# OLIVINAE (MOLLUSCA:GASTROPODA) FROM THE ALUM BLUFF GROUP OF NORTHWESTERN FLORIDA

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## I. ABSTRACT

The subfamily Olivinae encompasses six species and one subspecies in the Alum Bluff Group (lower to middle Miocene) of northwestern Florida. Of these, three species and one subspecies previously described are reviewed. The subspecies is raised to specific rank, and two of the three species receive a new subgeneric or generic assignment. Two new species are described: *Oliva blowi*, from the Chipola and Oak Grove faunas, and *Oliva vokesorum*, from the Chipola only. A new subspecies, *Oliva waltoniana calhounensis*, is named from the Chipola and Oak Grove units. Thus, there is a total of five species of *Oliva* in the Chipola Formation, four of which also occur in the Oak Grove Sand. One species of *Oliva* is confined to the Shoal River Formation, and one specimen of a second species has been collected there. The genus *Jaspidella* is limited to a single species in the Chipola Formation.

## II. INTRODUCTION

Only two species of *Oliva* from the Alum Bluff Group of northwestern Florida were included by Dall in his monumental work on the Tertiary fossils of Florida and adjacent areas. The two forms, *O. liodes* and *O. (Omogymna) martensii*, were figured (1903, pl. 58, figs. 1 and 4) and listed in his faunal list (*ibid.*, p. 1576) but were not described. Later, Gardner (1937) described Dall's two species and added a new subspecies of *O. liodes* from the Shoal River Formation, *O. liodes waltoniana*.

More recent collections have provided an abundance of olivid specimens for study, particularly from the Chipola Formation. The author had over 4600 specimens available (Chipola-4515, Oak Grove-7, Shoal River-167), as compared to 390 specimens for Gardner (Chipola-28, Oak Grove-21, Shoal River-341). Gardner's greater percentage of specimens from the Shoal River Formation and the Oak Grove Sand (which is probably a facies of the Chipola Formation) was due in part to her collections from many localities that have eluded subsequent workers.

Dall and Gardner failed to notice, on their specimens of *O. liodes*, the minute depressed posterior band that is characteristic of the subgenus *Omogymna*. Other specimens of this species often show a slightly wider band (± 1.2 mm), which occasionally is visible to the unaided eye. *Oliva*

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*(Omogymna) martensii* is another member of this subgenus in the Alum Bluff Group. The Chipola and Oak Grove faunas represent the only known occurrence for the presence of two species of *Omogymna* in the western Atlantic. *Oliva liodes waltoniana* is here raised to specific rank due to different subgeneric assignments for *O. liodes* and *O. waltoniana*. *Olivella cofacorys* Gardner was recognized by Olsson (1956, p. 212) to be a member of the Olivinae genus *Jaspidella*.

The subfamily Olivinae apparently evolved from *Agaronia*-like forms during the Jacksonian-Vicksburgian Stages (upper Eocene-middle Oligocene), first as the genus *Strephonella*.* *Oliva* s.s. and *Omogymna* made their first appearance in the late Oligocene and lower Miocene, thereafter rapidly diversifying and multiplying. *Oliva* s.s. reached its greatest development during the late Miocene to middle Pliocene in the western Atlantic and is now represented by only four known species in this area. *Omogymna* reached its greatest development in the lower Miocene and decreased in diversity and numbers thereafter. The last known occurrence of this genus in the western Atlantic is the middle Pliocene Agueguexquite Formation of Mexico (see Akers, 1972, p. 30; 1974, p. 120).

*Oliva* s.s. is characterized by a medium-sized to large shell, ovate-cylindrical to cylindrical in outline, with a low to medium spire, and teleoconch whorls separated by a distinct channeled suture that usually has a border of callus. The last whorl generally conceals most of the preceeding whorls, terminating in a smooth outer lip. The parietal callus is usually thick, with many weak lirae, stronger anteriorly. The columella is strong and heavy, with two or more oblique plications around the base. The posterior canal is notch-like, with the aperture widening anteriorly, ending in an emarginated siphonal canal.

The subgenus *Omogymna* has a small to medium-sized shell similar to *Oliva* s.s. in most characteristics but with a narrow depressed posterior band on the whorls.

The genus *Jaspidella* is represented by small *Olivella*-like species, with a large, obtuse nucleus on a high spire. The parietal wall usually lacks any callus above the columella folds. *Jaspidella* may have evolved out of small *Agaronia*-like forms, making its first appearance in the Oligocene of Florida (Suwannee Limestone), as *"Olivella" liveoakensis* (Mansfield, 1937, p. 96). *Jaspidella* has a meager representation in the Tertiary of the western Atlantic, and is now represented by three known Recent species.

Today, olives are carnivorous gastropods that inhabit sandy bottoms in temperate to tropical seas. They generally prefer shallow to intertidal areas, but some species are known to occur rarely at much greater depths (Zeigler and Porreca, 1969, p. 69).

The members of the subfamily Olivinae often show considerable variation within a species. This is particularly true of some species from the Alum Bluff Group. Because of the large number of specimens available for this study, many variations have been shown to occur within a species, which might have resulted in overnaming with fewer specimens.

The author had found as constant criteria for differentiation of species within a genus or subgenus: the number and shape of the nuclear whorls and the nature of the first teleoconch whorl; the width and depth of the suture; the nature of the intrasutural callus; the overall nature of the slope of the spire (convex or concave). Other factors such as height of spire, number and strength of lirae and plications, degree of convexity or concavity of spire, extent of coverage of intrasutural callus, may be variable within a species.

## III. ACKNOWLEDGMENTS

A very special note of gratitude goes to Drs. Harold E. and Emily H. Vokes, without whose constant encouragement and advice this paper would not have been possible. Gratitude is also expressed to them for the excellent photographs and the loan of many specimens from the Tulane University collections. A special thanks goes to Robert and the late Shirley Hoerle, West Palm Beach, Florida, and to Warren Blow, Washington, D.C., for the generous loan of specimens from their personal collections. The writer is also indebted to Thomas R.

*The earliest known olivid is a species of *Strephonella*, *"Oliva" mississippiensis* Conrad, 1847, which was described from the Vicksburg Oligocene. Subsequent workers have generally placed this species in the genus *Agaronia*. Palmer (*in* Harris and Palmer, 1947, p. 410, pl. 63, figs. 17-19) reported similar forms from the Moody's Branch Marl, Jacksonian upper Eocene, near Montgomery, Louisiana.

Waller and Wendell P. Woodring, of the U.S. National Museum, and Druid Wilson, of the U.S. Geological Survey, for the loan of comparative material.

Finally, the writer is deeply appreciative of the help and constructive criticisms of the editorial committee, who have added much to this paper.

## IV. SYSTEMATIC DESCRIPTIONS

Phylum MOLLUSCA
Class GASTROPODA
Subclass PROSOBRANCHIA
Order NEOGASTROPODA
Superfamily VOLUTACEA
Family OLIVIDAE Swainson, 1840
Subfamily OLIVINAE Swainson, 1840
Genus OLIVA Bruguière, 1789
Subgenus OLIVA s.s.

*Oliva* BRUGUIÈRE, 1789, Encycl. Méth. (Vers), v. 1, p. XV (genus without named species).

Type species: *Voluta oliva* Linnaeus (=*O. ispidula* of authors, not of Linnaeus) by tautonomy and monotypy.

*Discussion:* In the past, there has been much confusion about the correct citation for the author of the genus *Oliva*. There also has been confusion over the type species for the genus *Oliva*, as well as the correct subgenus for the modern species of *Oliva* of the western Atlantic and many of the related fossil forms.

Olsson and Harbison (1953, p. 182) summarized the situation well in their discussion of the *Oliva* from the Florida Pliocene:

"Authorship of the genus *Oliva* has been credited Martyn, 1786, Bruguière, 1789, and to Lamarck, 1799. Dall accepted Martyn as author of the genus and selected *Oliva corticaria* Martyn (*O. incrassata* Solander (*angulata* Lamarck)) in 1905 as type. This view was also shared by Woodring, 1928 and by Wenz, 1943. Martyn's generic names are now generally rejected since the author was not Linnean, but as he expressively stated, used his own system. No species was mentioned by Bruguière, 1789 in his description of the genus but it may be assumed that the name was derived from Linné's *Voluta oliva*. Lamarck, 1799, in the Prodrome mentioned but one species, the *Voluta oliva* Linné, under his description of *Oliva*. Thus *Oliva oliva* Linné is the type of the genus through tautonomy."

