

ΣΥΝΕΔΡΙΑ ΤΗΣ 21ΗΣ ΟΚΤΩΒΡΙΟΥ 1971

ΠΡΟΕΔΡΙΑ ΣΠΥΡ. ΜΑΡΙΝΑΤΟΥ

ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΗ ΜΕΛΩΝ

ΣΤΡΩΜΑΤΟΓΡΑΦΙΑ.— *Dictyomitra multicosata* ZITTEL (1876) in Cyprus
by *Mantis Michael*. Ἀνεκοινώθη ὑπὸ τοῦ Ἀκαδημαϊκοῦ κ. Ἰωάν.
Τρικκαλινού.

Abstract

Dictyomitra multicosata ZITTEL (1876), a radiolarian species, occurs in the dark brown mudstones, red and green bentonitic clays of the Perapedhi Formation and Moni Clays. These strata are of Campanian age. They are overlain by chalks and marls rich in *Globotruncana* and *Gumbelina* species. Available evidence seems to indicate that *Dictyomitra multicosata* ZITTEL is restricted to strata of Senonian (Campanian) age. This species, in Cyprus, occurs within the above mentioned sediments.

Introduction

During the last few years, increasing attention has been focused upon the importance of radiolaria in the Upper Cretaceous Stratigraphy of Cyprus.

Dictyomitra multicosata ZITTEL (1876), occurs in the argillaceous strata distributed round the Troodos Mountains (see location map): at the following area Skouriotissa, south of Peristerona village, Agrokipia, Kambia, Troulli, Moni, Parekklesia - Mangaleni, in the Paphos District at Lara Akamas and Istinjio, and at Paralimni Lake. It has been reco-

vered from subsurface strata penetrated by shallow water wells in the Southeastern Mesaoria and by exploration wells in the Kambia area.

The purpose of the present study is to clarify the stratigraphic position and significance of *Dictyomitra multicostata* ZITTEL, in Cyprus, and to describe and figure this species.

Local Stratigraphy

Dictyomitra multicostata ZITTEL (1876) occurs in Cyprus in the dark brown to green mudstones and red to green bentonitic clays. These sediments rest on pillow lavas or umbers. So far, no other microfossils, except other radiolaria, or megafossils have been recorded from these strata.

The term Perapedhi Formation was suggested by WILSON (1959) to include the umber and radiolarian shales which occur at the base of the marl and chalk succession on the south side of Troodos near Perapedhi village and which rest unconformably on the volcanic rocks. The term Moni Formation was proposed by PANTAZIS (1967) to embrace a series of clays intercalated in places with radiolarian siliceous, chalky and tuffaceous beds, which occur at the base of the Lefkara (ex-Lapithos) group and both are argillaceous sediments in places conformably overlain by calcareous sediments. These sediments rest unconformably on the volcanic rocks and the Parekklesia Sandstone in the Pharmakas Kalavassos area. Both formations yield a radiolarian fauna in which *Dictyomitra* ZITTEL predominates.

An outstanding example is a succession three quarters of a mile west of Troulli village. The succession here consists of clays and mudstones overlain by chalk. A detailed study of samples from this area suggests that the radiolarian fauna becomes extinct at the end of the clayey sedimentary and before. The beginning of calcareous sediments which is marked by a foraminiferal fauna in which *Globotruncana* and *Gumbelina* species predominate.

Bio - and Chrono-stratigraphy

The exact agreement of the lithological and biological boundaries would be the best evidence for differentiating chronostratigraphic units.

The fact the *Dictyomitra multicostata*, together with other radiolarian species, is found in the argillaceous strata and has not yet been recorded in the overlying foraminiferal calcareous strata can be used as a criterion for differentiating these two strata into separate chronostratigraphic units.

