

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Professional Paper 142—F

THE MOLLUSCAN FAUNA OF THE ALUM BLUFF GROUP
OF FLORIDA

BY
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PART VI. PTEROPODA, OPISTHOBRANCHIA, AND
CTENOBRANCHIA (IN PART)

Published November 1, 1937

(Pages 251--435)



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1937

as high as the entire shell. Whorls of conch $3\frac{1}{2}$, narrowly tabulated posteriorly, trapezoidal. Protoconch smooth, polished, acutely tapering, coiled a little more than four times; initial volution for the most part submerged, the succeeding turns broadly convex and increasing rather rapidly both in diameter and latitude. Line of demarcation between conch and protoconch irregular but very distinct, indicated by a decided change in the texture of the shell and by the abrupt appearance of both the axial and the spiral sculpture. Ornamentation similar in general character over the entire spire. Axials numerous, 18 on the spire, sharply rounded, uniform in prominence throughout their extent from the posterior to the anterior suture and well down to the base of the body, equal and separated by equal intercostals of approximately their own width. Both axials and interaxials overrun by rather low spiral fillets, usually 5 on the later whorls of the spire and twice as many upon the body, for the most part equal in size and spacing, though narrower, sharper, and more closely spaced upon the base of the body. Pillar girded by 3 or 4 broader and more elevated cords, which are only a little coarser than the 3 to 6 crowded lirae upon the anterior fasciole. Posterior fasciole not defined away from the aperture. Suture line deeply impressed. Aperture not very wide, oblancoelate. Outer lip broadly and very feebly arcuate, slightly thickened externally, thin edged, denticulate within; the denticles elongated normal to the margin, symmetrically disposed between the canals, the posterior tooth the most prominent and placed directly in front of the sinus, the anterior tooth the least prominent and placed at the entrance to the anterior canal and parallel to it, the medial denticles equal and equispaced; posterior sinus very broad and shallow, distant from the suture. Inner margin of aperture strongly excavated at the base of the body. Parietal wall thinly glazed, commonly somewhat rugose. Inner edge of pillar acute but not distinctly plicate. Anterior canal short, broad, recurved. Anterior fasciole very short and narrow, obliquely and very deeply emarginate at its extremity.

Dimensions: Height, 5.5 millimeters; length of aperture, 2.8 millimeters; maximum diameter, 2.6 millimeters.

Holotype: U. S. Nat. Mus. No. 351234.

Type locality: No. 3742, Shell Bluff, Shoal River, Walton County, Fla.

This small form is strikingly nassoid in general aspect.

Occurrence: Shoal River formation, localities 3856', 3742'.

Family CONIDAE

Genus CONUS Linnaeus

1758. *Conus* Linnaeus, *Systema naturae*, 10th ed., p. 712.

Type (by subsequent designation, Children, 1823): *Conus narmoreus* Linnaeus. (Recent in the Indo-Pacific.)

Shell heavy, porcellanous, inversely conical; spire short or depressed, simple, keeled, rarely tuberculate; body whorl generally smooth, in large measure embracing the spire. Aperture narrow, with parallel or subparallel margins. Outer lip simple, thin, acute, notched at the shoulder. Columella straight, smooth, truncate anteriorly.

A large genus, which has been in existence since Cretaceous times and now numbers about 400 species, most of which are inhabitants of the tropical seas.

The distribution of the cones in the Chipola, Oak Grove, and Shoal River faunas is remarkably local. Of the 14 species represented not one occurs in all the faunas, and only a single one is common to any two. Though clearly related to the mid-American cones none of the 14 has been recognized outside of the Alum Bluff of Florida. The Chipola fauna is characterized by *C. isomitratus* and the closely related *C. sulculus*, with the somewhat less abundant *C. demiurgus* of the larger, stouter type and, among the more slender races, *C. chipolanus* Dall, with a meager representation of the Oak Grove species *C. corrugatus*. The Oak Grove fauna is dominated by *Conus dodona*, a form that suggests *Conus proteus* Hwass of the late Tertiary and Recent seas, and the smaller *Conus corrugatus*. The Shoal River fauna is characterized by its isolated cone fauna of 3 species and 1 subspecies, none of which occur outside the Shoal River formation and two of which, *C. waltonensis* and its subspecies *anodosus*, greatly exceed in abundance any other member of the cones within the Alum Bluff group.

The Chipola and Oak Grove faunas are obviously much more closely related to each other than to the Shoal River. The Shoal River fauna is the most peculiar of the three, and through its dominant species, so extraordinarily prolific in Walton County, is related to other mid-Miocene faunas of the mid-American province.

The character of the cones as a whole indicates throughout the Alum Bluff warm and very shallow waters.

Most of the other species are members of groups widespread in the middle and later Tertiary in the warm temperate and tropical waters of eastern America, but in few of them is the specific likeness sufficiently close to argue strongly for stratigraphic contemporaneity.

