Sixteen New Species and One New Genus of Japanese Ovulidae

BY

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(2 Plates; 8 Text figures)

During the course of the preparation of a revision of the molluscan family Ovulidae by the junior author, Masao Azuma, Nishinomiya, Hyogo, Japan, sent a group of ovulid specimens to be identified. There were 22 lots of shells, consisting mostly of a single specimen each. It was a curious assortment, representing several genera, and, surprisingly, most of the shells appeared to be new to science. Since this work overlapped the larger revision of the family in several instances, it was decided to make a joint effort of both workers of describing the new taxa.

The excellent drawings of radulae and soft parts, and their descriptions, are the work of Masao Azuma. Identification of the host species is that of Dr. Huzio Utinomi of Kyoto University and the Seto Marine Laboratory. Descriptions of the shells are by Crawford N. Cate. All specimens were taken by lobster nets from deep water, 2 - 5 km west of the Kii Peninsula, Central Japan, during late 1969 and early 1970. The photographs are by Bertram C. Draper, their processing by Takeo Susuki.

1. *Prionovolva (Prionovolva) aenigma* Azuma & Cate spec. nov.

(Figure *1*)

Shell small, roundly pyriform; terminals produced, curved left, semi-pointed in back, rounded, slightly recurved in front; dorsum smooth, glossy, except that surface shows evidence of breaks, cracks, and repairs; base ovate, smooth, glossy, tapering sharply, thickly (ridge-like) to the front; a small triangular elevated eruption of callus forming a funiculum on rear base; columella smooth, very broad (extending from interior adaxial carinal ridge out to a noticeable central ridge on base), deepening, converging to the front to form a shallow fossula (a circular injury is also visible on columella); aperture crescent shaped, broad, becoming exceedingly broad to the front; outer lip semi-circular, thick, though barely shouldered above, with inward plane of lip flattened and numerously dentate with 14 fairly well formed large teeth; shell basically a honey-ivory color with 4 broad bands of deep rose extending over the dorsum from the outer lip shoulder, across the base and columella, to the interior adaxial carinal ridge.

Holotype: Azuma collection, no. 14826A.
Length 5.0 mm; width 3.5 mm; height 2.8 mm

Type Locality: 1 - 2 km off Kirimezaki, Kii Peninsula, Japan; leg. M. Azuma.

The name of this new species is based on its original confusion with *Ovula hervieri* Hedley, 1899, in the literature (see Azuma, 1970, **28** (4): 179; text fig. 1, spec. 2 from left). It differs from the Hedley species very distinctly by being more rounded and globular in shape (rather than sub-pyriform); by lacking the significant, incised dorsal striae over all – by being smooth, glossy; by having a differently shaped funicular projection; by a greater number of labial teeth, differently formed and constituted, on the inner edge; and by a different arrangement of shell colors. Future work on these animals, how-

ever, may eventually prove to closely relate them subspecifically.

2. *Prionovolva (Prionovolva)* ***nebula*** AZUMA & CATE spec. nov.

(Figure *4*)

Shell small, evenly ovate, humped, solid; terminals only barely produced, with rear projection somewhat curving left and fairly sharply pointed, beaked; dorsum dull, subglossy, with fine transverse incised lines emanating limitedly from either terminal, central dorsum without striation; base ovate, smooth, inflated, narrowing as a thick ridge to the front; a large triangular elevated funiculum on the rear base; columella broad, smooth, conspicuously concavely depressed, broadening and deepening in front as a fossula; aperture broad, evenly curving; outer lip thick, broad, with a central longitudinal ridge, which causes adaxial plane of lip to slope inward at a sharp angle; outer portion of lip thickly rounded, shouldered above; teeth (22) even, well developed, the length of adaxial lip plane, some of which cut the lip edge centrally in the manner of the genus; shell color dorsally light beige with 3 longitudinal, very irregular color bands of reddish-brown; funiculum, outer lip, and teeth off-white.

Holotype: Azuma collection, no. 14826B.
Length 6.6 mm; width 4.0 mm; height 3.5 mm

Type Locality: Off Minabe, Japan; leg. M. Azuma, 6 January 1969.

The name is derived from the Latin noun *nebula*, meaning cloud, fog.

