

Nummulitidae and Orbitoididae
from the « Molasse di Rio Giordano »
(Middle-Upper Eocene, northern modenese Apennines)

A. SIROTTI

Istituto di Paleontologia
Università di Modena

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RIASSUNTO — Vengono descritte e illustrate 17 specie di macroforaminiferi (Nummuliti ed Orbitoididi) provenienti da alcuni campioni raccolti nelle « Molasse di Rio Giordano » (Appennino settentrionale modenese). Il complesso da cui proviene la fauna in esame era cartografato nella Carta Geologica d'Italia all'1:100.000 (F. 86, Sacco, 1930 e F. 87, Lotti & Zaccagna, 1913) come m² (« Marne più o meno arenacee, talora banchi arenaceo-calcarei; spesso fossiliferi ») e riferito al Miocene per quanto riguarda la parte superiore arenacea di cui ci occuperemo nel presente lavoro, mentre la parte inferiore argillosa era cartografata assieme alle sottostanti formazioni flyschiodi cretacee.

E. Serpagli (1962) nel corso del rilevamento per la Seconda Edizione della Carta Geologica (F. 86) attribuiva all'Eocene medio-superiore l'intero complesso per la presenza di Globorotalia aragonensis e G. crassata nella parte bassa e Nummulites e Discocyclina nelle superiori molasse. Più recentemente Dieci (1965) riferiva al Lutetiano medio inferiore la parte basale argillosa della formazione di Rio Giordano.

Lo studio dei macroforaminiferi della parte arenacea del complesso, a me affidato, ha portato ugualmente a risultati interessanti per la datazione delle Molasse. I campioni raccolti, di cui è possibile stabilire la posizione stratigrafica, hanno permesso di suddividere, in base al contenuto paleontologico, le « Molasse di Rio Giordano » in tre livelli. Di questi il primo, che occupa i primi 200 m di spessore, con la presenza di 15 specie riconosciute delle quali 3 esclusive del Lutetiano medio, è databile con sufficiente sicurezza a questo piano.

Il secondo livello è paleontologicamente meno caratteristico in quanto sono state trovate solo 3 specie di macroforaminiferi che indicano genericamente Lutetiano.

Assume poi grande importanza la fauna del Campione 9, appartenente al terzo livello e raccolto circa 430 m sopra la base delle molasse, per la presenza di Nummulites cfr. fabianii (Prever) che permette di datare questo livello all'Eocene superiore.

Verso l'alto le molasse sono pressoché prive di fossili ad eccezione di rarissimi esemplari di Discocyclina scalaris (Schlumberger).

È pertanto possibile affermare che allo stato attuale delle ricerche le « Molasse di Rio Giordano » sono databili al Lutetiano medio per la loro parte basale e all'Eocene superiore per la loro parte media. L'eventuale presenza dell'Oligocene non è tuttora paleontologicamente documentabile per l'assoluta mancanza di reperti.

ABSTRACT — Seventeen species of larger Foraminifera (Nummulitidae and Orbitoididae) from the « Molasse di Rio Giordano » (Modenese Northern Apennines) are described and discussed. A Middle Lutetian age is ascribed to the basal part of the molassic foraminiferal sandstone, and an Upper Eocene age to the upper layers of the middle part. Towards the top fossils disappear, except very rare specimens of Discocyclina scalaris.

INTRODUCTION

In a preliminary note E. Serpagli (1962) recognized in the « Formazione di Rio Giordano » (Modenese Northern Apennines) the occurrence of two units, i.e. the « Argille di Rio Giordano » (thickness about 200 m) and, in regular stratigraphical succession, the « Molasse di Rio Giordano », a unit essentially molassic with coarse elements, mostly with quartz and feldspars, 700 m thick, where single layers have a thickness of 0,50-3 m. The Author preliminarily ascribed the « Molasse di Rio Giordano » to the Middle-Upper Eocene; but he did not exclude that the upper layers could represent the Oligocene, although he did not as yet find any Oligocene fossil. Recently Dieci (1965) ascribed the « Argille di Rio Giordano », which lie under the molasse, to the Middle-Lower Lutetian, on the basis of the microforaminifera.

ACKNOWLEDGEMENTS

The present work has been made possible by the financial contribution of the Consiglio Nazionale delle Ricerche and is part of the program established by the Research Group for Paleontology, Section I, Modena (E. Montanaro Gallitelli Director). I thank Professor Mrs. E. Montanaro Gallitelli, Director of the Institute of Paleontology, Modena University for the encouragement she gave me during the work. I am very indebted to prof. F. Bieda of the Institute of Paleontology, Krakow University, who kindly verified the identity of the species of larger interest.

OCCURRENCE OF THE MATERIAL

The best exposure of the « Molasse di Rio Giordano » can be observed along the course of the homonymous creek, but there the fossiliferous localities are scarce and generally contain small and not always significant specimens. It was thus necessary to collect both East and West of the creek

in fossiliferous localities richer in species and individuals. The exact location of samples is marked in the enclosed map and identified by geographical coordinates (U.T.M. system).

It has also been possible to reconstruct the succession of samples and so follow in detail the variations of the fauna that allow us to characterize three levels.

The rock in which the fossils are found is a « molassa » very rich in quartz and feldspars in coarse elements, sometimes up to 1 cm, poor in clay and carbonates (3-12%). The fossils are sufficiently common in the basal part of the formation with the tendency to diminish towards the upper layers, where they are represented only by very rare specimens of *Discocyclina scalaris*.

STRATIGRAPHIC AND SYSTEMATIC RESULTS

Samples 1-6. Sample 1 was collected on the lower, clearly sandy, layer of the « Formazione di Rio Giordano » and marks the limit between the lower and upper unit. It corresponds to sample 17 of Dieci (1965). Sample 6 is stratigraphically about 200 m above the basis. The exact location of these samples is respectively (geographical coordinates, U.T.M. system): 32TPQ41801174; 32TPQ43641145; 32TPQ43581145; 32TPQ42891110; 32TPQ43691109; 32TPQ40121096. The faunal association is:

Robulus sp.
Nummulites anomalus de la Harpe
N. beaumonti d'Archiac & Haime
N. discorbinus (Schlotheim)
N. aff. incrassatus de la Harpe
N. latispira Savi & Meneghini
N. millecaput Boubée
N. crassus Boubée
N. praeaturicus Schaub
N. brongniarti d'Archiac & Haime
Operculina sp.
Discocyclina douvillei (Schlumberger)
D. chudeaui (Schlumberger)
D. scalaris (Schlumberger)
D. fortisi (d'Archiac)
Asterocyclina stella (d'Archiac)
A. stellata (Gümbel)

