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LARGER FORAMINIFERA

Common Taxa
Late Middle Eocene to Oligocene

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FLORIDA FOSSIL INVERTEBRATES

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Florida Fossil Invertebrates is a publication of the Florida Paleontological Society, Inc., and is intended as a guide for identification of the many common invertebrate fossils found within the state. Two parts per year will be completed and each part will deal with a specific taxonomic group and contain a brief discussion of that group's life history along with the pertinent geological setting. This series deals solely with published taxa; no new species descriptions are included. Each issue will be image-rich and, whenever possible, specimen images will be at natural size (1x). Some of the specimens figured in this series are on display at Powell Hall, the museum's Exhibit and Education Center. **This publication is made possible through the generous financial support of James and Lori Toomey.**

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INTRODUCTION

This is the second part of the *Florida Fossil Invertebrates* series on larger foraminifera. It is intended as an introductory reference for the identification of most common species of late Middle Eocene to Oligocene age that are encountered in surface exposures of the Avon Park Formation, and the Ocala, Bumpnose, Marianna, Bridgeboro, and Suwannee Limestones. These formations are especially well known for their abundance of larger foraminifera. Constraints of time and space prevent treatment of the faunas of many stratigraphic intervals of Florida, including most of the record that is exclusively subsurface (Jurassic to early Middle Eocene, and Late Oligocene), the Miocene (several species present), the Plio-Pleistocene (which is poorly documented), and the Holocene (several modern species found in the shallow tropical waters of southern Florida). It would be desirable to have systematic coverage of the entire Florida fauna, with full taxonomic descriptions and illustrations, in one volume. But such an ambitious project will have to wait until a later time.

TAXONOMIC NOTES

When identifying fossil larger foraminifera (or, larger benthic foraminifera—LBF), it is helpful to first consider the *symmetry* of the test. Larger foraminifera display a wide variety of form, but common LBF test symmetries include *spherical*, *conical, radial* and various types of *spiral* symmetry. Many LBF begin growth with one symmetry, then develop another in the adult stage. Brief descriptions of the diagnostic morphologic criteria for each genus and species are given, with some additional notes on especially common and geologically important forms. These descriptions are by no means thorough or complete, but should be sufficient to distinguish the common species. For introductory information and references on larger foraminifera, please see Part 6 of the *Florida Fossil Invertebrates* series. A few additional references are included within this report.

Spherical Forms—Spherical forms are globular in shape, and resemble tiny golf balls.

Sphaerogypsina globulus (Reuss, 1848)

Plate 2 (figures A, B)

Test consists of a globular cluster of small, closely packed, stacked, and aligned layers of chambers. *Sphaerogypsina globulus* is common and distinctive. Test diameter ~1.0 - 1.5 mm. Found in the Ocala Limestone, but it is wide-ranging and known from Eocene and Oligocene strata. The genus *Sphaerogypsina* is known from the Paleocene to Holocene.

Conical Forms—Conical forms have an expanding, radial symmetry about a central axis, somewhat like a horn or a gourd, and are frequently referred to as “cones” by field geologists. Conical LBF are commonly encountered in Cretaceous strata of the subsurface of Florida. Only two or three species of the Family Orbitolinidae can be collected from surface exposures of Middle Eocene and Early Oligocene age. Recent work on the group has resulted in several name changes.

Cushmania americana (Cushman, 1919)

Plate 1 (figures E, F)

More commonly recognized by its former name, *Dictyoconus americanus*, this species has an uncoiled megalospheric embryon (unlike true *Dictyoconus*, which is characterized by a coiled embryonic apparatus), and is therefore properly placed in the genus *Cushmania*. The test consists of an ever-enlarging stack of disc-like chambers. The edge of each chamber is divided into sub-chambers by walls called major partitions (also called vertical or radial partitions), and each subchamber is further divided by two or more cycles of minor partitions, so that the edge of the test (when slightly abraded to remove the thin surface layer), appears as a polygonal pattern or meshwork. Test height ~2.0 - 3.5 mm. Test diameter up to ~5.5 mm. Generally found in the subsurface portion of the late Middle Eocene Avon Park Formation. The genus *Cushmania* is known only from the Middle Eocene.

Fallotella Mangin 1954

Two species are known (formerly classified as *Coskinolina, Dictyoconus,* or *Heterodicytoconus*), and are not easily distinguished without the aid of thin-sections. Compared to *Cushmania*, *Fallotella* is typically smaller and has a higher conical test. Like *Cushmania*, *Fallotella* also has the stacked chambers with marginal subchambers. But *Fallotella* has only one cycle of minor vertical/radial partitions at the margin of each chamber. Test height ~1.0 - 2.0 mm. Test diameter ~1.0 - 3.0 mm. The genus is known from the Paleocene to the Oligocene.

