

THE MIOCENE OF NORTHERN
COSTA RICA

WITH NOTES ON ITS GENERAL STRATIGRAPHIC
RELATIONS

BY

A. A. OLSSON

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PRELIMINARY REMARKS

The fossil collections and field information, on which this monograph is based, resulted from over two years of field work by the writer in Panama and Costa Rica. The writer's thanks are due to the Costa Rica Oil Corporation for permission to publish; and he is most grateful for assistance, and encouragement received in the course of this work from Drs. A. C. Veatch and D. F. MacDonald of the Sinclair Exploration Company, to the Officials of the National Museum of Costa Rica and Professor J. Fidel Tristan of San Jose'.

The collections were studied in the Paleontologic Laboratory of Cornell University, the facilities of which, Professor G. D. Harris, most generously placed at my disposal.

Cornell University,

January, 1922.

A. A. OLSSON

Conus proteus Dall, 1890, Trans. Wagner Free Inst. Sci., vol. 3, pt. 1, p. 26.

Conus proteus Maury, 1917, Bull. Amer. Pal., vol. 5, p. 206, pl. 6, fig. 11.

This is a common species in the Miocene and Pliocene beds of Costa Rica and Panama. It is generally possible to distinguish two forms, a smaller one which agrees with typical examples of *proteus* in form and coloration (which is frequently preserved,) and a larger and heavier type, like the so-called *leoninus*. This second variety may show several dark spiral bands in addition to the square yellow blotches. Such markings we have not observed on recent examples of *leoninus*.

Gatun Stage: Banana River, Port Limon, Water Cay. Pliocene: Monkey Point; Bocas.

Conus Veatchi, n. sp.

Plate 2, figures 5, 8

Shell rather large, heavy and broad, with a low, nearly flat spire, but pointed, slightly projecting apex; spire-whorls about 10 in number, with a slightly raised border near the suture and marked with fine spirals which on the last whorl number 10 or 11; shoulder of the last whorl rounded or beveled; last whorl, large and broad, nearly smooth above, except for the very faint spirals, but with numerous, fine, irregular spirals on the canal; pillar straight; aperture straight and narrow, slightly wider below.

Length 43, breadth 28 mm.

The present collection contains two specimens, the larger of which from Water Cay, serves as the *holotype*. The species is very unlike any of the associated Gatun species in its low, nearly flat spire. The *Conus demiurgus* Dall, of the Chipola Miocene of Florida, is a related species.

It is named for Dr. A. C. Veatch, Director of the Exploration Work of the Sinclair Consolidated Oil Corporation, for his

interest and co-operation in obtaining the extensive collections which form the basis of the present work.

Gatun Stage: Water Cay, Panama.

Gatun, C. Z.

Conus floridanus, var. **costaricensis**, n. var.

Plate 3, figures 3, 9

Shell conic, with a moderately high spire of about eleven whorls; profile of the spire flat or slightly concave to the long projecting apex seen in well-preserved specimens; shoulder angle rather sharp with the whorls slightly concave above between the sutures; spire-whorls generally show 3 or more faint, raised spirals and strongly arcuated growth lines; the last whorl below the shoulder angle is usually nearly smooth above (sometimes with faint spirals) but with heavy regular spiral groovings to the number of about fifteen on the canal; the canal is long, rapidly attenuated and usually somewhat flexed below.

Height 44, breadth 21 mm.

Type from the Gatun beds of the Banana River.

This fossil, quite common in Costa Rica, should probably be classed as a variety of the recent *Conus floridanus* Gabb, differing only in always being somewhat more slender. They also agree closely with Dall's figure of *Conus chipolanus* Dall from the Chipola Miocene of Florida.

Care should be taken in distinguishing this from *C. imitator* of the Canal Zone. In that species, the full-grown shell is larger, with nearly straight sides and finer irregular spirals on the canal.

Gatun Stage: Banana River; East Grape Point Creek.

Conus imitator Brown and Pilsbry

Plate 2, figure 6

Conus imitator Brown and Pilsbry, April, 1911, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 342, pl. 23, fig. 4.