Olsson and Harbison recognized that *Oliva oliva* was a composite species, including *O. maura* Lamarck in part. *Oliva maura* has a depressed spire and a raised and thickened lip at the suture. For this reason, some authors (Olsson and Harbison, 1953, p. 182; Weisbord, 1962, p. 362) have placed the western Atlantic olives in the subgenus *Ispidula* Gray, 1847, with *O. ispidula* (of authors *non* Linneaus 1758) as the type of the subgenus. Wenz (1943, p. 1280) put *Ispidula* Gray, 1847, in synomony with *Oliva* Martyn, 1786.

Olsson and Dance (1966, p. 215-222) examined the types of the three Linnean olives: *Voluta porphyria*, *Voluta oliva* and *Voluta ispidula*. Their findings are summarized below. The reader is referred to the article for a more complete discussion, especially in reference to the differentiation of the true Linnean types.

*Voluta oliva* was found to be the type for the genus *Oliva* Bruguière, by tautonomy and subsequent monotypy. The tray in the Linnean collection with the name *Voluta oliva* contained five specimens. Four unmarked specimens in the tray were referable to *O. maura* Lamarck and are assumed to have been added to the collection after the death of Linneaus, but before it was acquired by the Linnean Society. The one numbered specimen was identified, upon comparison with *Oliva* specimens in the U.S. National Museum, as *Oliva ispidula* of many authors (*non* Linneaus, 1758). *Voluta ispidula* Linneaus, 1758 was found to be identical with *Oliva plicaris* Lamarck, 1811, which is a fossil species of *Agaronia* from the Burdigalian Miocene of France. Thus, *Ispidula* Gray, 1847, becomes a synonym of *Agaronia* Gray, 1839. *Oliva maura* Lamarck was thought to be a synonym of *O. oliva*, but since *O. oliva* is now recognized not to be synonymous with *O. ispidula*, *O. maura* Lamarck, 1811, becomes a valid species (= *O. vidau* Röding, 1798) of the subgenus *Carmione* (Zeigler and Porreca, 1969, p. 83).

### OLIVA (OLIVA) WALTONIANA Gardner
Plate 1, figs. 1, 2

*Oliva liodes* subsp. *waltoniana* GARDNER, 1937, U.S. Geol. Surv. Prof. Paper 142-F, p. 379, pl. 46, figs. 2, 3.

*Diagnosis:* "Shell of only moderate altitude but rather stout and heavy. External surface smooth and very brightly polished. Spire only a little less than one-fifth the total altitude in the type but less than one-eighth in other individuals. Body whorl smoothly rounded both posteriorly and anteriorly, the maximum diameter falling a little behind the median line. Whorls probably 9 in all in the adult, 5 of these included in the conch and 4 in the

rather small, obtusely rounded protoconch. Initial turn minute, rather inflated but almost entirely submerged, the two succeeding volutions broadly rounded and increasing rather rapidly both in diameter and altitude; final whorl of the protoconch flattened laterally toward its close, increasing in altitude but scarcely at all in diameter. Boundary line between conch and protoconch very obscure, oblique, retractive, performing in the figured specimen about half a complete revolution, indicated by the more porcellaneous texture of the conch, the increased flattening of the whorl, and the deepening of the sutural channel. Conchal whorls of spire trapezoidal in outline, the degree of obliquity varying with the height of the spire. Incremental striae faint, least so toward the aperture. A polka-dotted color pattern discernible in some individuals. Sutural channel rather deep, undercutting the whorl behind it, partly concealed by the overhanging margin both of the whorl behind and the whorl in front of it. Aperture rather narrow, the margins approximately parallel throughout their posterior and medial extents. Labrum freebly constricted toward the suture but approximating the vertical, broadly and smoothly rounding into the siphonal notch in front. Parietal wall quite heavily corrugated except in the immediate environs of the posterior commissure, 8 rugae behind the heavy pillar callus, increasingly heavier, broader, and more cuneiform in outline anteriorly. Pillar reinforced near the base by 4 sharply overlapping folds of callus, terminating in heavy parietal rugae, the anterior the thinnest and the most clearly defined, obliquely directed toward the siphonal notch but evanescing before reaching it. A thinner wash spread across the base of the body, originating at a point about two-thirds of the distance from the posterior commissure to the anterior extremity and evanescing a short distance back from the outer margin of the siphonal notch, which it parallels through about half its extent. Siphonal notch only moderately deep and rather narrow, obliquely directed, its margins not quite parallel." (Gardner, 1937)

Dimensions of holotype: height 29.3 mm, diameter 13.4 mm.

Holotype: USNM 351282.

Type locality: USGS 3856, 6 miles west northwest of Mossyhead, Walton County, Florida (= TU 69).

*Occurrence:* Shoal River Formation, Florida; middle Miocene.

*Figured specimen:* Fig. 1, USNM 247885; height 25.5 mm, diameter 11.7 mm. Fig. 2, USNM 247886; height 4.7 mm, diameter 2.4 mm; locality of both TU 69a. Other occurrences: TU locality no. 69.

*Discussion: Oliva waltoniana* is a common member of the Shoal River fauna, representing the total olivid fauna from the Shoal River Formation, except for a single specimen of *O.* cf. *blowi.* Gardner (1937, p. 379) described *O. waltoniana* as a subspecies of *O. liodes,* not realizing that *O. liodes* belonged to the subgenus *Omogymna.* Because of this new assignment for *O. liodes,* as well as many other obvious differences, *O. waltoniana* is here raised to specific rank.

As with the other species of *Oliva* from the Alum Bluff Group, the four-whorled nucleus sets it apart from most of its relatives. Except for the subspecies *O. calhounensis, O. waltoniana* most clearly resembles *O. gatunensis* Brown and Pilsbry from the Gatun Formation of Panamá. *Oliva gatunensis* differs primarily in its three-whorled nucleus, slightly convex spire, shallow narrow suture and weaker lirae fading rapidly towards the posterior commissure.

### OLIVA (OLIVA) WALTONIANA CALHOUNENSIS Drez, n. subsp.
### Plate 1, figs. 3, 4

*Diagnosis:* Shell of medium size, relatively thin, body whorl smoothly rounded at both ends, slightly inflated, maximum diameter a little posterior to the mid-line. Eight to nine whorls in adult specimens, including a 4½-whorl naticoid nucleus; spire about one-fifth of the total height; straight to slightly convex in outline. First nuclear whorl minute, partially submerged, the following whorl increasing equally in width and height. The third and fourth whorls increasing rapidly in height, the last higher than the sum of the preceding whorls. The transition from nuclear to teleoconch whorls occurring over one-half of a volution, as a band of lighter-colored teleoconch material rises and overtakes the nuclear whorl, with a lateral flattening and deepening of the suture. A ribbon of callus on early post-nuclear whorls reaching up to the posterior edge of the preceding volution, gradually thickening and descending on later whorls until it occupies one-half to one-third of the lower visible portion of the penultimate whorl. Suture deeply channeled, narrow, with an overhanging ribbon of callus. Aperture narrow at the posterior end, widening upwards toward the anterior, and slightly flaring. Outer lip smooth, gently retracting toward the posterior commissure. A darker-colored band bordering the outside of the convex lip, widening anteriorly and continuing around to the siphonal canal notch. Parietal callus smooth and heavy at the posterior commissure, thinning in front of the commissure, thickening again anteriorly, with the callus intersecting the siphonal fasciolar band about halfway to the anterior end, the band widening as it cuts obliquely across the columella toward the siphonal notch, evanescing upon reaching it. Eight to ten single sharp lirae on

the parietal wall ending abruptly about one-fifth of the way to the posterior commissure, with two or three heavy lirae on the plications. Four to five plications on the base of the columella, stronger posteriorly, disappearing before reaching the siphonal notch. Siphonal notch moderately deep, wide, obliquely directed, with non-parallel margins.

Dimensions of holotype: height 31.1 mm, diameter 14.0 mm.

Holotype: USNM 247887.

Paratype: USNM 247888; height 9.0 mm, diameter 3.0 mm.

Type locality: USGS 10971, Turtle Lake Bluff, about 150 yards above the mouth of Fourmile Creek, Chipola River, Calhoun County, Florida [not located].

*Occurrence:* Chipola Formation, Florida; late lower Miocene. Oak Grove Sand, Florida; (?) late lower Miocene.

*Figured specimens:* Fig. 3, USNM 247887 (holotype). Fig. 4, USNM 247888 (paratype); locality same as holotype.

*Discussion:* The specimens of *O. calhounensis* were obtained from a lot in the U. S. National Museum collected by Mansfield in 1938, after the *Oliva* part of Gardner's U.S.G.S. Prof. Paper 142 had been published. Attempts by subsequent collectors to find the locality have proved unsuccessful.