Among the foraminiferal species present in the above mentioned calcareous strata are :

- Globotruncana gansseri* BOLLI
 » *arca* CUSHMAN
 » *stuarti* DE LAPPARENT
 » *conica* WHITE
Gumbelina globosa EHRENBERG
Pseudotextularia elegans RZEHAŁ

These *Globotruncana* species are also reported from the Maestrichtian elsewhere outside Cyprus. In the Esna - Idfu region they are reported from the Sharawna Formation of Maestrichtian age (EL - NAGGAR, 1966).

General Discussion :

D'Orbigny in 1842 introduced the term (Senonian) in the Upper Cretaceous Stratigraphy to define the white Chalk near (Sens) southeast of Paris. In 1852 he recognised seven stages in the Cretaceous System. They are, from the base upwards : Neocomian, Aptian, Albian, Cenomanian, Turonian, Senonian, and Danian. These stages have since been generally accepted by most stratigraphers, in spite of disagreements and controversies regarding their limits.

Coquard in 1857 divided the Senonian into four substages which he named from the base upwards : Coniacian, Santonian, Campanian, and Dordonian. (Dordonian is considered to be a junior synonym of the Maestrichtian). He also subdivided the Campanian into four zones on the basis of *ammonites*.

In 1959, the «Congrès des Sociétés Savantes de Paris et des Départements» held at Dijon, discussed the stratigraphical and palaeontological problems of the Upper Cretaceous in France «Colloque sur le Crétacé Supérieur Français». In spite of numerous disagreements, the

congress came to the following conclusion: Although strictly speaking, the Maestrichtian should be excluded from the Senonian, it is generally admitted in France that the Upper Senonian, includes both the Campanian and the Maestrichtian. For practical purposes, the Congress proposed continuation of this usage.

However, for the time being it is easier to treat the Maestrichtian separately from the Senonian (Campanian), in Cyprus, until the type sections of the Senonian and Maestrichtian are studied in detail and correlated more precisely.

Stratigraphic significance of *Dictyomitra multicosata* ZITTEL

ZITTEL K. G. described and figured *Dictyomitra multicosata*, in 1876, in the Zeitschrift d. Deutsch. Geol. Gesellsch. vol. XXVIII pl. II, figs. 2-4, from the Upper Senonian of Northern Germany. RUST D. in 1892, reports *Dictyomitra multicosata* from the Cretaceous (Senonian) rocks of the Pierre Formation of Northwestern Manitoba, Canada. HOLMES (1900), described and figured *Dictyomitra multicosata* in a radiolarian fauna from the Upper Chalk at Coulsdon (Surrey) England; the Upper Chalk at Coulsdon is of Senonian age. CAMPBELL and CLARK (1944) reported this species from the Campanian of Middle California, BOLIN (1956) reports *Dictyomitra multicosata* from the Senonian of Minnesota; PESSAGNO (1963) found *Dictyomitra multicosata* in the early Campanian of Puerto Rico (Parquera Limestone). BERGUIST (1966) reports *Dictyomitra multicosata* from the Senonian of Northern Alaska.

The radiolarian fauna described by Holmes in England from the Upper Chalk at Coulsdon (Surrey) and by PESSAGNO in Puerto Rico from the early Campanian Parquera Limestone is quite similar to the fauna present in Cyprus. (This fauna is now under more detailed investigation by the writer: thirty-two species have until now been recognized amongst which nine are described for the first time).

Dictyomitra multicosata ZITTEL, seems to be a distinct and cosmopolitan radiolarian species in the Upper Cretaceous. It occurs in the Senonian of Europe, Alaska, and Canada, the Campanian of California, and the Early Campanian of Puerto Rico.

Systematic Description

Campbell's classification is herein followed (1954, pp. D 11 D 181).

