The foraminifera of the Restin shale of Northwest Peru

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The foraminifera of the Restin shale of Northwest Peru.

By E. WILLARD BERRY (Negritos, Perú).

With 6 figures.

Many foraminifera are present in the lower part of the Lobitos Formation[1]) of Northwest Peru.

The horizon is, according to Mr. A. A. OLSSON, "Middle Eocene, and about the same as the Upper Claiborne of Southeastern North America, that is to say, Auversian, according to the European scale."[2])

This formation is composed of grey shales with some little sandy material. The lower hundred feet weather slightly yellow and the rest which is from two hundred and fifty feet to four hundred feet thick weathers a slightly greenish grey. The foraminifera are almost entirely confined to the lower part of the formation. (It has been studied foot by foot).

The lettres used after the names of species denote their abundance. c. common; f. few; s. several. The new species and forms described in the following pages are marked thus „*". The systematic part follows CUSHMAN's classification of 1925.[3])

The following forms have been found:

Astrorhizidae		Lituolidae	
1. **Ammodiscus restinensis* BERRY *n. sp.*	f.	2. *Haplophragmoides canariensis* H. B. BRADY	s.

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[1]) BOSWORTH T. O. Geology of the Tertiary and Quaternary Periods in the Northwest part of Peru, London, 1922.

[2]) BERRY, EDWARD W. Proceedings of the U. S. Nat. Mus. Vol. 70. Art. 3 (No. 2652), 1926.

[3]) CUSHMAN J. A. An introduction to the Morphology and Classification of the Foraminifera. Smithsonian Miscellaneous Collection. Vol. 77, No. 4, Washington, 1925.

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Textularidae

3. *Textularia gramen* D'ORBIGNY f.
4. *T. sagittula* DE FRANCE s.
5. *T. sp.* (lost) (1)
6. *Bolivina nobilis* HANTKEN f.
7. **B. restinensis* BERRY *n. sp.* c.
8. *B. cf. punctata* D'ORBIGNY s.
9. *B. cf. cookei* CUSHMAN s.
10. *B. cf. limbata* H. B. BRADY s.
11. *Bulimina affinis* D'ORBIGNY c.
12. *B. ovata* D'ORBIGNY f.
13. *Cassidulina crassa* D'ORBIGNY s.

Lagenidae

14. *Lagena costata* WILLIAMSON s.
15. *Nodosaria* (fragment) (1)
16. **Cristellaria multiseptae* BERRY *n. sp.* c.
17. **C. peruviana* BERRY *n. sp.* c.
18. *Uvigerina canariensis* D'ORBIGNY c.

Globigerinidae

19. *Globigerina bulloides* D'ORBIGNY f.
20. *G. dubia* EGGER s.
21. *Orbulina universa* D'ORBIGNY f.

Rotaliidae

22. *Truncatulina pygmaea* HANTKEN f.
23. *Anomalina grosserugosa* GÜMBEL s.
24. **A. grosserugosa* GÜMBEL *var. peruviana* BERRY *n. var.* c.
25. **A. restinensis* BERRY *n. sp.* c.
26. *Rotalia beccarii* LINNAEUS f.

In all, there are 25 species and 1 variety in this formation. Of these, 5 species and 1 variety are new to science.

The descriptions of the new forms are as follows:

Astrorhizidae.

1. — *Ammodiscus restinensis* BERRY *n. sp.* (Fig. 4).

Test free, a plano-spiral, consisting of a long closely coiled tube. The chamber increases slowly in diameter with length so that except in well preserved specimens it appears to be the same size throughout its entire length. The chamber usually makes about seven revolutions. The walls of the test are composed of very fine sand with much cement. The color is usually a sort of translucent white, although a few specimens are rusty brown, due to iron in the matrix staining them. The aperture is simply the end of the tube.

Diameter up to 0,42 mm. usually about 0.35 mm.