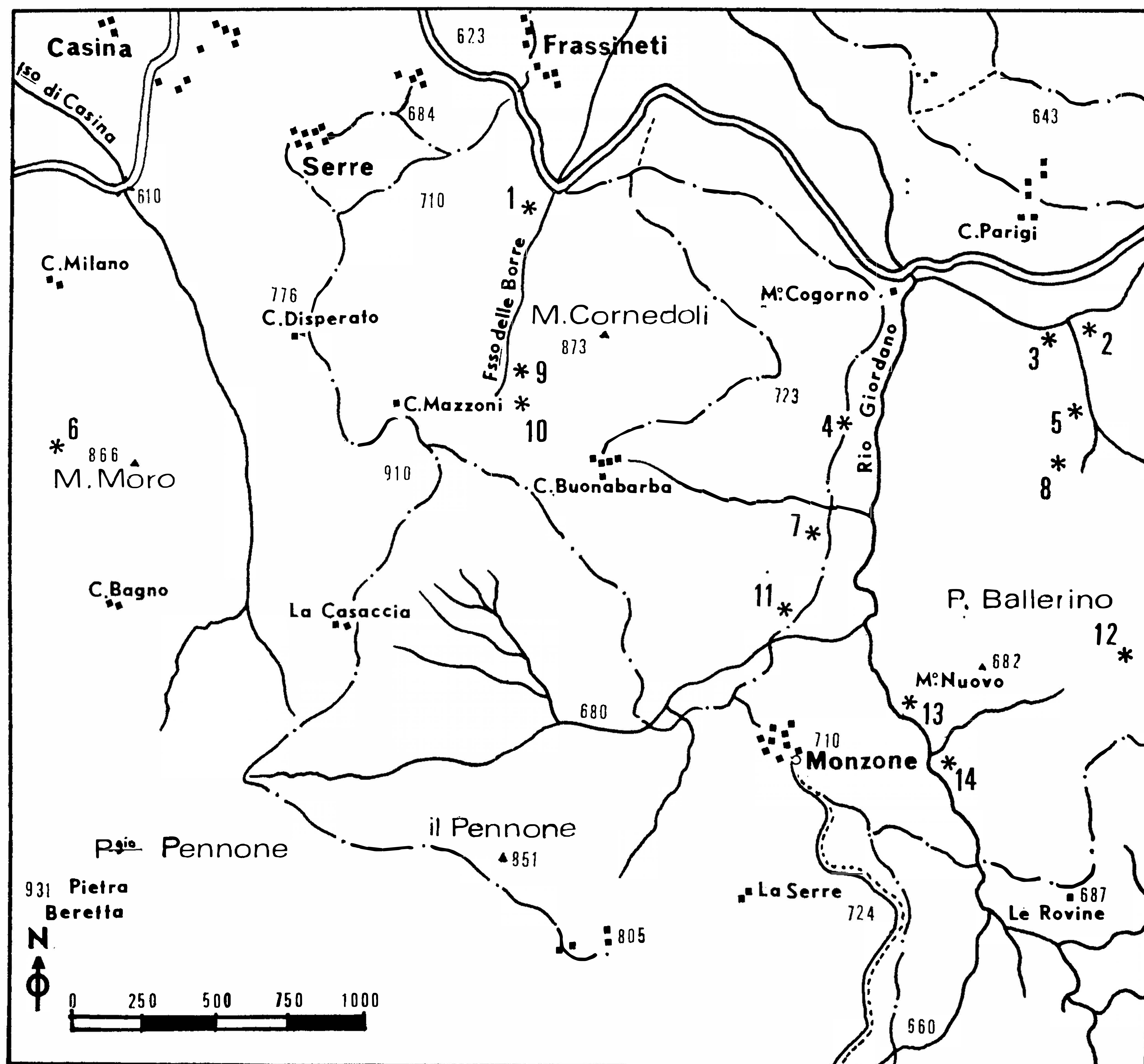


Fig. 1 - Sketch map of the Rio Giordano area showing the location of samples (*)

Among the 15 species recognized, *N. latispira*, *N. crassus*, and *N. praeaturicus* are exclusively of Middle Lutetian. *N. millecaput* is also frequent in the Middle Lutetian with specimens of modest size. The few specimens of *N. brongniarti* which occur in Rio Giordano Formation show the clear characteristics of the Middle Lutetian specimens. It should be noted, however, that *N. brongniarti* is more frequent in the Upper Lutetian.

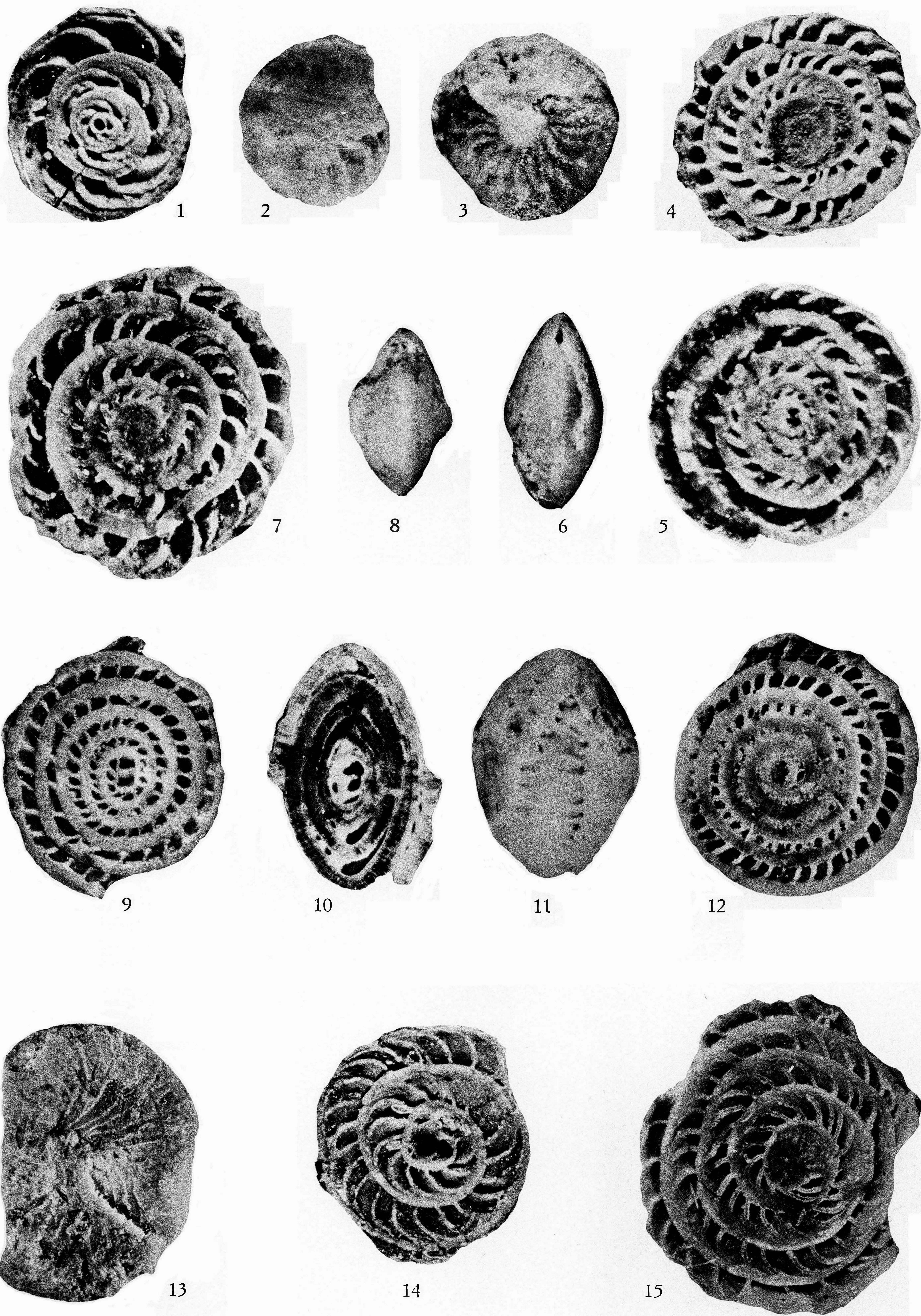
The Orbitoididae are stratigraphically less important. Nevertheless they occur frequently in almost all the Eocene sediments in Europe. The fauna of the first 6 samples can be referred to the Middle Lutetian.