3. *Pseudosimnia (Diminovula)* ***incisa*** AZUMA & CATE spec. nov.

(Figure *3*)

Shell small, solid, narrow, ovate; terminals produced, blunt in front, rounded in back; dorsum sub-glossy, evenly rounded, with numerous transverse incised striae over all; base ovate, smooth, sub-glossy, narrowing thickly to the front; a thick, multi-knobbed funiculum covers adapical end of base; columella broad, deep, curving, deepening into a long, concave fossula, both of which are outlined adaxially by a thick, longitudinal carinal ridge; aperture broad, curving; outer lip broad, rounded, roundly shouldered above, with numerous large, though weakly formed teeth; dorsal shell color light grey over all with irregularly sized large diffused punctations of bright orange; base light grey; adaxial carinal wall, funiculum, outer lip and teeth milk-white; terminal canals orange.

Holotype: Azuma collection, no. 14843.
Length 5.2 mm; width 2.7 mm; height 2.4 mm

Type Locality: 3 - 4 km off Hinomisaki, Kii Peninsula, Japan; 50 - 70 fathoms.

The name is derived from the Latin adverb *incise*, meaning cut into, grooved, incised.

4. *Primovula virgo* AZUMA & CATE, spec. nov.

(Figures *2* and 17 [E])

Shell large for the genus, elongate, broadening subcentrally, where it is angularly shouldered; terminals blunt, open, narrowing gently to the front and back; dorsum sub-glossy, with numerous transverse incised striae over all; base rhomboidly-ovate, smooth, glossy, narrowing constrictedly to the front; a large, thick crenular funiculum covers entire adapical triangle of base area; columella smooth, broad, depressed, with a long, low longitudinal ridge adaxially, which outlines a deepened fossular area; aperture straight, widening in front; outer lip broad, thick, rounded, with very weak teeth along $\frac{2}{3}$ of its length, some of which are lengthened

[E] Editor's note: Figure numbers in *Italics* refer to illustrations on halftone plates, whereas Roman numbers refer to illustrations in the text.

Plate Explanation

Figure *1*: *Prionovolva* ***aenigma*** AZUMA & CATE, spec. nov. Holotype Aza. 14826A × 12

Figure *2*: *Primovula* ***virgo*** AZUMA & CATE, spec. nov. Holotype Aza. 14841 × $3\frac{1}{2}$

Figure *3*: *Pseudosimnia* ***incisa*** AZUMA & CATE, spec. nov. Holotype Aza. 14843 × 10

Figure *4*: *Prionovolva* ***nebula*** AZUMA & CATE, spec. nov. Holotype Aza. 14826B × 9

Figure *5*: *Primovula* ***colobica*** AZUMA & CATE, spec. nov. Holotype Aza. 14848 × $4\frac{2}{3}$

Figure *6*: *Primovula* ***horimasarui*** AZUMA & CATE, spec. nov. Holotype Aza. 14842 × 5

Figure *7*: *Primovula* ***myrakeenae*** AZUMA & CATE, spec. nov. Holotype Aza. 14847 × $5\frac{1}{2}$

