

# LOCKHARTIA IN CUBA

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**ABSTRACT**—A new species of the foraminiferal genus *Lockhartia*, which genus heretofore has been reported only from the Paleocene and lower Eocene of India and Somaliland, occurs in Pinar del Rio, Cuba. It is associated with *Miscellanea catenula* (Cushman and Jarvis) in beds supposed to be of Upper Cretaceous age. Both species are described and figured.

THE GENUS *Lockhartia* was erected by Davies (1932, pp. 406-408) for certain foraminifera that had been assigned previously to the genus *Dictyoconoides*, from which they differ in not developing any intercalary whorls in the spire. Davies referred to it four species and one variety, which occur in the Paleocene and lower Eocene of India and Somaliland. Collections from Pinar del Río Province of Cuba made by Dr. Pedro Bermudez contain a new species that evidently should be referred to *Lockhartia*. The geographic range of the genus is thus extended to the West Indies.

The specimens were collected in an area mapped by Vermunt (1937) as Habana formation (Upper Cretaceous) combined with lower Tertiary. They were associated with the form described by Thiadens (1937, pp. 94, 95) as *Camerina vermunti* (here referred to *Miscellanea catenula* [Cushman and Jarvis]) from the Upper Cretaceous of Santa Clara Province, Cuba, where it occurs in association with *Orbitoides palmeri* Gravell, several species of *Lepidorbitoides*, and other genera, all of which are characteristic Upper Cretaceous forms. A fragment doubtfully identified as *Meandropsina? rutileni* Palmer was also found. The supposition seems warranted, therefore, that the beds containing the *Lockhartia* are Upper Cretaceous rather than early Tertiary. If this is so, the geologic range of *Lockhartia* is extended to the Upper Cretaceous. This is analogous to the recent determination by

Davies (1939, p. 776) that *Dictyoconus*, which had been considered to be a typical Eocene genus, originated in the Cretaceous.

## Family CAMERINIDAE

### Genus MISCELLANEA Pfender, 1934

#### MISCELLANEA CATENULA (Cushman and Jarvis)

#### Plate 92, figures 6-10

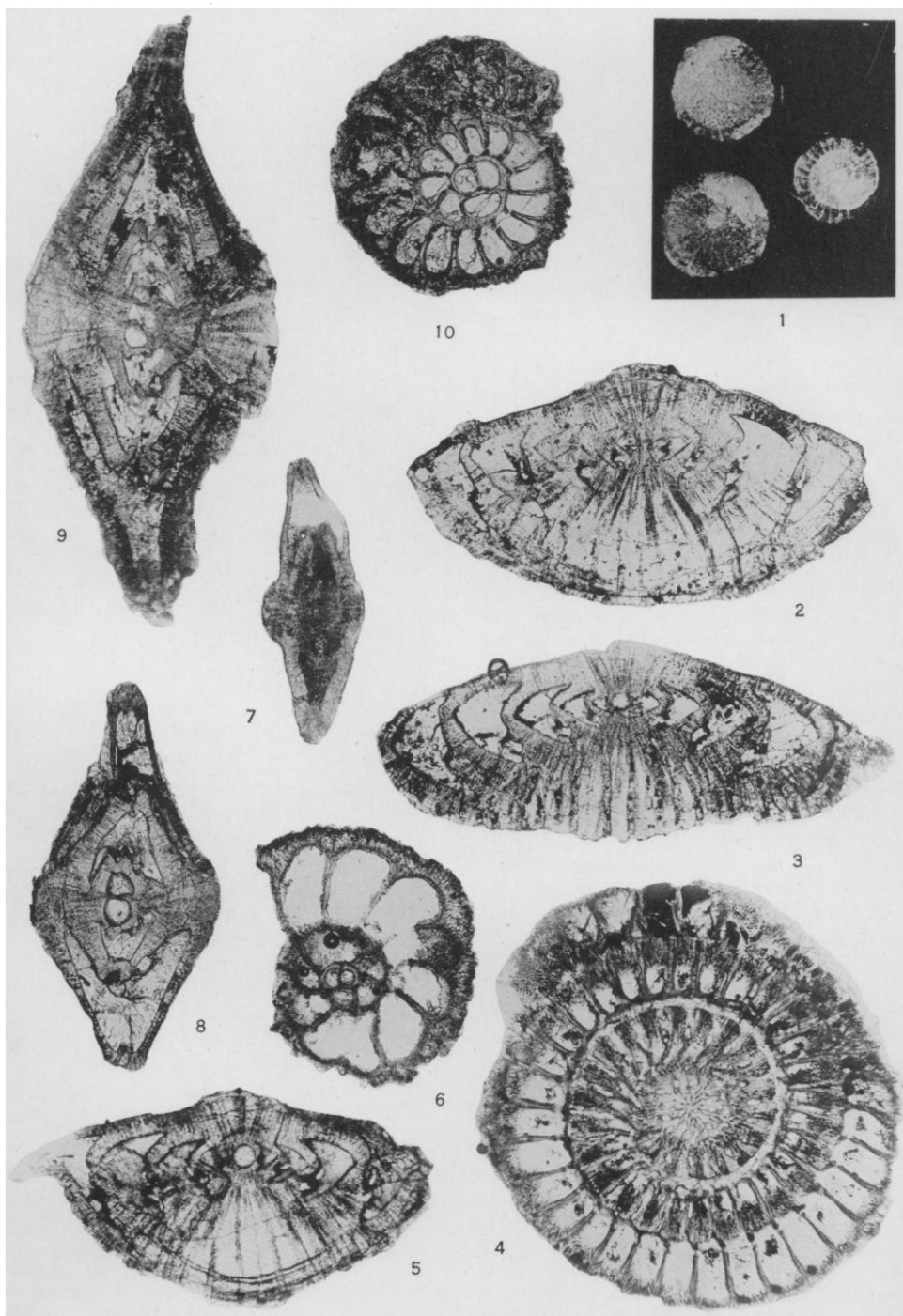
- Operculina catenula* CUSHMAN and JARVIS, 1932, U. S. Nat. Mus. Proc., vol. 86, no. 2914, p. 42, pl. 12, figs. 13a, b.  
*Camerina? dickersoni* D. K. PALMER, 1934, Soc. cubana historia nat. Mem., vol. 8, p. 243, pl. 14, figs. 1, 2, 4, 6, 8.  
*Camerina? cubensis* D. K. PALMER, 1934, *idem*, p. 245, pl. 14, figs. 3, 5, 7.  
*Camerina vermunti* THIADENS, 1937, Jour. Paleontology, vol. 11, p. 94, pl. 16, figs. 1, 11, 12; text figs. 2C, 3A, E.  
*Camerina dickersoni*, VOORWYK, 1937, K. Akad. Wetensch. Amsterdam Verh., vol. 40, p. 191, 192, pl. 2, figs. 11-16; pl. 3, figs. 3, 6.  
*Operculinoides catenula*, BARKER, 1939, U. S. Nat. Mus. Proc., vol. 86, no. 3052, p. 320, pl. 14, figs. 6, 8; pl. 18, fig. 5; pl. 21, figs. 7, 8.  
*Camerina? dickersoni*, Barker, 1939, *idem*, p. 326, pl. 20, fig. 3; pl. 21, fig. 12.