- Adult shell not exceeding 55 millimeters in altitude; no sculpture developed on body whorl except unequal and irregular lirations upon the anterior portion:
- Shoulder of whorls not spirally sculptured:
- Shoulder flattened, approximately horizontal in the later volutions..... *Conus demiurgus* Dall
- Shoulder concave between the appressed suture and the raised peripheral margin..... *Conus dodona* Gardner, n. sp.
- Shoulder turgid, in some specimens flattened on the ultima of the adult..... *Conus isomitratus* Dall
- Shoulder of whorls spirally sculptured..... *Conus sulculus* Dall
- Adult shell not exceeding 40 millimeters in altitude; spiral sculpture developed over all or a part of the body whorl, either in the form of broad fillets, linear sulci, or moniliform spirals:
- Nonmoniliform spiral sculpture developed with approximate uniformity over the entire body:
- Body whorl rather stout:
- Spirals rarely exceeding 20; shoulder usually flattened behind the periphery; body whorl not constricted at the base..... *Conus corrugatus* Gardner, n. sp.
- Spirals usually exceeding 20; shoulder not flattened behind the periphery; body whorl constricted at the base..... *Conus turbinopsis* Gardner, n. sp.
- Body whorl very slender:
- Spiral sculpture of approximately 20 sharp and narrow lirae..... *Conus fusiformis* Gardner, n. sp.
- Spiral sculpture of approximately 25 linear sulci..... *Conus chipolanus* Dall
- Spiral sculpture not uniformly developed over the entire body:
- Body whorl sculptured with linear sulci, feebly or not at all moniliform:
- Shell slender; spire high; sulci usually exceeding 7..... *Conus chipolanus* Dall
- Shell rather stout; spire of medium height; sulci rarely exceeding 7..... *Conus wallonensis anodosus* Gardner, n. subsp.
- Body sculpture more or less moniliform; shell rather stout; spire low or of only moderate height:
- Pustular spirals developed over the medial or the medial and posterior portions of the body; shoulder not spirally lirate..... *Conus wallonensis* Aldrich
- Pustular spirals very feebly developed over the medial portion of the body; shoulder spirally lirate..... *Conus submoniliferus* Gardner, n. sp.
- Adult shell exceeding 55 millimeters in altitude:
- Spiral sculpture not restricted to the base of the body..... *Conus molis* Brown and Pillsbury
- Spiral sculpture restricted to the base of the body:
- Shoulder of body whorl subacute..... *Conus draperi* Maury
- Shoulder of body whorl smoothly rounded..... *Conus nemorideditus* Maury
- Shoulder of body whorl acute..... *Conus demiurgus* Dall

Conus demiurgus Dall

Plate XLIII, figure 1

1896. *Conus demiurgus* Dall, U. S. Nat. Mus. Proc., vol. 18, p. 43.
1903. *Conus demiurgus* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 60, fig. 22.

Shell large, elongate, with a large, somewhat bulbous nucleus, and about 10 subsequent whorls; spire low, in the young nearly flat, with a distinct but not channeled suture; shoulder of the whorl angular, the space between the sutures flattish or feebly excavated, sculptured with obvious lines of growth, crossed by few faint, obsolete spiral traces; sides of the whorl smooth, except for obsolete spiral lines, rather wide and irregularly spaced; in the anterior third they are stronger, but even there not very marked; some specimens seem to indicate a faded color pattern of continuous, narrow spiral lines, rather evenly and uniformly spaced; aperture narrow, of equal width or nearly so; the anal notch moderately deep, the pillar straight, with a narrow callous part not showing any ridge or plait. Longitude of spire, 5; of shell, 65; diameter, 35; width of aperture, 6 millimeters.

Habitat: Chipola beds (2211-2213), Florida.

Types: No. 113920, U. S. Nat. Mus.; and in the Aldrich collection.

This species is the largest yet found in these beds, and among recent species finds its nearest analog in *C. papilionaceus* Hwass. It is a more slender shell than the latter, with more flattened spire and larger nucleus. It is a shell without striking characteristics, yet which will not fit in with any of the other forms of this horizon.—Dall, 1896.

The type is No. 113920 in the collections of the U. S. National Museum from No. 2213, 1 mile below Baileys

Ferry, Chipola River, Calhoun County, Fla. The specimen figured by Dall is U. S. Nat. Mus. No. 113920 from No. 2212, Tenmile Creek, 1 mile west of Baileys Ferry, Calhoun County, Fla.

No other species within the area combines the rather slender outline, the low spire planulated toward the periphery, the flattened nonplicate, nonlirate shoulder, and the sharply angulated periphery of the body whorl.

C. demiurgus Dall is restricted to the Chipola fauna but is rather common within those narrow limits.

Occurrence: Chipola formation, localities 2789, 2212^p, 2213^p, 2564^c, 3419^a, 2211^p.

Conus isomitratus Dall

Plate XLIII, figure 2

1896. *Conus isomitratus* Dall, U. S. Nat. Mus. Proc., vol. 18, p. 43.
1903. *Conus isomitratus* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 60, fig. 26.

Shell small, solid, short, stout, with a rather low spire of 9 whorls beside the nucleus; a single elevated thread runs at the shoulder, on which the suture is laid; between the sutures, whorls are deep and distinct, the whorl is convex, turgid, with only incremental lines; in front of the shoulder the sides are slightly swollen, the posterior half obsolete spirally striate or smooth anteriorly with distinct spiral threads and equal interspaces crossed by conspicuous lines of growth; the siphonal fasciole distinct, swollen, showing as a rounded ridge; outer lip straight, thin, sharp; anal notch shallow, aperture narrow, siphonal notch

pillar with the edge thickened and twisted, forming in developed specimens with the siphonal fasciole two obscure body with little or no callus. Longitude of shell, 28; of

Habitat: Chipola beds (2212, 2213), Chipola River, Fla., and Bluff beds near De Funiak Springs (2238).

Types: No. 113980, U. S. Nat. Mus.; and in the collection of Aldrich.

The young of this species have 9 or 10 deep grooves, with interspaces, covering a little more than the anterior of the shell. These grooves during growth become gradually modified to the adult sculpture.—Dall, 1896.