There is one adult specimen with a crushed spire in Gardner's collection from the Oak Grove fauna (USGS 2646), which is referable to *O. calhounensis*. All the diagnostic characteristics are present, except for a defective nucleus.

*Oliva calhounensis* differs from *O waltoniana* s.s. by its consistently higher spire, less inflated outline near the posterior end, thinner shell, and more exserted nuclear whorls. Lirae and plications on the columella are generally more callused on *O. calhounensis*.

### OLIVA (OLIVA?) BLOWI Drez, n. sp.
Plate 1, figs. 5, 6, 7

"*Oliva*, near *reticularis* Lamarck." DALL, 1903, Wagner Free Inst. Sci., Trans., v. 3, pt. 6, p. 1590.

*Oliva cylindrica* Sowerby. DALL, 1903, Wagner Free Inst. Sci., Trans., v. 3, pt. 6, p. 1590 (*not* of Sowerby).

*Diagnosis:* Shell of medium size, thick and heavy, subcylindrical in outline, with the periphery about one-third of the way from the posterior commissure. Nine to ten whorls in adult specimens, including a small papillary four-whorl nucleus; spire varying between one-eighth to one-fourth of the total height, slightly to strongly convex in outline. First nuclear whorl small, partially submerged, the following whorl increasing equally in width and height. The third whorl greatly expanded, increasing slightly more in height than width; the fourth whorl increasing in height but only slightly in width. The transition to teleoconch whorls obscure, characterized by a rapid vertical flattening of the fourth nuclear whorl and deepening of the suture. The first teleoconch whorl nearly vertical in outline, with a tendency to lateral flattening toward the end of the first volution. A ribbon of callus, straight to convex in outline, on the early post-nuclear whorls bordering the posterior edge of the preceding volution, the callus gradually thickening and descending on later whorls, occupying between one-third to nine-tenths of the penultimate whorl, depending upon the height of the spire. Suture deeply channeled, narrow, with an overhanging ribbon of callus. Aperture narrow at posterior commissure, gradually widening anteriorly. The outer lip nearly vertical, slightly retractive at the posterior commissure. A wide, depressed porcelaneous band present in juvenile specimens, occupying the posterior one-third of the body whorl, the band rapidly narrowing during the latter part of the third teleoconch whorl and completely disappearing in one-half of a volution. The extent of parietal callus varying considerably, usually heavy, with eight to 15 irregular lirae of shorter length posteriorly. The callus fading about three-fourths of the way to the posterior commissure, being barely discernible above the lirae. Four to five plications on the base of the columella, stronger posteriorly, evanescing before reaching the siphonal notch. The siphonal fasciolar band intersecting the parietal callus on the columella about half-way up the aperture, widening as it cuts obliquely across the columella toward the siphonal notch, fading around the notch. Siphonal notch moderately deep, sides slightly flaring.

Dimensions of holotype: height 34.8 mm, diameter 14.8 mm.

Holotype: USNM 247889.

Paratype A: USNM 247890; height 11.4 mm, diameter 5.4 mm.

Paratype B: USNM 247891; height 27.2 mm, diameter 11.9 mm.

Type locality: TU 459, east bank of Chipola River, steep bank about 1500 feet above the mouth of Taylor Lake Branch (NW ¼ Sec. 29, T1N, R9W), Calhoun County, Florida.

*Occurrence:* Chipola Formation, Florida; late lower Miocene. Oak Grove Sand, Florida; (?) late lower Miocene.

*Figured specimens:* Fig. 5, USNM 247889 (holotype). Fig. 6, USNM 247890 (paratype A); locality same as holotype. Fig. 7, USNM 247891 (paratype B); locality TU 555. Other occurrences: TU locality nos. 70, 457, 458, 546, 549, 554, 821, 825, 830, 951, 998, 1098.

*Discussion:* One juvenile specimen shows the wide posterior band over one complete whorl before fading away totally in less than one-half of a volution. The juvenile specimens seem to indicate an *Omogymna* assignment, but since this characteristic band is only present in extremely small individuals, not in adult forms, an assignment of *Oliva* s.s. seems best at this time.

Because of this unusual juvenile characteristic of *O. blowi*, a question arises as to the relationship between *Oliva* s.s. and *Omogymna*. This occurrence of a juvenile *Omogymna*-like band in *O. blowi* records an apparent evolutionary trend that led to the divergence of *Oliva* s.s. and *Omogymna*. Perhaps *Omogymna* is the ancestral form from which *Oliva* s.s. evolved, or possibly *Oliva* s.s. and *Omogymna* diverged from a common ancestor. Only careful examination of many fossil and Recent species of both subgenera, including the anatomical parts responsible for the posterior band, will reveal the evolutionary line.

*Oliva blowi* is the only Alum Bluff Group olivid that shows great variation. Along Ten Mile Creek and Farley Creek localities, as well as the lower beds on the Chipola River, the specimens show an average amount of variation but retain the moderately high spire, heavy parietal callus and the heavy stout lirae that gradually shorten and evanesce posteriorly. As one moves downstream on the Chipola River (higher stratigraphically), the spire has a tendency to decrease in height, the ribbon of callus occupying almost all of the penultimate whorl; thus the shell subsequently assumes a more cylindrical outline. The lirae also tend to become fewer in number and more evenly spaced, with a lighter covering of parietal callus.

Gardner mentions that she had specimens of *O. "liodes"* from four localities in the Oak Grove: USGS 2646, 5631, 2652, 7055. In the U.S.N.M. collections the author could only find specimens of olives from a single locality, USGS 2646 (Oak Grove, Yellow River, Okaloosa County, Florida). One lot contains two specimens referable to *O. blowi*. One is a small, high-spired individual; the second specimen is large, low-spired, subcylindrical, and similar to the figured specimen from TU 555 (fig. 7). The high-spired individual is probably Dall's "*Oliva*, near *reticularis* Lamarck," and the

PLATE 1

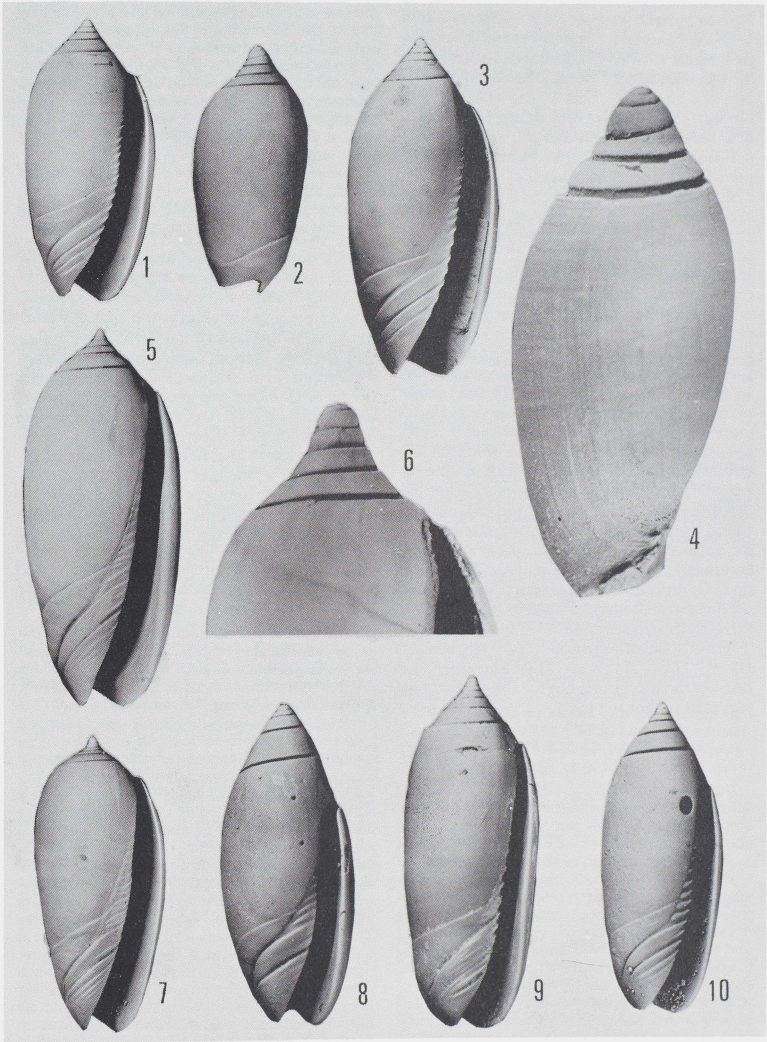


PLATE 1

low-spired specimen the one he cited as "*Oliva cylindrica* Sowerby" (1903, p. 1590).

