

GEOLOGICAL DISTRIBUTION OF *DISCOSPIRINA*  
(FORAMINIFERA) AND OCCURRENCE OF  
*D. ITALICA* IN THE MIOCENE OF CYPRUS

by C. G. ADAMS

ABSTRACT. Previous records of *Cycloloculina miocenica* Cushman and Ponton from the Miocene of Cyprus are shown to be based on misidentifications of *Discospirina italica* (Costa). Examination of existing records of the latter genus indicates that its geological range may now be assumed to be Middle Miocene to Recent.

THE Geological Survey of Cyprus recently submitted a large number of foraminiferal specimens preserved in blocks of fine-grained chalky Miocene limestone, and requested confirmation of their identification of *Cycloloculina miocenica* Cushman and Ponton. Examination revealed that all the specimens were *Discospirina italica* (Costa), and this prompted an investigation of the previously published record (Dusenbury 1949) of *C. miocenica* from Cyprus. It was found that this also was based on a misidentification of *D. italica*. As these foraminifera have been used as marker fossils for the Miocene of the area it seemed desirable to correct the name and to determine, as far as possible, the range of the genus in case it should prove of value in dating Tertiary sediments. This entailed a comprehensive search of the literature and the author is indebted to Miss C. M. Underwood for her assistance with this. His thanks are also due to Dr. A. H. Smout and the management and Chief Geologist of the Iraq Petroleum Company for allowing him to examine some of their material; to Dr. H. W. Ball who read the typescript and to Dr. R. H. Hedley who also read the typescript and kindly took the micro-radiograph.

Family OPTHALMIDIIDAE

Genus *DISCOSPIRINA* Munier-Chalmas 1902

Type species by monotypy *Orbitolites tenuissimus* Carpenter, a subjective synonym of *Pavonina italica* Costa

1903 *Cyclophthalmidium* Lister, p. 110 (type species *O. tenuissimus* Carpenter).

1920 *Krumbachina* Wiesner, p. 14 (type species *O. tenuissimus* Carpenter).

*Remarks.* Authors subsequent to Munier-Chalmas have sometimes included *D. italica* as a separate species, and sometimes regarded *D. italica* and *D. tenuissima* as synonymous.

*Discospirina italica* (Costa)

Plate 61

1856 *Pavonina italica* Costa, p. 178, pl. 16, figs. 26–28.

1870 *Orbitolites tenuissimus* Carpenter, p. 8.

1883 *Orbitolites tenuissima* Carpenter, pp. 553–9, pl. 37–38.

1886 *Orbitolites italica* (Costa), Brady, p. 191.

1932 *Orbitolites tenuissima* Carpenter, Lipparini, pp. 8, 18.

1949 *Cycloloculina miocenica* Cushman and Ponton, Dusenbury *in* Henson, Browne, and McGinty, pp. 21, 24, 25.

[*Palacontology*, Vol. 1, Part 4, 1959, pp. 364–8, pl. 61.]

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Apart from the type references of Carpenter, only the fossil records of the genus are included here. A more complete list of recent records and references can be obtained from Ellis and Messina (1940 et seq.) under 'Additional References for *O. tenuissimus* Carpenter'.

*Material and localities.* Over 100 specimens from the Upper Paghna siliceous marls of Cyprus, British Museum (Natural History) P. 43936-8. Thirteen specimens from the 'Miocene (Dhali formation) St. Theodore, Cyprus', the property of the Iraq Petroleum Co., Ltd., London. Two specimens from Castanea, near Messina, Sicily, Ex. H. B. Brady Collection, British Museum (Natural History) P. 43934.

*Description.* The compressed, calcareous imperforate test consists of an initial coil of chambers arranged in an Ophthalmidium-like manner, followed by a number of uncoiling chambers which gradually expand laterally until they become annular and enclose the initial coil. The adult test is therefore disk-shaped. Three stages in test growth can be recognized.