The figured type is in the United States National Museum collection, No. 113980, from locality 2212, Tenmile Creek, 1 mile west of Baileys Ferry, Calhoun County, Fla.

The species is set apart from all the coexistent forms by the peripheral cord outlining the inflated shoulder. It is common within the Chipola formation.

Occurrence: Chipola formation, localities 2212^a, 2213^b, 2564^p, 7151^r, 7468^r.

Conus sulculus Dall

Plate XLIII, figure 3

1896. *Conus isomitratu*s var. *sulculus* Dall, U. S. Nat. Mus. Proc., vol. 18, p. 43.

1903. *Conus sulculus* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 60, fig. 27.

Shell resembling the type, except that the sutural border or shoulder of the shell is flattened or excavated with a few or numerous spiral grooves upon its surface. It is also larger. Longitude of spire, 5; of shell, 38 [39.0]; diameter, 24 [22.0] millimeters.

Habitat: Chipola beds (2212, 2213), Chipola River, Fla.

Types: No. 113924, U. S. Nat. Mus.

The transition from a concave to a turgid sutural border, from smooth to spirally grooved, is quite gradual, though the extremes have a very different aspect, and would, by some writers, be put in different sections of the genus. This species recalls *C. mus* of the recent fauna as much as any species. It is much shorter and stouter than the line which begins with *auridens* et al., and is represented in the present fauna by *daucus*.—Dall, 1896.

Shell rather large and not very stout, moderately heavy in texture. Spire low, between one-sixth and one-fifth of the total altitude of the shell. Tip of nucleus broken away in all available material even in the holotype. Whorls of conch 8 or 9, closely embracing, so coiled that the spire is moderately steep in the apical region but flattens to a peneplain toward the periphery. Suture line following the periphery of the preceding volution. Shoulders of whorls of conch sculptured with 3 to 5 shallow linear sulci; shoulder of body whorl acutely rounded at the outer margin. Anterior third or more of the ultima sculptured with close-set, minutely sinuous spirals which tend to alternate in size, except near the canal, where they are uniform and much crowded. Labrum thin, deeply marginate at the shoulder. Inner lip simple, reinforced at the anterior canal; canal slightly flaring, terminated by a broad and shallow indentation.

Type locality: No. 2212, Tenmile Creek, 1 mile west of Baileys Ferry, Calhoun County, Fla.

Conus sulculus Dall is most certainly near of kin to *C. isomitratu*s Dall, but it is so readily separable by reason of its larger size, more attenuated anterior portion, and sulcated shoulder and is connected with *C. isomitratu*s by so few intermediate forms that it seems worth while to give it specific rank.

The species is fairly common within the Chipola formation but has not been reported from outside of it.

Occurrence: Chipola formation, localities 2212^a, 2213^b, 2564^p, 3419^p, 7151^r, 2211^p, 7183^r.

Conus trajectionis Maury

1910. *Conus trajectionis* Maury, Bull. Am. Paleontology, vol. 4, no. 21, p. 5, pl. 1, fig. 6.

Shell of medium size, elongately pyriform, with an elevated and very acute spire not convex in profile; whorls 11, of which the first 2 nuclear are smooth, the 5 following show a coronation under the lens, while the remainder have only a spiral ornamentation. Spiral sculpture of 3 or 4 strong threads on each volution of the spire. The spirals are absent on the last whorl below the shoulder but are strongly developed near the base of the shell. Lines of growth inconspicuous. Length of shell 50; greatest width 26 millimeters.

Chipola marls, Baileys Ferry, Fla.

Cornell University collection.—Maury, 1910.

Conus trajectionis has much in common with *Conus sulculus* Dall, but the profile of the spire is not the same and the shoulder is rounded more broadly than in Dall's smaller species. Nothing specifically identical with Miss Maury's *trajectionis* is included in our collections.

Conus dodona Gardner, n. sp.

Plate XLIII, figure 4

Shell rather large and heavy. Spire not more than one-fifth of the entire altitude in the adult forms. Whorls approximately 9, including the 2 or 3 nuclear coils, which are small, of nearly the same size, and laterally compressed and form a sharp and prominent little knob in the center of the low spire. Earlier whorls of conch flattened upon the shoulder; later whorls concave, the sutures very closely appressed and the peripheral margin slightly elevated. Incremental sculpture well developed in the concave area between the periphery and the suture. Spiral sculpture restricted to a dozen or more unequal and inequidistant, irregular oblique spirals upon the anterior third of the body. Aperture of average width. Outer lip thin, sharp, deeply emarginate at the shoulder. Inner lip smooth, reinforced at the anterior canal. Anterior canal wide, flaring slightly, obliquely truncated.

Dimensions: Maximum height, 33.8 millimeters; length of aperture, 29.0 millimeters; maximum diameter, 19.0 millimeters.

Holotype: U. S. Nat. Mus. No. 349858.

Type locality: No. 2646, Oak Grove, Yellow River, Okaloosa County, Fla.

This species suggests a low-spired *Conus proteus* Hwass (pl. XLIII, fig. 5) with a scooped-out shoulder.

Conus demiurgus Dall attains a larger size, has a lower spire, with a flattened rather than a concave shoulder even in the later whorls, and is more attenuated anteriorly.

Conus isomitratus Dall is smaller and stouter as a rule and does not reveal the periphery of the whorls of the spire.

Conus fusoides brachys Pilsbry from the Gurabo formation of the Dominican Republic is more angular with the suture, particularly on the early whorls, following more closely the periphery.

Conus dodona is the largest cone reported from the Oak Grove. It is abundant at certain localities, notably on the Yellow River, half a mile east of Oak Grove, but it has not been found at any other horizon of the Alum Bluff.