Class	<i>Reticularia</i>
Subclass	<i>Radiolaria</i>
Order	<i>Ossulosida</i>
Suborder	<i>Nassellina</i>
Superfamily	<i>Archipiliacea</i>
Family	<i>Stichocorythidae</i>
Subfamily	<i>Stichocorythidae</i>
Genus	<i>Dictyomitra</i> ZITTEL (1876)
Subgenus	<i>Dictyomitra</i> ZITTEL (1876)

Description

Test slender and conical with numerous equidistant costae, which appear to cover all segments except the cephalis. The costae vary from coarse and massive and are apparently continuous across the five to ten deep constrictions. The cephalis is a dome-shaped cone. The Thorax, abdomen, and postabdominal segment increase in breadth, but only slightly in height. The number of postabdominal segments vary from five to ten. Pores are present on the segments but they are lacking in the cephalis.

Occurrence: In Cyprus this species occurs in the mudstones, shales and clay member of the Perapedhi Formation and in the Moni Clays. Both Formations were considered previously as part of the Mamonia Formation of the Trypa Group.

Remarks: *Dictyomitra (Dictyomitra) multicosata* ZITTEL, (1876) is a cosmopolitan species that appears to be restricted to the Senonian in North America and Europe. Although its precise position has not yet been established in the senonian it may be further restricted to rocks of Campanian age.

A P P E N D I X I
Localities Sampled

L o c a l i t y	Military Sheet Number Scale 1 : 50000	Geographical position	
		Latitude	Longitude
1. Skouriotissa	Sheet 4	35° 5' 20'' N	32° 63' 32'' E
2. South of Peristerona	» 8	35° 4' 44'' N	33° 4' 28'' E
3. Agrokippia	» 8	35° 2' 46'' N	33° 8' 30'' E
4. Troulli West (3/4 of mile)	» 12	35° 1' 48'' N	33° 34' 34'' E
5. Paralimni (Lake)	» 15	35° 1' 24'' N	33° 57' 54'' E
»	»	35° 1' 36'' N	33° 57' 32'' E
6. Trimiklini	» 5	34° 50' 34'' N	32° 54' 6'' E
7. Pareklisshia (North Armenochori)	» 10	34° 44' 44'' N	33° 8' 00'' E
8. Valva	» 9	34° 50' 10'' N	33° 15' 14'' E
9. Kambia Area	» 9	35° 0' 6'' N	33° 14' 44'' E
10. Lara	» 1	34° 5' 46'' N	32° 19' 56'' E
11. Instinjo	» 1	34° 58' 34'' N	32° 31' 42'' E
12. South Kalavasos Mines	» 10	34° 46' 14'' N	33° 15' 18'' E
»	»	34° 46' 16'' N	33° 15' 10'' E
13. »	» 9	34° 47' 4'' N	33° 14' 52'' E
»	»	34° 47' 8'' N	33° 14' 46'' E
14. Moni	» 10	34° 43' 48'' N	33° 13' 2'' E

Π Ε Ρ Ι Λ Η Ψ Ι Σ

Ἡ παροῦσα ἐργασία ἀποτελεῖ μέρος μιᾶς εὐρύτερας μελέτης ὑπὸ τὸν τίτλον «Upper Cretaceous Radiolaria from Cyprus».

Μέγα ἐνδιαφέρον παρουσιάζουν ὠρισμένα εἶδη ἀκτινοζώων εἰς τὴν στρωματογραφίαν τοῦ Ἄνωτέρου Κρητιδικοῦ (Καμπανίου) τῆς Κύπρου.

Αἱ ἀπὸ τετραετίας ἀρξάμεναι ἡμέτεραι ἔρευναι ἐπὶ σειρᾶς δειγμάτων ἐκ διαφόρων περιοχῶν τῆς νήσου (ληφθέντων ὑπὸ κανονικὴν στρωματογραφικὴν σειρὰν ἐνίοτε ἀνὰ ἓν μέτρον) δεικνύουν τὴν μεγίστην σπουδαιότητα τῶν ἀκτινοζώων εἰς τὴν στρωματογραφίαν τοῦ ἀνωτέρου Κρητιδικοῦ.