Test small, completely involute, slightly asymmetrically lenticular with reference to the median plane, thickest in the center sloping gradually outward, but flattening rapidly near the periphery. The periphery of the test is composed of two rows of closely packed plates, which give it a fringed appearance. Between the rows of plates there is a shallow V-shaped depression, which encircles the test. Surface ornamentation

## EXPLANATION OF PLATE 92

All figures  $\times 41$  except figure 1,  $\times 10$ .

- FIGS. 1-5—*Lockhartia bermudezi* Cole, n. sp. 1, External views of syntypes. 2, 3, 5, Vertical sections. 4, Horizontal section. 3, 4, Paratypes. 1, 3, 4, Bermudez sta. 537. 2, 5, Bermudez sta. 538. (p. 641)  
 6-10—*Miscellanea catenula* (Cushman and Jarvis). 6, 10, Median sections. 7-9, Transverse sections. 6, 7, Topotypes of *Camerina? dickersoni* D. K. Palmer from 1 kilometer west of Baños de Ciego, Santa Clara province, Cuba. 8-10, Bermudez sta. 537 (p. 640)



Cole, Upper Cretaceous? Foraminifera

consists of a large, prominent, slightly elevated, central boss, from which radiate straight, slightly raised sutures of clear shell material. The area between the sutures is without ornamentation. A specimen with a diameter of 1.3 mm. is 0.64 mm. thick; a specimen with a diameter of 2.12 mm. is 0.86 mm. thick.

A horizontal section of a specimen with a length of 0.86 mm. shows two whorls with 17 chambers in the final volution. The initial chamber is subspherical in shape with internal diameters of 80 by 60 $\mu$ . The second chamber has internal diameters of 100 by 100 $\mu$ . The partition separating the two chambers is straight. The chamber walls are nearly straight and radial, although a few slightly recurve as they approach the periphery. Slit apertures lie near the inner margins of the septa. Slight anteriorly directed lips are developed on either side of the slitlike aperture (pl. 92).

A specimen 1.66 mm. long has two and seven-eighths whorls with about 23 chambers in the final volution. Another specimen 1.95 mm. long has three whorls with about 24 chambers in the final volution. In this section the initial chamber appears to be circular, with an internal diameter of 70 $\mu$ . Certain septa seem to broaden as the periphery is approached, so that a light inwardly projecting triangular area is formed between the darker walls of the septum. This is not true of all the septa.

Vertical sections indicate that the central boss seen in external views is composed of a series of small closely packed pillars, which extend outward from the embryonic apparatus and increase in size toward the periphery. The surface diameter of this boss ranges from 0.24 to 0.40 mm. depending on the size of the specimen. The central group of pillars is normally slightly better developed on one side of the test than the other.