Occurrence: Oak Grove sand, localities 2646^a, 5633^p, 7054^p.

Conus chipolanus Dall

Plate XLIII, figure 6

1896. *Conus chipolanus* Dall, U. S. Nat. Mus. Proc., vol. 18, p. 42.

1903. *Conus chipolanus* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 60, fig. 23.

Shell double-conic, with a rather elevated spire of 9 normal and about 3 lucid nuclear whorls; profile of the spire somewhat concave, turreted shoulder of the whorls sharply keeled, concave between the keel and the suture, without spiral grooving but showing faint microscopic spiral scratches, the prominent sculpture of this area being the delicately arched lines of the anal fasciole, which are sometimes very conspicuous; the keel is wholly without nodules; sides in front of the keel straight, slightly concave toward the canal, smooth, except for incremental lines, polished anteriorly, with about 9 sharp, channeled spiral grooves, besides some striations on the canal; the grooves are separated by wider interspaces and crossed by numerous elevated lines of growth, which only appear in the channels; each channel in the fully adult shell has a spiral row of faint, round tubercles close to its anterior margin; in the young the grooves sometimes cover the whole shell before the keel, and the nodules are often absent; in the adult the grooves cover somewhat less than half the whorl, while on the smooth part traces of 5 narrow, revolving color bands are sometimes visible, with wider interspaces; anal notch only moderately deep; outer lip thin, only moderately arched; aperture narrow, with nearly parallel sides; the pillar straight, thin, slightly twisted. Longitude of shell, 32; of spire, 7.5; maximum diameter, 15.0 millimeters.

Habitat: Chipola beds (2213), Chipola River, Fla.

Type: No. 113985, U. S. Nat. Mus.; and in the collection of Mr. Aldrich.

This species recalls *C. interstinctus* Guppy, of the Haitian Miocene, but is a smaller, more slender, and more delicate shell, without any grooving in the sutural fasciole. It is more nearly related to *C. marylandicus* [pl. XLIII, fig. 8], of the newer Miocene, and to *C. floridanus* [pl. XLIII, fig. 7], Pliocene and Recent, than to any of the Antillean fossils with which I have compared it.—Dall, 1896.

Type locality: No. 2213, 1 mile below Baileys Ferry, Chipola River, Calhoun County, Fla.

Conus chipolanus Dall, though larger and more attenuated than *C. pealii* Green, suggests that Pliocene and Recent species in general outline and type of sculpture. Some of the variants of *C. multiliratus* are also suggested but the mid-American species is usually stouter and more strongly sculptured.

Conus chipolanus Dall is common at all of the Chipola localities from which extensive collections have been made, but it is apparently restricted to the single horizon.

Occurrence: Chipola formation, 2213^a, 2564^c, 3419^c, 7151^r, ?6175^r.

Conus corrugatus Gardner, n. sp.

Plate XLIII, figure 9

Shell rather small, biconic, the sharply angulated periphery of the body forming the base of each cone. Spire rather high, approximately one-third the altitude of the entire shell. Whorls 10 or more, including the 3 or 4 turns of the protoconch. Nuclear turns small, polished, laterally compressed, and very gradually increasing in size; line of differentiation between conch and protoconch marked by the abrupt initiation of the angulated shoulder and the incremental sculpture. Whorls of conch increasing in size with a moderate degree of rapidity, the sides of the spire serrated by the projecting peripheries of the successive volutions. Shoulder behind the periphery conspicuously flattened as a rule, a broad spiral fillet being thus formed, which is persistent in some individuals almost to the nucleus. Sculpture of spire restricted to arcuate incremental striations that mark the former presence of the posterior siphonal notch and restricted, in those individuals that are conspicuously flattened upon the front part of the shoulder, to the area between the fillet and posterior suture. Sutures distinct, even a little impressed. Body whorl sculptured with 12 or more low, broad spiral bands and in front of these upon the anterior canal 4 to 6 crowded lirae; interspirals linear in most individuals and finely striated by the incrementals. Aperture more than half the altitude of the entire shell, rather narrow, with subparallel margins. Outer lip thin, sharp, deeply indented upon the shoulder for the protrusion of the posterior siphon. Inner lip oblique, parietal wall smooth. Anterior canal slightly flaring, obliquely truncate.

Dimensions: Maximum height, 15.5 millimeters; height of spire, 5.0 ± millimeters; maximum diameter, 7.9 millimeters.

Holotype: U. S. Nat. Mus. No. 349864.

Type locality: No. 2646, Oak Grove, west bank of Yellow River, Okaloosa County, Fla.

Conus corrugatus is smaller and stouter than *C. chipolanus* Dall and differs from it further in having a well-established spiral sculpture over the entire body whorl in front of the periphery instead of merely the anterior two-thirds, with fortuitous spirals here and

there upon the posterior third. *Conus turbinopsis* has a lower and more evenly sloping spire, with no tendency toward a flattening behind the periphery, more numerous and somewhat lower spiral fillets upon the body, and a constriction at the base of the body that is not suggested in *C. corrugatus*. *Conus fusiformis* is much more slender, with a much higher spire, and is ornamented with narrower but sharper lirations.

Conus corrugatus is the only one of the 11 species from the Alum Bluff group that has been collected at more than one horizon. It has a meager distribution in the Chipola, but in the Oak Grove sand it is abundant and widely distributed. *Conus harveyensis* Mansfield from the Choctawhatchee beds of Florida is more slender (pl. XLIII, fig. 11).

