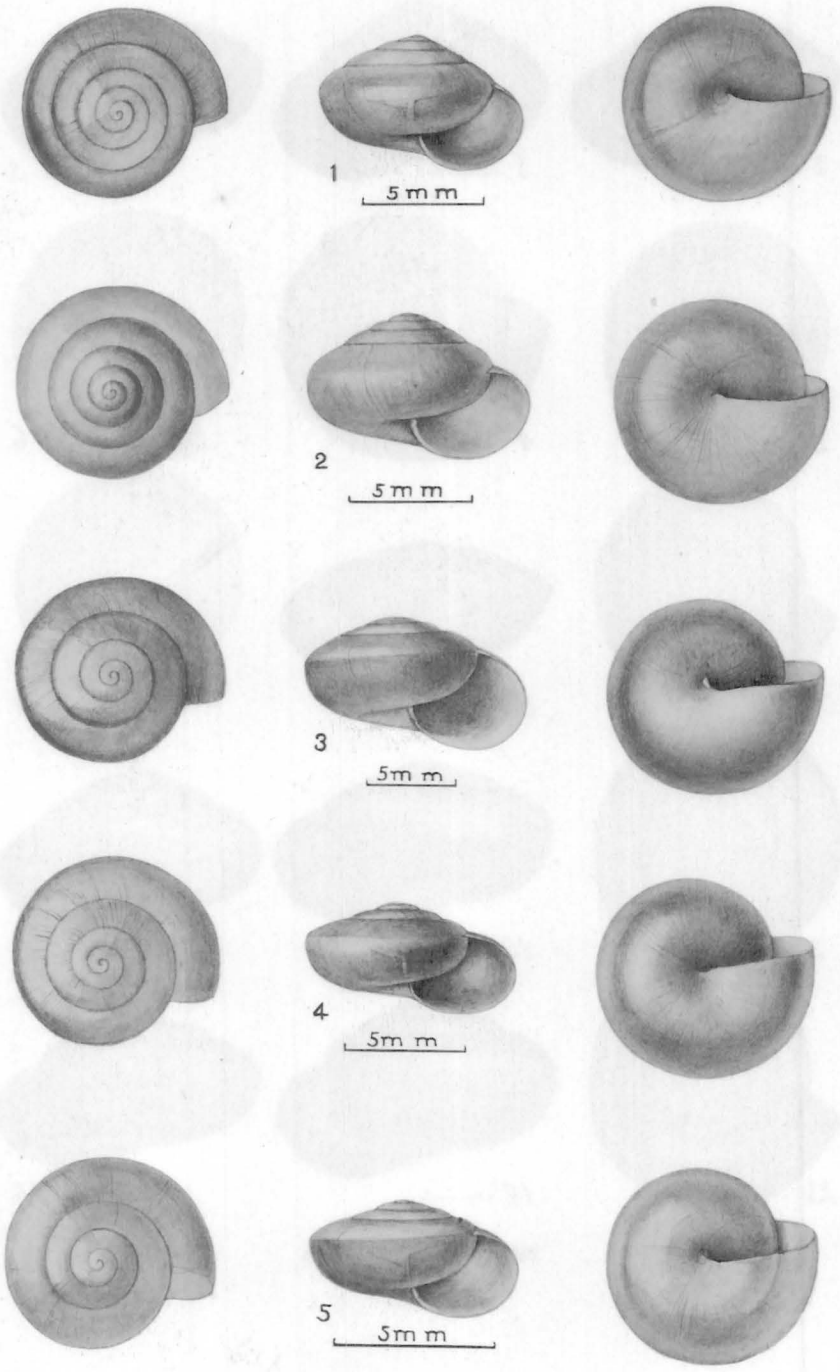
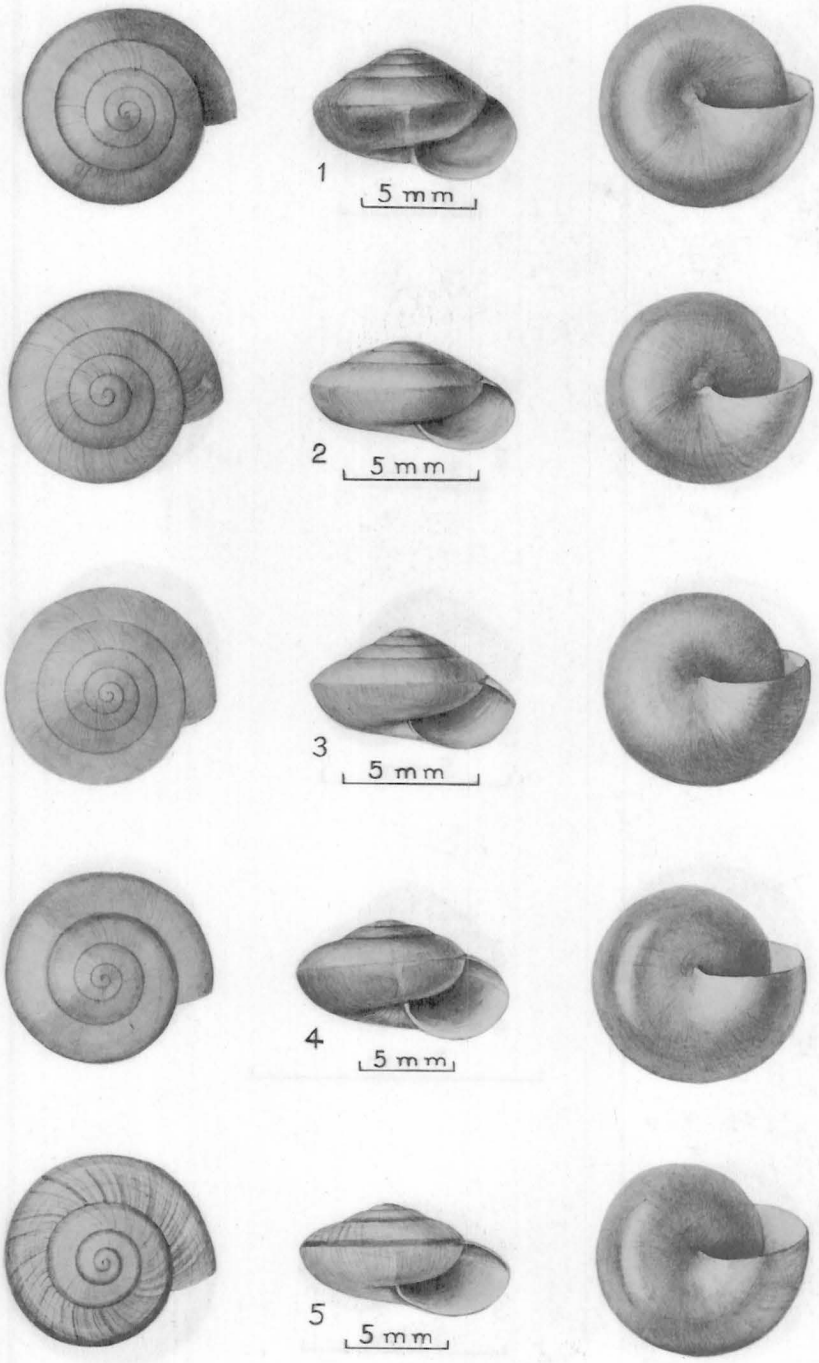


LAMPROCYSTIS, PHILONESIA, AND