Sample 7 and 8. Sample 8 was collected in the middle-lower part of the « Molasse », being stratigraphically 330-350 m above the basis. The location of these samples is: respectively 32TPQ42781077; 32TPQ-43561091 (U.T.M. system). The specie re-

EXPLANATION OF PLATE 27

- Figs. 1-2 - *Nummulites anomalus* de la Harpe (A Form). 1, equatorial section, Sample 9; 2, external view, Sample 1, x16.
- 3-6 - *Nummulites* sp. ind. aff. *N. incrassatus* de la Harpe (A Form). 3, external view, Sample 1; 4, equatorial section, Sample 2; 5, equatorial section, Sample 1; 6, profile, Sample 3, x16.
- 7 - *Nummulites* sp. aff. ind. *N. incrassatus* de la Harpe (B Form). Equatorial section, Sample 1, 18x.
- 8-9 - *Nummulites beaumonti* d'Archiac & Haime (A Form). 8, profile, Sample 2; 9, equatorial section, Sample 3, x16.
- 10-12 - *Nummulites discorbinus* (Schlotheim) (A Form). 10, vertical section, Sample 1, x15; 11, profile, Sample 2, x13,5; 12, equatorial section, Sample 2, x13,5.
- 13-15 - *Nummulites latispira* Savi & Meneghini (A Form). 13, external view, Sample 4; 14, equatorial section (anomalous embryonic apparatus), Sample 4; 15, equatorial section, Sample 1, x11.

A. SIROTTI, NUMMULITIDAE AND ORBITOIDIDAE FROM «MOLASSE DI RIO GIORDANO»



cognized in the two samples are:

Nummulites millecaput Boubée
Discocyclus douvillei (Schlumberger)
D. scalaris (Schlumberger)

The faunal assemblage is very poor and indicates generically a Lutetian age. We note, however, that the species characteristic of the Middle Lutetian are lacking.

Sample 9. This sample comes from the middle-upper part of the « Molasse » and was collected about 430 m above the basis. The location of this sample is 32TPQ-41791128 (U.T.M. system). The faunal assemblage is given by:

Robulus sp.
Nummulites anomalus de la Harpe
N. aff. incrassatus de la Harpe
N. beaumonti d'Archiac & Haime
N. cfr. fabianii (Prever)
Discocyclus chudeaui (Schlumberger)
D. scalaris (Schlumberger)
Asterocyclus stellata (d'Archiac)

The occurrence of *Nummulites* cfr. *fabianii* thus allows us to ascribe this layer to the Upper Eocene.

The next samples, from 10 to 14 (geographical coordinates, U.T.M. system 32TPQ41691121; 32TPQ42751058; 32TPQ44151022; 32TPQ43011024; 32TPQ43340983), with the occurrence of only *Discocyclus scalaris*, are of very little significance.

To sum up, keeping in mind the elements gathered up to now, it is possible to say:

- 1) that, like the microforaminifera (Dieci, 1965), Nummulitidae and Orbitoididae allow the « Formazione di Rio Giordano » to be ascribed to the Middle till Upper Eocene;
- 2) that no strictly Oligocene species has been found in the upper part of the formation;
- 3) that in the layers of the first 430 m of the formation it is possible to follow a slight variation of the fauna with the disappearance of the older Middle Lu-

tetian forms and the appearance of a species strictly connected to *Nummulites fabianii* (Prever) of the Upper Eocene.

SYSTEMATIC DESCRIPTIONS

Since this is not a monographic study, synonymy is limited to the citation of the papers in which the represented types have a better correspondence with my specimens.

Fam. NUMMULITIDAE

Subfam. NUMMULITINAE de Blainville 1825

Gen. NUMMULITES Lamarck 1801

NUMMULITES ANOMALUS de la Harpe

A Form

Pl. 27, figs. 1, 2

Text-fig. 2

Nummulites anomala DE LA HARPE, 1879, Bull. Soc. Géol. France, Sér. 3, vol. 10, pag. 287, pl. 10, figs. 13, 16, 18 (*non* figs. 12, 14, 15, 17); (*fide* Cat. of Foram.);

Hantkenia venosus PREVER, 1902, Mém. Soc. Pal. Suisse, vol. 29, pp. 81-83, pl. 4, figs. 23-25;

Nummulites anomalus BIEDA, 1963b, Inst. Geol. Prace, vol. 37, pp. 75-77, pl. 7, figs. 4, 5, 11, 12.

Description — Lenticular form, slightly bulging, sometimes even asymmetric. Margin slightly depressed and rounded. The surface shows a more or less developed and evident median tubercle from which falciform, coarse and slightly protruded septal filaments radiate. The equatorial section shows a spire growing quickly in the first and second whorl, more slowly in the third. The septa are bigger at the base, bent and sloping back steeply so as to encounter the upper spiral lamina at a very sharp angle. The chambers are falciform, almost isometric in the first whorl, thereafter higher than they are long. The very small anisolepidine nucleconch (125-175 μ) presents a somewhat round protoconch (75-120 μ) and a kidney-

shaped deuteroconch of slightly smaller dimensions. Microspheric form absent.