Occurrence: Chipola formation, localities 77893^r, 2213^p, 2564^p; Oak Grove sand, localities 2646^a, 5632^a, 5633^c, 7054^c.

Conus fusiformis Gardner, n. sp.

Plate XLIII, figure 10

Shell small for the genus, slender, fusiform in outline. Spire elevated, scalariform, between one-third and one-half the height of the entire shell. Whorls 9 to 9½, including the 3 or 3½ small, smooth, laterally compressed protoconchal turns. First whorl of conch axially costate, the peripheral keel developing only toward the close of the turn. Later whorls of spire strongly angulated at the periphery, which falls a little less than two-thirds the distance from the posterior to the anterior suture. Incremental sculpture vigorous near the posterior suture, especially in the earlier whorls, becoming more feeble toward the periphery and absent altogether in front of it. Sutures distinct, even a little impressed. Shoulder of body whorl sharply angulated, outlined by the posterior of 20 prominent, subequal rounded spirals separated by interspaces of slightly greater width upon the earlier portion of the whorl but becoming more and more narrow toward the anterior canal, where they are reduced to linear dimensions. Incrementals well developed in the interspiral sulci. Aperture very narrow but little more than half the total height. Outer lip broken; the posterior siphonal notch as revealed by the growth lines only moderately deep. Inner lip smooth, straight. Anterior canal narrow, obliquely truncate. The type, which is unique, had suffered injury, but the animal has been able to make effective repairs upon its shell.

Dimensions: Maximum height, 13.8 millimeters; height of spire, 5.6 millimeters; maximum diameter, 5.4 millimeters.

Holotype: U. S. Nat. Mus. No. 349870.

Type locality: No. 5633, Yellow River below Oak Grove Bridge, Okaloosa County, Fla.

C. fusiformis stands apart from all its kin in the slender fusiform outline and relatively few but con-

spicuous spirals almost equally prominent over the entire body whorl exclusive of the shoulder.

Occurrence: Oak Grove sand, locality 5633^r.

Conus turbinopsis Gardner, n. sp.

Plate XLIII, figure 12

Shell of medium size, moderately heavy, rather stout, suggesting in outline a rather slender, elongated top. Spire between one-fourth and one-third the height of the entire shell, the sides uniformly converging at an angle of about 90° until the nucleus is reached, when the slope becomes abruptly much more steep. Suture line running directly in front of the periphery of the preceding whorl, thus making a barely perceptible break in the uniformity of the slope. Whorls 10 or more, including the 1 or 2 small, smooth, laterally compressed protoconchal volutions and an axially costate turn. Periphery developed on the succeeding whorl acute, that of the whorls of the spire barely visible behind the suture line. External sculpture of spire restricted to vigorous incrementals, which mark the successive margins of the posterior siphonal notch. Suture lines distinct but inconspicuous. Body whorl sculptured in front of the periphery with 20 to 25 spiral fillets separated by squarely channeled sulci of rarely more than half the width of the fillets; spirals uniform for the most part in size and spacing but slightly narrower near the periphery and, at the anterior canal, appearing as crowded linear lirations; interspiral sulci finely striated by the incrementals. Shell rather conspicuously constricted and attenuated near the base of the body. Aperture rather narrow, the margins subparallel. Outer lip probably thin but broken in all specimens collected. Posterior siphonal notch moderately deep. Anterior canal narrow, feebly marginate.

Dimensions: Maximum height, 20.0 millimeters; length of aperture, 16.5 millimeters; maximum diameter, 12.0 millimeters.

Holotype: U. S. Nat. Mus. No. 371397.

Type locality: No. 3856, 5 to 6 miles west-northwest of Mossyhead, Walton County, Fla.

Conus turbinopsis has a meager representation in the Shoal River faunas. It is most closely related to *Conus corrugatus* of the Chipola and Oak Grove faunas, a form characterized by a higher and steeper spire, upon which the sharply angulated peripheries of the succeeding whorls are plainly revealed; then, too, the body whorl of *C. corrugatus* tapers more uniformly and is not constricted at the base as in *C. turbinopsis*.

The relationship to the more strongly sculptured but variable *C. multiliratus* Böse is in some individuals rather striking.

Occurrence: Shoal River formation, locality 3856^p.

Conus waltonensis Aldrich

Plate XLIII, figures 13, 14

1903. *Conus waltonensis* Aldrich, Nautilus, vol. 16, no. 11, p. 131, 2 text figs.

Shell medium in size, substance rather thin; spire elevated, with 9 whorls including the apex, which is rather sharp; profile of spire slightly broken by a shoulder just above the suture on each whorl, the suture impressed, each whorl of the spire concave, and marked by numerous curved lines; periphery sharp; body whorl below the keel in some specimens over one-half smooth, then below this bearing two or three spirals of evenly spaced nodules without any grooves between, gradually changing to rows of nodules on bands between grooves, which are 8 or 10 in number, the nodules fading away as the canal is reached, but in the type specimen the nodules are present over the whole of the smooth part, without, however, any grooves between. Anal notch rather deep and marking the spire with its former positions; outer lip thin, pillar lip straight with a very slight twist; aperture straight above, widening near the base.

Length, 20 millimeters, maximum diameter, 12 millimeters.

Locality: Shoal Creek, Walton County, Fla.—Aldrich, 1903.

Two topotypes: U. S. Nat. Mus. No. 371398.

