CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

142. NOTES ON SOME OF THE EARLIER SPECIES ORIGINALLY DESCRIBED AS BULIMINA

By J. A. CUSHMAN and F. L. PARKER

Our studies in Europe in the summer of 1932 and the subsequent study of much topotype material has made clear the relationships of many of these species. Some of the earlier species must still be left in an uncertain state as the actual types are not available for study and the original figures and descriptions are inadequate to give the characters with certainty.

By a study of actual types and of topotype specimens many of the species are now definitely fixed, and the result of this preliminary work is here given that it may be available for other workers. Figures of types or topotypes are given for several of the species and other specimens which seem to belong definitely in the species to which they are referred. A few originals are copied where other material is lacking.

Fortunately there are in existence at least three collections named by Reuss at the time he was publishing his work on the Bohemian Cretaceous. All three of these have been carefully studied and they are invaluable in settling many obscure points in regard to Reuss' species.

Our thanks are due to numerous European workers and institutions who have been generous in supplying us with material and allowing access to type collections. Thanks are also due for grants from the Milton Fund of Harvard University and the Permanent Science Fund of the American Academy of Arts and Sciences which made possible the study of European collections.

The species here noted are those of the older authors and include most of those described before 1890. The species belonging to *Bulimina* will be taken up in detail in a later paper by the

junior author, and the American species by the senior author will be described and figured in full detail in a forthcoming large report on the American Cretaceous foraminifera now being completed for the U. S. Geological Survey. The arenaceous forms belonging to the Verneuilinidae and Valvulinidae will soon be published it is hoped in a monograph of those two families now completed.

"Bulimina obtusa d'Orbigny" (Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 39, pl. 4, figs. 5, 6.)=*Buliminella obtusa* (d'Orbigny) (Pl. 5, figs. 1 *a*, *b*). A study of material from the Upper Cretaceous of the Paris Basin and England and comparison with the type figure and description show that this is a *Buliminella* and has been wrongly identified by most authors. The American records of *"Bulimina obtusa"* must be revised. Also many of the records for *"Bulimina ovulum"* should be referred to *Buliminella obtusa* (d'Orbigny). Many of our specimens show a greater inflation of the upper chambers and fewer coils than in our figured specimen, which is from the Craie Blanche of Bougival in the Paris Basin.

"Bulimina obliqua d'Orbigny" (Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 40, pl. 4, figs. 7, 8.)=*Arenobulimina obliqua* (d'Orbigny) (Pl. 5, figs. 5, 6). The figured specimen is from Bougival, France, from the Craie Blanche and represents practically topotype material. The species is definitely arenaceous. It is widely distributed in the Senonian of Western and Central Europe. The Senonian material referred to *"Bulimina preslii* Reuss" probably belongs to d'Orbigny's species. There is a decided difference in shape and number of chambers in the microspheric and megalospheric forms of this species.

"Bulimina variabilis d'Orbigny" (Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 40, pl. 4, figs. 9-12.)=*Ataxophragmium variabile* (d'Orbigny) (Pl. 5, fig. 24). This species is the genotype of *Ataxophragmium*. It shows a rather wide range of form, the megalospheric form tending to assume a uniserial growth and to have a terminal aperture. The wall is distinctly arenaceous, often coarsely so. Its range is confined to the Senonian of England, France, and Western Germany. In the Bohemian Cretaceous Basin it has been confused with the microspheric form of *Pernerina depressa* (Perner).

"Bulimina brevis d'Orbigny" (Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 41, pl. 4, figs. 13, 14.) This species is from the Upper Cretaceous of the Paris Basin. We have been unable to

find typical specimens in our material, and while it seems to be a true *Bulimina* its exact position is somewhat obscure.

"*Bulimina murchisoniana* d'Orbigny" (Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 41, pl. 4, fig. 15.) (Pl. 5, figs. 7 *a*, *b*). This seems to be a true *Bulimina* and has a wide range in the European Cretaceous. The figured specimen is from Gravesend, England. The aperture is evidently somewhat filled with matrix and is not typical in that respect. "*Bulimina intermedia* Reuss" from our material seems very similar though usually specimens from the lower part of the range seem rather consistently smaller.

"*Bulimina truncata* Reuss" (Geogn. Skizze Böhmen, vol. 2, 1844, pt. 1, p. 215; Verstein. böhm. Kreide, pt. 1, 1845, p. 37, pl. 8, fig. 73.)=*Arenobulimina truncata* (Reuss) (Pl. 5, fig. 8, 9). Reuss' original material was from the Upper Cretaceous, Plänermergel of Luschitz and Kosstitz, Bohemia. We have material from both of these localities. The test is arenaceous. The angle of the apertural face gives a peculiar truncated appearance to the test, evidently suggesting to Reuss the name for this species. It ranges from the Turonian to lower Senonian of Central Europe.

"*Bulimina tumida* Reuss" (Geogn. Skizze Böhmen, vol. 2, 1844, pt. 1, p. 215.) This species was apparently never figured and may be left out of further consideration.

"*Bulimina ovulum* Reuss" (Verstein. böhm. Kreide, pt. 1, 1845, p. 37, pl. 8, fig. 57; pl. 13, fig. 73.) (Pl. 5, figs. 10, 11). There has been considerable difference of opinion concerning this species, owing probably to the fact that the two figures given by Reuss vary considerably. The first figure is quite evidently inaccurate in drawing and it is useless to make any identifications from it. We were unable to obtain material in Europe from the type locality of Rannay for Pl. 8, fig. 57. It seems best, therefore, to designate the second figure, Pl. 13, fig. 73, as the type figure. It seems to be well drawn. It is from Luschitz from which we have topotype specimens, one of which is figured. The species is common in the Cretaceous of Europe, and similar forms occur in the American Cretaceous.

"*Bulimina intermedia* Reuss" (Verstein. böhm. Kreide, pt. 1, 1845, p. 37, pl. 13, fig. 71.)=*Bulimina murchisoniana* d'Orbigny. From our studies this seems to be a synonym of d'Orbigny's species.

"*Bulimina preslii* Reuss" (Verstein. böhm. Kreide, pt. 1, 1845,

p. 38, pl. 13, fig. 72.)=*Arenobulimina preslii* (Reuss) (Pl. 5, figs. 12, 13). This species is the genotype of *Arenobulimina*. The wall is definitely arenaceous. There are several chambers in the last-formed whorl particularly of the megalospheric form. Our figured specimens represent topotypes, one a specimen identified by Reuss. The species is a short broad one confined to the Turonian and lower Senonian of Central Europe. The records for the species from the upper Senonian seem to be best referred to *Arenobulimina obliqua* (d'Orbigny). The species has been recorded from the Cretaceous of the United States, but our American form is another species.

"*Bulimina d'Orbignyi* Reuss" (Verstein. böhm. Kreide, pt. 1, 1845, p. 38, pl. 13, figs. 74 *a*, *b*.)=*Arenobulimina d'Orbignyi* (Reuss) (Pl. 5, figs. 14, 15). This is a distinctly arenaceous species and the largest of the Arenobuliminas in the Plänermergel of the Bohemian Cretaceous. The spiral form of the test is very clearly marked, and the chambers are decidedly inflated giving a strongly lobulate appearance to the periphery. The species seems to be limited in its range to the Turonian of Central Europe.