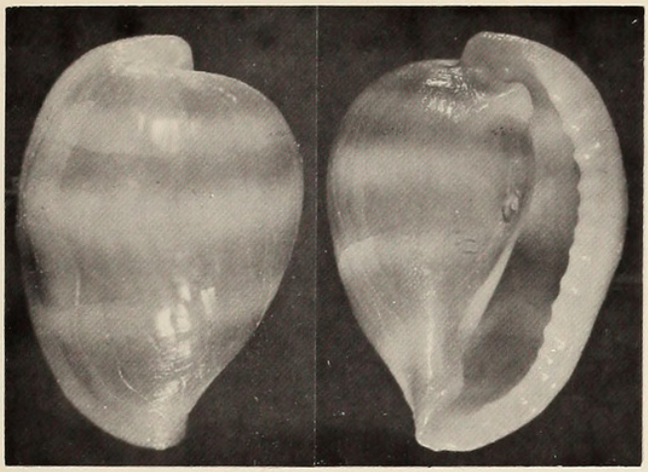


Figure 1
Prionovolva ***aenigma***

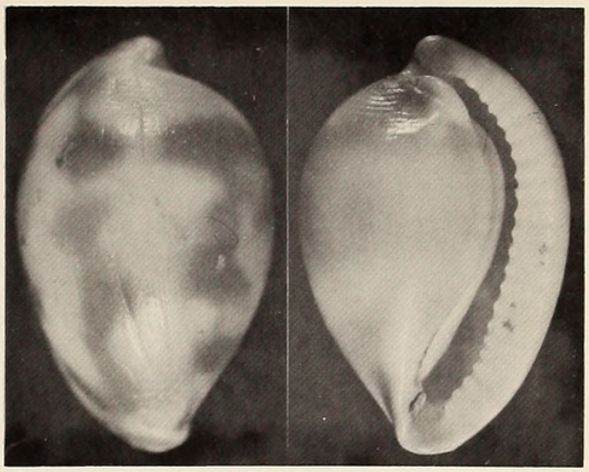


Figure 4
Prionovolva ***nebula***

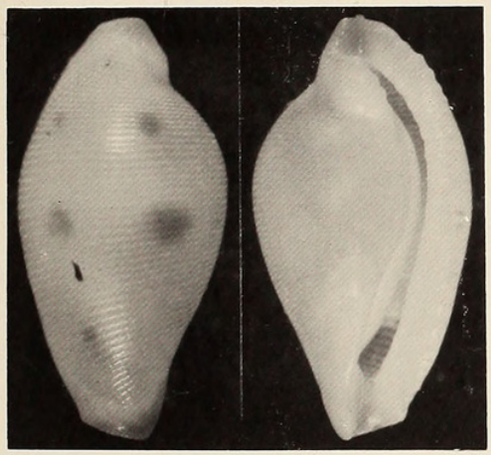


Figure 3
Pseudosimnia ***incisa***

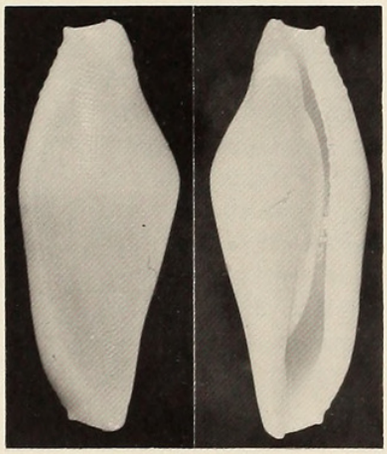


Figure 2
Primovula ***virgo***

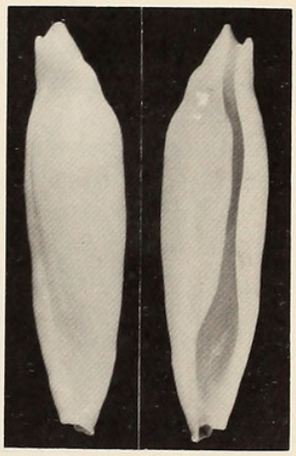


Figure 6
Primovula ***horimasarui***

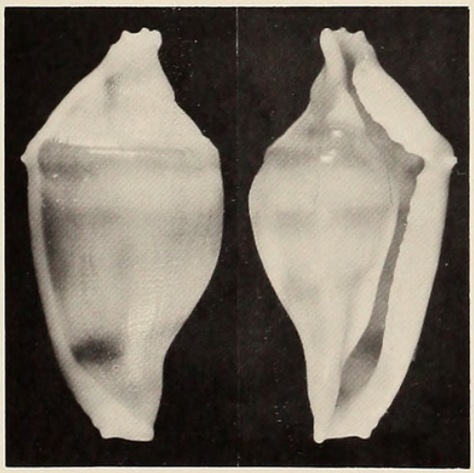


Figure 5
Primovula ***colobica***

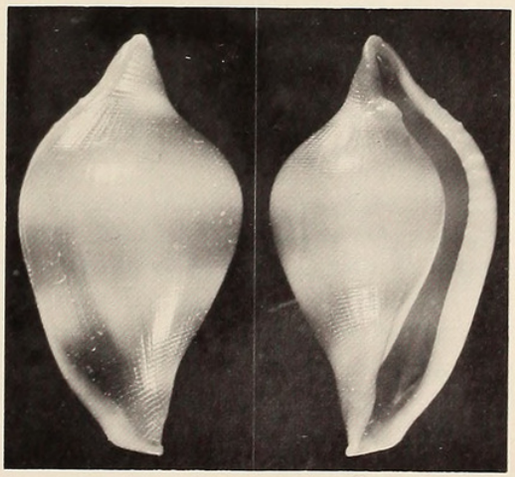


Figure 7
Primovula ***myrakeenae***

photographs by BERTRAM C. DRAPER

to reach outer lip edge in back; color milk-white over all.
Length 14.2 mm; width 5.5 mm; height 4.4 mm

Radula: Radula of taenioglossate type; formula 2 · 1 · 1 · 1 · 2. The central tooth is rounded, rectangular in shape, with a moderate central cusp and 7 minute denticles on both sides, the innermost of which is the smallest. The lateral teeth are rather cactus leaf-shaped, the outer base of which is very slender, projected backwards and the inner base with a minute cusp; the frontal has a large cusp that is slightly curved within; near frontal edge are 3 obsolete minute denticles.

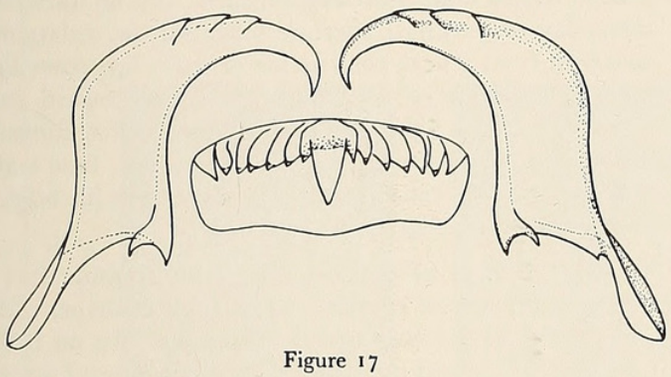


Figure 17

Radula of *Primovula virgo* AZUMA & CATE, spec. nov.

Holotype: Azuma collection, no. 14841. Collected by Mr. Shingo Habu, 20 March 1970.
Length 14.2 mm; width 5.5 mm; height 4.4 mm

Type Locality: 3 - 4 km off Hinomisaki, Kii Peninsula, Japan; living on a host capitulum of *Solenocaulon chinense* KÜKENTHAL, at a depth of 50 - 70 fathoms.

5. *Primovula* ***horimasarui*** AZUMA & CATE, spec. nov.

(Figure *6*)