The apex of the spire is capped by a nucleus of 2 to 3 rather high, flattened whorls that form a prominent little knob on the relatively few individuals from which it is not broken away. The spire is higher proportionately in the young than in the adult form, constituting as much as a third of the total height in some of the former and less than a fifth in some of the latter. The whorls are very closely appressed and usually 10 in the adult. There is a considerable degree of variation in the steepness of the shoulder, the apical angle ranging from less than 90° to more than 120°. Usually there is a slight depression between the shoulder and the suture. The periphery is sharp and visible to the apex. Incremental sculpture is evenly developed behind the periphery but is rather feeble in front of it. Spiral sculpture is present only upon the body whorl. The moniliform spirals are developed over a much wider area in the individual selected by Mr. Aldrich as the type than in the average form. In probably half the individuals on which pustules are developed at all they are confined to the medial portion of the ultima and are commonly stronger near the inner than the outer lip. The pustules range from 20 to 30 to a series and in some specimens are so regularly arranged in the vertical plane that the suggestion of an axial sculpture is stronger than that of a spiral. On the anterior half of the body whorl 10 to 15 prominent spirals are present, the earlier spirals taking the form either of low fillets separated by squarely grooved channels or of oblique ridges separated by asymmetric V-shaped depressions. The 5 or 6 anterior spirals are uniform lirae separated only by linear interspaces. There is a barely perceptible constriction of the body whorl directly behind the anterior canal, a slight flare at the canal, and a feeble emargination.

Conus waltonensis Aldrich is exceedingly abundant at Shoal River and constitutes one of the most conspicuous elements of the molluscan fauna in the area.

It is the possible analog of the Pliocene *Conus trisculptis* Pilsbry and Johnson from Limón, Costa Rica, and may perhaps be an ancestral type of *C. pygmaeus* Reeve, which in rare specimens develops pustular spirals upon the posterior and medial portions of the body. *C. verrucosus* Hwass has the same general type of sculpture but coarser, and unlike that of *C. waltonensis*, the periphery is finely nodulated.

Occurrence: Shoal River formation, localities 3856^o, 2645^o, 3732^c, 3742^a, 3731^a, 5080^c, 5184^a.

Conus waltonensis anodosus Gardner, n. subsp.

Plate XLIII, figure 15

Shell of moderate size, of rather heavy texture and inclined to be stout; relative height of spire ranging as in *C. waltonensis* s. s. from less than one-fifth to one-third of the altitude of the entire shell and the apical angle from approximately 90° to 120°. Whorls 9 or 10 in the adult, closely embracing the suture line, falling a little in front of the periphery of the preceding volution. Nucleus, small, smooth, erect, its two or three component whorls relatively high and flattened laterally. Axial sculpture of conch restricted to incrementals, which are strongest upon the shoulders of the whorls of the spires. Spiral sculpture confined to the anterior half of the body, 6 to 10 fillets or ridges separated by narrower channels usually developed, exclusive of the half dozen crowded lirae upon the anterior canal. Sutures strongly impressed. Aperture rather wide, the margins subparallel. Outer lip deeply emarginate at the shoulder for the protrusion of the posterior siphon. Labrum very thin and parallel to the inner lip. Aperture slightly expanded at the anterior canal, which is broadly and very feebly emarginate.

Dimensions: Maximum height, 20.0 ± millimeters; altitude of spire, 3.5 ± millimeters; maximum diameter, 12.0 millimeters.

Holotype: U. S. Nat. Mus. No. 351122.

Type locality: No. 3856, 5 to 6 miles west-northwest of Mossyhead, Walton County, Fla.

The subspecies differs most radically from *C. waltonensis* s. s. in the nondevelopment of spiral rows of pustules upon the body whorl. In some specimens a few rows are present on the medial portion near the aperture, but commonly they are absent altogether. Transitional forms are less abundant than might be expected in two races, both so prolific within the same area. The subspecies runs a little larger possibly than the species in the strict sense, although the relation is apparently not that of young and adult, since young forms occur with no trace of a nodose sculpture developed upon them, whereas adults, such as Mr. Aldrich's type, occur with nodules from the periphery of the ultima to the anterior canal. The thinness of the outer lip seems to have rendered the form peculiarly suscep-

tible to injury, and repairs have been made on a large proportion of the shells collected.

Occurrence: Shoal River formation, localities 3856^{pr}, 2645^p, 3731^a, 5080^c, 5184^a, 5195^p, 3742^a.

Conus submoniliferus Gardner, n. sp.

Plate XLIII, figure 16

Shell rather large, moderately heavy. Spire low, a little less than one-sixth of the total altitude. Whorls apparently 10 exclusive of the protoconch, which is broken away, the first 5 whorls converging at an angle of approximately 70°, the last 5 at an angle of about 125°; whorls shouldered, those of the earlier turns oblique, and those of the later not far from horizontal. Suture line deeply impressed, following the periphery of the preceding turn except on the later volutions, where it drops forward a little to reveal the slightly elevated peripheral margin. Spire sculptured with somewhat irregular spiral lirations, 3 on the shoulder of each whorl. Incremental sculpture strong enough to crenulate the spiral minutely. Body whorl feebly inflated in front of the shoulder, so that the maximum diameter does not coincide, as in the majority of the cones, with the outer margin of the shoulder; sculptured on its medial portion, with 7 faint moniliform spirals that grow fainter and, with the exception of the anterior 2 or 3, evanesce before reaching the labrum. Simple, irregular, spiral lirae developed between the 3 or 4 anterior beaded spirals and in front of them, becoming more regular and more crowded toward the anterior extremity. Labrum broken away, probably thin and deeply emarginate at the shoulder. Labium simple, smooth, reinforced at the anterior canal. Canal short, somewhat flaring, truncate.

Dimensions: Maximum height, 40.0 ± millimeters; length of aperture, 36.0 ± millimeters; maximum diameter, 25.5 millimeters.