Προσδιορίσθησαν πέραν τῶν 32 εἰδῶν ἀκτινοζώων· μεταξὺ τούτων ἐννέα νέα εἶδη θὰ περιγραφοῦν καὶ ἀνακοινωθοῦν συντόμως. Μεταξὺ τῶν εἰδῶν τούτων εἶναι καὶ τὸ *Dictyomitra multicosata*. Τοῦτο θεωρεῖται ὡς ἓν τῶν πλέον καθοδηγητικῶν ἀκτινοζώων τοῦ ἀνωτέρου Κρητιδικοῦ. Ἄνευρίσκειται ἐντὸς πηλιτῶν καὶ ἀργίλλων τῶν σχηματισμῶν Μαμονιῶν, Περαπεδίου καὶ Μονῆς. Πλὴν τῶν ἀκτινοζώων δὲν ἀνευρέθησαν ἄλλα ἀπολιθώματα ἐντὸς τῶν ἀνωτέρω ἰζημάτων. Τὰ ἰζήματα ταῦτα ὑπέρκεινται ἀσυμφώνως τῶν ἐκρηξιγενῶν πετρωμάτων, ὑπόκεινται δὲ ἀσβεστολιθικῶν ἰζημάτων πλουσιῶν εἰς τρηματοφόρα κυρίως *Globotruncana* & *Gumbelina*, ὑποδηλοῦντα Μαιστρίχιον ἡλικίαν.

Ὡς γνωστὸν τὸ *Dictyomitra multicosata* τὸ πρῶτον περιεγράφη ὑπὸ τοῦ ΖΙΤΤΕΛ (1876) ἀπὸ τὸ Σενώνιον τῆς Βορείου Γερμανίας. Ἀκολούθως ὁ RUST (1892) ἀναφέρει τοῦτο ἐκ τοῦ Σχηματισμοῦ Pierre τῆς Β.Δ. Manitoba τοῦ Καναδά, Σενωνίου ἡλικίας. Ὁ HOLMES (1900) περιγράφει τοῦτο ἀπὸ τὰς Κρητίδας τοῦ Coulsdon (Surrey) Ἀγγλίας, ἐπίσης Σενωνίου ἡλικίας. Ὁ BOLLIN ἀναφέρει τοῦτο ἀπὸ τὸ Σενώνιον τῆς Minnesota. Τέλος ὁ PESSAGNO (1963) ἀνεῦρε τοῦτο εἰς στρώματα τοῦ Καμπανίου εἰς Puerto Rico.

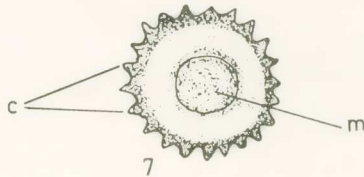
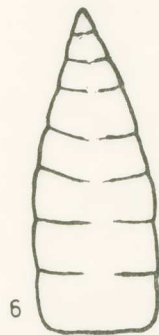
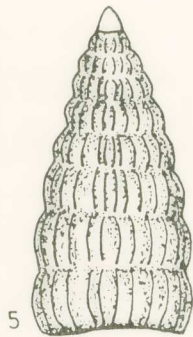
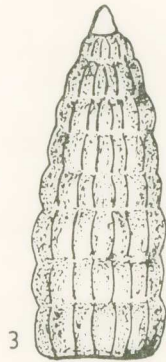
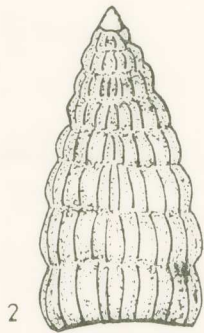
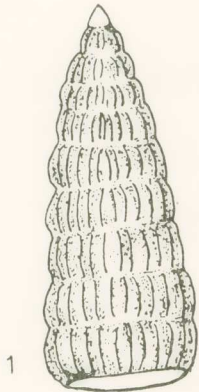
Ἐκ τῆς ἀναδαφείσης βιβλιογραφίας φαίνεται ὅτι τὸ *Dictyomitra multicosata* εἶναι ἓν τῶν χαρακτηριστικῶν καὶ κοσμοπολιτικῶν ἀκτινοζώων τοῦ ἀνωτέρου Κρητιδικοῦ (ἀπαντᾷ εἰς τὸ Σενώνιον ἐν Εὐρώπῃ, Καναδᾷ καὶ Ἀμερικῇ).