EUCONULUS



PHILONESIA AND HIONA



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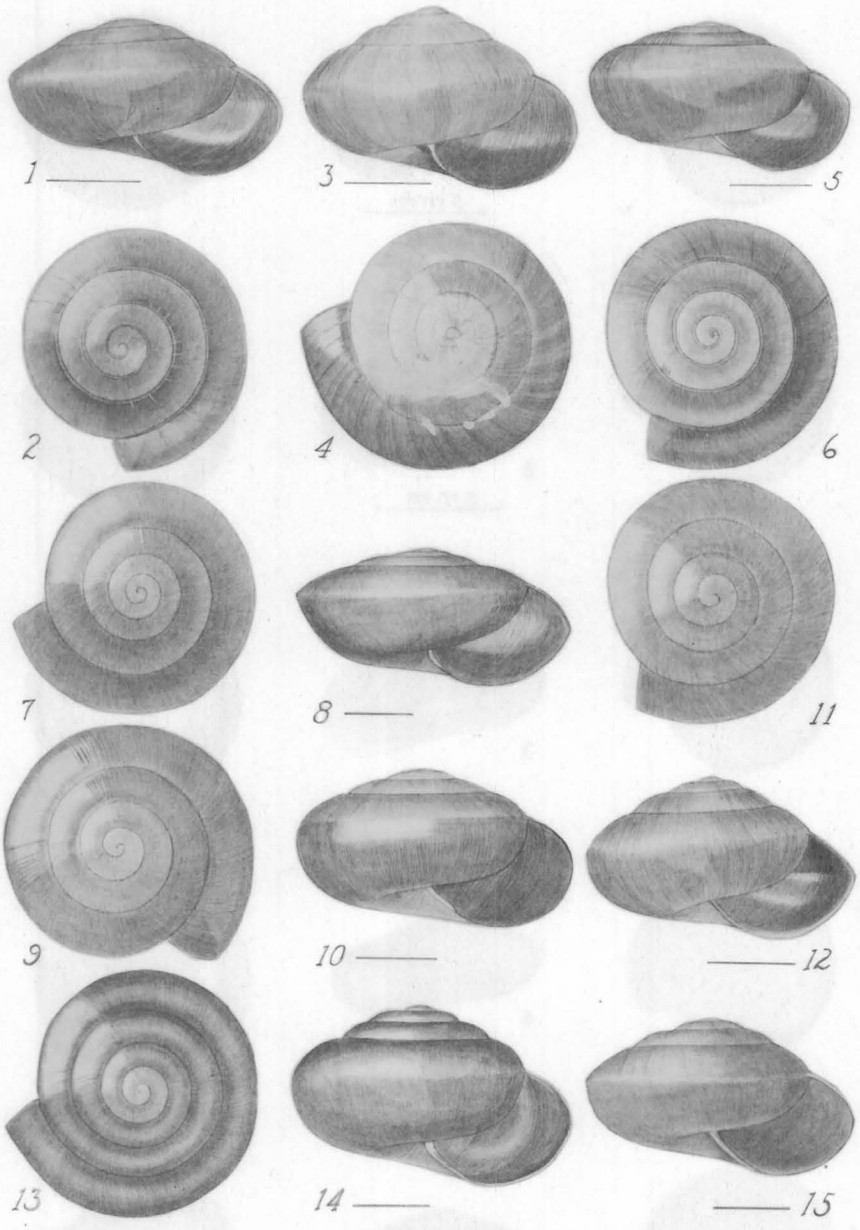

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