Holotype: U. S. Nat. Mus. No. 351132.

Type locality: No. 3732, Dave Adams Mill Creek, sec. 2, T. 3 N., R. 21 W., Walton County, Fla.

C. submoniliferus suggests a *C. sulculus* that has been influenced by the prolific and coexistent *C. waltonensis* Aldrich to the extent of developing a faint copy of the *C. waltonensis* sculpture.

The type is unique.

The most similar cone in the mid-American faunas is perhaps *C. symmetricus* Sowerby *semiobsoletus* Maury, of the Gurabo formation of the Dominican Republic. The Dominican species is stouter, a little more inflated in front of the periphery, higher-spined, and broader at the base.

Occurrence: Shoal River formation, locality 3732^p.

Conus molis Brown and Pilsbry

1911. *Conus molis* Brown and Pilsbry, Acad. Nat. Sci. Philadelphia Proc., vol. 63, p. 343, pl. 23, fig. 1.

A large, ponderous cone resembling *C. promethus* in figure, the ratio of diameter to length as 1 : 1.7.

Spire but little raised except at the center, where the early whorls project in a short acute cone. Whorls about 13, the earlier 6 flat, later whorls concave, spirally striate with about 5 striae between the seamlike sutural margins; crossed by weak growth lines, which are not very deeply arcuate. The shoulder of the last whorl is subacute. Side strongly convex below the angle, then straight, finely striate spirally throughout, the lower third coarsely striate. Aperture as in *C. haytensis* Sowb.

Length, 124, diameter, 71.2 millimeters.—Brown and Pilsbry, 1911.

Holotype: No. 5502, Princeton University.

Type locality: Monkey Hill, Gatun, Panama.

A single worn fragment, obviously of a very large cone and differing in no essential from Brown and Pilsbry's striking species, was collected half a mile east of Oak Grove on the Yellow River.

Occurrence: Oak Grove sand, locality 2646^r.

Conus draperi Maury

1910. *Conus draperi* Maury, Bull. Am. Paleontology, vol. 4, no. 21, p. 5, pl. 1, fig. 4.

Shell large, surpassing in size all the other species of the genus yet found in the Chipola beds. General form conic, with 8 whorls exclusive of the eroded nucleus; spire moderately elevated, not convex in profile; last whorl distinctly shouldered; surface of shell eroded in small circular spots, which may be an indication that the original color pattern consisted of small dark spots on a light ground. Transverse sculpture lacking except for faint lines near the base of the shell; lines of growth inconspicuous. Length of shell 60; greatest width 38 millimeters.

Chipola marls, Baileys Ferry, Calhoun County, Fla.

Cornell University collection.

Named in honor of Mrs. Henry Draper of New York City.—Maury, 1910.

The type has not been examined but the description and figure indicate a shell rather similar to *C. demiurgus* Dall but broader relatively and less angular. Perforations similar to those mentioned in the description occur in other species—such as *C. proteus* Hwass, which persists into the Recent fauna—and are apparently made by a boring sponge. In *C. proteus* they bear no relation whatever to the color pattern.

Occurrence: Chipola formation, Cornell University collection.

Conus nemorideditus Maury

1910. *Conus nemorideditus* Maury, Bull. Am. Paleontology, vol. 4, no. 21, p. 5, pl. 1, fig. 5.

Shell large, smooth, thin in proportion to its size; whorls 8 exclusive of the eroded nucleus; spire moderately elevated, not concave in profile, last whorl of the shell full and rounded near the shoulder and tapering rapidly to a rather slender base. Spiral sculpture consisting only of rather faint raised lines on the lower one-third of the shell; lines of growth inconspicuous. Length of shell 70; greatest width 42 millimeters.

This is the largest species of *Conus* found in either the Oak Grove or Chipola beds. Only one specimen was obtained.

Oak Grove, Florida.

Cornell University collection.—Maury, 1910.