Shell long, narrow, bluntly-lanceolate, with a sinistral twist of terminal area adapically, causing a low dorsal ridge in same area, in same direction; terminals open, bluntly angled; dorsum sub-glossy, numerously finely transversely incisedly striate over all; base long, narrow, centrally ridged longitudinally, smooth, glossy, narrowing and obliquely angling right front and back; no funicular swelling adapically; columella without depression, a continuation of the base slanting adaxially, with only a very slight concavity in the fossular area, outlined by an interior longitudinal ridge that disappears on the columella centrally; aperture narrow, twisting, with a long widening in front due to constriction of base and outer lip; outer lip thick, broadly shouldered above, angling flatly inward; no indication of teeth; color milk-white over all, except that interior carinal ridge is deep pink.

Holotype: Azuma collection, no. 14842.
Length 10.4 mm; width 2.5 mm; height 2.1 mm

Type Locality: 2 - 3 km off Kirimezaki, Kii Peninsula, Japan; in 30 - 50 fathoms; leg. Masaru Hori, 6 January 1969.

The species is named in honor of Mr. Masaru Hori, who collected the shell.

6. *Primovula colobica* AZUMA & CATE, spec. nov.

(Figure *5*)

Shell fairly large, sub-bulbous, rhomboid, angularly elevated sub-centrally, with numerous transverse, incised striae (these are disturbed centrally by shell wound); terminals acutely produced, blunt in front, squarely beaked in back, with 3 protruding tooth processes; base inflated, ovate, faintly striate, tapering sharply to the front; funiculum on rear base thickened, triangular, undulating eruption of nacreous callus; columella wide, only slightly depressed, faintly striate, then deepening, with the aid of interior wall, to form a significant fossula; outer lip narrowly thickened, with numerous large, weak teeth most of its length; color light beige (ivory) over all, except that dorsum and base are variably 3-banded with bright orange; terminal canals deep orange.