1. An initial coil in which the chambers make up to five or more turns round the globular proloculum, individual chambers being  $\frac{1}{2}$ - $1\frac{1}{4}$  turns in length.
2. An uncoiling stage in which the chambers increase rapidly in size and begin to develop septa.
3. A final stage commencing with the growth of semi-annular chambers and ending with the development of completely annular chambers.

In the second and third stages the chambers are characterized by the presence of numerous internal septa which stop short of the anterior border of each chamber. The diameter of the test is usually 5 to 6 mm.; maximum diameter recorded 7 mm.

*Remarks.* W. B. Carpenter (1870, 1883a) has given detailed descriptions of the living representatives of the genus to which nothing can be added here. The Miocene specimens appear to differ from the living ones mainly in size. Whereas the latter range up to 20 mm. (Flint 1899, p. 305) or even 30 mm. (Lister 1903, p. 108) in diameter, the former are not known to exceed 7 mm. It should be noted that Lister does not figure or describe these very large specimens, nor does he say where they were found. The diameter of the largest recent specimen in the British Museum Collection is 13.5 mm. Carpenter (op. cit.) estimated that the maximum diameter of the tests he examined was 0.6 inch (= 16 mm.). Exact measurements are rarely possible as the largest tests, which are very fragile, have always been obtained in a broken condition. The large size of the modern tests appears to be due to an increase in the number of annular, i.e. third stage, chambers, and not to a difference in the rate or pattern of growth. It has been noticed that there are more septa per annular chamber in the recent than in the fossil specimens. Further work on better-preserved fossil material and on additional Recent material might indicate that this is a character of specific importance, in which case a new name will be required for the Miocene forms. The diameter of the initial coil is not appreciably greater in the living forms than in the fossils, neither is the number or size of the chambers in the second stage in any way different. For these reasons the author considers that all the known representatives of *Discospirina* should be included for the present under one specific name. Another argument in favour of this is that no practical stratigraphic advantage results from regarding them as two species.

It is unfortunate that the excellent description and figures of Carpenter should have

been pre-dated by the relatively poor ones of Costa. However, despite the small size of Costa's specimen (max. diam. 2.8 mm.) and the fact that the details of the initial coil cannot be seen, although the outline can, there is no doubt that he was figuring the same organism. There are two reasons for stating this: (1) No known foraminifera, other than *Discospirina*, have a structure closely resembling that depicted by Costa. (2) Good specimens of *Discospirina*, larger than Costa's and similar to Carpenter's, except in size, are now known from the Miocene of Sicily and Italy. It is therefore probable that the same species existed there during the Pliocene.

In the annual report of the Geological Survey of Cyprus for 1956, there is (p. 35) a reference to specimens which 'greatly resemble *Cycloloculina*'. This is certainly a mis-identification of *Discospirina*, and the 'coarse perforations' reported are no doubt caused by the septa showing through the thin wall of the test. This pseudo-perforate appearance is quite common.

*Geological distribution.* The range of the genus has been given as Pliocene to Recent (Galloway 1933), late Tertiary to Recent (Glaessner 1945), Tertiary and Recent (Cushman 1927, 1928, and subsequent editions to 1940), and Upper Cretaceous to Recent (Cushman 1948). This last statement is probably a printing error as Cushman cites no evidence for the change and states elsewhere in the same edition (p. 188) that *Discospirina* is known only 'from the present oceans or late Tertiary'. Sigal (1952) also gives the range as Upper Cretaceous to Recent but this appears to be a copy of the error in the last edition of Cushman. Carpenter (1883a, p. 559; 1883b, p. 20) expressed the opinion that *Orbitolites tenuissima* was an early form of the genus which probably existed throughout the greater part of the Tertiary. But since Carpenter, who believed in Orthogenesis and regarded the initial coil as a primitive feature, had placed his species in the wrong genus, no importance need now be attached to his view. The only known fossil record at the time Carpenter wrote was *Pavonina italica* Costa from the Pliocene of Italy, and he did express the view (1883a, p. 559) that the two species might be identical.