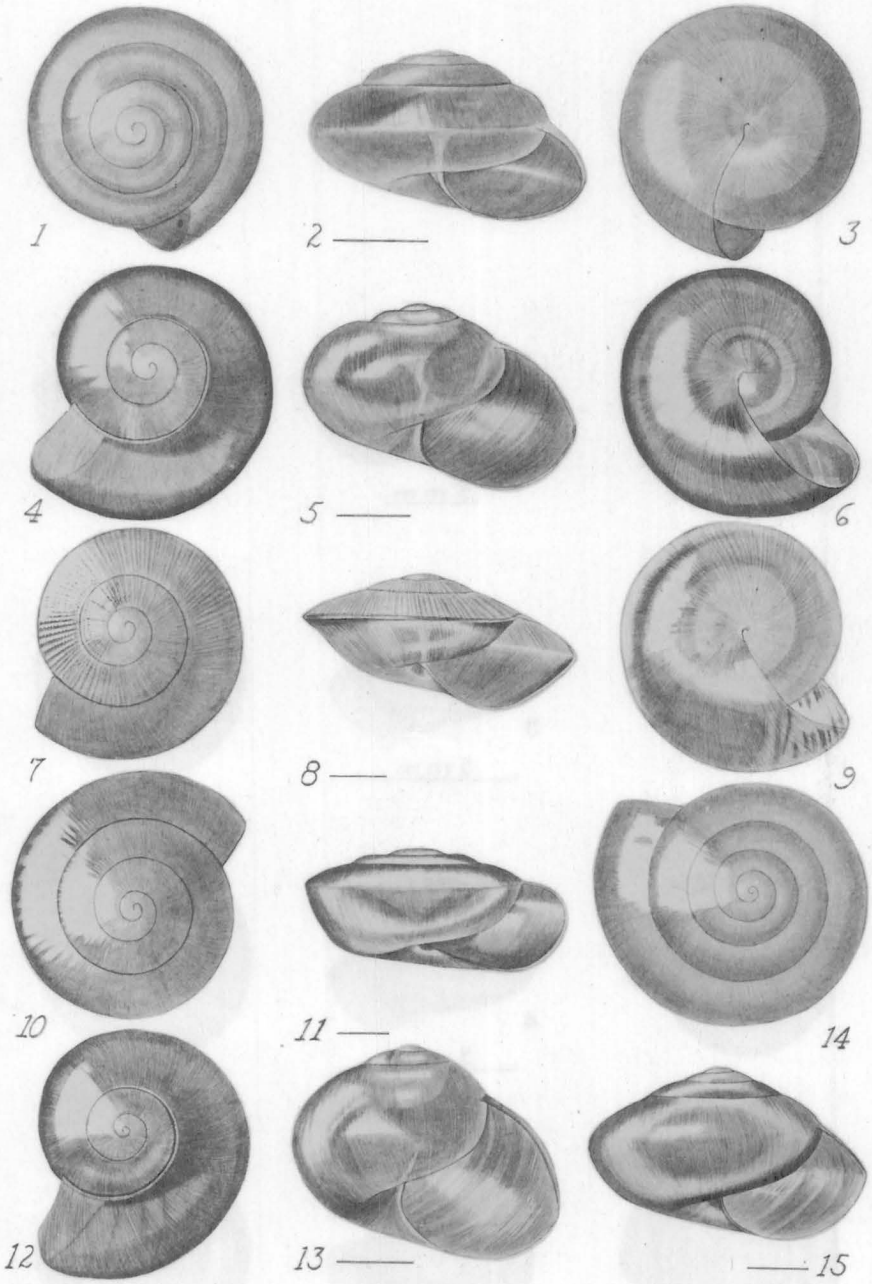

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