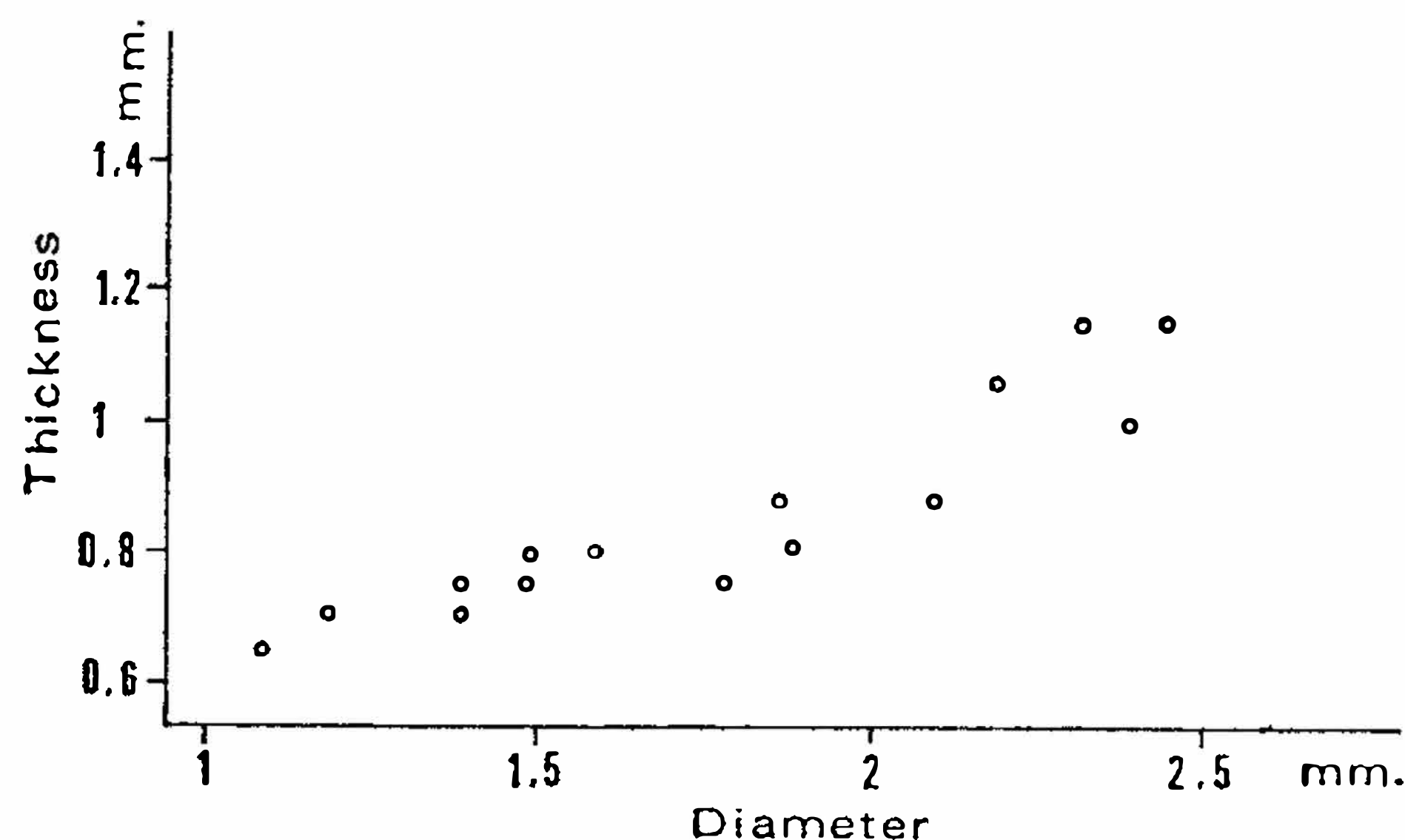


Fig. 2 — Relations between diameter and thickness in 15 specimens of *N. anomalus* de la Harpe.

Number of septa per whorl:

1st whorl	septa Nos.	6 - 7
2nd whorl	»	8 - 10
3rd whorl	»	11 - 12

Remarks — It is similar to *N. stellatus* Roveda, although the latter presents radial tubercles. The equatorial section is identical in the two species. The specimens in my possession correspond closely to those described and figured by Prever (1902) and Bieda (1963).

Material available — 31 specimens, half of which in equatorial section.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4, 9.

Range and distribution — Common in the Lutetian-Bartonian of the Apennines. It is also recorded at Menton (de la Harpe), Dalmazia (Martelli), in northern Somaliland (Silvestri, sub *N. budensis* var. *crassa*) and in southern Poland (Bieda).

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NUMMULITES BEAUMONTI d'Archiac
& Haime
A Form
Pl. 27, figs. 8, 9
Text-fig. 3

Nummulites sub beaumonti DE LA HARPE, 1883, Palaeontographica, vol. 30/1, pp.

182, 183, pl. 31, figs. 48-56; SILVESTRI, 1942, Pal. Italica, vol. 32, suppl. 5, pp. 32-34;

Hantkenia sub-discorbina PREVER, 1902, Mém. Soc. Pal. Suisse, vol. 29, pag. 98, pl. 5, figs. 3, 4.

Description — Specimens of small dimensions, globous, with rounded margin. The polar zones are occupied by a tubercle from which numerous stright, protruded septal filaments radiate. Spire increasing slowly, consisting of four whorls. Spiral lamina strong with thickness equal to $1/2-2/3$ of the light of the spiral canal. The septa are thin, very close together, slope at an angle of about $10-20^\circ$ and are very slightly bent in their upper part. The rectangular chambers are higher than they are long ($175 \times 100 \mu$ half way up the fourth whorl) with the upper part arched. The embryonic apparatus shows a protoconch and a deuteroconch of almost equal size (protoconch: $125-160 \mu$; nucleoconch: $200-275 \mu$). The microspheric form has not been found.

Material available — 12 specimens.