Conus Dalli Toula, Dec., 1911, Jahrb. der K-K Geol. Reichsanstalt, Wien, vol. 61, p. 508, pl. 31, figs. 23 a-d.

pyriformis Reeve of the west coast of Central America but the fossil shells have generally a lower and flatter spire. It is also known from the Miocene of Santo Domingo, Jamaica and Trinidad.

Gatun Stage: Banana River, Hill No. 3.

Conus limonensis, n. sp.

Plate 3, figures 7, 8

Shell rather large, but delicate and rather slender; spire low, concave to the slightly projecting apex; spire whorls 10 or more, nearly flat between the sutures or slightly concave due to a slightly raised border; spire-whorls with 3 or 4 low spirals which become faint on the later whorls so that they are nearly smooth; sutures deep; shoulders of the last whorl angled or somewhat raised; body-whorl long and slender, polished and smooth, except for a few faint spirals near the tip of the canal; anterior canal long and straight, evenly tapering.

Length 41, breadth 24 mm.

This species is based on 2 specimens from the coral limestones of Port Limon, where it is associated with *Conus stenostomus* and *planiliratus*. From *stenostomus*, its straight canal, low spire and nearly smooth, polished surface is most noticeable.

Gatun Stage: Port Limon, C. R.

Conus musaensis, n. sp.

Plate 1, figures 22, 24

Shell small and solid; spire short, conic, composed of about 2 pellucid, globular and projecting whorls and 6 post-nuclear whorls; the spire-whorls are flat or slightly concave and project slightly over the anterior sutures; body-whorl with the upper half smooth, but with 12 deep grooves on the anterior canal which produce wide, spiral bands: these grooves are delicately incised by raised longitudinal lines; color markings are sometimes preserved, which appear as 8 narrow, gray bands on the upper half of the whorl.

Length 19, breadth 9 mm.

This small species, the Gatun analogue of the recent West

Indian *Conus Agassizi* Dall, is abundant along the Banana River and elsewhere in Costa Rica.

Gatun Stage: Banana River, Zone 6 Red Cliff Creek, C. R.

Conus cf. interstinctus Guppy

Plate 3, figure 12

Conus interstinctus Guppy, 1866, Quart. Jour. Geol. Soc. London, vol. 22, p. 288, pl. 16, fig. 3.

A single specimen from Hill 1, of the Banana River, agrees closely with Guppy's figure of this Jamaican species. The shell measures 39 by 20 mm. The spire is moderate in height, with a slightly concave profile. The spire-whorls are smooth between the sutures but also show a slight coronation. The last whorl carries about 15 narrow, widely spaced, spiral cords which anteriorly are slightly beaded.

Dr. Maury unites *interstinctus*, with Sowerby's *catenatus*, but that species is based on a very young and scarcely distinguishable specimen. We therefore prefer to compare the Costa Rican shell with Guppy's larger and well-figured *interstinctus*.

Gatun Stage: Banana River, Hill No. 1.

Conus cf. Sewalli Maury

Conus Sewalli Maury, 1917, Bull. Amer. Pal., vol. 5, . 201, pl. 5, fig. 3, pl. 6, fig 3.

The collection contains 2 young shells which may belong to this Dominican species. They differ from the preceding *interstinctus* in being shorter and broader, and the spire-whorls in place of being smooth are marked with 5 or 6 strong spirals. The last whorl is sculptured with 15 or more widely spaced beaded spirals. The dimensions of the largest shell are: Length or height 30, breadth 19 mm:

Gatun Stage: Banana River.

Conus toroensis n. sp.

Plate 2, figure 7

Shell of medium size, with a conic spire a little more than $\frac{1}{2}$ the length of the aperture; the whorls of the spire numbering

12 plus are flat or slightly concave and bordered below by a low carina projectly slightly above the suture; this carina on all except the last whorl bears low nodes, about 20 to the later whorls; the spire-whorls are otherwise smooth except for the arcuate growth lines; the last whorl is a tapering cone, nearly smooth, except for the faint spirals about its lower one-third; the aperture is narrow, straight, with a thin arcuate outer lip.

Height 45, diameter 21, aperture 33 mm.