*Oliva blowi* most closely resembles an undescribed species of *Oliva* that occurs in the "Silverdale beds" (early lower Miocene, North Carolina). This is the species that Kellum (1926, p. 41) and Richards (1943, p. 525) referred to *O. posti* Dall, originally described from the Tampa Limestone (early lower Miocene) of Florida (Dall, 1915, p. 49). This Silverdale species has the general characteristics of *O. blowi*, but the depressed posterior band does not disappear until the last adult whorl (fifth teleoconch). It also has a more slender outline, without the posterior bulge on the body whorl, a wider fasciolar band, and many fine lirae near the posterior commissure on the columella. The undescribed species also lacks the nearly vertical first post-nuclear whorl so characteristic of *O. blowi*. The presence of this undescribed Silverdale olivid species, which shows the same evanescing depressed posterior band as *O. blowi* on the adult body whorl, provides additional evolutionary evidence as mentioned earlier for the divergence of *Oliva* s.s. and *Omogymna*. *Oliva blowi* can be easily separated from its probable descendants, *O. reticularis* Lamarck, *O. reticularis trochala* Woodring, and *O. cylindrica* Sowerby, by its four-whorled nucleus and nearly vertical first teleoconch whorl.

This species is named for Warren C. Blow, U.S. National Museum, the one person most responsible for the writer's interest in paleontology.

### Oliva cf. O. blowi Drez
### Plate 1, fig. 8

*Diagnosis:* A high-spired, thick and heavy, subcylindrical shell, with the maximum diameter approximating the median. The spire occupying about one-third of the total height, feebly convex in outline, convexity increasing on the body whorl. Nuclear whorls lost; 5½ teleoconch whorls in the adult. Early teleoconch whorls with a ribbon of callus approaching the posterior edge of the preceeding volution, gradually thickening and descending on later whorls, occupying two-thirds of the penultimate whorl just behind the outer lip. Suture deeply channelled, narrow, with a small overhanging ribbon of callus attached to the preceding whorl. Aperture moderately wide at the anterior end, rapidly narrowing toward the posterior commissure. Outer lip smooth, thick and vertical. Parietal callus generally heavy, but thinner near the posterior commissure, thickening rapidly anteriorly. Siphonal fasciole intersecting the callus about the median line of the columella, widening gradually as it cuts obliquely across the columella and fading around the siphonal notch. Eight single narrow lirae on the parietal callus, evanescing rapidly posteriorly. Two equally strong plications on the base of the columella, disappearing in the siphonal fasciole. Siphonal notch deep and narrow, margins parallel.

*Occurrence:* Shoal River Formation, Florida; middle Miocene.

*Figured specimen:* USNM 247892; height 29.4 mm, diameter 12.8 mm; locality TU 69a.

*Discussion:* It is unfortunate that the sole specimen of this interesting form available for study should have a defective nucleus. The extremely high spire, the strongly convex final whorl tapering at both extremities and the two strong plications make this a distinctive form. Although the figured specimens of *O. blowi* are generally low-spired, a few high-spired individuals of *O. blowi* from the Chipola Formation bear a close resemblance to the Shoal River specimen. The lack of a nucleus and part of the teleoconch whorls makes a definite assignment impossible at this time. This form seems to be the Shoal River equivalent of the Chipola species, *O. blowi*, if not identical to it.

### Oliva (Oliva?) vokesorum Drez n. sp.
### Plate 1, figs. 9, 10

*Diagnosis:* Shell of medium size, subcylindrical to cylindrical in outline, the maximum diameter falling about one-sixth of the distance from the posterior suture. Nine to ten whorls in adult specimens, including a four-whorl naticoid nucleus; a generally low conic spire varying between one-fourth to one-fifth of total height, straight to slightly concave in outline. Initial nuclear whorl minute, partially submerged, the following whorl increasing slightly in diameter but almost totally submerged in the third nuclear whorl. Third and fourth whorls continuing to increase slightly in width, but more rapidly in height, the transition to the teleoconch whorls occurring rather abruptly over one-fourth of a whorl, characterized by a rapid lateral flattening with a deepening and widening of the suture. Teleoconch whorls with a ribbon of callus, flat in outline and approaching the preceding suture, completely covering the intrasutural area of each spire shorl. Suture deep and wide, with a small overhanging ribbon of callus. Aperture generally narrow, widening gradually anteriorly. Outer lip vertical in outline, abruptly rounded at the posterior commissure. Parietal callus almost completely absent; six to nine strong single lirae on the columella, weaker posteriorly, ending one-

fifth of the way from the posterior commissure. Siphonal fasciole originating slightly less than half way from the posterior commissure, widening rapidly as it cuts obliquely across the columella and evanescing around the siphonal notch. One strong plication on the columella base, with three minor plications anteriorly, becoming weaker with maturity. Siphonal notch deep and narrow, with subparallel sides.

Dimensions of holotype: height 32.3 mm, diameter 12.4 mm.

Holotype: USNM 247893.

Paratype: USNM 247894; height 27.3 mm; diameter 10.8 mm.

Type locality: TU 951, Ten Mile Creek, about 1½ miles west of Chipola River (SE ¼ Sec. 12, T1N, R10W), Calhoun County, Florida.

*Occurrence:* Chipola Formation, Florida; late lower Miocene.

*Figured specimen:* Fig. 9, USNM 247893 (holotype). Fig. 10, USNM 247894 (paratype); locality same as holotype. Other occurrences: TU locality nos. 70, 457, 546, 655, 830.

*Discussion: Oliva vokesorum* is confined to Ten Mile Creek, except for one specimen from a Chipola River locality (TU 457), which is just above the lower contact of the Chipola Formation. In the Chipola fauna it is most easily confused with *O. liodes*, especially specimens of *O. liodes* that are waterworn, or that show only a microscopic posterior depressed band. In addition to the obvious feature of the depressed posterior band on the whorls of *O. liodes*, *O. vokesorum* differs in its more cylindrical shape, wider and deeper suture, general lack of parietal callus, one large plication (with three weaker plications anteriorly) on the columella, fewer and stronger lirae, trapezoidal-shaped callus between sutures, and narrow aperture.

*Oliva vokesorum* also resembles *O. sayana* Ravenel, which is the dominant olivid along the Atlantic and Gulf Coast today; the latter differs in having a three-whorled nucleus, generally larger size, wider aperture, heavy parietal callus, weaker lirae, wider and deeper suture and a slight bulging of the body whorl. Fossils olives from the Jackson Bluff Formation (Choctawhatchee Group, lower Pliocene) have been referred to *O. sayana* by Mansfield (1930, p. 51) and are probably the descendants of *O. vokesorum*.

One juvenile specimen (TU 951), which seems referable to this species, bears a small posterior band that disappears over the last quarter of the second teleoconch whorl. This is one whorl less than the three in which *O. blowi* loses its depressed posterior band. As with *O. blowi*, there remains some doubt about an *Oliva* s.s. assignment for this species. For a more complete discussion of the possible implications see *O. blowi* (above).

*O. vokesorum* is named for Drs. Harold E. and Emily H. Vokes, without whose help this paper would have never been written.

## Subgenus OMOGYMNA Von Martens, 1897

*Omogymna* VON MARTENS, 1897, Conchologische Miscellen II, p. 157.

Type species: *Oliva paxillus* Reeve, by monotypy.

"Unterabtheilung der Gattung *Oliva*, dadurch charakterisirt, dass die äusserste (letzte) Schalenschicht den letzten Umgang nicht in seiner ganzen Ausdehnung einnimmt, sodern nach oben mit einer scharf gezogenen schiefen Linie endigt, welche von der Mündungswand ausgehend, nach aussen mehr und mehr gegen die Naht zu aufsteigt. Der oberste Theil der letzten Umgangs entbehrt demgemäss der letzten Auflagerung, die auf ihm befindlichen Flecke sind daher schärfer begrenzt und von etwas anderem dunklerem Farbenton, als auf den übrigen Theile der Schale. Die Nahtrinne ist sehr schmal, kaum sichtbar; der sichtbare Theil der vorhergehenden Windung ist wie bei den normalen Oliven in siener unteren Hälfte von einer wulstigen Auflagerung bedeckt.

Ob die Auflegerung, welche mit der shiefen Ebene endigt, vom Fuss oder vom Mantel gebildet wird, lässt sich nicht sagen, da die Weichtheile noch nicht bekannt sind. Mantel oder Fuss dürften aber voraussichtlich auch einen Unterschied von den normalen Oliven zeigen.

Die schiefe Linie macht gewissermassen den Eindruck, als ob ein Kleindungsstück von der Schulter herabgleite, daher die Benennung. Sie steht nicht bei allen Exemplaren dersleben Art in gleicher Höhe.