The spiral suture has a small, V-shaped groove, which is a very distinctive feature in vertical sections. The walls of the spiral lamina are coarsely perforated by vertical canals.

Affinities: Three species that closely resemble each other have been described from the Upper Cretaceous of Cuba: *Camerina? dickersoni* and *C. cubensis* by Mrs. Palmer (1934, pp. 243-246) and *C. vermunti* by

Thiadens (1937, pp. 94, 95). Voorwijk (1937, pp. 191, 192) considers that *cubensis* and *vermunti* do not show sufficient differences from *dickersoni* to justify the retention of these specific names. Barker (1939 p. 327) states that

The principal difference between *C. dickersoni* and *C. vermunti* (from a study of Mexican specimens of the former) seems to be in the form of the septa, which are much thicker and more recurved in the former species.

Mrs. Palmer kindly sent the writer four topotype specimens of *C. dickersoni*. A horizontal section from a megalospheric individual and a vertical section from a microspheric individual are introduced on plate 92, figs. 6, 7, for comparison with the specimens associated with *Lockhartia*.

Cushman and Jarvis (1932, p. 42) described *Operculina catenula* from the Upper Cretaceous at Lizard Springs near Guayamayare, Trinidad, B.W.I. Barker (1939, pp. 320, 321) referred certain Mexican specimens to this species, although he placed it in the genus *Operculinoides*. These specimens appear to be similar to the Cuban specimens.

Thalman (1938, p. 330) created a new subgenus *Sulcoperculina* with *Camerina? dickersoni* as the subgenotype. This subgenus was placed under the genus *Operculina*.

Without examination of the type specimens, it is impossible to decide questions that have been raised. However, the writer is of the opinion that Voorwijk is correct in combining *dickersoni-cubensis-vermunti* under one specific name. It seems highly probable that the *dickersoni* group might be combined with *catenula*, as the figures given by Barker suggest that the internal structure of *catenula* is the same as that seen in *dickersoni*.

*Occurrence*.—Kilometer 10 (Bermudez station 537) and 200 meters N. 23°W. of kilometer 9 (station 538) on the road from Pinar del Río to Luis Lazo.

#### FAMILY ROTALIIDAE

Genus LOCKHARTIA DAVIES, 1932

LOCKHARTIA BERMUDEZI Cole, n. sp.

Plate 92, figures 1-5

Test small, unequally biconvex, ventrally more convex than dorsally, diameter from

0.89 to 1.8 mm., thickness from 0.46 to 0.92 mm. Average-sized adult individuals have a diameter of about 1.5 mm. and a thickness of about 0.7 mm. Perfectly preserved individuals have the dorsal side smooth and unornamented except for a small apical boss of clear shell material; the ventral side is covered with coarse pits except for a narrow band adjacent to the periphery, which is smoother and shows the sutures of the chambers which comprise the final whorl. Slightly weathered specimens exhibit on the dorsal side straight sutures which radiate from the apical boss to the periphery. In some specimens these radial sutures break up into a series of small knobs or beads as they approach the central boss.

A horizontal section of a specimen with a diameter of 1.4 mm. shows four and three-quarters whorls with 26 chambers in the final volution. A specimen with a diameter of 1.6 mm. had 32 chambers in the final whorl. The chamber walls are usually straight and radial. Occasionally, some are very slightly recurved. Slitlike apertures occur near the proximal end of the radial chamber walls. The chambers increase but slightly in size as added, and normally the final chambers are reduced in size.

Vertical sections show pillars that extend from the embryonic chambers in a dorsal and ventral direction. The ventrally directed pillars are large and strong, occupying a considerable portion of the interior of the test, but the dorsally directed pillars are small and more or less fused together, so that they form the central boss. The ventrally directed pillars are separated from each other. The initial chamber is spherical, with an internal diameter of about 75 $\mu$ . The inner ends of chamber walls are flattened and slightly expanded where they abut against the umbilical pillars.

*Affinities:* *L. bermudezi* belongs to the group in which Davies (1937, p. 407) places *L. newboldi* and *L. conditi*. All of these have typically smooth dorsal surfaces, and the inner ends of the chamber walls are flat-

tened and expanded where they abut against the umbilical pillars. *L. conditi* has fewer chambers in the final whorl than *L. bermudezi*. The chamber walls of *L. conditi* are more recurved, and there are fewer and thicker umbilical pillars. *L. newboldi* is approximately the same size as *L. bermudezi*. There is, however, a marked difference in the vertical sections.

It is a distinct pleasure to be able to name this species after Dr. Pedro J. Bermudez, who has given us so much information concerning the Cuban smaller foraminifera.

*Occurrence.*—Kilometer 10 (Bermudez station 537) and 200 meters N. 23° W. of kilometer 9 (station 538) on the road from Pinar del Río to Luis Lazo.

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