This shell belong to the *Conus consobrinus* group, agreeing in its form and strongly nodulated spire whorls. The main difference is that *toroensis* is nearly smooth, the spirals showing only on the lower one-third, while *consobrinus* has most of the last whorl covered with beaded spirals.

Gatun Stage: Toro Cays.

Conus (Chelyconus) tortuosostriatus Toula

Plate 1, figure 15

Conus (Chelyconus) tortuosostriatus Toula, 1911, Jahrb. der K-K. Geol. Reichsanstalt, Wien, vol. 61, p. 508, pl. 31, fig. 22.

Conus (Hemiconus) tortuosostriatus Cossmann, 1913, Jour. de Conchyliologie, vol. 61, p. 40, pl. 3, figs. 28, 29.

Conus tortuosostriatus Maury, 1917, Bull. Amer. Pal., vol. 5, p. 205, pl. 6, fig. 9

This shell should probably be considered as a short variety of *gracilissimus* Guppy, differing chiefly in its broader form and shorter spire.

The body-whorl is sculptured with about 24 raised, even, spiral cords, separated by deep, even interspaces. These interspaces are crossed by neat, incised lines, corresponding to the lines of growth. The nucleus consists of about 3, long, tapering smooth whorls, after which follow several turns of carinated and finely coronated post-nuclear whorls.

Length 22, breadth 9 mm.

Gatun Stage: Bocas del Toro.

Conus granozonatus Guppy

Plate 3, fig. 15

Conus granozonatus Guppy, 1866, Jour. Geol. Soc. London, vol. 22, p. 287, pl. 16, fig. 5.

This is a rare species in Costa Rica, our collection containing only a single specimen from the Gatun beds of the Rio Blanco. It is characterized by a rather high, conic spire, with smooth or only slightly coronated whorls. The last whorl has about 18, wide, spiral bands, which are heavily granulated above. The specimen agrees well with Guppy's figure of the Jamaican shell.

Length 25, breadth 11 mm.

Gatun Stage: Rio Blanco, C. R.

Conus planiliratus Sowerby

Plate 3, figures 10, 13

Conus planiliratus Sowerby, 1849, Quart. Jour. Geol. Soc. London, vol. 6, p. 44.

Conus planiliratus Guppy, 1866, *Idem.* vol. 22, p. 287, pl. 16, figure 7.

Conus planiliratus Gabb, 1873, Trans. Amer. Phil. Soc., p. 230, in part.

Conus planiliratus Guppy, 1875, Quart. Jour. Geol. Soc. London, vol. 32, p. 528.

Conus planiliratus Dall, Trans. Wagner Free Inst. Sci., vol. 3, pt. 6, p. 1583.

Conus planiliratus Cossmann, Jour. de Conchyliologie, vol. 61, p. 48, pl. 3, figs. 25, 26, 27.

Conus regularis Gabb, Jour. Acad. Nat. Sci. Phila., vol. 8, 2nd series, p. 359, pl. 46, figs. 45-48. Not of Sowerby.

Conus planiliratus Maury, Bull. Amer. Pal., vol. 5, p. 209, pl. 7, fig. 10.

The occurrence of this species in Costa Rica is limited to the coral limestones of Limon. Gabb had specimens from here which he identified with the recent West Coast *Conus regularis* of Sowerby. The Limon shells agree very well with Guppy's figure in the Quarterly Journal and with Cossmann's figures of Bowden and Mindi specimens. The species appears to be closely

related to the recent *Conus Stimpsoni* Dall from the Florida Straits. (Proc. U. S. Nat. Mus., vol. 24, p. 503, pl. 29, fig. 7, 1903).

Surface of whorls are heavily sculptured with 25, 30 or more subequal spiral cords. Upper surface of whorls, flat or slightly concave and with 3 or more spirals. The shoulder is sharp and bounds a rather high, conic spire.

Length 31, breadth 16 mm.

Gatun Stage: Port Limon.

Conus planiliratus, var. *bocasensis*, n. var.

Plate 3, fig. 14, 16

Shell of medium size, solid with a broad, stubby outline; spire low, conic with nearly straight sides and composed of seven or more whorls; the 1st 4 or 5 post-nuclear whorls are coronated; spire-whorls with 3 faint spirals and curved growth-lines; body-whorl large and wide, with 25 strong but somewhat irregular simple spiral cords; their interspaces are wide and with crowded, raised lines of growth and sometimes intercalated spirals; anterior canal nearly straight.