Bis jetzt habe ich diese eigenthümliche Bildung nur an einer Art gesenhem, nämlich der folgenden." (Von Martens, 1897).

*Discussion:* To the author's knowledge, the original description *Omogymna* (Von Martens, 1897, p. 157) has not been quoted in a work on western Atlantic olivids to date, and is reproduced here.

As with *Oliva* s.s., over the years there has been confusion about the authorship and type species of this interesting group. Dall (1903, p. 1574), in describing the Chipola fauna, made mention of the occurrence of this subgenus, as ". . . a species of the group *Oliva* called by von Martens *Omogymna*," listing the species *Oliva (Omogymna) mar-*

*tensii* Dall in his checklist (p. 1576) as well as figuring it (pl. 58, fig. 4). Woodring (1928, p. 226) noted the occurrence of a species of *Omogymna* from the Cercado Formation of Santo Domingo, *Oliva (Omogymna) gradata* Gabb, attributing *Omogymna* to Dall (1903) with the type by monotypy, *Oliva (Omogymna) martensii* Dall. Tomlin (1934) rectified the position of *Omogymna*, reinstating Von Martens as the author and *Oliva (Omogymna) paxillus* Reeve as the type species.

*Omogymna* is characterized by a depressed posterior band on the body whorl, which may or may not be visible on the spire whorls, depending upon the amount of intrasutural callus. The width of the band may vary considerably from species to species, usually attaining a constant width by maturity. On juvenile specimens the posterior band can occupy up to two-thirds of the body whorl, gradually narrowing and becoming more depressed with maturity.

OLIVA (OMOGYMNA) LIODES Dall

Plate 2, figs. 1, 2

*Oliva liodes* DALL, 1903, Wagner Free Inst. Sci., Trans., v. 3, pt. 6, p. 1576 (name only), pl. 58, fig. 1.

*Oliva liodes* Dall. MAURY, 1922, Bulls. Amer. Paleontology, v. 9, no. 38, p. 45.

*Oliva liodes* Dall. GARDNER, 1937, U. S. Geol. Surv. Prof. Paper 142-F, p. 378, pl. 46, fig. 1.

*Oliva* cf. *liodes* Dall. GARDNER, 1945, Geol. Soc. Amer., Memori 11, p. 216.

Not *Oliva liodes* Dall. MASSON and ALENCASTER-IBARRA, 1951, Asoc. Mex. Geol. Petrol., Bol., v. 3, p. 210, fig. 23.

Not *Oliva (Oliva) liodes* Dall. PERRILLIAT-MONTOYA, 1963, Paleontologia Mexicana, no. 14, p. 23, pl. 5, figs. 4, 5. (A new, unnamed species.)

Not *Oliva (Oliva) liodes* Dall. WOODRING, 1964, U. S. Geol. Surv. Prof. Paper 306-B, p. 276. (Fragments of two unknown species.)

*Diagnosis:* "Shell of moderate dimensions for the group but thick and heavy, smooth, and polished and subcylindrical in outline, the maximum diameter falling a little behind the median line. Spire very low, approximately one-sixth the total altitude of the shell, tapering rather unevenly in the apical region owing to the more rapid enlargment of the later volutions. Whorls 8 in all in the type, 9 in larger individuals, 4 or 5 of them included in the conch and 4 in the small, smooth knob of a protoconch. Initial turn minute and almost entirely submerged; succeeding turns broadly rounded, all but the second increasing more rapidly in altitude than in diameter, the final whorl of the protoconch flattening laterally toward its close. Bounding line between conch and protoconch obscure, indicated by the more porcellaneous texture of the conch, the greater lateral flattening, and the more deeply impressed suture. Whorls of spire trapezoidal in outline, the earlier whorls increasing more slowly in diameter than the later. Incremental striae feeble, least so toward the aperture. Sutural channel profound, deeply undercutting the preceding turn, partly concealed by the acute overhanging margins. Aperture narrow, the sides rudely parallel through their posterior and medial extent. Outer lip smooth, sharp-edged, almost vertical, very feebly contracted near the suture, rounding smoothly anteriorly into the siphonal notch. Parietal wall scored with numerous transverse corrugations, which become increasingly lower and less produced and commonly evanesce altogether toward the posterior commissure. Base of pillar heavily reinforced with 4 or 5 overlapping folds of callus which die out near the siphonal notch; posterior margin of basal callus intersecting the labium about one-third of the way from the anterior to the posterior extremity of the shell, cutting obliquely across the base of the shell toward the anterior notch, where it almost but not quite evanesces, faintly discernible upon the labrum at a distance of about 3 millimeters from the outer margin. Siphonal notch broad and deep. The margins parallel and obliquely directed." (Gardner, 1937)

Dimensions of holotype: height 27.0 mm, diameter 11.5 mm.

Holotype: USNM 113971.

Type locality: USGS 2212, Ten Mile Creek near Chipola River, Calhoun County, Florida (= TU 546).

*Occurrence:* Chipola Formation, Florida; late lower Miocene. Oak Grove Sand, Florida; (?) late lower Miocene. (?) Guajalote Formation, Tamaulipas, Mexico; late lower Miocene.

*Figured specimens:* Fig. 1, USNM 247895; height 30.5 mm, diameter 13.6 mm; TU locality 546. Fig. 2, USNM 247896; height 9.5 mm, diameter 3.9 mm; TU locality 459. Other occurrences: TU locality nos. 70, 91, 196, 456, 457, 458, 547, 548, 549, 550, 554, 555, 655, 708, 709, 711, 768, 810, 817, 820b, 821, 824, 825, 830, 831, 949, 950, 951, 998, 999, 1019, 1021, 1050, 1052, 1097, 1098. (?) USGS 13455, 14584, 13588. Bascom No. 2 well, Mobile, Alabama (1241 feet, Chipola horizon).

*Discussion:* In this species the spire varies between one-half and one-ninth of the total height and is straight to strongly concave in outline. There are nine to ten whorls in adult specimens, the posterior edge of the body whorl on some low-spired individuals rising during the last half of the body whorl but not reaching the top of the penultimate whorl. The transition between the nuclear and teleoconch whorls is gradual over the last half turn of the fourth nuclear whorl, as

a whitish band of teleoconch material rises and overtakes the nuclear material.

On juvenile specimens a wide band occupies the posterior third of the whorl, slowly narrowing to a band of constant width (1.2 mm or less) after two and one-half to three teleoconch whorls. The band has a rough undulating edge, which is sharp to the touch. This band is exposed on the spire whorls, with a ribbon of callus reaching up to but not covering the depressed band.

Dall (1903, pl. 58, fig. 1) originally figured *O. liodes*, but he did not describe it. Gardner (1937, p. 378) described the species and placed it in *Oliva* s.s., failing to notice the thin depressed posterior band. This band is extremely thin on the type and on Gardner's material (0.2-0.5 mm), which might explain the oversight*. Over 2500 specimens of *O. liodes* were available to the author for examination, as compared to the 38 that Gardner had. Many of the specimens have the posterior band developed enough for observation with the unaided eye, but most specimens require slight magnification for positive identification (see pl. 2, fig. 1b). A quick field method is to feel the posterior edge of the body whorl for a sharp undulating edge, which is the knife-like edge of the posterior band.

*Oliva liodes* was described by Gardner (1937) as belonging to the *O. sayana* group. Although *O. liodes* does resemble *O. sayana* superficially, the presence of the depressed posterior band, the smaller size, three-whorled nucleus, wider and deeper suture and a narrower aperture separate the two species.

Maury (1922, p. 45) reported *O. liodes* at the 1241-foot level of the Bascom No. 2 well, in Mobile, Alabama, which she referred to the Chipola horizon. The author attempted to examine the specimen(s), but they apparently have been temporarily misplaced at the Paleontological Research Institution.

Gardner (1945, p. 216) noted the occurrence of some imperfectly preserved molds of an olivid from the Guajalote Formation (USGS 13455, 13584, 13588) of Mexico, which she tentatively referred to *O. liodes*. If these molds are truly *O. liodes*, then this would greatly extend the geographic range of the species although not the stratigraphic range, as the formation is correlated with the Chipola.

Perrilliat Montoya (1963, p. 23) figured a species from the Agueguexquite Formation of Mexico, which she referred to *O. liodes*. A comparison of Agueguexquite specimens with those of *O. liodes* from the Chipola shows that those from the Agueguexquite are markedly different. The Mexican specimens have a three-whorled, exserted nucleus, a shallow narrow suture, a convex ribbon of callus on the spire whorls, a larger height/diameter ratio, a narrower aperture, heavier unpaired lirae, a prominent rounded shoulder and lack the depressed posterior band. The specimens referred by Perrilliat Montoya to *O. liodes*, from the Agueguexquite Formation (her locality = TU 1046), belong to an unnamed species of *Oliva* s.s.