Holotype: Azuma collection, no. 14848.
Length 10.6 mm; width 5.0 mm; height 4.3 mm

Type Locality: Off Kirimezaki, Kii Peninsula, Japan, in 30 - 50 fathoms; leg. M. Azuma.

The name is derived from the Latin *colobicus,* meaning mutilated.

7. *Primovula myrakeenae* AZUMA & CATE, spec. nov.

(Figure *7*)

Shell small, bulbously inflated, rhomboidly pyriform, thinly formed, sub-translucent; terminals extended, somewhat pointed in back, blunt in front; dorsum glossy, although having wavy, transversely incised striae all over, which are intercepted longitudinally by incremental growth lines; base pyriformly ovate, roundly inflated, tapering sharply, narrowly adapically, transversely striate to adaxial edge within; there is a small, subcircular, upraised, multi-knobbed funiculum on rear base; aperture fairly broad, curving; columella follows natural curve of base, striate, though indistinctly outlined by a ridge within, with a deepening in the fossula area;

outer lip somewhat thickened, rounded, with large, rudimentary, widely separated teeth on rear half of lip edge, front half without teeth; color bright red-brown with 3 bands of light grey and a yellowing of the red brown on the adapical terminal beak.

Holotype: Azuma collection, no. 14847.
Length 9.7 mm; width 5.2 mm; height 4.4 mm
Type Locality: Off Nada, Kii Peninsula, Japan, in 30 to 50 fathoms; leg. M. Azuma.

This species is named in honor of Dr. A. Myra Keen, Curator of Mollusca, Emeritus, Stanford University, Stanford, California.

8. *Primovula* ***mucronata*** AZUMA & CATE, spec. nov.

(Figure *8*)

Shell small, angularly ovate, thin, translucent; terminals sharply produced, more so adapically; dorsum smooth, glossy, except that transverse, incised striae emanate restrictedly from either terminal, with more numerous lines at the rear; base ovate, with more numerous incised striae than above, covering most of the ventral surface; funiculum a narrow, thickened, uneven elevation on the rear base; columella rounded, striate, without depression; fossula only barely recognizable; aperture long, curving; outer lip rounded, thickened, with numerous large, short, weak teeth on inner edge; color basically light grey-white over all, with large red-brown, elongate clouds on dorsum, especially on the right side; both terminal beaks yellow, except tip of adapical beak which is white; terminal channel yellow in front, brown in back.

Holotype: Azuma collection, no. 14845.
Length 9.7 mm; width 4.2 mm; height 3.6 mm

Type Locality: 2 - 3 km off Kirimezaki, Kii Peninsula, Japan, in 30 - 50 fathoms; leg. M. Azuma, 20 March 1969.

The name is derived from the Latin *mucronatus,* signifying sharp, pointed, a striking character of the adapical terminal beak.

9. *Primovula* ***tosaensis*** AZUMA & CATE, spec. nov.

(Figures *9* and 18)

Shell small, long, narrow, broadening and enlarged sub-centrally, thinly formed, translucent, sub-glossy, with transverse, widely separated incised striae over all; terminals narrowing to the front and back, almost beaked adapically; base narrow, elongately-ovate, uncalloused, transversely striate; posterior funiculum long, thick, curiously twisting obliquely to form a second dextral canal opening; columella rounded, striate, without depression, and with a longitudinal low carinal wall adaxially; fossula long, shallowly trenched, with an upraised triangular wall within; aperture long, narrow, enlarging openly in front due to constriction of outer lip; outer lip fairly thick, rounded, only slightly crenate toward the rear; color bright light grey over all, except that funicular tip and columellar carinal wall are white; base wall of front and rear canal bright lavender-red, with bright canary yellow enveloping the terminals.