"*Bulimina subsphaerica* Reuss" (Verstein. böhm. Kreide, pt. 2, 1846, p. 109, pl. 24, fig. 53.)=*Arenobulimina subsphaerica* (Reuss) (Pl. 5, fig. 16). This is a definitely arenaceous species, although the wall is usually finely arenaceous. Reuss' types were from the lower Plänerkalk from Weisskirchlitz in the Bohemian Basin. The species somewhat resembles *Arenobulimina obesa* (Reuss). That species is larger, broader, and lower spired, and apparently limited to the Senonian of Europe, while *A. subsphaerica* is found largely in the Turonian.

"*Bulimina polystropha* Reuss" Verstein. böhm. Kreide, pt. 2, 1846, p. 109, pl. 24, fig. 53.)=*Verneuilina polystropha* (Reuss) (Pl. 5, figs. 17 *a*, *b*). The types of this species were from the Cretaceous, Plänerkalk of Weisskirchlitz, Bohemia. Unfortunately we found no specimens of this species in any of the three collections identified by Reuss. No material from the type locality has been available to us. According to Reuss the surface is very rough. From the original figures, which are copied here, the test is triserial, and it is probably a *Verneuilina*.

"*Bulimina puschi* Reuss" (Haidinger's Nat. Abhandl., vol. 4, 1851, p. 37, pl. 3, figs. 6 *a*, *b*.)=*Arenobulimina puschi* (Reuss) (Pl. 5, figs. 18 *a*, *b*). The types of this species are from the Upper Cretaceous, Senonian of Lemberg, Galicia. Our figured

specimen is a topotype. There seems to be no doubt that this is an arenaceous species and should be referred to *Arenobulimina*. American records for this species are incorrect as shown by our study of European material. The species seems to be confined to the upper Senonian of Central Europe.

"Bulimina imbricata Reuss" (Haidinger's Nat. Abhandl., vol. 4, pt. 1, 1851, p. 38, pl. 3, fig. 7.)=*Buliminella imbricata* (Reuss) (Pl. 5, figs. 19 *a, b*). This species was described and figured from Lemberg. We have topotype specimens, one of which is figured. We have not seen it from other localities. The wall is more coarsely perforate, but in many other characters it closely resembles *Buliminella obtusa* (d'Orbigny), although much smaller. There are too few available specimens to warrant uniting the two species at the present time.

"Bulimina acuta Reuss" (Haidinger's Nat. Abhandl., vol. 4, pt. 1, 1851, p. 38, pl. 3, fig. 8.) (Pl. 5, fig. 21). Only one specimen, that here figured, was found in our Lemberg material that could be referred to this species. It has a punctate appearance, and the sutures are very indistinct. The specimen has the character of *Bulimina,* and it seems advisable to consider it a valid species of that genus. More material is desirable, however, to furnish a complete understanding of the species.

"Bulimina obesa Reuss" (Haidinger's Nat. Abhandl., vol. 4, 1851, p. 40, pl. 3, fig. 12.)=*Arenobulimina obesa* (Reuss) (Pl. 5, fig. 20). Reuss' types are from the Senonian of Lemberg. Our figured specimen is a topotype. It is apparently limited to the Senonian of Western and Central Europe. The young stages of *Ataxophragmium* are easily mistaken for this species. *Arenobulimina obesa* is close to *A. subsphaerica,* but the former is a larger, coarser species, occurring higher in the stratigraphic series.

"Bulimina tortilis Reuss" (Sitz. Akad. Wiss. Wien, vol. 44, pt. 1, 1861 [1862], p. 338, pl. 8, figs. 3 *a, b.*) (Pl. 6, figs. 1 *a, b*). We have found no specimens in the New Jersey material at our disposal, and have been unable to determine the full characters of this species described by Reuss from the Cretaceous of New Jersey but not referred to since.

"Bulimina frons Olszewski" (Sprawozd. Kom. fizyj. Akad. Umiej. Krakowie, vol. 4, 1875, p. 121, pl. 2, fig. 1.)=*Arenobulimina frons* (Olszewski) (Pl. 6, fig. 2). The type figure is copied here. It is apparently an *Arenobulimina,* but we have

had no topotype material for comparison nor have we seen the holotype.

"*Bulimina rimosa* Marsson" (Mitth. nat. Ver. Neu-Vorpommern u. Rügen, vol. 10, 1878, p. 153, pl. 3, figs. 2 *a*, *b*.)=*Ataxophragmium rimosum* (Marsson) (Pl. 6, figs. 3-5). This species was described from the Senonian of the Island of Rügen in Northern Germany where it is common. Two figures are from Marsson and another is a topotype. We have the species from other localities in Germany but have not seen it elsewhere.

"*Bulimina presli* Reuss var. *sabulosa* Chapman" (Journ. Roy. Micr. Soc., 1892, p. 7, pl. 12, fig. 5.)=*Arenobulimina sabulosa* (Chapman) (Pl. 6, figs. 6 *a*, *b*). Chapman described this form as a variety of Reuss' species from the Gault. *Arenobulimina preslii* (Reuss) does not range as low as the Gault so far as we

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EXPLANATION OF PLATE 5

FIGS. 1 *a*, *b*. *Buliminella obtusa* (d'Orbigny). Bougival, France. × 33. *a*, front view; *b*, apertural view.

FIGS. 2–4. *Ataxophragmium variabile* (d'Orbigny). 2, 3 (After d'Orbigny). 4, Gravesend, England. *a*, *b*, opposite sides.

FIGS. 5, 6. *Arenobulimina obliqua* (d'Orbigny). Bougival, France. × 30. *a*, front view; *b*, apertural view.

FIGS. 7 *a*, *b*. *Bulimina murchisoniana* d'Orbigny. Gravesend, England. × 40. *a*, front view; *b*, apertural view.

FIGS. 8, 9. *Arenobulimina truncata* (Reuss). Lubitsch, Bohemia. × 30. *a*, front view; *b*, apertural view.

FIGS. 10, 11. *Bulimina ovula* Reuss. Luschitz, Bohemia. × 60. *a*, front view; *b*, apertural view.

FIGS. 12, 13. *Arenobulimina preslii* (Reuss). 12, (After Reuss). 13, Kosstitz, Bohemia. × 30. *a*, front view; *b*, apertural view.

FIGS. 14, 15. *Arenobulimina d'Orbignyi* (Reuss). Luschitz, Bohemia. Specimens identified by Reuss. × 30. *a*, front view; *b*, apertural view.

FIG. 16. *Arenobulimina subsphaerica* (Reuss). Near Hildesheim, Germany. × 30.

FIGS. 17 *a*, *b*. *Verneuilina polystropha* (Reuss). (After Reuss). *a*, *b*, opposite sides.