Length 32, breadth 17 mm.

This Cone, which should probably be considered as distinct, is fairly common in the shale beds, belonging to the Gatun Stage on Bocas Island. From typical *planiliratus* it differs in its broad stubby form and coarse sculpturing.

Gatun Stage: Bocas del Toro, Panama.

Conus marginatus Sowerby

Plate 1, fig. 20

Conus marginatus Sowerby, 1849, Quart. Jour. Geol. Soc. London, vol. 6, p. 44.

Conus marginatus Gabb, 1873, Trans. Amer. Phil. Soc., vol. 16, p. 230.

Conus marginatus Guppy, 1876, Quart. Jour. Geol. Soc. London, vol. 32, p. 528, pl. 29, fig. 5.

Conus marginatus Maury, 1917, Bull. Amer. Pal., vol. 5, p. 210, pl. 7, fig. 11.

faint arcuate lines of growth and very indistinct spirals; the earlier whorls have a carinated suture but are only very faintly coronated; last whorl heavily sculptured with about 20, wide, even spiral bands, separated by grooves of about 1-3 of their width; these grooves are faintly incised by the longitudinal lines of growth; the spiral bands are slightly wider above and smooth, becoming granulated on the canal; this granulation appears on the posterior side of the bands only; aperture long and narrow.

Length 36, diameter 14.5 mm.

33 (apex broken) diameter 15 mm.

The original specimen of *Conus Burckhardti* was described from the Miocene of Mexico, State of Oaxaca. Our specimens from Panama and Costa Rica are a little larger, but show the characteristic high, smooth, spire and strong, flat, spiral bands of the body-whorl.

Conus tortuosopunctatus Toula is a similiar but smaller species. The difference in sculpture of the two species may be seen in the accompanying figures, the spiral bands of *tortuosopunctatus* being double or incised, while in *Burckhardti*, they are broad and simple.

Gatun Stage: Water Cay, Panama.

Zone 2, East Grape Point Creek.

Conus Harris, n. sp.

Plate 3, fig. 1

Shell of moderate size, subcylindric with a high, even, conic spire; spire-whorls about 6 plus, flat, with close sutures, except for the upper whorls which are slightly carinate; the surface of the spire-whorls is nearly smooth, except for a few faint spirals; the last or body whorl is strongly sculptured with widely spaced and sub-regular grooves; these grooves form about 14 wide, spiral bands about the lower 3-4th of the last whorl; the upper 4th below the shoulder angle forms a wide, smooth band; below, the spiral bands are generally smooth except those about the lower

half of the shell, which may become, mesially divided and bear a few small granulations or beads about their upper half; aperture sublinear.

Height 51, diameter 23 mm.

A single specimen of this elegant species was collected from the Gatun of the Banana River. It is a species of the *Conus Burckhardti* type but much larger and when perfect reaching a length of nearly 60 mm. The sculpture is of wide bands formed by deep, and regularly spaced grooves about the lower 3-4ths of the shell.

Gatun Stage: Hill No. 3, Banana River.

Conus multistriatus Bose

Plate 1, figures 21, 23

Conus Agassizi Dall, var. *multistriatus* Bose, 1906, Bull. de Inst. Geol. de Mexico, numero 22, p. 49, pl. 5, figs. 34-38.

Conus gaza Johnson and Pilsbry, 1911, Proc. Acad. Nat. Sci. Phila., vol. 63, pl. 23, figs. 2, 3.

Conus gaza Maury, 1917, Bull. Amer. Pal., vol. 5, p. 210, pl. 7 fig. 12.

This is the *Conus gaza* of Johnson and Pilsbry described from the Miocene of Santo Domingo and the Isthmus. It is a small, pretty species, recognized by its nearly biconic outlines and neat sculpture. The spire is high; with nearly smooth, spire-whorls and carinated sutures. The last whorl is rather short and heavily sulcated with about 18, regular, spiral cords, separated by intervals of their own width.