Fallotella cookei (Moberg, 1928)

Plate 5 (figure A)

Along the margin of each chamber is a cycle of horizontal partitions. The horizontal partitions can be seen in a transverse section of the test. In tangential views of the test (with the thin surface layer removed), the horizontal and radial partitions often make a grid of square chamberlets. Avon Park Formation, lower Ocala Limestone (formerly the Inglis Limestone), and Suwannee Limestone.

Fallotella floridana (Cole, 1941)

Plate 5 (figures B, C)

Does not have the cycle of horizontal partitions (like *F. cookei*). Tangential views of test may show elongated, rectangular chamberlets that are formed by the chamber floors and the major radial partitions. Avon Park Formation, lower Ocala Limestone (formerly the Inglis Limestone), and Suwannee Limestone.

Conical-Compressed Forms—Conical LBF that appear to be secondarily flattened or compressed.

Fabiana cassis (Oppenheim, 1896)

Plate 1 (figures G, H, I)

Begins with a trochospiral growth of chambers, it later becomes conical to compressed conical in shape. Test height ~1.0 - 1.5 mm. Test diameter ~1.5 - 3.5 mm. Avon Park Formation and Lower Ocala Limestone.

Trochospiral Forms—Trochospiral forms (also called conical spiral) coil about an axis like a gastropod mollusc. One side of the test is *evolute* (all chambers are visible) and is usually flat to slightly convex. The other side is *involute* (each chamber overlaps the other, so that only the last chamber is visible) and is more convex-to-conical in shape.

Amphistegina pinarensis cosdeni Applin & Applin, 1944

Plate 2 (figures C, D)

This species was first described from the Cuban Eocene, but the subspecies *cosdeni* was named for the variety from the Floridan Eocene. Easily recognized by its gently convex ventral side, strongly convex dorsal side, and strongly recurved septal sutures on the dorsal side. Test diameter ~1.5 - 1.7 mm. Lower to middle Ocala Limestone.

Discorinopsis gunteri Cole, 1941

Plate 1 (figures A, B)

Easily recognized by its low-spired, trochospiral form. The shape of the flattened spire is sometimes described as plano-convex. All whorls are visible on the dorsal side. Has an open cavity called an umbilicus on the ventral side. Test diameter ~1.5 - 2.0 mm. Avon Park Formation.

Planispiral Forms—Planispiral forms coil about an axis in the same plane (i.e., they coil but do not spiral), and may look like miniature nautiluses (in fact, some foraminifera were originally classified as nautiloid cephalopod molluscs before their true taxonomic nature was understood). The spire is divided into chambers by numerous septa. Planispiral forms also have a secondary, *bilateral* (mirror-image) symmetry.

Nummulites Lamarck, 1801

Nummulites is the "darling" genus of all larger foraminifera. Because of its large size, complexity, near global occurrence (in warm water environments), and usefulness as an index fossil, it has received an enormous amount of scientific attention. Several entire books have been written on this group of foraminifera alone. The genus is known from the Paleocene to Holocene. According to Vorhis (1973), about 160 species names have been published for American nummulitids. Most of these names have been placed into synonomy, although taxonomic problems remain. Only six species are presently recognized for the late Middle Eocene and early Oligocene surface exposures of Florida (four are illustrated here). Test morphology of *Nummulites* is illustrated in Figures 1 and 2.

Some of the literature on Florida taxa lists these *Nummulites* species under the genus, *Camerina*. The genus *Camerina* (1792, Bruguiere), in fact, has priority over the genus, *Nummulites* (1801, Lamarck). Normally, the older name would stand as the appropriate genus, but because of long, established usage, an exception was made in 1945 by the