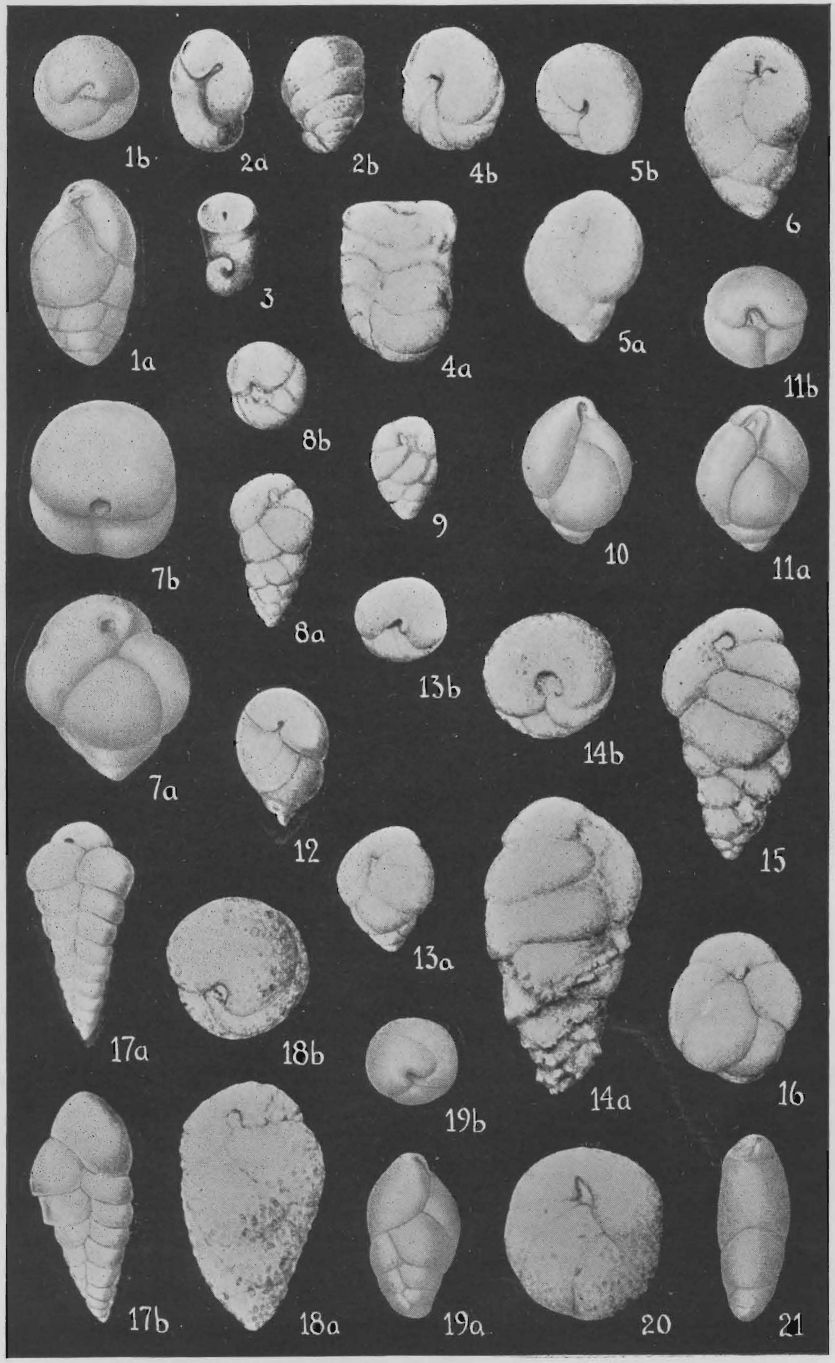
FIGS. 18 *a*, *b*. *Arenobulimina puschi* (Reuss). Lemberg, Galicia. × 30. *a*, front view; *b*, apertural view.

FIGS. 19 *a*, *b*. *Bulimina imbricata* Reuss. Lemberg, Galicia. × 80. *a*, front view; *b*, apertural view.

FIG. 20. *Arenobulimina obesa* (Reuss). Lemberg, Galicia. × 30.

FIG. 21. *Bulimina acuta* Reuss. Lemberg, Galicia. × 35.

Figures drawn by Margaret S. Moore.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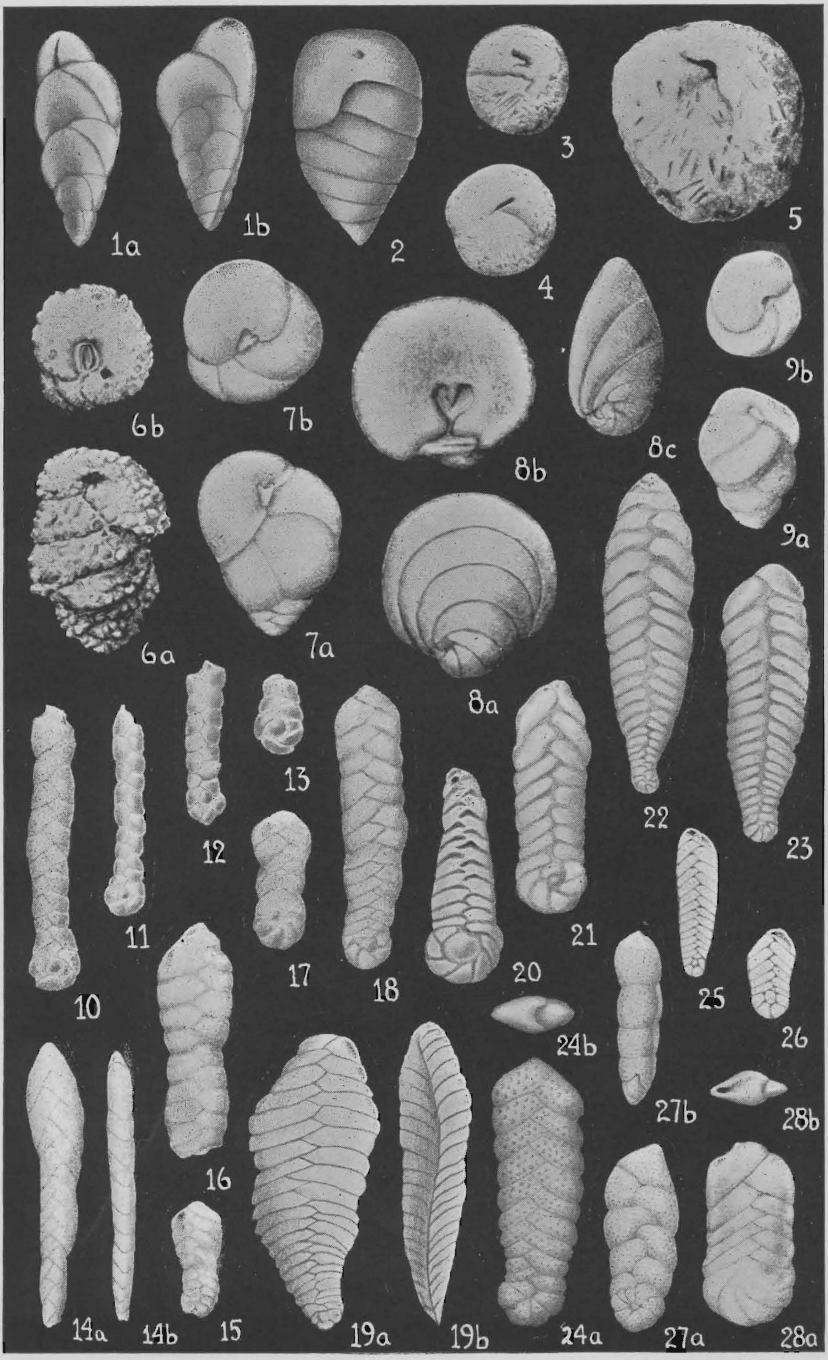
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have seen. The form described by Chapman is common in the upper beds of the Gault at Folkestone and is a distinct species very restricted in its vertical range. The figured specimen is a topotype.

"*Bulimina brevicona* Perner" (Foram. Ceskeho Cenomann, 1892, p. 54, pl. 3, figs. 1 *a*, *b*.)=*Arenobulimina brevicona* (Perner) (Pl. 6, figs. 7 *a*, *b*). We were able to examine the types of Perner's species in the Narodni Museum in Prague. Dr. Perner also presented us with additional specimens from Kank in Czechoslovakia, one of which is here figured. A study of the

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EXPLANATION OF PLATE 6

FIGS. 1 *a*, *b*. "*Bulimina tortilis* Reuss". (After Reuss). Cretaceous, New Jersey. *a*, *b*, opposite sides.