Radula: Radula of taenioglossate type, formula 2 · 1 · 1 · 1 · 2. Central tooth rounded, rectangular in shape, with a moderate central cusp and 5 minute denticles on both sides, the innermost of which is the smallest. Lateral

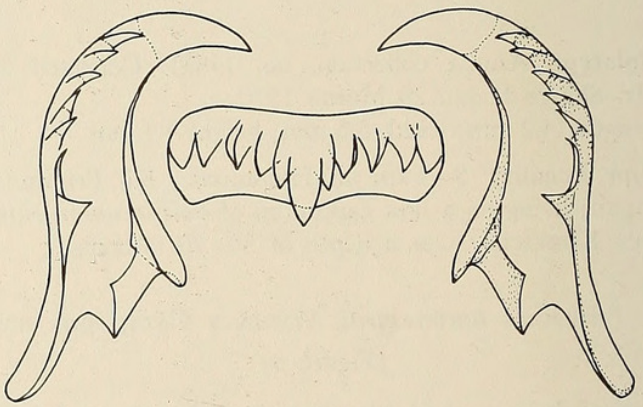


Figure 18
Radula of *Primovula* ***tosaensis*** AZUMA & CATE, spec. nov.

Plate Explanation

Figure *8*: *Primovula* ***mucronata*** AZUMA & CATE, spec. nov. Holotype Aza. 14845 × 6
Figure *9*: *Primovula* ***tosaensis*** AZUMA & CATE, spec. nov. Holotype Aza. 14840 × 4
Figure *10*: *Phenacovolva* ***tayloriana*** AZUMA & CATE, spec. nov. Holotype Aza. 1739A × 5
Figure *11*: *Phenacovolva* ***kiiensis*** AZUMA & CATE, spec. nov. Holotype Aza. 1737 × 2¼
Figure *12*: *Phenacovolva* ***improcera*** AZUMA & CATE, spec. nov. Holotype Aza. 1739B × 5
Figure *13*: *Phenacovolva* ***yoshioi*** AZUMA & CATE, spec. nov. Holotype Aza. 1750 × 1⅔
Figure *14*: *Kuroshiovolva* ***shingoi*** AZUMA & CATE, spec. nov. Holotype Aza. 14839 × 4
Figure *15*: *Pseudosimnia (Diminovula)* ***fulguris*** AZUMA & CATE, spec. nov. Holotype Aza. 14844 × 9
Figure *16*: *Primovula* ***fumikoae*** AZUMA & CATE, spec. nov. Holotype Aza. 1036 × 5½

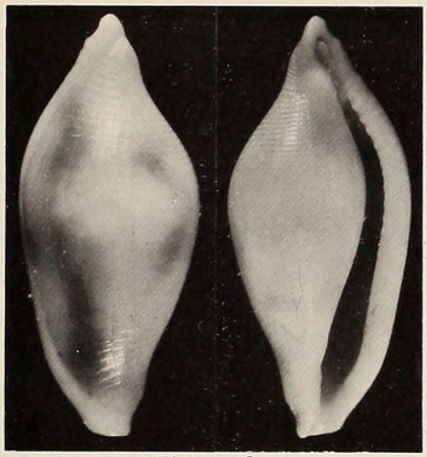


Figure 8

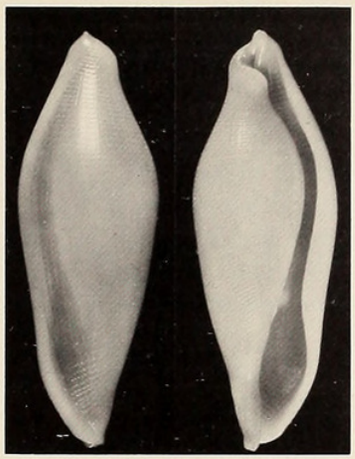


Figure 9

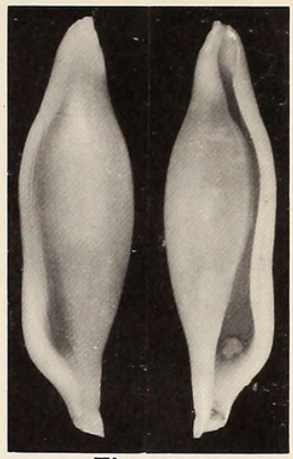
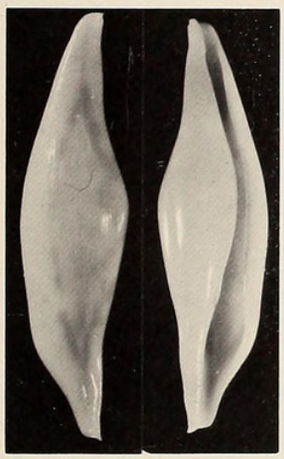