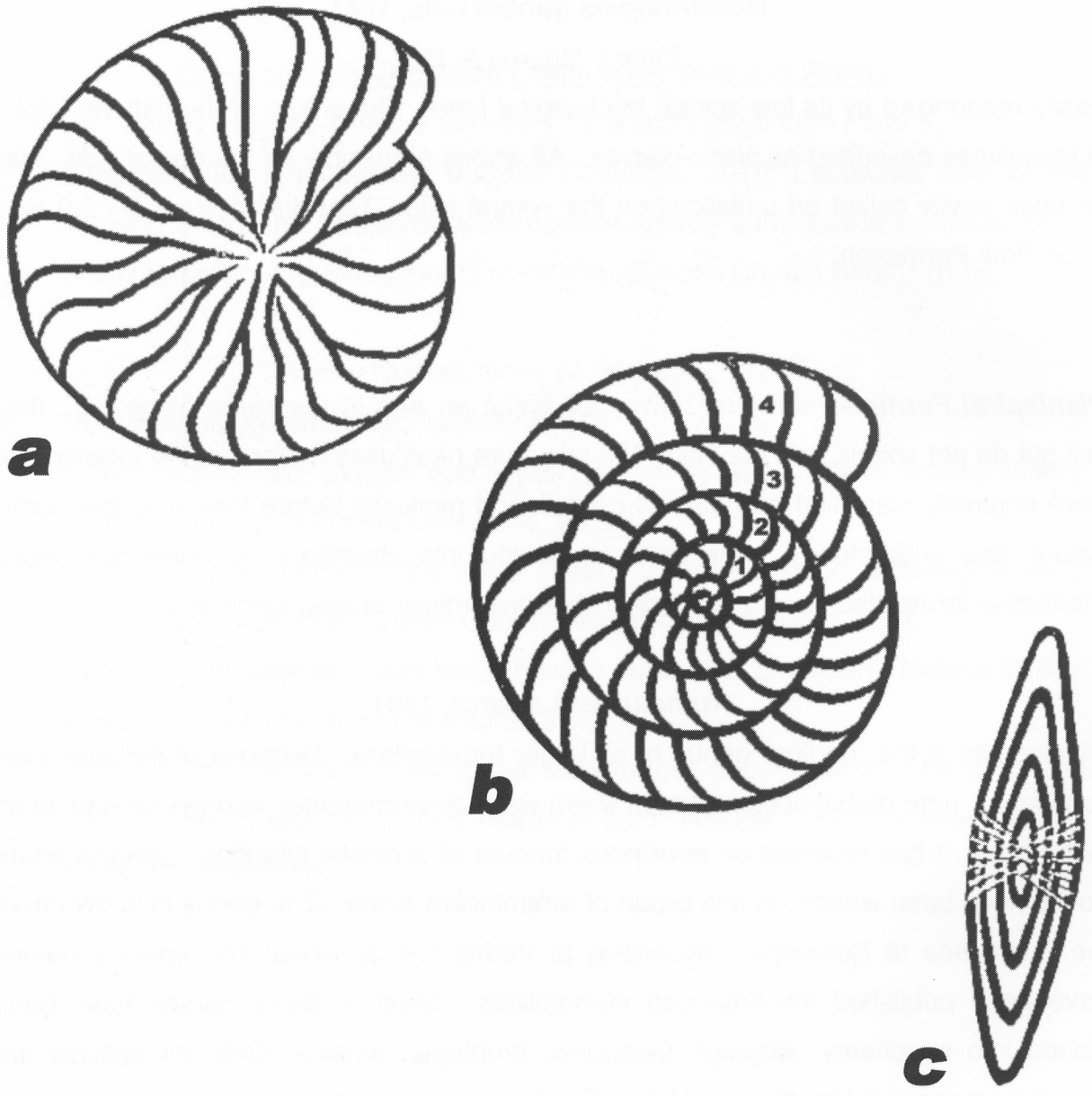

Figure 1. Test morphology of *Nummulites* (*N. willcoxi*). ***a***, external view, showing septa traces/filaments; ***b***, internal equatorial view, showing chambers of 4 whorls; ***c***, internal axial view, showing the involute (overlapping) growth of each spiral. From Puri, H. 1957, Stratigraphy and Zonation of the Ocala Group, *Florida Geological Survey Bulletin* 38, figure 2.