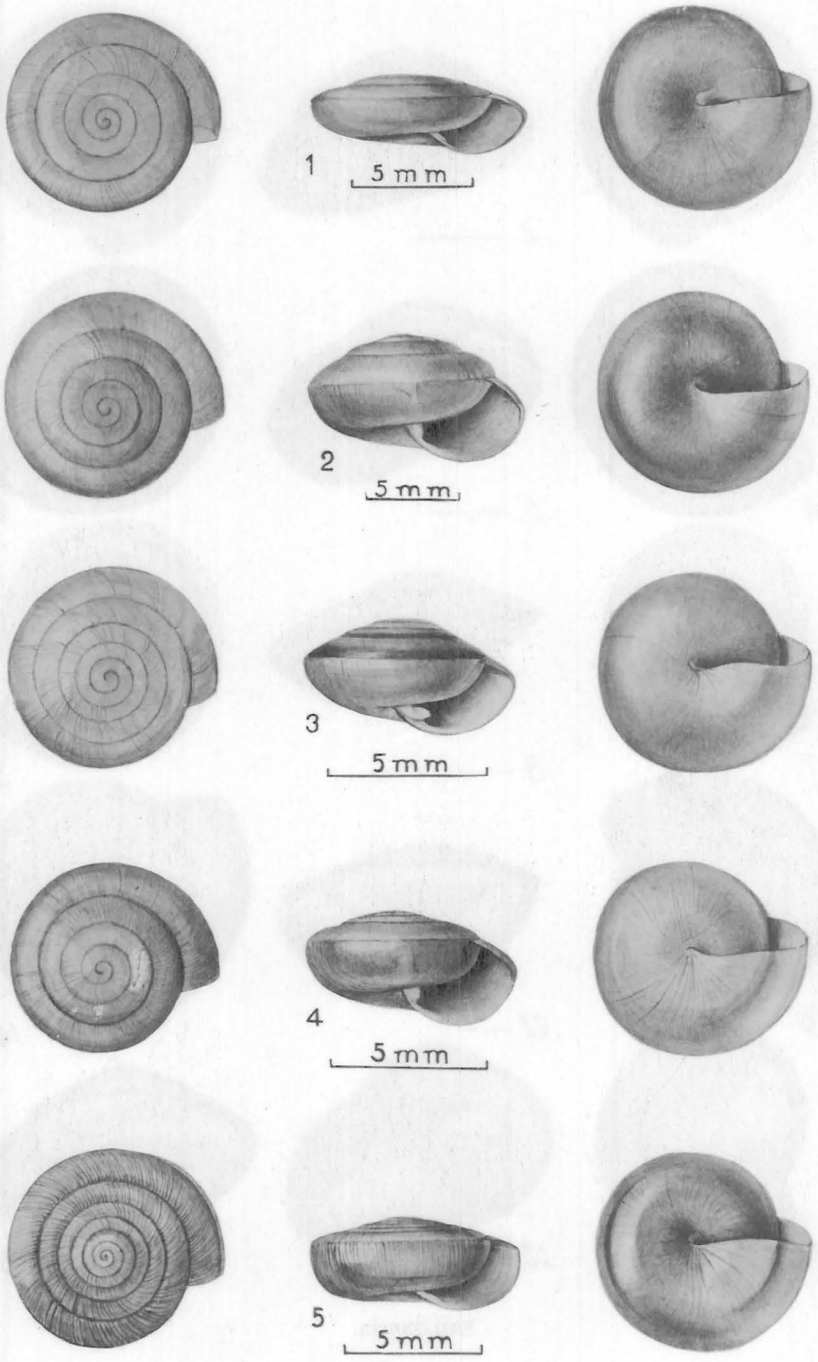
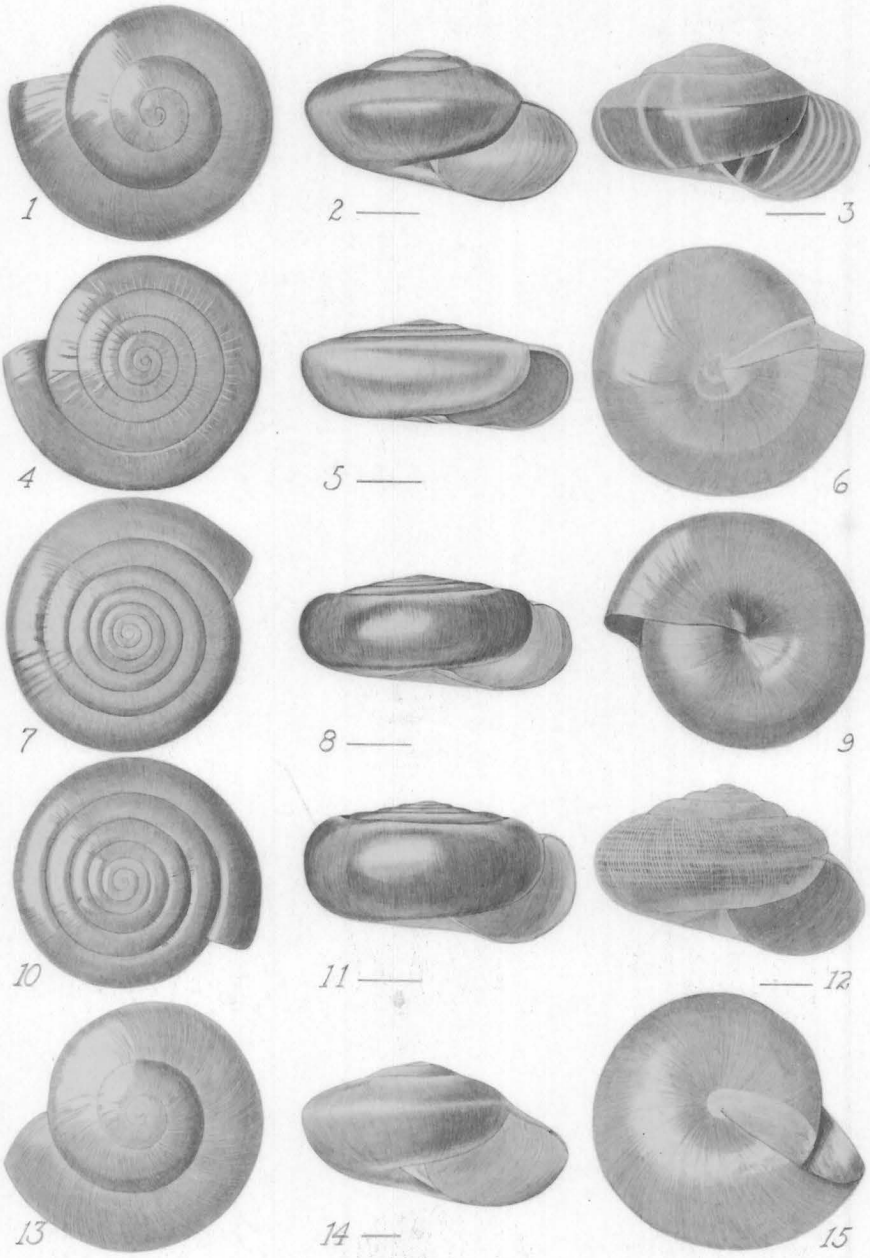


HIONA AND KAALA



HIONA AND ORPIELLA