Οὕτω ἡ ἐν Κύπρῳ παρουσία τούτου εἰς τοὺς πηλίτας καὶ ἀργίλλους τῶν σχηματισμῶν Μαμονιῶν, Περαπεδίου καὶ Μονῆς, χαρακτηρίζει τὴν ἄνω κρητιδικὴν (Καμπάνιον) ἡλικίαν τούτων καὶ οὐχὶ Ἰουρασικὴν ὡς ἀναφέρεται εἰς τὴν Κυπριακὴν βιβλιογραφίαν διὰ τοὺς σχηματισμοὺς Μαμονιῶν καὶ Περαπεδίου.

★

Ὁ Ἀκαδημαϊκὸς κ. Ἰω. Τρικκαλινός, παρουσιάζων τὴν ἀνωτέρω ἀνακοίνωσιν, λέγει τὰ ἑξῆς:

MICHAEL, MANTIS.— DICTYOMITRA MULTICOSTATA ZITTEL (1876) IN CYPRUS



«Έχω τὴν τιμὴν ν' ἀνακοινώσω εἰς τὴν Ἀκαδημίαν Ἀθηνῶν μελέτην τοῦ Γεωλόγου τῆς Γεωλογικῆς Ὑπηρεσίας τῆς Κύπρου, κ. Μιχαὴλ Μάντη. Ἡ μελέτη αὕτη ἣτις φέρει τὸν τίτλον «*Dictyomitra multicostata* ΖΙΤΤΕΙ (1876) in Cyprus», ἀποτελεῖ μέρος ἐτέρας ὑπὸ μελέτην εὐρύτερας ἐργασίας του, ἣτις ἐπὶ τῇ βάσει τῶν ἐν ἀπολιθώσει εὐρισκομένων ἀκτινοζῶων ἐξετάζει τὴν ἡλικίαν τῶν ἀνωτέρων κρητιδικῶν στρωμάτων τὰ ὁποῖα συναντῶνται ἐπὶ τῆς νήσου Κύπρου.

Ἰδιαιτέρας σημασίας εἶναι ὅτι ἡ ἡλικία τῶν κρητιδικῶν στρωμάτων προσδιορίζεται ὑπὸ τοῦ κ. Μάντη ἐπὶ τῇ βάσει μεγάλου ἀριθμοῦ ἀπολιθωμάτων καὶ κατὰ συνέπειαν εἶναι ἀκριβής.

Ἡ σήμερον ὑπ' ἐμοῦ ἐνταῦθα παρουσιαζομένη μελέτη τοῦ Γεωλόγου κ. Μ. Μάντη προέρχεται ἀπὸ τὴν Γεωλογικὴν Ὑπηρεσίαν τῆς Κύπρου ἣτις διὰ τῶν πρωτοτύπων ἐρευνῶν της, οὐσιωδῶς συμβάλλει εἰς τὴν γεωλογικὴν ἐξερεύνησιν τῆς Λεκάνης τῆς Ἀνατ. Μεσογείου.

Τὰς λεπτομερείας θὰ εὔρουν οἱ ἐνδιαφερόμενοι εἰς τὰ ἀντίστοιχα Πρακτικὰ τῆς Ἀκαδημίας».

ACKNOWLEDGMENT

The author is indebted to Mr Y. H. STAVRINOU, Director of Geological Survey Department, and Dr P. KNUP U.N.D.P. Geologist for their constructive criticisms and suggestions. A special word of thanks goes to the field geologists for their co-operation in collecting the rock samples.