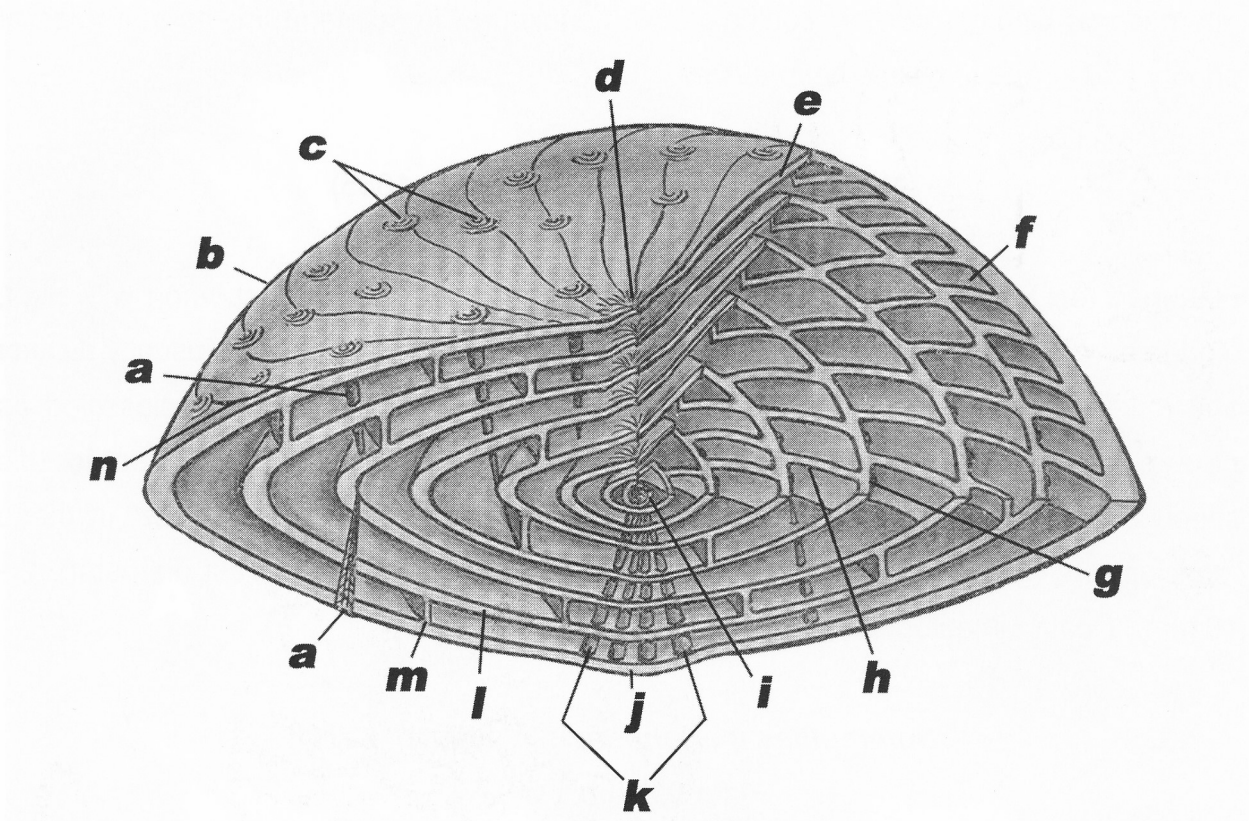

Figure 2. Test morphology of *Nummulites*. ***a***, pillar or column; ***b***, test periphery, and location of marginal cord; ***c***, granules or pustules (surface bumps which may be extensions of pillars); ***d***, central or polar axis of coiling; ***e***, spiral sheet or lamina (external view), which grows as a V-shaped layer, covering the entire test with each whorl (involute pattern); ***f***, chamber (which is V- or cresent-shaped in axial view); ***g***, interlocular space (opening between chambers); ***h***, septum, formed by a fold of the spiral lamina; ***i***, proloculus (initial chamber); ***j***, marginal cord (a system of canals along the periphery of the test used for cytoplasmic flow); ***k***, central large pustule or boss; ***l***, spiral lamina (internal view); ***m***, septum; ***n***, septal trace (surface expression of septa). From Puri, H, 1957, Reclassification, Structure, and Evolution of the Family Nummulitidae. *Journal of the Paleontological Society of India*, v. 2, pp. 95-108, figure 2 (original labeling modified).

International Commission on Zoological Nomenclature, to suspend the normal rules of priority and keep the genus *Nummulites*.

Nummulites floridensis (Heilprin, 1885)

Plate 3 (figures A, B)

Flattened test with rapidly expanding spire of 2.25-3.5 whorls, the last whorl with high, elongated chambers. On the external surface of the test, the sutures are usually distinct and raised (and are called septal filaments or septal traces). Formerly classified as *Operculina* or *Operculinoides*. Numerous names have also been applied to this species, including *vaughani*, *ocalana/ocalanus*, *cushmani*, and others. Most of these "species" are now understood as ecological variants of *floridensis*. Test diameter ~2 - 16 mm. Ocala Limestone.

Nummulites mariannensis (Vaughan, 1928)

Plate 3 (figures C, D)

Very small, sometimes laterally compressed, nummulitid, ornamented with many rounded bumps (called granules or tubercles) on the test surface. Test diameter ~2 mm. Upper Ocala Limestone.

Nummulites panamensis Cushman, 1918

Plate 6 (figures B, C, D, E)

Similar to *N. floridensis*, but generally smaller, thinner, and usually having a smooth-surfaced test (without septal traces). Spire of 3.5 - 5.5 whorls with strongly recurved septa. Test diameter ~1.2 - 4.8 mm. Previously classified under the species names *dia/dius, vicksburgensis*, and others, most of which are considered ecological variants. Marianna Limestone.

Nummulites willcoxi Heilprin, 1882

Plate 3 (figures E, F)

The first named nummulite species in the New World. Compared to *N. floridensis* and *N. panamensis*, *N. willcoxi* has a spire that expands at a nearly constant rate, and so