Masson and Alencaster-Ibarra (1951, p. 210, fig. 23) figured a species as *O. liodes* from the Filisolo Formation (= TU 1095) of Mexico. The figure in the publication is extremely poor, but the description seems adequate for a comparison. The height/diameter ratio is much smaller (3.75) than for any specimen of *O. liodes* that the author has seen from the Chipola Formation. The specimens have three plications, as opposed to four or five for Chipola specimens. Also, the protoconch-teleoconch transition in *O. liodes* is gradual over one-half of a turn, but the Filisolo specimens have an abrupt and profound change. Masson and Alencaster-Ibarra's material appears not to be related to *O. liodes*.

*Oliva liodes* is the most common and widespread of the olivids in the Alum Bluff Group, occurring in both the Chipola and Oak Grove faunas. It is present at almost all localities. Although not as numerous as in the Chipola Formation, it is well represented in the Oak Grove Sand. One lot from Gardner's collection (USGS 2646) identified as *O. liodes*, also contained specimens of *O. martensii*, *O. calhounensis*, and *O. blowi*, in addition to *O. liodes*. The Oak Grove specimens are typical of the species.

The shell of *O. liodes* is large for the subgenus *Omogymna*, only *O. (Omogymna)*

*Olsson maintains that the criteria selected by the author for the placement of *O. liodes* in the subgenus *Omogymna* are not valid, but Von Martens (1897) did not specify any minimum width for the depressed posterior band. Since the nature of the band on juvenile specimens of *O. liodes* and *O. martensii* are similar and only differ in size on mature specimens, the author feels justified in his assignment.

*valens* Jung, 1971, from the Miocene of Carriacou, West Indies, being of comparable size. *Oliva valens* differs from *O. liodes* in having a three-whorled nucleus, fewer teleoconch whorls, only three plications on the base of the columella, and a wider posterior band on adult specimens.

*Oliva liodes* shows faint traces of a color pattern on certain individuals, either under visible or ultraviolet light. The pattern is not bold enough to be photographed, but appears to be similar to the general pattern of *O. sayana* (Recent, Atlantic and Gulf Coasts of United States).

In the Chipola fauna, *O. liodes* could be confused with *O. vokesorum;* the latter can best be separated by the lack of the depressed posterior band, as well as the many other crieria already mentioned.

### Oliva (Omogymna) martensii Dall
Plate 1, figs. 3-5

*Oliva (Omogymna) martensii* DALL, 1903, Wagner Free Inst. Sci., Trans., v. 3, pt. 6, p. 1576 (name only), pl. 58, fig. 4.

*Oliva (Omogymna) martensii* Dall, GARDNER, 1937, U. S. Geol. Surv. Prof. Paper 142-F, p. 380.

*Diagnosis:* "Shell small for the group but moderately thick and heavy, subcylindrical in outline, smooth and highly polished. Spire approximately one-fourth as high as the entire shell, smoothly tapering, commonly a little convex, the protoconch appearing as a minute apical knob. Whorls 8 in all, probably only 3 of them included in the protoconch. Initial turn of protoconch minute, largely submerged; succeeding volution broadly rounded, increasing slowly in altitude but rather rapidly in diameter, the 2 remaining volutions increasing in altitude but scarcely at all in diameter. Boundary line between conch and protoconch obscure, indicated by the more porcellaneous texture of the conch, the increased flattening of the whorl, and its more rapid enlargement, and the deepening of the suture. Whorls of spire trapezoidal in outline, the body rounding smoothly toward the suture, a band a trifle narrower than the penult planed off from the body directly in front of the suture, margined anteriorly by a sharp clean-cut edge. Sutural channel undercutting the whorl behind it, deep but not very wide, overhung by the free and proximate margins of both the preceding and the succeeding volutions. Aperture rather narrow, the margins subparallel through their posterior and medial extent. Outer lip thin, sharp, approximately vertical. Parietal callus smooth and moderately heavy at the posterior commissure, thinning out just in front of the commissure, then thickening again and becoming increasingly heavy and heavily corrugated anteriorly, spreading out rather abruptly at about two-thirds of the distance from the commissure to the anterior extremity in two major, overlapping folds with minor surficial sulci; major folds swinging from the base of the pillar across toward the siphonal notch but evanescing before reaching it. A lighter but more widely spread coat of glaze extending from about half way down the apertural wall obliquely across the base of the body until it parallels the outer margin of the notch, where it gradually evanesces without mounting the labrum. Siphonal notch rather narrow but very deep, the margins parallel and obliquely directed." (Gardner, 1937).

Dimensions of holotype: height 19.5 mm, diameter 8.5 mm.

Holotype: USNM 113974.

Type locality: USGS 2212, Ten Mile Creek, near Chipola River, Calhoun County, Florida (= TU 546).

*Occurrence:* Chipola Formation, Florida; late lower Miocene. Oak Grove Sand, Florida; (?) late lower Miocene.

*Figured specimens:* Fig. 3, USNM 247897; height 21.7 mm, diameter 8.7 mm; TU locality 830. Fig. 4, USNM 247898; height 18.7 mm, diameter 8.5 mm; TU locality 546. Fig. 5, USNM 247899; height 6.1 mm, diameter 2.9 mm; TU locality 830. Other occurrences: TU locality nos. 70, 91, 456, 457, 458, 459, 547, 548, 549, 554, 555, 655, 708, 787, 810, 817, 818, 820b, 821, 824, 825, 827, 831, 951, 998, 999, 1050, 1051, 1097, 1098.

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PLATE 2

Figures — Page

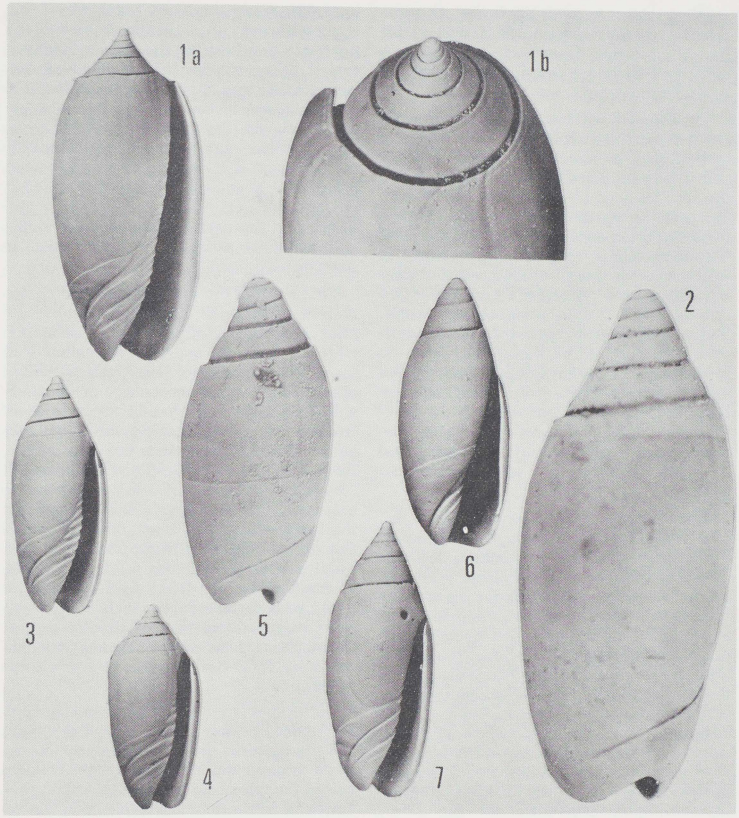


PLATE 2

4. (× 2) USNM 247898; height 18.7 mm, diameter 8.5 mm.
Locality: TU 546, Chipola Formation.
5. (× 10) USNM 247899; height 6.1 mm, diameter 2.9 mm.
Locality: TU 830, Chipola Formation.
6. *Oliva (Omogymna) gardnerae* (Richards) ..... 119
(× 2) USNM 247900; height 24.4 mm, diameter 9.5 mm.
Locality: TU 562, Silverdale Beds, North Carolina.
7. *Jaspidella cofacorys* (Gardner) ..... 119
(× 4) USNM 247901; height 12.2 mm, diameter 5.1 mm.
Locality: TU 554, Chipola Formation.

*Discussion:* As with *O. liodes*, *O. martensii* was only figured by Dall (1903, pl. 58, fig. 4) and not described until Gardner (1937, p. 380) did her systematic work on the Alum Bluff Group.