FIG. 2. *Arenobulimina frons* (Olszewski). (After Olszewski). Cretaceous, Poland.

FIGS. 3–5. *Ataxophragmium rimosum* (Marsson). 3, 4, (After Marsson). 5, × 22. All from Island of Rügen, Germany.

FIGS. 6 *a*, *b*. *Arenobulimina sabulosa* (Chapman). From Gault of Folkestone, England. × 30. *a*, front view; *b*, apertural view.

FIGS. 7 *a*, *b*. *Arenobulimina brevicona* (Perner). Kank, Bohemia. × 30. *a*, front view; *b*, apertural view.

FIGS. 8 *a–c*. *Pernerina depressa* (Perner). Kank, Bohemia. × 15. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

FIGS. 9 *a*, *b*. *Arenobulimina conoidea* (Perner). Kank, Bohemia. × 30. *a*, front view; *b*, apertural view.

FIGS. 10–13. *Spiroplectoides rosula* (Ehrenberg). 10, 1 mile E. of Booneville, Miss. × 50. 11-13, 8.4 miles S. of Paris, Lamar Co., Texas. × 60.

FIGS. 14–18. *Spiroplectoides flexuosa* (Reuss). 14, (After Reuss). Type figures of "*Textularia articulata* Reuss". *a*, front view; *b*, side view. 15, 16, Topotypes from Lemberg. × 50. 17, 18, Specimens from Hamm, Germany. × 50.

FIGS. 19–23. *Spiroplectoides clotho* (Grzybowski). 19, (After Grzybowski). *a*, front view; *b*, side view. 20-23, Trinidad. × 40. 20, 21, Megalospheric. 22, 23, Microspheric.

FIGS. 24 *a*, *b*. *Spiroplectoides papillata* Cushman. Tennessee. × 100. *a*, front view; *b*, apertural view.

FIGS. 25, 26. *Spiroplectoides spectabilis* (Grzybowski). (After Macfadyen). × 25. 25, Microspheric. 26, Megalospheric.

FIGS. 27 *a*, *b*. *Spiroplectoides curta* Cushman. Eocene, South Carolina. × 100. *a*, front view; *b*, side view.

FIGS. 28 *a*, *b*. *Spiroplectoides eocenica* Cushman and Barksdale. Eocene, California. × 50. *a*, front view; *b*, apertural view.

Figures drawn by Margaret S. Moore.

types of "*Bulimina inflata* Perner" showed that this should, in our opinion, be considered a synonym of *brevicona*. The wall is finely arenaceous but rather smoothly finished.

"*Bulimina depressa* Perner" (Foram. Ceskeho Cenomann, 1892, p. 55, pl. 3, figs. 3 *a*, *b*.)=*Pernerina depressa* (Perner) (Pl. 6, figs. 8 *a-c*). This species is the genotype of *Pernerina*. It is widely distributed in the Cretaceous of Central Europe. "*Bulimina Jaekeli* Franke" (Abhandl. geol. pal. Instit. Greifswald, vol. 6, 1925, p. 24, pl. 2, figs. 15 *a-c*) is evidently a synonym.

"*Bulimina inflata* Perner" (Foram. Ceskeho Cenomann, 1892, p. 55, pl. 3, figs. 4 *a-c*.)=*Arenobulimina brevicona* (Perner). As noted above this is a synonym. The inflation of the adult chambers is variable.

"*Bulimina conoidea* Perner" (Foram. Ceskeho Cenomann, 1892, p. 55, pl. 3, figs. 5 *a*, *b*.)=*Arenobulimina conoidea* (Perner) (Pl. 6, figs. 9 *a*, *b*). The types of this species were examined in the Narodni Museum at Prague and proved to have arenaceous walls, but the exterior is smoothly finished, the sutures very distinct, and often slightly limbate.

"*Bulimina trigona* Chapman" (not Terquem, 1882) (Quart. Journ. Geol. Soc. London, vol. 48, 1892, p. 514, pl. 15, fig. 8.) This is from the Cretaceous of Taplow, England. We searched material from the type locality kindly sent us by Dr. Chapman but did not find this species. It was later named "*Bulimina trigonula* var. *inornata* Chapman". Apparently this is an *Arenobulimina*.

The following Cretaceous species were never figured or described and cannot be further considered.

"*Bulimina amphicona* v. Hagenow" (Neues Jahrb., 1842, p. 570.)

"*Bulimina cenomana* d'Orbigny" (Prodrome de Paleont., vol. 2, 1850, p. 185, No. 759.)

"*Bulimina sarthacensis* d'Orbigny" (l.c., p. 185, No. 760.)

143. NOTES ON THE GENUS SPIROPLECTOIDES AND ITS SPECIES

By J. A. CUSHMAN

A study of much American and European material belonging to *Spiroplectoides* or related to it has developed several interesting facts that may be of general interest. The various species are distinctive and have definite geographic distribution and geologic ranges. The genus *Spiroplectoides* has for its genotype "*Spiroplecta rosula* Ehrenberg" originally described from America. This species, if we have correctly identified it, is completely calcareous and distinctly perforate. Specimens leave no residue when dissolved in acid. On the other hand, there are numerous species which are very similar in their general structure and appearance which are apparently siliceous and are not affected by acid. Both groups are for the most part found in the Upper Cretaceous. In order to bring these various species to the attention of workers on the group with the hope that more light on their relationships and structure may be developed, figures and descriptions of these and something of their known distribution are given here.

Genus SPIROPLECTOIDES Cushman, 1927

Genotype, *Spiroplecta rosula* Ehrenberg

Spiroplectoides CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, pt. 4, 1927, p. 77; vol. 3, pt. 1, 1927, p. 62; Journ. Pal., vol. 1, 1927, p. 159; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 235. —WHITE, Journ. Pal., vol. 3, 1929, p. 32.—CUSHMAN, Special Publ. No. 4, Cushman Lab. Foram. Res., 1933, p. 209.

Spiroplecta (part) of authors.

Spiroplectammina (part) of authors (?).

Test elongate, sides nearly parallel; early chambers planispiral in both microspheric and megalospheric forms, later ones biserial, numerous; wall calcareous, perforate; aperture elliptical, terminal or nearly so in adult.—Cretaceous and Tertiary. Recent (?).

There are at least three definitely calcareous species which will be noted first, and in addition several species that have a siliceous

test and are included here with some question. It is very possible that these siliceous forms may have arisen from calcareous ones and their form may be due to parallelism rather than to actual close relationships of the two groups.

SPIROPLECTOIDES ROSULA (Ehrenberg) (Pl. 6, figs. 10-13)

Spiroplecta rosula EHRENBERG, Mikrogeologie, 1854, pl. 32, pt. 2, fig. 26.
Spiroplectoides rosula CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 62, pl. 13, figs. 9 *a*, *b*; p. 114, pl. 23, figs. 6, 7.

Test very elongate, slender, compressed, the early portion close coiled, planispiral, with a single coil, later chambers biserial, of uniform size and shape, the sides of the test parallel; chambers numerous in the adult, often higher than broad; sutures distinct, extending obliquely backward; wall smooth and polished, calcareous, finely perforate. Length up to 1.00 mm.; breadth 0.10-0.15 mm.