All our specimens come from Water Cay, where the species is fairly abundant. The largest specimen measures 20 by 11 mm. Bose's original specimens are from the Miocene of the State of Oaxaca, Mexico. They are somewhat larger, measuring 28 by 15 mm.

Gatun Stage: Water Cay.

Conus tortuosopunctatus Toula

Plate 3, figures 6, 11

Conus tortuosopunctatus Toula, 1911, Jahrb. der K-K. Geol. Reichsanstalt, Wien, vol. 61, p. 507, pl. 31, fig. 21.

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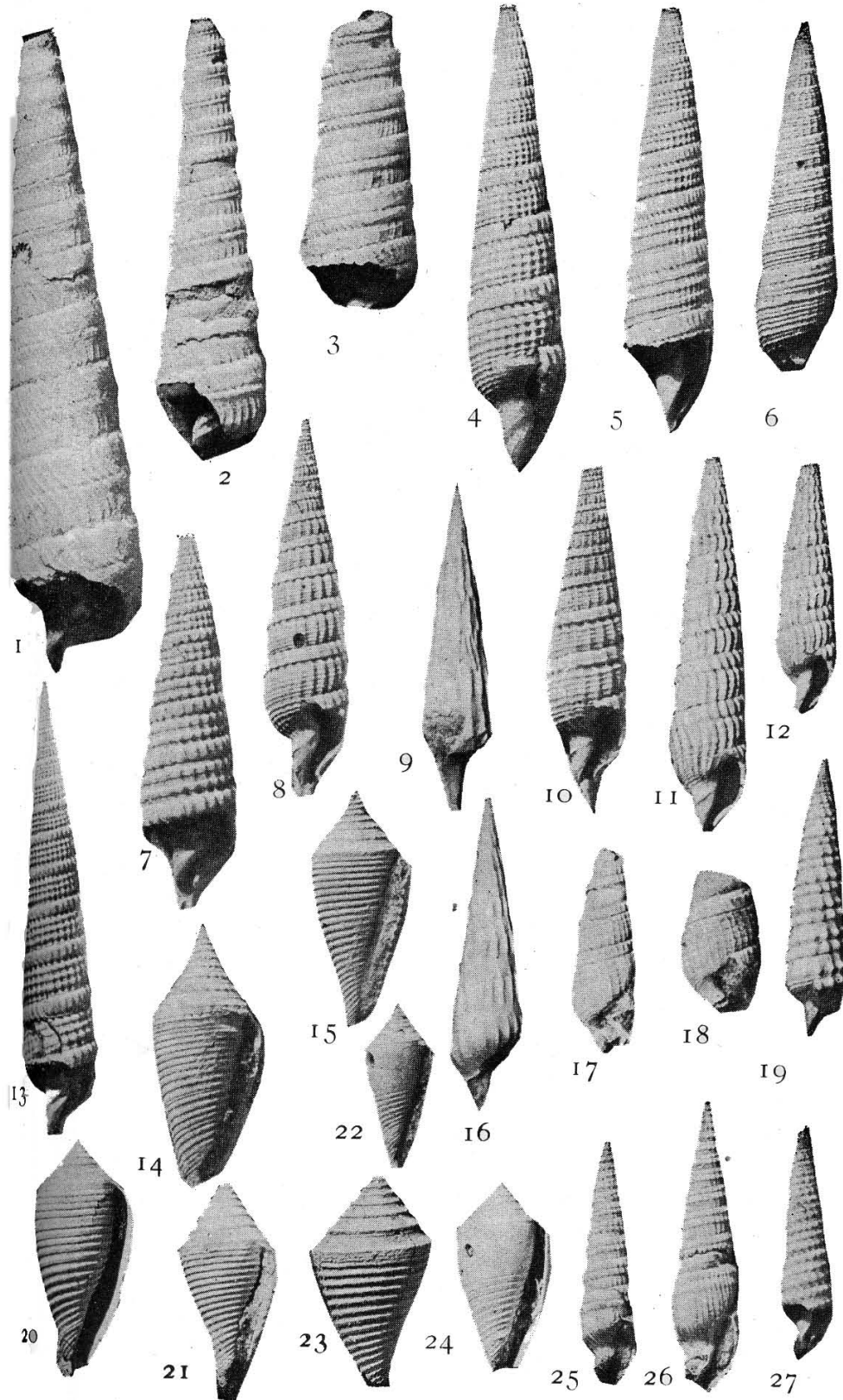
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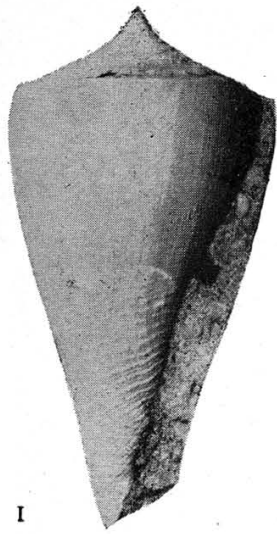
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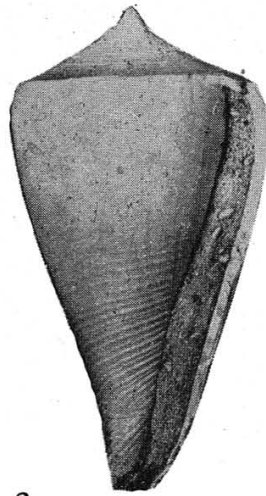
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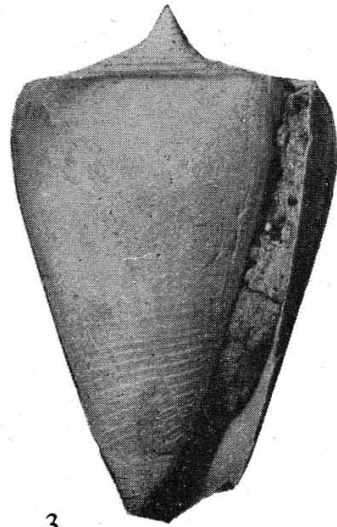