The four-whorled nucleus sits on top of a low convex spire like a little knob. The posterior band is smooth in outline but not sharp to the touch as with *O. liodes*, due to the smooth edge along the top of the band. On juvenile specimens the wide, glossy, posterior band occupies about two-thirds of the body whorl, gradually decreasing in width on subsequent volutions and reaching a constant width (1.2 to 2.4 mm) after two and one-half to three teleoconch whorls. The only change during maturation is a general subsiding of the band. The band on juvenile specimens gives a *Strephonella*-like appearance to the juvenile shells. But the band is glossy and depressed on the juvenile specimens of *O. martensii;* in *Strephonella* the posterior section is not depressed and the dividing line is an impressed groove.

*Oliva martensii* is of average size for species of the subgenus *Omogymna*. Its distribution in the Chipola is second only to *O. liodes* in number of specimens. It is generally uncommon on the upper part of Ten Mile Creek, increasing in abundance downstream. On Farley Creek, it becomes the dominant member of the olivid fauna and attains a generally larger size. This species is also represented in collections from the Oak Grove fauna by three juveniles (USGS 2646) and one adult specimen (TU 91). These specimens appear to be identical with the Chipola material, except that the posterior band is slightly narrower than on typical Chipola specimens.

Some confusion may arise in separating the juvenile forms of *O. blowi*, *O. liodes* and *O. martensii*, since all possess a wide posterior band. When comparing juvenile specimens with the same number of teleoconch whorls, the separation becomes simple. *Oliva liodes* and *O. martensii* are both relatively cylindrical in outline, whereas *O. blowi* has a distinct bulge at the posterior of the body whorl and has a strongly convex spire. *Oliva blowi* can be further distinguished from the other two by its knob-like nucleus and the rapid rate of narrowing and eventual disappearance of the posterior band during the third teleoconch whorl. *Oliva martensii* is always considerably smaller and narrower than *O. liodes* or *O. blowi* with the same number of teleoconch whorls. The posterior band is never as wide on the earliest juvenile specimens of *O. liodes* as it is on the third teleoconch whorl of *O. martensii*. The smaller size of *O. martensii*, the consistently wider posterior band, and the two strong plications on the columella are sufficient characteristics to distinguish it from *O. liodes*.

The width of the posterior band is essentially constant on *O. liodes* and *O. martensii* after completion of the third teleoconch whorl. Therefore, as *O. liodes* and *O. martensii* reach maturity, the posterior band occupies a smaller percentage of the body whorl. This is not true in all species of *Omogymna*, including the type of the subgenus, *Oliva (Omogymna) paxillus* Reeve, Recent of the Indo-Pacific. Specimens at hand show that even on adult examples the band has not achieved a constant width for the body whorl. Apparently the species of *Omogymna* with a constant-width posterior band are limited to the western Atlantic Tertiary. Possibly, these forms should be assigned to a different group from the typical *Omogymna* species of the Recent. A thorough study of the worldwide *Omogymna* fauna is needed in order to answer this question.

Some specimens exhibit a faint color pattern under visible and/or ultraviolet light, but the patterns are not sufficiently intense to be photographed. *Oliva martensii* had a rather complex color pattern, consisting of a series of small dots just anterior to the revolving posterior band, with a narrow dashed band around the middle of each whorl. The overall background pattern resembles a miniature *O. sayana* (Recent, western Atlantic), but the revolving line around the middle of the whorls and the series of dots resembles the modern *O. paxillus* from the Indo-Pacific.

As with *O. blowi*, *O. martensii* seems also to have had its ancestry in the "Silverdale" fauna (lower Miocene). Richards (1943, p. 525) described the species "*Olivella*" *gardnerae* from the marl ("Silverdale beds") of

the Trent Formation at Silverdale, North Carolina.* From his description, he apparently described a juvenile form of the *Omogymna* ancestor of *O. martensii*. An adult figure (see Pl. 2, fig. 6) of *Oliva (Omogymna) gardnerae* is furnished for comparison. It differs mainly from *O. martensii* in the fact that the posterior band does not attain a constant width until the final adult whorl. This species also has a more exserted nucleus, with the intraspinal callus not covering all of the preceding whorl in the early teleoconch whorls. The posterior band on the Silverdale species is not as depressed as on *O. martensii*, and the spire tends to have a high trapezoidal outline, rather than the lower convexity of the younger species.

The *O. martensii* line seems to continue in the form of *O. gradata* from the Miocene Cercado Formation of the Dominican Republic. *Oliva gradata* is close to *O. martensii*, but the exserted two and one-half-whorled nucleus serves best to differentiate the two species. On the specimens of *O. gradata* available to the author from the Cercado Formation (TU 1230), the posterior band is consistently wider (2.4 - 2.5 mm) than that of *O. martensii*, as well as more depressed. Due to the lack of any juvenile specimens of *O. gradata* no comparison can be made of the different rates of band narrowing on the early whorls of the two species.

## Genus JASPIDELLA Olsson, 1956

*Jaspidella* OLSSON, 1956, Acad. Nat. Sci. Phil., Proc., v. 108, p. 212.

Type species: *Voluta jaspidea* Gmelin, by original designation.

"Oliviform shell with a high spire of several whorls terminating in an obtuse nucleus. Sutures narrowly grooved, the collar of the preceding whorl appressed. No callous wash on the parietal wall. Pillar structure is a low, finely plaited fold at the end of the columella. Fasciole wide and undivided. Internally with a fold at the end of the pillar, the internal walls of the spire whorls reabsorbed. Operculum present, chitinous. The radular ribbon is very long, with numerous teeth (±100), the rachidian tooth tricuspidate." (Olsson, 1956)

*See E. H. Vokes, 1967, p. 140, for discussion of the relationship of the "Silverdale Beds" and the Trent Formation.

*Discussion:* This genus of Olivinae was first recognized by Olsson (1956, p. 212) during his studies of the Olivellinae. Examining the radula he noticed that those of *"Olivella" jaspidea* were like the Olivinae and not the Olivellinae. The genus *Jaspidella* is still included in the Olivellinae by many workers due to its small size, but as with the genus, *Strephonella*, it belongs in the Olivinae, based on the radula.

As noted in the description above, the genus in the fossil state can be best characterized by the general lack of parietal wall callus and a low, finely plaited fold at the anterior end of the columella. *Jaspidella* has a meager representation in the western Atlantic Tertiary. The oldest known form is *J. liveoakensis* (Mansfield, 1937), from the Oligocene of Florida. *Jaspidella* is represented in the Recent western Atlantic by three known species.

### JASPIDELLA COFACORYS (Gardner)
Plate 2, fig. 7

*Olivella cofacorys* GARDNER, 1937, U. S. Geol. Surv. Prof. Paper 142-F, p. 383, pl. 46, figs. 10, 11.

*Jaspidella cofacorys* Gardner, OLSSON, 1956, Acad. Nat. Sci. Phil., Proc., v. 108, p. 212.

*Diagnosis:* "Shell of moderate dimensions for the group, rudely elliptical in outline, smooth and very highly polished. Spire rather elevated, the whorls closely overlapping one another like a bandage. Body broadly and smoothly rounded. Whorls 5½ in all, 4 of this number included in the conch. Initial whorl broad and full, immersed at the tip; succeeding half-turn high, feebly convex. Dividing line between conch and protoconch indicated by a slight difference in the texture of the shell and by the abrupt initiation of the sutural channel. Postnuclear whorls of the spire trapezoidal in outline, increasing regularly and not very rapidly in diameter. Sutural channels very narrow, not undercutting the preceding volution, margined in front by the sharp edge of the succeeding turn. Incremental striae exceedingly feeble. Aperture narrow, cuneiform in outline, acutely angulated posteriorly. Outer lip thin, sharp, approximately vertical, slightly patulous anteriorly; posterior two-thirds of ultima free from callus, even at the posterior commissure. Basal coat of glaze cutting obliquely across from a point a little less than halfway from the posterior to the anterior extremity of the aperture, the labral margin parallel throughout its later extent with the outer arm of the siphonal notch. Body wall obscurely corrugated with 6 or 8 transverse sulci. Base of pillar reinforced with a narrow but

heavy deposit of callus laid parallel to the obtuse pillar margin, bearing a few secondary sulci directed toward the siphonal notch but evanescing before reaching it. Anterior emargination very broad but shallow, approximately horizontal." (Gardner, 1937)

Dimensions of holotype: height 11.6 mm, diameter 4.7 mm.

Holotype: USNM 328665.

Type locality: USGS 2213, one mile below Bailey's Ferry, Chipola River, Calhoun County Florida (= TU 457).