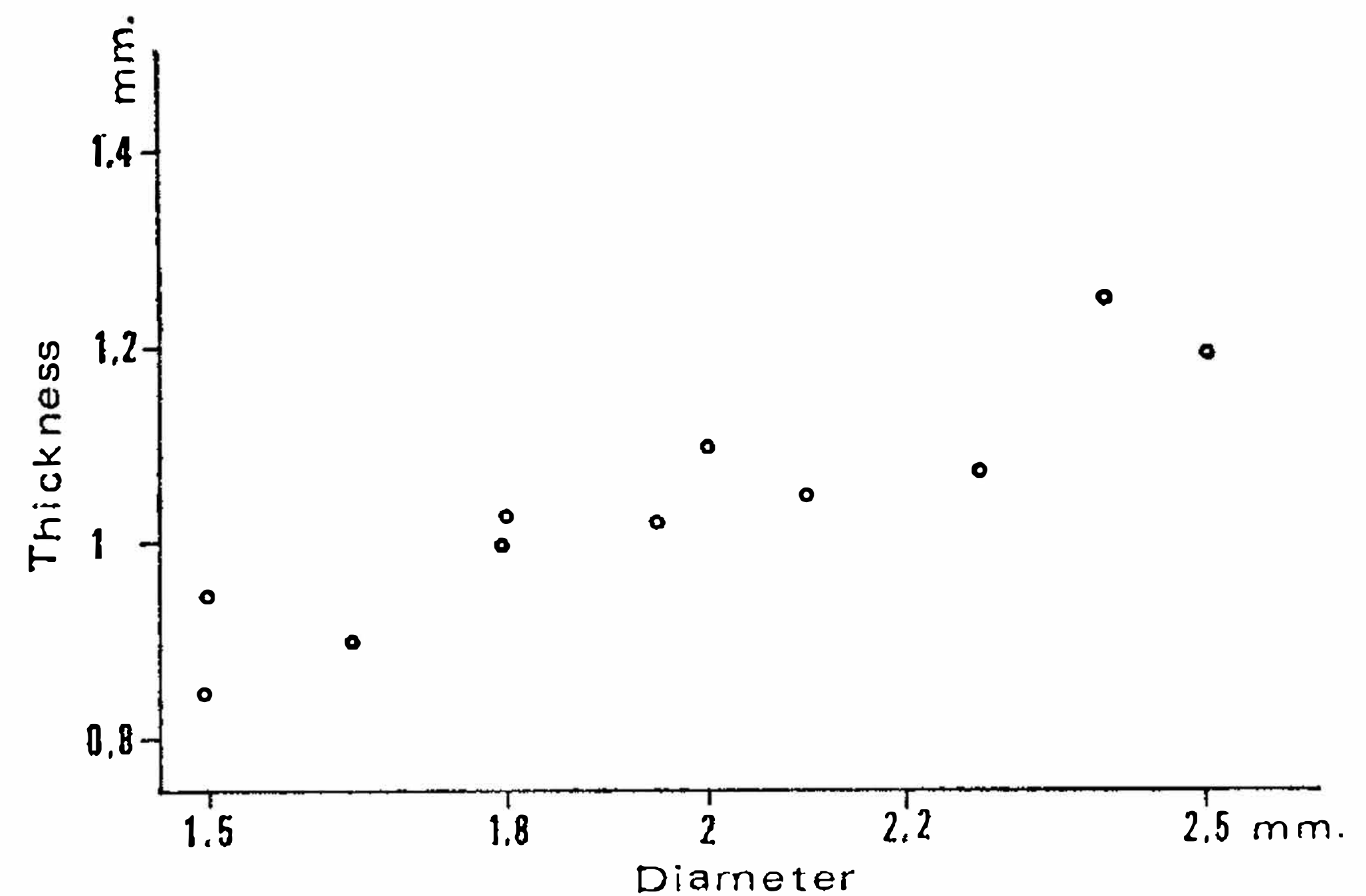


Fig. 2 — Relations between diameter and thickness in 11 specimens of *N. beaumonti* d'Archiac & Haime.

Number of septa per whorl:

1st whorl	septa Nos.	10-14
2nd whorl	»	19-22
3rd whorl	»	24-28
4th whorl	»	29-32

Remarks — There is a great confusion of interpretation between this species and

N. discorbinus (Schlotheim) and particularly between the respective microspheric forms. It seems that the otype of *N. subdiscorbinus* de la Harpe does correspond to *N. beaumonti* (Davies, 1940, *vide* Smout, 1954, pp. 77-79). The two forms are, however, very close and chiefly distinguishable by the lower number of septa per whorl in *N. beaumonti*.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4, 9.

Range and distribution — The species has been found in the Lutetian layers of Potenza (Prever), lower Alps of Lombardy (Vialli). The species is most widespread in the Lutetian and Bartonian of North Africa.

Depository — Institute of Paleontology (Modena University) Nos. 6005-6010.

NUMMULITES DISCORBINUS (Schlotheim)

A Form

Pl. 27, figs. 10-12

Nummulites subdiscorbina CHECCHIA-RISPOLI, 1911, Giorn. Sc. Nat. ed Econ. Palermo, vol. 28, pp. 138, 139, pl. 4, figs. 13-17; SILVESTRI, 1942, Pal. Italica, vol. 32, suppl. 5, pp. 36-38, pl. 14, fig. 6, pl. 21, fig. 2, pl. 22, fig. 4, pl. 27, figs. 4-5;

Nummulites discorbinus SMOUT, 1954, Low. Tert. Foram. Quatar Peninsula, pp. 77-79 (*cum syn.*).

Remarks — It bears a likeness to the previous form but is distinguishable by its greater size, more bulging shape and more rounded margin. In equatorial section *N. discorbinus* shows a larger number of septa (36-40 in the fourth whorl, where *N. beaumonti* shows only 29-32) and a larger nucleoconch (about 320 μ).

Material available — 11 specimens.

Dimensions — $\frac{D}{T} = \frac{3,2}{2,4} ; \frac{3,0}{1,9} ; \frac{2,0}{1,5}$ mm.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4.

Range and distribution — In Italy it has been found in the Middle Lutetian of Lombardy (*vide* Vialli) and in the Bartonian of Florence (*vide* Azzaroli).

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NUMMULITES sp. ind.

aff. *N. INCRASSATUS* de la Harpe

Nummulites vascus var. *incrassata* DE LA HARPE, 1883, Mém. Soc. Pal. Suisse, vol. 10, pl. 7, figs. 27-28 (*vide* Cat. of Foram.).

A Form

Pl. 27, figs. 3-6

Text-fig. 4

Description — Specimens of small dimensions, bulging, with rounded margin. There is always a median tubercle from which radiate thick septal filaments which are bent towards the edge. There is a corresponding tubercle like mark on the bend which is only slightly if at all visible, but which can be clearly seen if the specimen is lightly burned or abraded. The equatorial section shows a regular spire developing quickly. The septa, thickened at the base, slightly oblique and sloping back, cause fal-ciform chambers which are higher than they are long. The nucleoconch, anisolepidine (125-225 μ), presents an oval protoconch (75-125 μ) and a kidney-shaped deuteroconch of slightly smaller dimensions.