Figure 10



Figrue 11

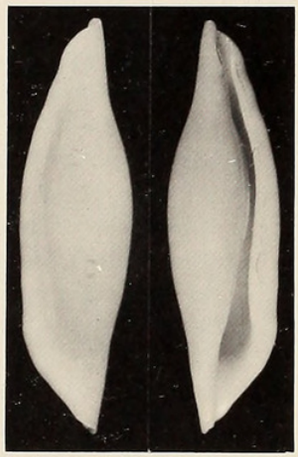


Figure 12

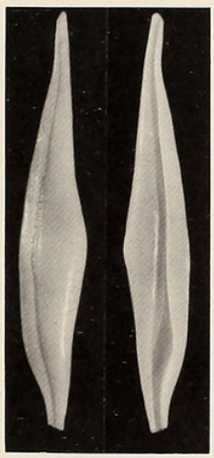


Figure 13

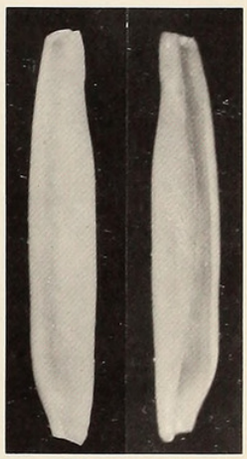


Figure 14

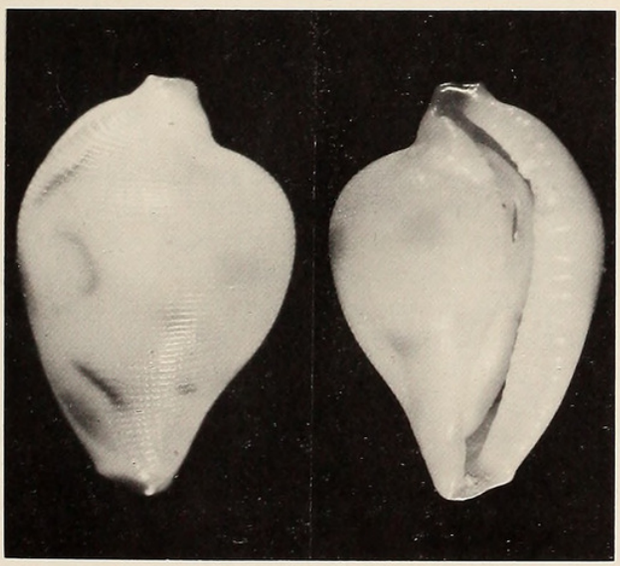


Figure 15

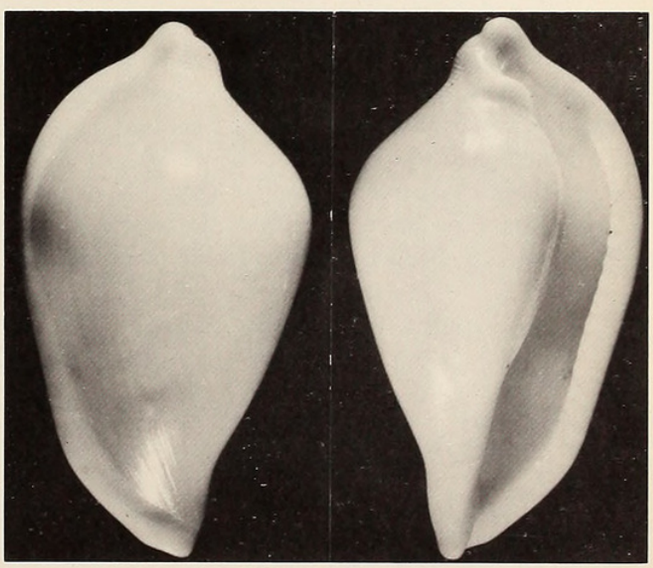


Figure 16

photographs by BERTRAM C. DRAPER