*Occurrence:* Chipola Formation, Florida; late lower Miocene.

*Figured specimen:* Fig. 7, USNM 247901; height 12.2 mm, diameter 5.1 mm; TU locality 554. Other occurrences: TU locality nos. 457, 458, 547, 548, 810, 950, 1020.

*Discussion: Jaspidella cofacorys* is confined in its distribution to the Chipola River, being absent along Ten Mile and Farley Creeks. It is most common in the lower beds along the river, represented by only two specimens from the upper part of the section on the Chipola River (TU 547).

*Jaspidella santidominici* (Maury), from the Gurabo Formation of the Dominican Republic is extremely close in general outline and appearance to *J. cofacorys* and probably represents a descendant of the Chipola species. *Jaspidella santidominici* differs from *J. cofacorys* in having a much larger bulbous nucleus and narrower sutures. The appressed posterior part of the body whorl and the more inflated anterior, gives a distinct flaring to the aperture of *J. santidominici.*

## V. LOCALITY DATA

The following are Tulane University fossil localities. All localities are in the Chipola Formation, Calhoun County, Florida, except where noted:

69. Shoal River Fm., type locality, Shell Bluff, Shoal River (NW ¼ Sec. 4, T3N, R21W), about 3½ miles north of Mossyhead, Walton Co., Florida.

69a. Shoal River Fm., first ravine upstream from Shell Bluff, Shoal River (NW ¼ Sec. 4, T3N, R21W), about 3½ miles north of Mossyhead, Walton Co., Florida.

70. Ten Mile Creek, at bridge of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

91. Oak Grove Sand (type locality), west bank of Yellow River, about 100 yards below bridge at Oak Grove (NE ¼ Sec. 20, T5N, R23W), Okaloosa Co., Florida.

196. Ten Mile Creek, about ¼ mile upstream from bridge of Florida Highway 73 (NE ¼ Sec. 11, T1N, R10W).

456. Ten Mile Creek, about ¼ mile downstream from bridge of Florida Highway 73 (NE ¼ Sec. 12, T1N, R10W).

457. West bank of Chipola River, about ½ mile below Ten Mile Creek (SW ¼ Sec. 17, T1N, R9W).

458. East bank of Chipola River above Farley Creek (SW ¼ Sec. 20, T1N, R9W).

459. East bank of Chipola River, steep bank about 1500 feet above the mouth of Taylor Lake Branch (NW ¼ Sec. 29, T1N, R9W).

546. Ten Mile Creek, about 1½ miles west of Chipola River (NW ¼ Sec. 12, T1N, R10W).

547. West bank of Chipola River, about 2000 feet above Four Mile Creek (SW ¼ Sec. 29, T1N, R9W).

548. West bank of Chipola River at bend about 1800 feet south of mouth of Farley Creek (NW ¼ Sec. 29, T1N, R9W).

549. East bank of Chipola River, about ¼ miles below Four Mile Creek (NE ¼ Sec. 32, T1N, R9W).

550. Chipola River, east bank 1¼ miles below Ten Mile Creek (NE ¼ Sec. 20, T1N, R9W).

554. East bank of Chipola River at power line crossing (SW ¼ Sec. 17, T1N, R9W).

555. East bank of Chipola River, about 1000 feet above Four Mile Creek (SW ¼ Sec. 29, T1N, R9W).

655. Ten Mile Creek, about 0.1 mile downstream from bridge of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

708. At small waterfall on tributary to Ten Mile Creek, south bank, about ¼ mile downstream from bridge of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

709. South bank of Ten Mile Creek, about ¼ mile downstream from bridge of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

711. West bank of Chipola River, about ¼ mile up from mouth of Farley Creek (SW ¼ Sec. 12, T1N, R10W).

786. Ten Mile Creek, about 50 yards upstream from TU 196 or about ¼ mile upstream from bridge of Florida Highway 73 (NE ¼ Sec. 11, T1N, R10W).

787. Ten Mile Creek, south bank, about 1½ miles west of Chipola River (SE ¼ Sec. 12, T1N, R9W).

810. East bank of Chipola River opposite mouth of Taylor Branch (SW ¼ Sec. 17, T1N, R9W).

817. South side of Ten Mile Creek, large gully on the property of Mr. A. Sexton (1967) (SE ¼ Sec. 12, T1N, R10W).

818. Farley Creek, 0.1 mile west of bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W).

820b. Farley Creek (lower beds), at bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W).

821. Farley Creek, 0.1 mile east of bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W).

824. Farley Creek, south bank about 0.5 mile east of bridge of Florida Highway 275 (SE ¼ Sec. 21, T1N, R9W).

825. Farley Creek at abandoned mill about ¼ mile west of bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W).

827. Farley Creek, about ½ miles west of bridge of Florida Highway 275 (SE ¼ Sec. 20, T1N, R9W).

830. Ten Mile Creek at power line crossing, about one mile west of Chipola River (SE ¼ Sec. 12, T1N, R10W).

831. Ten Mile Creek (lowest Chipola beds exposed), slightly less than one mile west of Chipola River (SW ¼ Sec. 7, T1N, R9W).

949. Chipola River, west bank about 0.1 mile below power line crossing (SW ¼ Sec. 17, T1N, R9W).

950. Chipola River, west bank about 2000 feet above Farley Creek (SW ¼ Sec. 20, T1N, R9W).

951. Ten Mile Creek, about 1¼ miles west of Chipola River (SE ¼ Sec. 12, T1N, R10W).

998. Ten Mile Creek, about 1¼ miles west of Chipola River (SE ¼ Sec. 12, T1N, R10W).

999. Farley Creek, about 1000 yards downstream from bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W).

1019. East bank of Chipola River, about 2000 feet downstream from power line crossing (NW ¼ Sec. 20, T1N, R9W).

1020. Small tributary (not shown on USGS topographic map) on east bank of Chipola River about ½ mile below power line crossing (NE ¼ Sec. 12, T1N, R9W).

1021. Ten Mile Creek, north bank, about 2200 feet east of bridge of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

1046. Agueguexquite Fm., roadcuts on both sides of Mexico Highway 180, 7.5 miles east of junction with side road into Coatzacoalcos, Veracruz, Mexico.

1050. West bank of Chipola River at power line crossing (SW ¼ Sec. 17, T1N, R9W).

1051. Ten Mile Creek, south bank, just downstream from large gully on property of Mr. A. Sexton (1967) (SE ¼ Sec. 12, T1N, R10W).

1052. Ten Mile Creek, north bank, just upstream from large dry cut-off meander (SE ¼ Sec. 12, T1N, R10W).

1095. Filisolo Fm., Mexico Highway 180, at west side of Arroyo Limon, 5 km west of San Andres Tuxtla, Veracruz, Mexico.

1097. Ten Mile Creek, south bank of recently (1972) cut-off meander, 500 yards east of Florida Highway 73 (NW ¼ Sec. 12, T1N, R10W).

1098. Ten Mile Creek, south bank, just below power line crossing (and just below TU 830) (SE ¼ Sec. 12, T1N, R10W).

1230. Cercado Fm., Rio Caña, east bank, bluffs just above the ford at Caimito on Los Quemados-Sabaneta road, Dominican Republic (=USGS 8532; Maury's Zone H).

## VI. LITERATURE CITED


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# REVIEWS

EARTHLIKE PLANETS: Surfaces of Mercury, Venus, Earth, Moon, Mars, by Bruce Murray, Michael C. Malin, and Ronald Greeley. Published by W. H. Freeman Company, San Francisco, California, 1981, xv + 387 pp., illus. (some in color).

A synthesis of information gathered in the past two decades on the surface geology of Earth, the similar nearby planets, and the Moon, such as presented here is a worthwhile addition to the geological literature. The authors are quite well qualified to present an overview and analysis of these data. This work is quite well and pleasingly organized, the subject is definitively treated, and all parts are profusely illustrated with diagrams and actual photographs (many in color) of the planetary surfaces.

PALEONTOLOGY AND PALEOENVIRONMENTS, edited by Brian J. Skinner. Published by William Kaufmann, Inc., Los Altos, California, 1981, iv + 206 pp., illus. (some in color), $8.95

This is a new volume in the series *Earth and its Inhabitants*, consisting of reprints of articles published originally in *American Scientist*. This is one of the best of the volumes to appear thus far. It deals with a rapidly developing field of the geosciences and one that still requires considerable definition to enable earth scientists to appreciate properly its place in the study of the Earth.

This collection of reprints is highly recommended for student readings and for geoscientists interested in keeping abreast of progress in geology and paleontology.

—H.C.S.