REFERENCES

- 1) BERGUIST, R. H. (1966).—Micropaleontology of the Mesozoic Rocks of Northern Alaska. *Geological Survey Prof.*, Paper 302-D.
- 2) BOLIN, E. J. (1956).—Upper Cretaceous foraminifera, ostracoda, and radiolaria from Minnesota: *Journ. Pal.*, vol. 30, no 2, pp. 278-298, pl. 37-39, text figs 1-5.
- 3) CAMPBELL, A. S. & CLARK, B. L. (1944).—Radiolaria from the Upper Cretaceous of Middle California. *Geological Society of America Special*, Paper 57, pp. 1-61, pls. 1-8.
- 4) CAMPBELL, A. S. N. (1954).—Radiolaria. In: CAMPBELL, A. S. and MOORE, R. C., *Treatise on Invertebrate Palaeontology*, pt. D. Prodistia 3; Lawrence, Kansas. *University Press*, pp. D11-D163.
- 5) EL-NAGGAR, R. Z. (1966).—Stratigraphy and Planktonic Foraminifera of the Upper Cretaceous. *Lower Tertiary succession in the ESNA-IDFU Region*, Nile valley, Egypt, U.A.R.

- 6) HOLMES, M. W. (1900).— On Radiolaria from the Upper Chalk at Coulsdon (Surrey) England. *Geological Society, London. Quart. Journal*, vol. **56**, pl. 4, no 224, pp. 694 - 704, pls. 37 - 38.
- 7) PANTAZIS, TH. (1967).— The Geology and Mineral Resources of the Pharmakas - Kalavassos Area. Memoir No 8. *Geological Survey. Dept. Nicosia, Cyprus*.
- 8) PESSAGNO, E. A., JR (1963).— Upper Cretaceous radiolaria from Puerto Rico. *Micropaleontology*, vol. **9**, no 2, pp. 197 - 214, pls. 1 - 7.
- 9) RIEDEL, W. R. and SCHLOCKER, J. (1956).— Radiolaria from the Franciscan group, Belmont, California. *Micropaleontology*, vol. **2**, no 4, pp. 357 - 360, text figs 1 - 7.
- 10) RUST, D. (1892).— Radiolaria from the Pierre Formation of Northwestern Manitoba. *Geol. Nat. Hist. Survey Canada, Contr. Canadian Micro-pal.*, pt. 4, pp. 101 - 110, pls. 14 - 16.
- 11) VINASSA DE REGNY, P. (1901).— Radiolari Cretacei dell' isola di Karpathos. *R. Accad. Sc. Inst. Bologna, Mem. Ser. 5*, vol. **9**, pp. 211 - 226, pl. 1.
- 12) WILSON, R. A. M. (1959).— The Geology of the Xeros - Troodos Area with an Account of the Mineral Resources. Memoir No 1. *Geological Survey Nicosia, Cyprus*.

***Dictyomitra (Dictyomitra) multicosata* ZITTEL (1876).**

Plate 1 Figs 1 - 6

- Dictyomitra multicosata* ZITTEL (1876), *Zeitschr. Deutsch. Geol. Ges.*, vol. **28**, p. 81, pl. 2, figs 2 - 4.
-
- RUST (1892), *Geol. Nat. Hist. Survey Canada Contr.*, Canadian Micropaleontology, pt. 4, p. 109, pl. 16, fig. 3.
-
- CAMPBELL and CLARK (1944), *Geol. Soc. Amer., Spec. Paper* No **57**, pp. 39 - 40, pl. 8, figs 22 - 24, 29, 35, 42.
-
- PESSAGNO (1963), *Micropaleontology*, vol. **9**, No 2, pl. 1, figs 9 - 10; pl. 4, figs 1, 3; pl. 5, figs 3, 7.
- Dictyomitra tiara* HOLMES (1900), *Geol. Soc. London, Quart. Journ.*, vol. **56**, p. 701, pl. 38, fig. 4.