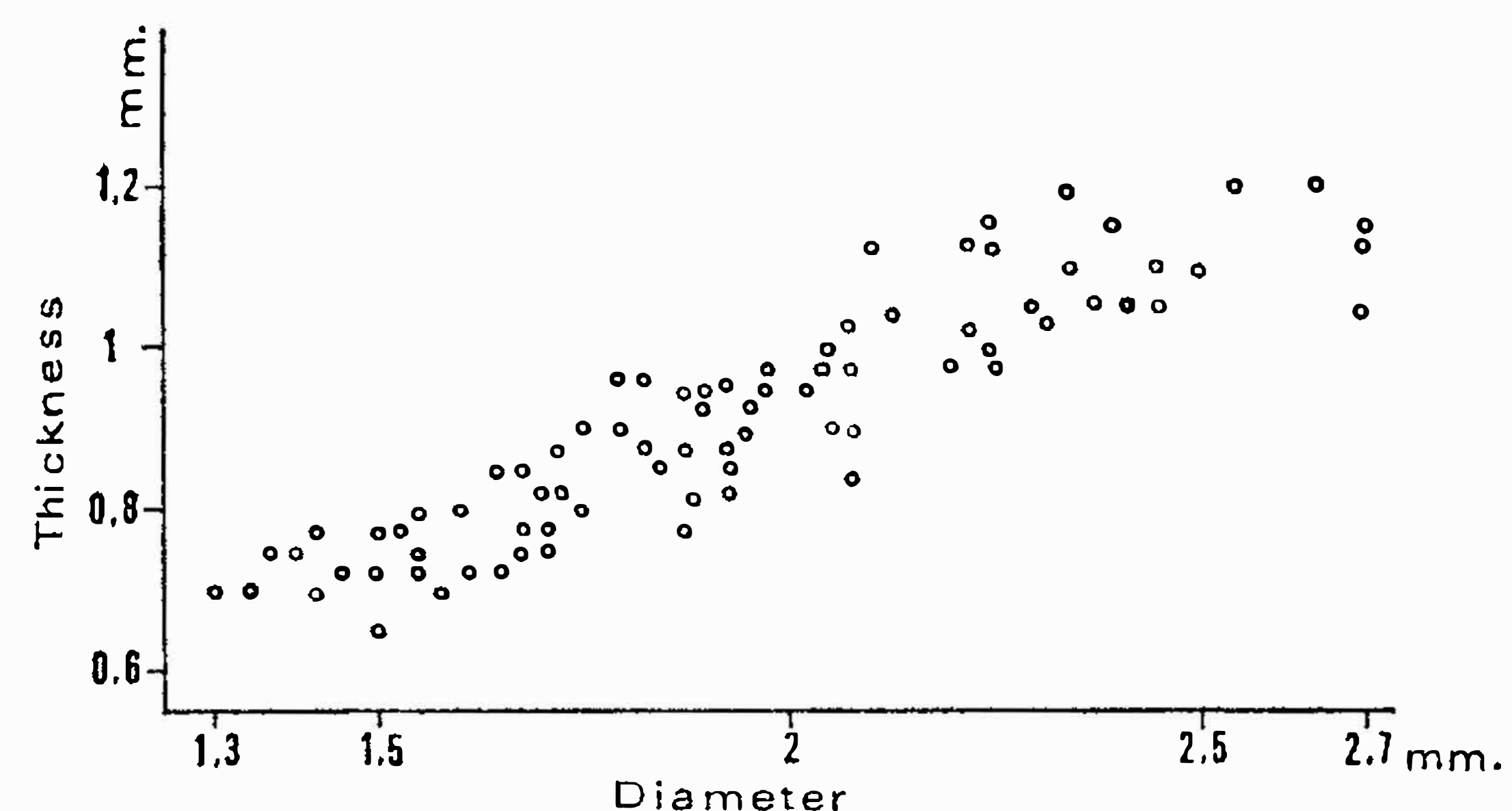


Fig. 4 — Relations between diameter and thickness in 80 specimens of *Nummulites* sp. ind. aff. *N. incrassatus* de la Harpe.

Number of septa per whorl:

1st whorl	septa Nos.	8-10
2nd whorl	»	» 15-17
3rd whorl	»	» 18-22
4th whorl	»	» 23-27

Material available — About 300 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-5, 9. The specimens of sample 9 are rather eroded.

B Form
Pl. 27, fig. 7

The microspheric form shows a more gathered spire and slightly less bent septa than does the macrospheric form.

Material available — Only one specimen in equatorial section.

Dimensions — Diameter 2,85 mm.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Sample 1.

Remarks — The specimens I found seem close to *N. boucheri* Heim and particularly, in so far as concerns the external characteristics, to the specimen figured by Heim (1908) in Tab. 6, fig. 3 from the Middle - Upper Lutetian of the Swiss Alps. Lanterno & Roveda (1957) quoted *N. boucheri* Heim as a synonym of *N. ramondiformis* de la Harpe (= *N. incrassatus* de la Harpe). I maintain, however, that the specimens I examined cannot be ascribed to *N. incrassatus* de la Harpe since this species is more bulging, presents different outer ornamentation with generally bigger and more numerous septal filaments, considerably more anisolepidine embryonic apparatus and statistically bigger dimensions. The comparative examination was carried out with specimens of *N. incrassatus* from Grancona. All these characters led us clearly to distinguish our specimens from *N. incrassatus* de la Harpe, a typical species of the Upper Eocene and Oligocene. Probably the specimens from

the « Molasse di Rio Giordano » are ancestral forms of *N. incrassatus*.

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NUMMULITES LATISPIRA Savi & Meneghini

A Form

Pl. 27, figs. 13-15

Pl. 28, fig. 1

Text-fig. 5

Nummulites latispira SAVI & MENEGHINI, 1851, Osserv. strat. e Paleont. concernenti la Geol. della Toscana, pp. 189, 200, 203 (*fide* Cat. of Foram.); D'ARCHIAC & HAIME, 1853, Descr. an. foss. groupe Numm., pp. 93-94, pl. 1, figs. 1-1a; BIEDA, 1959b, Inst. Geol. odb. Biul. 131, pp. 30, 31, pl. 2, fig. 8.

Description — Lenticular depressed form, with slightly rounded margin and undulating, often bifurcate septal filaments. Spire not very regular, composed of 4-5 whorls, growing quickly in the first and in the second, constant or decreasing thereafter. The last whorl is always decreasing. The spiral lamina is thin and equal to 1/5-1/3 of the light of the spiral canal. Numerous, irregular septa, sloping steeply on the spiral lamina of the former whorl then, two thirds to three-quarters of the way up, bending back so as to become almost parallel to the upper spiral lamina. Irregular, falciform chambers, noticeably higher than they are long.