The types of this species were from the American Cretaceous but the exact locality is not known.

With the Bailey collection in the Boston Society of Natural History is a series of letters received by Bailey from various correspondents. Among them are letters showing that Bailey had an extensive correspondence with Ehrenberg. In a letter of Ehrenberg dated Berlin, August 29, 1843, and received by Bailey March 16, 1844, Ehrenberg thanks him for the samples of Cretaceous from Missouri and Mississippi, very definitely settling the source of those samples figured in the Mikrogeologie. Unfortunately the letters of Bailey to Ehrenberg are not available. In another letter of Ehrenberg dated August 10, 1844, he speaks of the fact that he has figured various species sent him by Bailey from various localities. Among these he mentions *Spiroplecta rosula* from three localities, the first "Cretaceous of Claiborne Bluff," also "Cretaceous, Selma, Alabama," and thirdly "Upper Mississippi." Which of these three localities forms the actual type locality for the species cannot be determined, but it does give a hint to the localities from which Ehrenberg had material of this species at the time he prepared his figures for the Mikrogeologie. In Berlin some years ago I saw the original drawings of Ehrenberg, prepared for various works, but do not at this time recall whether or not the exact localities are given on the sheets of drawings. If so, the type locality might be even more definitely determined.

As *Spiroplectoides rosula* (Ehrenberg) occurs in the Selma

chalk of various localities in Alabama, Tennessee, and Mississippi, specimens from these regions may be taken as typical, as we are sure that Ehrenberg had specimens from the Selma chalk of Alabama. A figure is given of a fairly complete specimen from the Selma of Mississippi and others from the Cretaceous of Texas. There seems little doubt as to the true characters of this species, and therefore, of the typical form of the genus *Spiroplectoides* of which it is the genotype.

Spiroplectoides rosula is a rather common species in the Cretaceous of the Gulf Coastal Plain of the United States although it is small and delicate, being easily broken in the preparation of material. The early coiled stages are frequently broken away. The chambers are often much higher than broad in the adult making it distinct from any other American species. No specimens have been found at the many localities represented in our collections which have developed any sign of a siliceous test. Specimens are in our collection from the following localities: Selma chalk, Barton's Bluff, Tombigbee River, Maruego Co., Ala.; Upper end of bluff on Tombigbee River, Demopolis, Ala.; 10 mi. E. of Blue Springs, Miss.; 11½ mi. E. of Blue Springs, Miss.; 1 mi. E. of Booneville, Miss.; *Exogyra-cancellata* subzone, 3½ mi. N.W. of Booneville, Miss.; Cut of M. & O. R. R., ¼ mi. S. of station, Booneville, Miss.; Ill. Central R. R. cut, 1½ mi. S.E. of So. R. R. crossing, Corinth, Miss.; 10½ mi. S. of Corinth, Miss.; 1 mi. W. of Tupelo, Miss.; Alpine rd., 2 mi. S. of Graham, Union Co., Miss.; 2 mi. W. of Guntown, Miss.; Bridge near Cemetery, Corinth, Miss.; ½ mi. W. of Guys, McNairy Co., Tenn.; New Corinth Highway, 13½ mi. S. of Selmer, McNairy Co., Tenn.; Blue Cut, M. & O. R. R., at State Line, McNairy Co., Tenn.; 1½ mi. W. of Sardis, on Sardis-Henderson rd., Henderson Co., Tenn.; Navarro, *Bulimina* zone, Mexia highway at forks of Wortham rd., 2.8 mi. E.S.E. of Coolidge, Limestone Co., Texas; about 17′ above base of bluff on Onion Creek, 2½ mi. W. of Garfield, Travis Co., Texas; Pecan Gap chalk, Greenville rd., 5.1 mi. S. by W. of Wolfe City, Texas; Roadside ditch, N. side of Forney-Mesquite rd., 0.7 mi. W. of Forney, Texas; R. R. cut, ½ mi. E. of Pecan Gap, Lamar Co., Texas; 0.75 mi. N. of Rockwall, Rockwall Co., Texas; Wolfe City sand, ditch E. of Wolfe City-Greenville Highway, 4.3 mi. S. of Wolfe City, Texas; Roadside ditch, N. of McKinney-Farmersville rd., 13.85 mi. E. of M. K. & T. tracks in McKinney, Texas; 1-2 mi. N. of Lamar, Collin Co., on rd. to Farmersville, Texas; Taylor, 2.1 mi. from Forney, Kauf-

man Co., on rd. to Heath, Rockwall Co., Texas; 3.2 mi. S.W. of Mart, McLennon Co., Texas; 1.9 mi. E. of Bristol, on rd. to State Rock Ferry, Ellis Co., Texas; 4.9 mi. E. of Forney, on Forney-Terrell Highway, Kaufman Co., Texas; 2.6 mi. E. of Barry, Navarro Co., Texas; Marquez Salt Dome, Leon Co., Texas; 3.9 mi. E. of Farmersville, Collin Co., Texas; 3 mi. W. of Rogers, Bell Co., Texas; ¼ mi. N. of Castroville rd., Bexar Co., Texas; Bously Creek, 2.3 mi. W. by N. of Copeland, Williamson Co., Texas; ½ mi. S. of Taylor, Williamson Co., Texas; Bluff on San Gabriel River, 1+ mi. below Jonah, Williamson Co., Texas; Wolfe City rd., 2.5 mi. S. of Gober, Fannin Co., Texas; Honey Grove-London Highway, 10.8 mi. S. of Honey Grove, Fannin Co., Texas; Paris-Greenville Highway, ½ mi. S. of N. fork of Sulphur River, Delta Co., Texas; Paris Highway, 1.8 mi. E. of Deport, Red River Co., Texas; chalk on rd. at N. edge of Whiteright, Grayson Co., Texas; Medio Creek Valley, ¼ mi. N. of Castroville rd., Bexar Co., Texas; Castroville rd., 0.35 mi. E. of Medio Creek Bridge, Bexar Co., Texas; 5.3 mi. W. of intersection of Medina Lake rd. and Zarzanora Ave., San Antonio, Bexar Co., Texas; Ditch S. of McKinney-Farmersville rd., 7.2 mi. E. of M. K. & T. tracks in McKinney, Texas; Ditch E. of Commerce-Paris Highway, 8.4 mi. S. of Paris, Lamar Co., Texas; Basal Annona, N. of Paris-Clarksville Highway, 3.1 mi. N.E. of Clarksville, Red River Co., Texas; Austin, 6.5 mi. E. by N. of Allen, Collin Co., Texas; Gully S. of Hillsboro-Corsicana rd., 10 mi. E. of Hillsboro, Texas; Rd. cut, 3.7 mi. E. of M. K. & T. tracks in McKinney, on McKinney-Farmersville rd., Texas; 3.4 mi. toward Farmersville Court House, Collin Co., Texas; Gober chalk, 4.7 mi. S. of Honey Grove, Fannin Co., Texas; N. of Paris-Bonham Highway, 2.2 mi. W. of Petty, Lamar Co., Texas; Greenville-Paris Highway, 5.15 mi. S. of Paris, Lamar Co., Texas; 2.8 mi. W. of High on Paris-Bonham Highway, Texas; 0.8 mi. W. of town of High, on Paris-Bonham Highway, Texas; Brownstown marl, Ditch S. of Greenville-Paris Highway, 3.9 mi. S. of Paris, Lamar Co., Texas; Ditch E. of Commerce-Paris Highway, 2.9 mi. S. of Paris, Lamar Co., Texas; and Paris-Clarksville Highway, 1.85 mi. S.E. of Bagwell, Texas.