This species is so small that I should take it for a microspheric form, if any other *Ammodiscus* were found in these deposits, but such is not the case. This form is fairly common and where found often occurs in great numbers.

Textularidae.

7. — *Bolivina restinensis* BERRY *n. sp.* (Fig. 5).

Test elongate, distinctly biserial throughout, tapering, very slightly compressed. The proloculum rounded almost spherical, the chambers generally ten in number somewhat inflated, sutures depressed slightly. No surface ornamentation other than coarsely punctate. Aperture elongate, symmetrical.

Length 0.53 mm.

Bolivina restinensis BERRY *n. sp.* resembles *Bolivina compacta* SIDEBOTTOM in general appearance, but lacks the areolated surface of *Bolivina compacta. Bolivina restinensis* is in general slightly longer.

Bolivina restinensis also appears like *Bolivina brevio* CUSHMAN, but is larger and much less compressed, with less number of chambers.

Bolivina restinensis differs from *Bolivina tumida* CUSHMAN, in being larger, and with less number of chambers.

I sent several specimens of this species to Dr. J. A. CUSHMAN, and his idea was that it was the same as some of the species from the Miocene of California. I have not been able to identify it with any of the Miocene forms of California, and still believe it to be a new species.

8—10. — *Bolivina cf. punctata, N. cf. cookei,* and *B. cf. limbata,* are very poorly preserved and as I have only one specimen of each, I believe it best to leave them until such time as more specimens come to hand.

Lagenidae.

16. — *Cristellaria multiseptae* BERRY *n. sp.* (Fig. 2).

Test of this species is a closely coiled bi-convex planospiral. The walls are thin, smooth, unornamented, except for the pronouncedly raised and broadened suture. The umbilical region is raised to the same level as the sutures, but not enough to form a decided lump or knot. The sutures are slightly curved. The periphery of the test is acute but not carinate. There are usually about 15 chambers visible. Aperture radial, small at the radial extremity of last formed chamber. This is usually invisible in most specimens.

Diameter up to 0.5 mm.

In weathered specimens the thin wall is gone, leaving the raised sutures and umbilical region looking like a wheel with spokes, but without a rim.

This species is somewhat like *C. orbicularis* D'ORBIGNY, but lacks the keel and has raised sutures.

17. — *Cristellaria peruviana* BERRY *n. sp.* (Fig. 3).

Test closely coiled bi-convex, walls thin, sutures raised broad prominent, chambers 8 to 9 in number, aperture radial and on the radial extremity of last formed chamber.

Diameter 0.32 mm.

Test of this species is like that of *C. multiseptae,* but has only 8 to 9 chambers instead of the 15 of that species. The sutures also are more nearly straight, but they have the same raised and broadened habit of the first species.