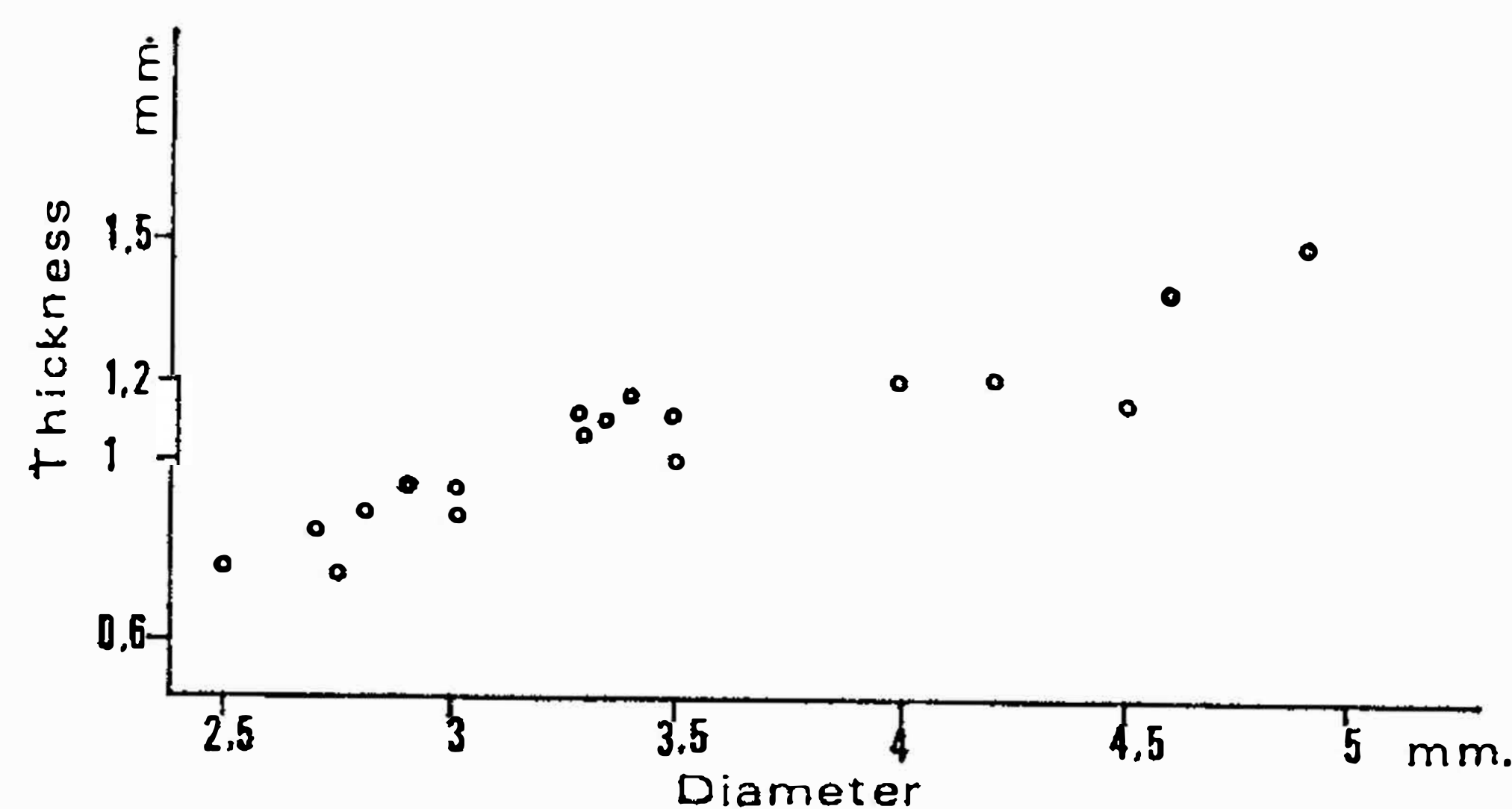
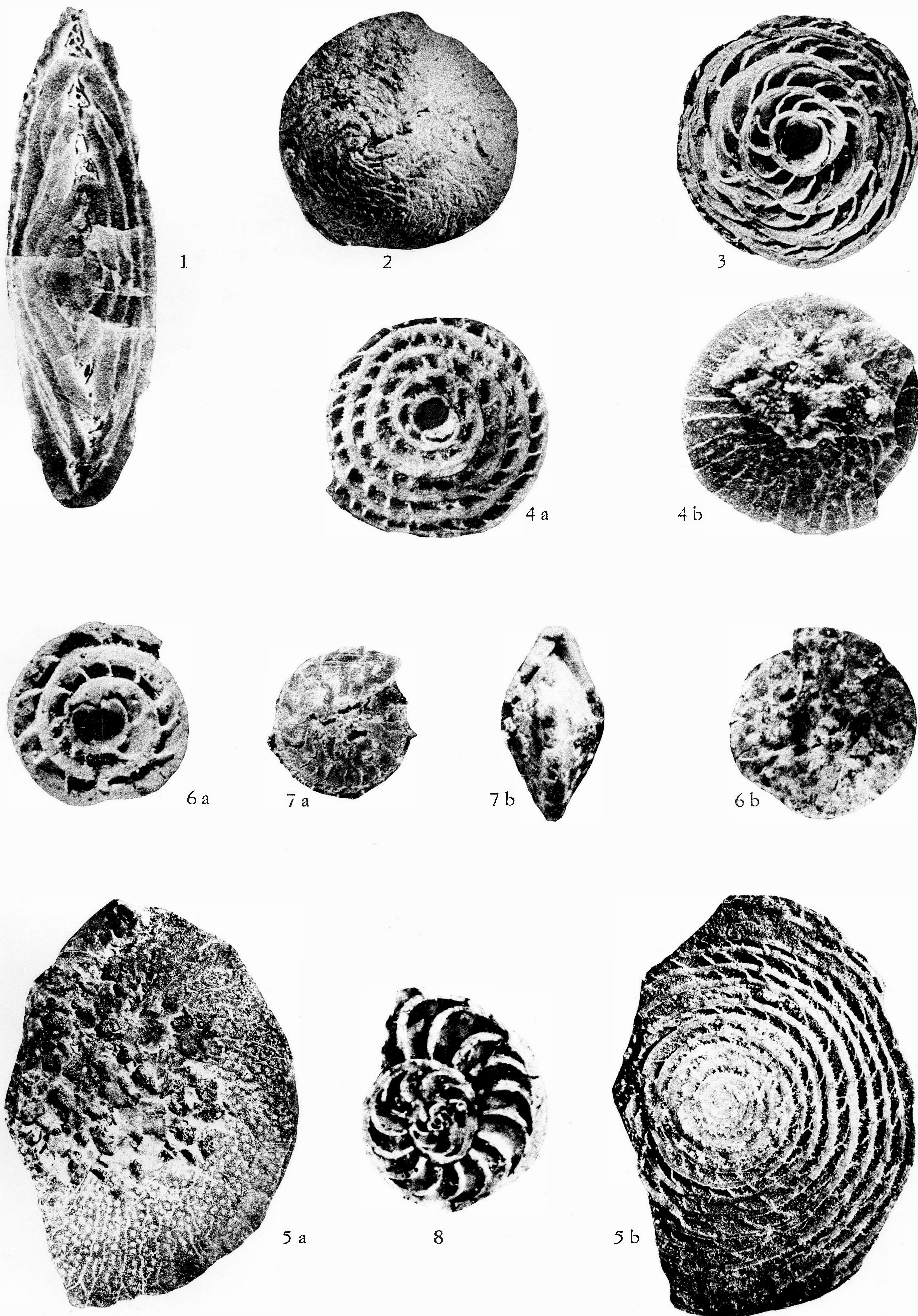


Fig. 5 — Relations between diameter and thickness in 18 specimens of *N. latispira* Savi & Meneghini.

EXPLANATION OF PLATE 28

- Figs. 1 - *Nummulites latispira* Savi & Meneghini (A Form). Vertical section, Sample 2, x16.
- 2-3 - *Nummulites millecaput* Boubée (A Form). 2, external view, Sample 1; 3, equatorial section, Sample 4, x8.
- 4a-b - *Nummulites crassus* Boubée (A Form). 4a, equatorial section; 4b, external view, Sample, 3, x10.
- 5a-b - *Nummulites crassus* Boubée (B Form). 5a, external view; 5b, equatorial section, Sample 3, x5,2.
- 6a-b - *Nummulites praeaturicus* Schaub (A Form). 6a, equatorial section; 6b external view, Sample 1, x15.
- 7a-b - *Nummulites praeaturicus* Schaub (A Form). 7a, external view, x11,4; 7b, profile, Sample 1, x14,8.
- 8 - *Operculina* sp. Equatorial section, Sample 1, x20.

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The nucleoconch is anisolepidine (550-700 μ) with globular protoconch (400-500 μ) and semilunar deutoconch. The vertical section shows a flattened profile of the specimens and sometimes a slight polar protuberance. On the sides, the laminae of the various whorls are very close together, on the borders the spiral canal is pretty high, particularly in the first whorls.

Number of septa per whorl:

1st whorl	septa	Nos.	8-10
2nd whorl	»	»	17-21
3rd whorl	»	»	26-29
4th whorl	»	»	31-35
5th whorl	»	»	9 in 1/4 of the whorl

Remarks — The species is seldom recorded in literature, but rather common in the Eocene formations of the Apennines. It is distinguishable from *N. archiaci* Schaub, the form which it most closely resembles, by the fact that it is more depressed and shows a tighter spiral. This last characteristic distinguishes it also from *N. formosus* de la Harpe.