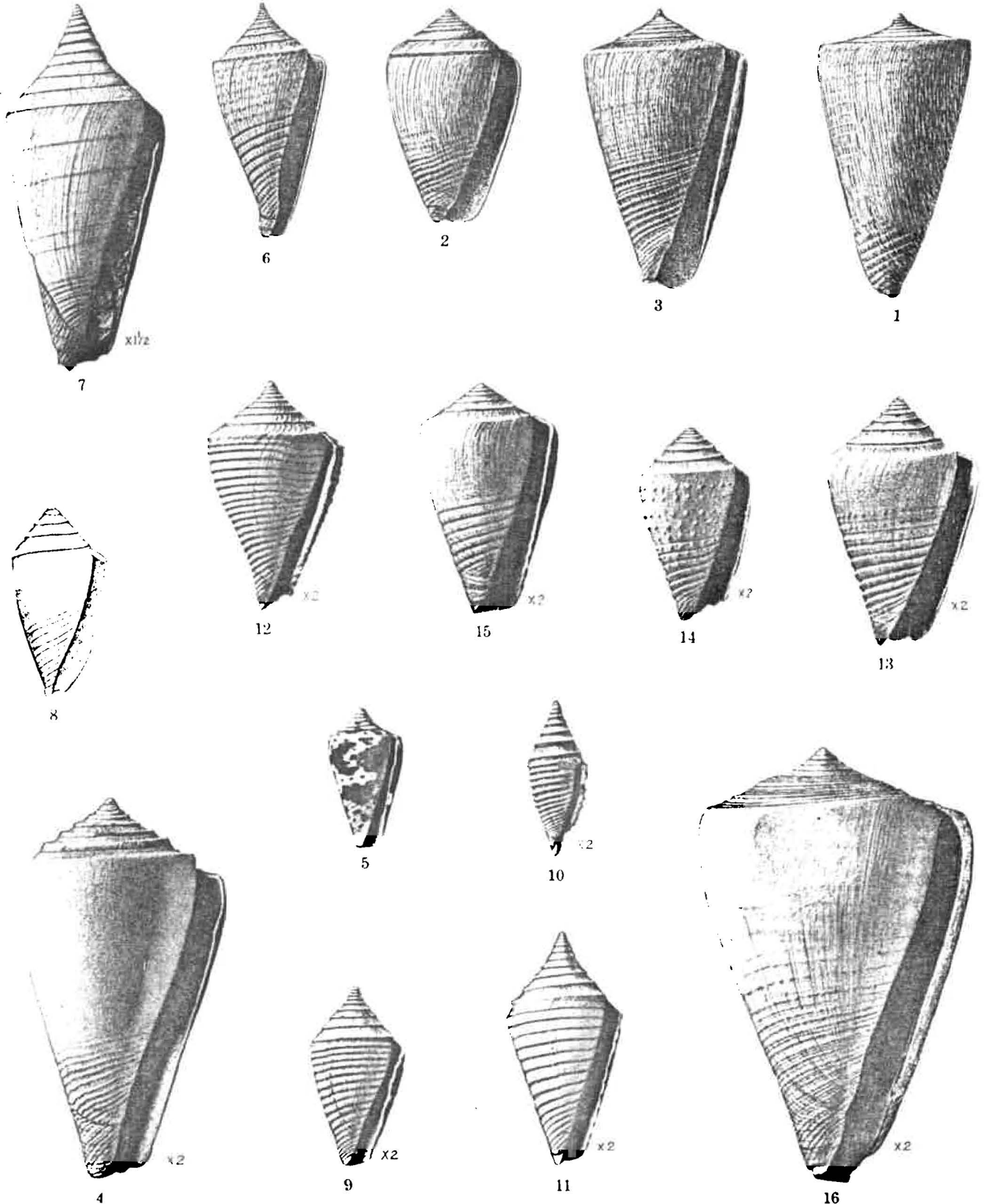
This species does not appear in the later collections.

Occurrence: Oak Grove sand, Cornell University collection.

PLATE XLIII

[The type specimens have been remeasured and some of the dimensions here given differ from those in the original descriptions]

- FIGURE 1. *Conus demiurgus* Dall (p. 358). Rear view of immature paratype; height 37.0 millimeters; maximum diameter 20.6 millimeters. (After Dall.)
- FIGURE 2. *Conus isomitratatus* Dall (p. 358). Apertural view of holotype; height 28.0 millimeters; maximum diameter 17.5 millimeters. (After Dall.)
- FIGURE 3. *Conus sulculus* Dall (p. 359). Apertural view of holotype; height 39.0 millimeters; maximum diameter 22.0 millimeters. (After Dall.)
- FIGURE 4. *Conus dodona* Gardner, n. sp. (p. 359). Apertural view of holotype; height 33.8 millimeters; maximum diameter 19.6 millimeters.
- FIGURE 5. *Conus proteus* Hwass (p. 360). Apertural view of a recent specimen from the West Indies (U. S. Nat. Mus. No. 18519); height 25.6 millimeters; maximum diameter 13.8 millimeters.
- FIGURE 6. *Conus chipolanus* Dall (p. 360). Apertural view of holotype; height 32.0 millimeters; maximum diameter 15.0 millimeters. (After Dall.)
- FIGURE 7. *Conus floridanus* Gabb (p. 360). Apertural view of a specimen from the Choctawhatchee formation of Florida (U. S. Nat. Mus. No. 370104); height 42.0 millimeters; maximum diameter 19.5 millimeters. (After Mansfield.)
- FIGURE 8. *Conus marylandicus* Green (p. 360). Apertural view of type from "Maryland"; dimensions: "length an inch and a half, and half as broad." (After Green.)
- FIGURE 9. *Conus corrugatus* Gardner, n. sp. (p. 360). Apertural view of holotype; height 15.5 millimeters; maximum diameter 7.9 millimeters.
- FIGURE 10. *Conus fusiformis* Gardner, n. sp. (p. 361). Apertural view of holotype; height 13.8 millimeters; maximum diameter 5.4 millimeters.
- FIGURE 11. *Conus harveyensis* Mansfield (p. 361). Apertural view of holotype from the upper Miocene (Choctawhatchee) of Harveys Creek, Leon County, Fla. (U. S. Nat. Mus. No. 370102); height 21.0 millimeters; maximum diameter 10.5 millimeters. (After Mansfield.)
- FIGURE 12. *Conus turbinopsis* Gardner, n. sp. (p. 361). Apertural view of holotype; height 20.0 millimeters; maximum diameter 12.0 millimeters.
- FIGURES 13, 14. *Conus waltonensis* Aldrich (p. 362).
13. Apertural view of topotype; height 22.3 millimeters; maximum diameter 13.5 millimeters.
14. Apertural view of topotype; height 17.2 millimeters; maximum diameter 10.0 millimeters.
- FIGURE 15. *Conus waltonensis anodosus* Gardner, n. subsp. (p. 362). Apertural view of holotype; height 20.0 ± millimeters; maximum diameter 12.0 millimeters.
- FIGURE 16. *Conus submoniliferus* Gardner, n. sp. (p. 363). Apertural view of holotype; height 40.0 millimeters; maximum diameter 25.5 millimeters.



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