C. peruviana is probably closely related to *C. multiseptae.*

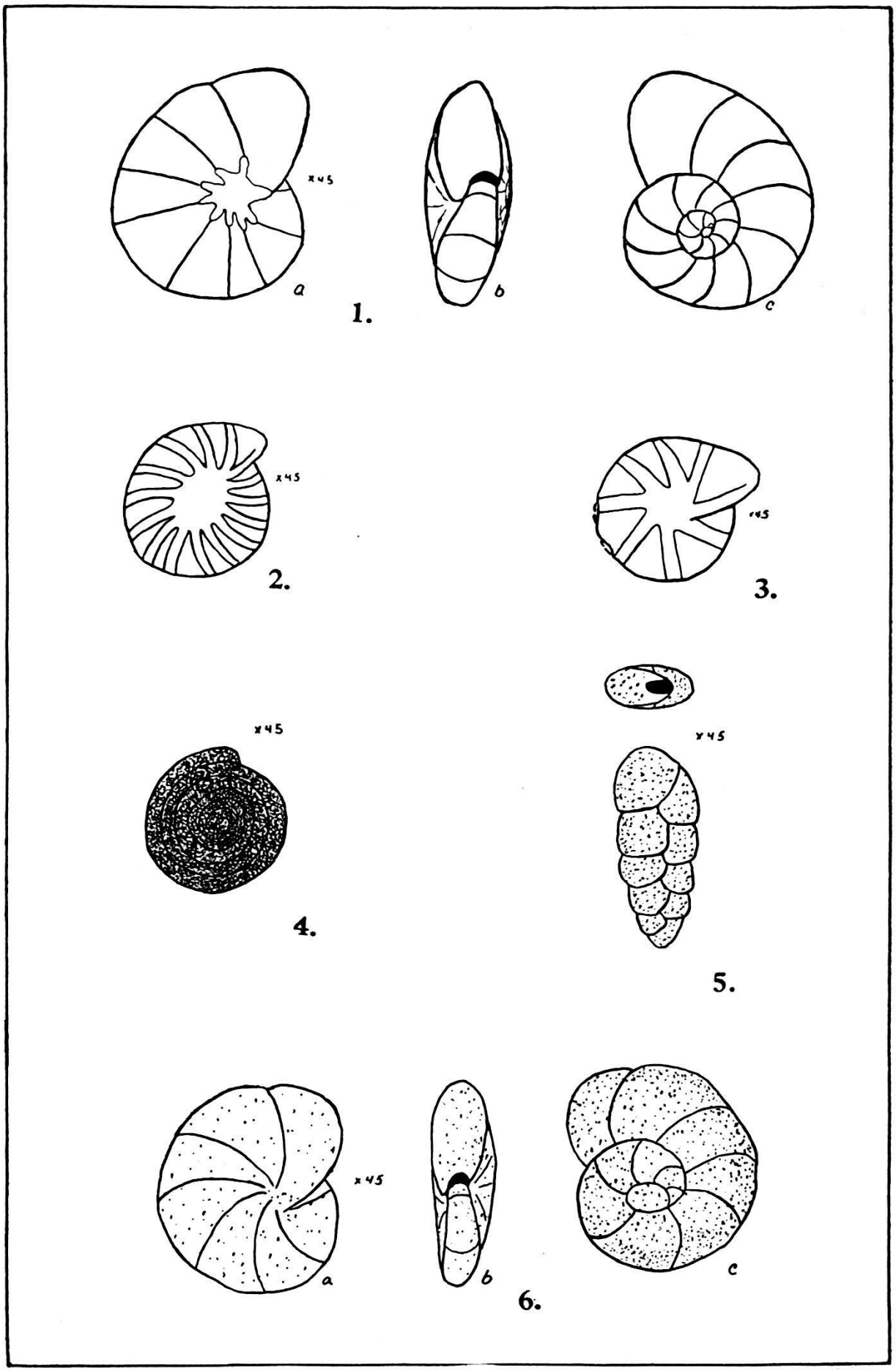

Fig. 1. *Anomalina restinensis* BERRY *n. sp.*
Fig. 2. *Cristellaria multiseptae* BERRY *n. sp.*
Fig. 3. *Cristellaria peruviana* BERRY *n. sp.*
Fig. 4. *Ammodiscus restinensis* BERRY *n. sp.*
Fig. 5. *Bolivina restinensis* BERRY *n. sp.*
Fig. 6. *Anomalina grosserugosa* GÜMBEL *v peruviana* BERRY *n. var.*

Rotalidae.

24. — *Anomalina grosserugosa* GÜMBEL *var. peruviana* BERRY *n. var.* (Fig. 6).

Test nearly symmetrical but not quite. It is composed of chambers arranged in usually three coils. The umbilical region slightly concave on the dorsal side and very slightly convex on the ventral side. All the chambers visible on the ventral and only those of the last formed whorl on the dorsal side. The sutures are very slightly depressed. Usually seven chambers in the last formed coil. The periphery is rounded and the walls are finely perforate, more so on the ventral than on the dorsal side. The aperture is at the base of the last chamber and is a curved elliptical opening.