The geologic range is a fairly long one, but there seems to be little variation throughout its occurrence.

SPIROPLECTOIDES FLEXUOSA (Reuss) (Pl. 6, figs. 14-18)

Textularia articulata REUSS (not D'ORBIGNY), Haidinger's Nat. Abhandl., vol. 3, pt. 2, 1850, p. 45, pl. 4, fig. 14.
Textularia flexuosa REUSS, Sitz. Akad. Wiss. Wien, vol. 40, 1860, p. 235.
Spiroplectoides flexuosa CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 8, 1932, p. 91.

Test elongate, somewhat compressed, the sides in the adult nearly parallel, often constricted slightly at various points; chambers of the earliest portion distinct, planispiral, forming a single coil, later chambers biserial, of rather uniform size and shape, in the adult about twice as broad as high, slightly overlapping; sutures distinct, slightly depressed, forming an angle of usually not more than 25° with the horizontal; wall calcareous, apparently perforate. Length up to 1.00 mm.; breadth up to 0.20 mm.

The types of this species are from the Upper Cretaceous of Lemberg, Galicia, and two topotypes are here figured, together with specimens from the Upper Cretaceous, near Hamm, Westphalia, Germany, from which Reuss recorded the species. This has the chambers much broader and lower than in *S. rosula* (Ehrenberg). The surface is smooth, and the specimens are apparently entirely calcareous. There is a tendency for definite constrictions to appear in the biserial portion.

SPIROPLECTOIDES PAPILLATA Cushman (Pl. 6, figs. 24 a, b)

Spiroplectoides papillata CUSHMAN, Bull. 41, Tenn. Geol. Survey, 1931, p. 44, pl. 7, figs. 10 *a*, *b*.

Test elongate, compressed, early chambers planispirally coiled, later ones regularly biserial, low and broad; sutures distinct, slightly depressed, directed obliquely backward; wall ornamented by small, slightly raised papillae arranged more or less in lines parallel to the sutures; aperture at the base of the inner margin of the chamber. Length of holotype 0.35 mm.; breadth 0.12 mm.

The type of this species is from the Upper Cretaceous, Selma chalk, New Corinth Highway, 13½ miles South of Selmer, McNairy County, Tennessee.

Additional specimens are in our collection from the Selma chalk of Blue Cut on the M. & S. R. R., at State Line, McNairy Co., Tenn. Very similar specimens are in the collection from the upper Ozan of White Cliff, Arkansas, and from the Taylor marl, 3.5 miles S.W. of Clarksville, Red River Co., Texas.

The species is a very small one but seems to be characteristically ornamented and has much broader chambers than the other distinctive American species, *S. rosula*, the chambers being at least twice as broad as high.

SPIROPLECTOIDES (?) CLOTHO (Grzybowski) (Pl. 6, figs. 19-23)

Spiroplecta clotho GRZYBOWSKI, Rozprawy Akad. Umiej. (Mat.-Przyrod.), vol. 41, 1901, p. 283, pl. 7, fig. 18.

Spiroplectoides clotho CUSHMAN, Journ. Pal., vol. 1, 1927, p. 159, pl. 28, fig. 6.—CUSHMAN and JARVIS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 101, pl. 14, figs. 13, 14.—WHITE, Journ. Pal., vol. 3, 1929, p. 32, pl. 4, fig. 5.—JARVIS, Journ. Instit. Petr. Tech., vol. 15, 1929, p. 441.—CUSHMAN and JARVIS, Proc. U. S. Nat. Mus., vol. 80, art. 14, 1932, p. 43, pl. 13, figs. 5, 6.

Spiroplecta annectens CUSHMAN (not PARKER and JONES), Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 584, pl. 15, figs. 4 *a*, *b*.

Test elongate, somewhat compressed, thickest along the median line, megalospheric form broadest at the base with the sides either parallel or decreasing in breadth toward the apertural end, microspheric form with the early coiled portion the narrowest, thence increasing rapidly in breadth toward the apertural end which sometimes again becomes reduced to a blunt point; chambers distinct, earliest ones planispiral, forming about a single coil, later biserial, low and broad, often several times as broad as high; sutures distinct, slightly depressed, often distinctly limbate, forming an angle with the horizontal which in the earlier stages may be as low as 15°, but in the final stages may increase to as much at 50°; wall apparently siliceous, surface smooth. Length up to 1.25 mm.; breadth up to 0.35 mm.

This species was originally described by Grzybowski from the Upper Cretaceous of Poland. The species occurs abundantly in the Upper Cretaceous of Trinidad, and also in the Velasco shale of Mexico. I have tested numerous specimens from both areas with acid, and they seem to be entirely siliceous. There is no indication of an arenaceous test having been altered to a siliceous one, and the source of these siliceous forms becomes a perplexing problem. A copy of the original figure given by Grzybowski is given here. This shows a test of very similar form but with the chambers even lower and broader than in most of our specimens. This character is, however, subject to some variation in the considerable number of specimens we have.

SPIROPLECTOIDES SPECTABILIS (Grzybowski) (Pl. 6, figs. 25, 26)

Spiroplecta spectabilis GRZYBOWSKI, Rozprawy Akad. Umiej. (Mat.-Przyrod.), vol. 13, 1898, p. 293, pl. 12, fig. 12.

Spiroplectammina spectabilis MACFADYEN, *Discovery* Rep'ts, vol. 7, 1933, p. 8, text figs. *c, d, i, j.*

Spiroplecta brevis GRZYBOWSKI, Rozprawy Akad. Umiej. (Mat.-Przyrod.), vol. 13, 1898, p. 293, pl. 12, fig. 13.

(?) *Spiroplectammina rosula* GALLOWAY and MORREY (not EHRENBERG), Journ. Pal., vol. 5, 1931, p. 335, pl. 37, fig. 10.

Copies of the figures given by Macfadyen are on our plates. These are from specimens from the Burdwood Bank, dredged by the *Discovery* Expedition. These are evidently redeposited Cretaceous forms. Both megalospheric and microspheric specimens are shown.

Heron-Allen and Earland (*Discovery* Rep'ts, vol. 4, 1932, p. 353, pl. 9, figs. 5, 6) figure a small form which they refer to *Spiroplectoides rosula* (Ehrenberg) from a dredging off the Falkland Islands. This does not have the very high chambers characteristic of *rosula* and has more coiled chambers than is usual in our Cretaceous forms. This is a somewhat perplexing form but is noted here for future reference.

SPIROPLECTOIDES EOCENICA Cushman and Barksdale (Pl. 6, figs. 28 a, b)

Spiroplectoides eocenica CUSHMAN and BARKSDALE, Contr. Dept. Geol. Stanford Univ., vol. 1, 1930, p. 66, pl. 12, figs. 5 *a, b.*

Test elongate, much compressed, greatest thickness in the median line, early portion planispirally coiled, later portion biserial, with the sides parallel; chambers distinct, those of the biserial portion very low and broad, considerably overlapping; sutures fairly distinct, very slightly limbate; wall distinctly perforate, otherwise smooth. Length 0.45 mm.; breadth 0.20 mm.; thickness 0.08 mm.

The only record of this species is from the Eocene, Martinez formation, just West of the town of Martinez, on the road leading to Port Costa, Contra Costa Co., California.

The general form of this species is similar to that of other species of *Spiroplectoides,* but little is known of it except from the type specimen.