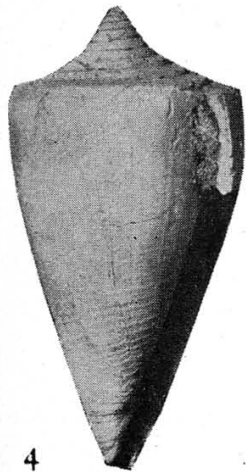
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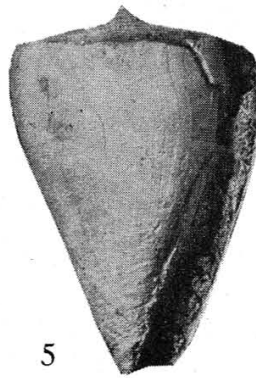
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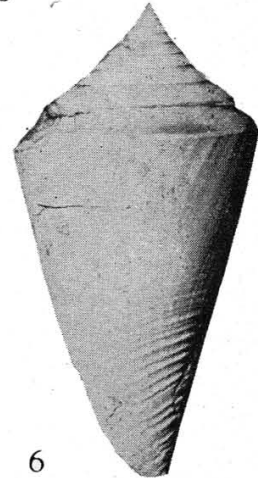
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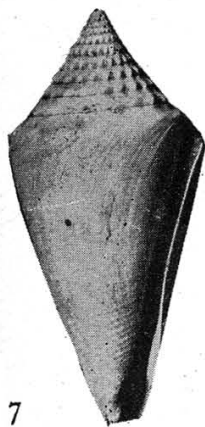
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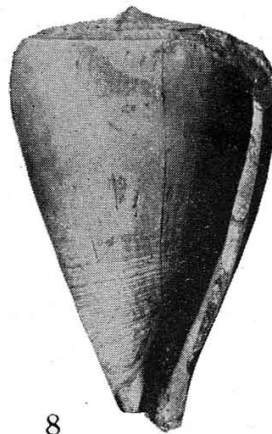
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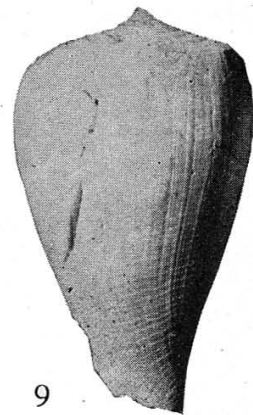
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