Diameter 0.45 mm. to 0.55 mm.

The distinguishing feature of this variety from *Anomalina grosserugosa* is the smaller size and finer perforation of the test. It is very common in this formation.

25. — *Anomalina restinensis* BERRY *n. sp.* (Fig. 1).

Test nautiloid, dorsal side slightly convex, ventral side slightly concave, composed of numerous chambers. All chambers visible from dorsal side but only those of the last formed coil visible on ventral side, usually 9 chambers in last formed coil. Sutures distinct, and slightly depressed. In side view the periphery elongately rounded, surface very finely perforate. Aperture a narrow curved slit, at base of last chamber. The umbilical region on the ventral side is covered.

Diameter up to 0.59 mm.

This species which is somewhat like *Anomalina grosserugosa* GÜMBEL especially in poorly preserved specimens where the central regions are broken or covered with matrix is the most common of the nautiloid forms in the Restin.

Discussion of Fauna.

This fauna has certain very noticeable features. The most outstanding is the small size of the forms, most of them being quite small. Another is that, with the exception of *Globigerina* and *Orbulina*, which are pelagic and hence found at many depths, all the genera are best developed at moderate depths of warm seas. This would seem to indicate that the sea in which they lived was of moderate depth and warm. Another interesting fact is an abundance of green sand or glauconite associated with them, also small grains looking like resin, which are very phosphatic. I believe these grains are of organic origin, but am not certain. They may be fish droppings but are more like particles from Pago Pago Harbor, Samoa, described

by BRAMLETTE[1]), except that his are of clear calcium carbonate and these are of clear phosphatic material. What they are I do not know. They are very resistant to weathering and can be found in our present beach sands on this coast today, apparently washed out of the older rocks.

It is from this formation that Professor BERRY described some palm nuts in 1925.

The material making up this section is shale with a little very fine sand. This sand is not apparent in a hand specimen but under the lens is shown up well.

From the foregoing facts I conclude that the Restin material was laid down under shallow to moderate depths in warm water.

Manuscript received January 18, 1928.

Zur Geologie des thessalischen Pindos.

Von CARL RENZ (z. Zt. Korfu).

Im Anschluss an meine früheren Arbeiten im Pindos beabsichtigte ich im letzten Herbst (1927), den die Gebirgsketten von Agrapha[2]) nach Norden fortsetzenden thessalischen Pindos zu untersuchen und von hier aus weiterhin den Übergang der östlichen und zentralen Gebirgsglieder zu dem bereits besuchten Tsumerkagebirge[3]) zu verfolgen.

Es sollte somit ein zusammenhängendes Profil durch die nördlichen Ketten der Olonos-Pindoszone konstruiert werden.

Infolge der Ungunst des Wetters musste aber die geplante Bereisung vorzeitig abgebrochen werden und blieb zunächst auf den Gebirgskomplex der Karáva beschränkt.

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[1]) BRAMLETTE, M. N., Publication No. 344, Carnegie Institution of Washington, 1926, p. 8.

[2]) CARL RENZ: Die Gebirge von Agrapha (Pindos). Neues Jahrb. für Min. etc. 1915, Beil. Bd. 40, S. 229—252. A. PHILIPPSON und V. HILBER, auf deren Publikationen hiermit verwiesen sei, sind vor mir in diesen Gebirgen gereist. Vergl. besonders A. PHILIPPSON: Reisen und Forschungen in Nordgriechenland. Zeitschr. der Ges. für Erdkunde. Berlin 1896, Bd. 31, Nr. 4, S. 385 ff., sowie Bd. 30 (1895), Nr. 2, S. 417 ff.

[3]) CARL RENZ: Stratigraphische Untersuchungen im griechischen Mesozoikum und Paläozoikum. Jahrb. österr. geol. R. A. 1910, Bd. 60, S. 557.