SPIROPLECTOIDES CURTA Cushman (Pl. 6, figs. 27 a, b)

Spiroplectoides curta CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 9, 1933, p. 11, pl. 1, figs. 24 *a, b.*

Test minute, about three times as long as broad, only slightly

compressed in the later biserial portion, early planispiral portion much compressed, sides of the test nearly parallel; chambers distinct, slightly inflated, usually four pairs in the biserial portion, periphery in the later chambers broadly rounded; sutures distinct, very slightly if at all depressed, nearly at right angles to the periphery; wall distinctly perforate, otherwise smooth; aperture narrow on the terminal face, median. Length 0.25 mm.; breadth 0.10 mm.; thickness 0.06 mm.

The types of this species are from the Cooper marl, 1 mile South of Moncks Corner, Berkeley Co., South Carolina.

The chambers of this species are somewhat higher than most of the others except *S. rosula.*

144. THE GENERIC POSITION OF "CORNUSPIRA CRETACEA REUSS"

By J. A. CUSHMAN

Reuss described this species as *Operculina* in his classic work on the foraminifera of the Cretaceous of Bohemia. Later he changed the generic position to *Cornuspira,* and that position has been accepted since Reuss placed it there in 1860. It has been interesting to study numerous excellently preserved specimens from various localities in Europe, particularly a large series from the Cretaceous near Hamm, Westphalia, Germany, as this is the material on which Reuss changed the position of the species to *Cornuspira.* The specimens often show distinct lines of growth or radial creases as shown in Reuss' figure and indicated by later authors. Most of the specimens are distorted in various ways, although the truly calcareous forms from the same material are excellently preserved. This form of the test alone would make one suspicious that these forms are not truly calcareous. Numerous specimens were treated with acid, and were found to be noncalcareous. The external appearance as indicated by many authors is white, and often appears polished. Apparently this external appearance was the character which has so long influenced authors in placing this species under *Cornuspira.* As the material from Hamm has turned out to be noncalcareous it has been interesting to test other specimens in the large series which we have available here for study. All

these have proved to be noncalcareous, and one comes to the very definite conclusion that the species belongs in *Ammodiscus*. A study of the wall itself with high power, also shows that it is composed of very fine fragmentary material with a predominance of cement.

It is an interesting fact in reviewing the literature, and particularly the descriptions and notes, that there seems to have been an almost complete avoidance of any mention of the material of which the test itself is composed. Whether this indicates that the authors themselves had some suspicion as to the true character of the test and have avoided this point cannot be determined. The large series from Europe, Mexico, the United States, and Canada, have all been tested and found to be noncalcareous. Whether these all represent one species or not may be open to question, but the forms are very similar in general appearance and have a long vertical range both in Europe and America. The references are given to this species, and notes on the distribution so far as is shown by our specimens.

AMMODISCUS CRETACEA (Reuss)

Operculina cretacea REUSS, Verstein. böhm. Kreide, pt. 1, 1845, p. 35, pl. 13, figs. 64, 65.

Cornuspira cretacea REUSS, Sitz. Akad. Wiss. Wien, vol. 40, 1860, p. 177, pl. 1, fig. 1; vol. 46, pt. 1, 1862 (1863), p. 34, pl. 1, figs. 10 *a*, *b* (not 11, 12); vol. 52, pt. 1, 1865, p. 459; Palaeontographica, vol. 20, pt. 2, 1872-75 (1874), p. 117.—BURROWS, SHERBORN and BAILEY, Journ. Roy. Micr. Soc., 1890, p. 552, pl. 8, figs. 5, 6.—CHAPMAN, l. c., 1891, p. 574, pl. 9, figs. 11 *a*, *b*.—PERNER, Sitz. kön. Böhm. Ges. Wiss. Prag, 1893, p. 37.—MATOUSCHEK, Lotos, vol. 43, 1895, p. 125.—SCHACKO, Arch. Ver. Freunde Nat. Mecklenburg, vol. 50, 1896, pp. 156 (list), 159, pl., fig. 2.—EGGER, Abh. Kön. bay. Akad. Wiss. München, Cl. II, vol. 21, pt. 1, 1899, p. 18, pl. 22, figs. 1, 2.—FRANKE, Bonn Verh. Nat. Hist. Ver., vol. 59, 1912 (1913), p. 259; Abhandl. geol. pal. Instit. Univ. Greifswald, vol. 6, 1925, p. 7, pl. 1, fig. 5.—CUSHMAN, Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 608, pl. 21, figs. 3 *a*, *b*; Contr. Cushman Lab. Foram. Res., vol. 2, pt. 1, 1926, p. 24, pl. 3, fig. 3; Trans. Roy. Soc. Canada, Sec. IV, 1927, p. 132, pl. 1, fig. 12.—FRANKE, Abhandl. Preuss. Geol. Landes, n. ser., vol. 111, 1928, p. 16, pl. 1, fig. 22.—WHITE, Journ. Pal., vol. 2, 1928, p. 188, pl. 27, fig. 9.—STORM, Lotos, Prag, vol. 77, 1929, p. 56 (list).—CUSHMAN, Bull. 41, Tenn. Geol. Survey, 1931, p. 24, pl. 2, fig. 7.—SANDIDGE, Journ. Pal., vol. 6, 1932, p. 271, pl. 41, fig. 22.

Cornuspira involvens W. BERRY (not REUSS), in Berry and Kelley, Proc. U. S. Nat. Mus., vol. 76, Art. 19, 1929, p. 15, pl. 1, fig. 15.

Test planispiral, close coiled, slightly involute, chamber in-

creasing gradually and uniformly in size as added, with many coils, often with distinct radial creases or constrictions and frequently distorted in fossilization; suture distinct, depressed; wall very finely arenaceous, with much cement, noncalcareous, smooth, usually white and fairly thick; aperture formed by the open end of the tube. Diameter averaging about 1.00 mm.

In Europe this species is recorded from the Gault of the Lower Cretaceous to the Senonian, but apparently is most characteristic of the Turonian and lower Senonian. We have material from various localities, but all the specimens show a rather uniform character.

In the American Cretaceous we have specimens representing the following localities.

The following Mexican localities are from the Mendez shale, all in the state of San Luis Potosi, and all but the first two in Hacienda El Limon: 10 km. South of Rancho Nuevo; 5 km. Southeast of Guerrero; Near Coco; 1 mile Southeast of Taninul Tunnel; North of Las Palmas; River bank, Guerrero; Near Huiches; Near km. post 578, San Luis Potosi-Tampico R. R.; Hill 2 km. South, 50° East of Huiches.

The species is most common in the lower Velasco and upper Mendez shale, particularly the latter, but has a rather wide vertical range.

We have specimens from the Canora Well, at 485-520 feet, Section 25, Township 30, Range IV, Western Canada. It also occurs in the Pelican Rapids Well, in Section 6, Township 79, Range XVII, Western Canada.

In the Cretaceous of the United States we have the species represented from the following localities.

Selma chalk, 1½ miles West of Sardis, on Sardis-Henderson road, Henderson County, Tennessee.

Arkadelphia Clay, 5½ miles Northeast of Hope, Hempstead County, Arkansas.

Navarro, upper clay member, 6 miles East of Corsicana, Navarro County, Texas.

Navarro, calcareous marl member or *Bulimina* zone, pit at Corsicana Brick Company, 5 miles South of court house, at Corsicana, Navarro County, Texas; and Mexia road, 2.75 miles East of Cooledge, Limestone County, Texas.