Brady (1886) stated that although he had been unable to obtain any information about Costa's figures from Professor Seguenza of Messina, he had been furnished with some friable Upper Miocene limestone containing *O. italica*. These specimens are now in the British Museum (Natural History), number P. 43934, and are clearly *Discospirina*; this constitutes the first record of the genus from any rock older than the Pliocene. The diameter of these specimens is 6 and 7 mm. respectively. There appears to be no further record until Lipparini (1932) found it in the Upper Miocene, 'Marne Azzurre', near Bologna. Lipparini (p. 18) gave the previous range of the species as Pliocene to Recent

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EXPLANATION OF PLATE 61

The specimens are in the British Museum (Natural History).

Figs. 1-6. *Discospirina italica* (Costa). 1, Block of Miocene limestone from Cyprus showing the surface crowded with *Discospirina*; P. 43936. 2, Well-developed specimen showing septa in the annular chambers; Miocene, Cyprus, P. 43936. 3, Showing septa in second and third stages; Miocene, Cyprus, P. 43936. 4, Enlargement of same specimen as fig. 3 to show structure of first and second stages. 5, Recent specimen, off north-west coast of Africa, 28° 25' N., 13° 34' W., depth 1,300 m.: 1958. 3. 41. 6, Direct print of X-ray photograph of the same specimen as fig. 5 to show internal structure. Radiographic factors: 25 kv, 10 mA, 15 cm., 15 mins.

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and indicated that it should be extended back to the Miocene; he was apparently unaware of Brady's paper. The author knows of no other record until that of Dusenbury (1949). This, as has been shown, was a misidentification which was subsequently accepted and perpetuated by the geologists of the Cyprus Geological Survey.

There are many records of living representatives of the genus from the North Atlantic and Mediterranean, for details see Carpenter (1883*a, b*) and Brady (1884). It lives in both cool, deep water and warm, shallow water.

The available evidence suggests that *Discospirina* appeared in the Mediterranean area during the Upper Miocene and has continued to live there until today. Statements that it existed, or may have existed, in early Tertiary times cannot be substantiated, and the following negative evidence is also opposed to this view: (1) Wherever *Discospirina* is found fossil it seems to occur in large numbers; it is typically preserved in fine-grained chalky limestones or clays. Limestones of an apparently suitable lithological type occur as a thick succession from Upper Cretaceous to Oligocene or Lower Miocene (the Lapithos Group) in Cyprus. *Discospirina* has not, however, been found in this succession, and it is very unlikely that such distinctive and large foraminifera could have been missed. (2) During the last thirty years a great deal of micropalaeontological research has been carried out on the lower Tertiary successions of the Mediterranean area, and so far as the author has been able to ascertain, no record of the genus has been published. The probability is therefore great that it did not appear in the area until Middle Miocene times.

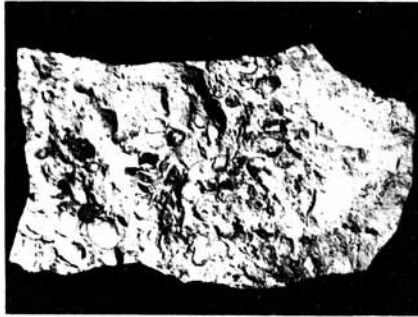
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1 3 cm.



2 3 mm.



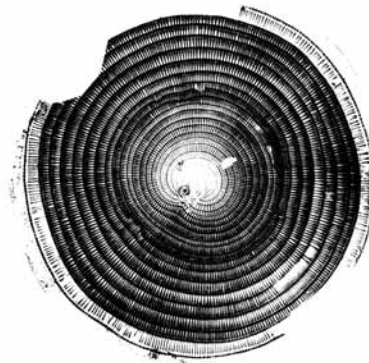
3 3 mm.



4 1 mm.



5 6 mm.



6 6 mm.

ADAMS, *Discospirina italica*