Middle Taylor marl, 3 miles West of Rogers, Bell County, Texas.

Lower Taylor marl, Dallas road, 1.5 miles East of Garland, Dallas County, Texas.

Austin, Gober chalk, clay marl in lower part, Bonham road, 2.3 miles West of Petty, Lamar County, Texas; and public road, South of R.R., 3¼ miles Northwest of Bailey, Fannin County, Texas.

In addition to the above localities represented by specimens in our collections the species has been recorded by Sandidge from the Ripley formation of Alabama.

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the foraminifera that have come to hand.

Todd, J. U. Metagenesis in *Lepidocyclina* from the Eocene of Peru.—Geol. Mag., vol. LXX, Sept., 1933, pp. 393-6. T.

Vaughan, Thomas Wayland. Studies of American Species of Foraminifera of the Genus Lepidocyclina.—Smithsonian Misc. Coll., vol. 89, No. 10, (Publ. 3222), Dec. 4, 1933, pp. 1-53, pls. 1-32. T.—30 species and varieties of which 13 are new.

Gravell, Donald Winchester. Tertiary Larger Foraminifera of Venezuela.—l. c., vol. 89, No. 11, (Publ. 3223), Dec. 9, 1933, pp. 1-44, pls. 1-6. T.—28 species, 4 new.

Yabe, H. Geological Age of the Miogypsina and Operculina Bed of Nishikurosawa.—Jap. Journ. Geol. Geog., vol. XI, Nos. 1, 2, 1933, pp. 25, 26. T.

Arni, P. Foraminiferen des Senons und Untereocäns im Prätigauflysch.—Beiträge Geol. Karte der Schweiz., n. ser., pt. 65, 1933, pp. I-VIII, 1-18, pls. 1-5. C. T.—One new variety.

Bourcart, Jacques, and Elizabeth David. Étude stratigraphique et paléontologique des grès a foraminiferes d'Ouezzan au Maroc (Oligocène et Miocène inférieur).—Mém. Soc. Sci. Nat. Maroc., vol. 37, 1933, pp. 1-59, 14 pls. T.—Numerous larger foraminifera described and figured, 1 new. Includes the following as an appendix.

Abrard, R. Description d'une nouvelle variété de Nummulite.—l. c., pp. 58, 59, pl. 12, figs. 6-9. T.

Van der Vlerk, I. M. The Task of the Oil Paleontologist.—Geologie & Mignbouw, No. 2, May 1, 1933, 4 pp., 4 text figs., and chart.—Deals largely with orbitoid foraminifera.

Van der Vlerk, I. M., and J. J. Dozy. The Tertiary Rocks of the Celebes Expedition 1929.—Verhandl. Geol. Mijn. Genootschap Ned. en Koloniën, Geol. Ser., vol. 10, 1934, pp. 183-217, 2 pls., 2 text figs., 7 maps. T.—Many records for larger foraminifera.

Colom, Guillermo. Notas sobre foraminíferos.—Bull. Inst. Catalana d'Història Natural, vol. 33, 1933, pp. 205-207, 4 text figs. T.—Notes on *Halkyardia* and *Choffatella.*

Galloway, J. J., and L. Erskine Spock. Pennsylvanian Foraminifera from Mongolia.—American Museum Novitates, No. 658, Sept. 8, 1933, pp. 1-7, figs. 1, 2. P.—6 species, one new but not named.

Kahler, Franz. Fusulinidae.—Paleontographica, vol. 79, 1933, pp. 168-172. P.—One new species of *Polydiexodina.*

Gubler, J. La valeur stratigraphique des Fusulinidés du Permien.—Comptes Rendus, Géol. Soc. France, seance du 22 Janvier, 1934, pp. 381-383. P.

Gocev, P. Paläontologische und stratigraphische Untersuchungen über das Eocän von Varna.—Zeitschr. Bulgarischen Geologischen Gesellschaft, Jahrg. V, Heft 1, 1933, 82 pp., 7 pls., 14 text figs. T.—Several species figured, 2 new.

Hecht, Franz. Arbeitsweisen der Mikropaläontologie.—"Senkenbergiana," vol. 15, 1933, pp. 346-362, 11 text figs.—Various methods of technique described and illustrated.

Moreman, W. L. Arenaceous Foraminifera from the Lower Paleozoic Rocks of Oklahoma.—Journ. Pal., vol. 7, Dec., 1933, pp. 393-397, pl. 47. P.—One new genus and 10 new species.

Vanderpool, H. C. Upper Trinity Microfossils from Southern Oklahoma.—l. c., pp. 406-411, pl. 49. C.—8 species of foraminifera noted, 2 new.

Miller, A. K., and A. M. Carmer. Devonian Foraminifera from Iowa.—l. c., pp. 423-431, pl. 50, figs. 10, 11. P.—One new genus and 2 new species.

Dorr, James B. New Data on the Correlation of the Lower Oligocene of South and Central America with that of Southern Mexico.—l. c., pp. 432-438. T.

Carson, Carlton M. A Method of Concentrating Foraminifera.—l. c., p. 439.

Barbat, W. F., and F. L. Johnson. Stratigraphy and Foraminifera of the Reef Ridge Shale, Upper Miocene, California.—l. c., vol. 8, No. 1, March, 1934, pp. 3-17, pl. 1. T.—Describes and figures 12 species, 4 of which are new.

Cole, W. Storrs. Oligocene Orbitoids from near Duncan Church, Washington County, Florida.—l. c., pp. 21-28, pls. 3, 4. T.—Describes and figures 6 species and varieties, one new variety.

Howe, Henry V., and W. E. Wallace. Apertural Characteristics of the Genus Hantkenina, with Description of a new Species.—l. c., pp. 35-37, pl. 5, figs. 13-17. T.—Figures 4 species, one new.

Palmer, Dorothy K. The Upper Cretaceous Age of the Orbitoidal Genus *Gallowayina* Ellis.—l. c., pp. 68-70. C.

Vaughan, Thomas Wayland. A Note on *Orbitoides browni* (Ellis) Vaughan. —l. c., pp. 70-72. C.

Dunbar, Carl O. Stratigraphic Significance of the Fusulinids of the Lower Productus Limestone of the Salt Range.—Rec. Geol. Survey India, 1933, pt. 4, June, pp. 405-413, pl. 22. P.

Henbest, Lloyd G. A New Term for the Youthful Stage of Foraminiferal Shells.—Science, vol. 79, No. 2051, 1934, pp. 363, 364.

Kofoid, C. A. *An Interpretation of the conflicting views as to the life cycle of the Foraminifera.*—Science, vol. 79, No. 2054, May 11, 1934, p. 436.

Myers, Earl H. *The life history of Patellina corrugata, a Foraminifera.*— l. c., pp. 436, 437.

Schnetzer, Robert. Nummuliten und Orbitolinen aus dem Gilboagebirge in Palästina.—Centralblatt für Min., etc., Jahrg. 1934, Abt B, No. 2, pp. 19-27, 4 text figs. C.—10 species, none new.

Foraminiferen des Betzensteiner Kreidekalks. Studien über die fränkischen albüberdeckende Kreide III.—l. c., pp. 86-95, 9 text figs. C.— 12 species, none new.

Cole, W. Storrs, and Gerald M. Ponton. New Species of Fabularia, Asterocyclina, and Lepidocyclina from the Florida Eocene.—Amer. Midland Nat., vol. XV, No. 2, 1934, pp. 138-147, pls. 1, 2. T.—3 new species.

J. A. C.