Material available — 41 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4.

Range and distribution — The species has been found in the Lutetian of the Maiella (d'Archiac & Haime), Palermo (Cecchia-Rispoli), Dalmazia (Martelli), Yugoslavia (Rozlozsnik), and southern Poland (Bieda).

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NUMMULITES MILLECAPUT Boubée

A Form

Pl. 28, figs. 2, 3

Text-fig. 6

Nummulina helvetica KAUFMANN, 1867, Beitr. Geol. Karte der Schweiz., n. 5, pp. 145-147, pl. 8, figs. 1-12 (*fide* Cat. of Foram.); HEIM, 1908, Mém. Suisses Pal., vol. 35, pp. 212-213;

Nummulites tchihatcheffi MARTELLI, 1902, Pal. Italica, vol. 8, pp. 52-53, pl. 6, fig. 1; SILVESTRI, 1938, Pal. Italica, vol. 32, suppl. 3, pl. 9, fig. 6; SILVESTRI, 1942a, Pal. Italica, vol. 32, suppl. 4, pl. 10, figs. 1-2, pl. 11, fig. 5, pl. 12, fig. 3; SILVESTRI, 1942b, Pal. Italica, vol. 32, suppl. 5, pp. 5-8, pl. 9, fig. 1;

Nummulites millecaput BOUSSAC, 1911, Mém. serv. expl. Carte Géol. dét. France, pp. 93-97, pl. 5, figs. 9, 10; BIEDA, 1963b, Inst. Geol. Prace, vol. 37, pp. 89-91, pl. 10, figs. 1-3, pl. 15, figs. 3-5.

Description — Swollen, lenticular form with rounded margin. The surface shows undulating septal filaments, more evident in the outer parts than near the poles. The granules are minutes; their position in relation to the septal filaments is variable: the granules occur either beside the septal filaments or on the septal filaments themselves. The equatorial section shows an irregular spire growing rapidly in the first and second whorls and decreasing in the last. The spiral lamina is uniformly thick. The septa, slope initially, then bend back strongly, and are regularly undulating and spaced. The chambers are falciform, higher than they are long and irregular. Very large anisolepidine nucleoconch (0,88-1,05 mm) formed by a globular protoconch and by a smaller semilunar deutoconch. Teratologic or anyway abnormal forms are frequent. No microspheric form was found.

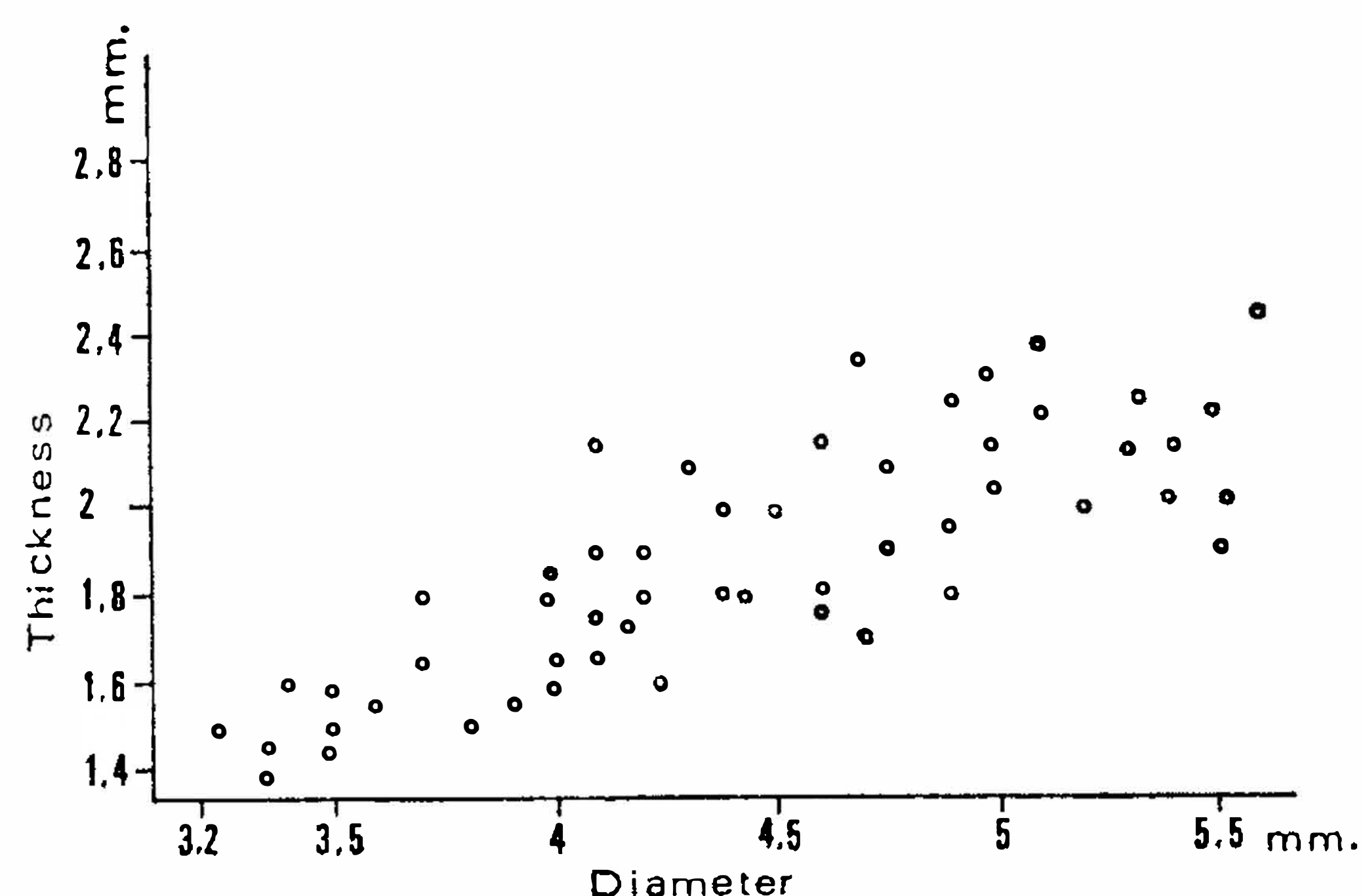


Fig. 6 — Relations between diameter and thickness in 52 specimens of *N. millecaput* Boubée.

Number of septa per whorl:

1st whorl	septa	Nos.	7- 9
2nd whorl	»	»	11-14
3rd whorl	»	»	17-20
4th whorl	»	»	21-24
5th whorl	»	»	7 in 1/4 of the whorl

Remarks — The only possible confusion is with *N. munieri* Ficheur. This however shows reticulated septal filaments near the border and a larger nucleoconch. We note that the specimens from Rio Giordano are smaller than Kaufmann's types.

Material available — About 120 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4, 6-8.

Range and distribution — Lutetian of Palermo (Checchia-Rispoli), Lower Alps of Lombardy (Vialli), Rovereto (Castellarin), Bartonian of Florence (*fide* Azzaroli) and of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6035-6041.

NUMMULITES CRASSUS Boubée

Nummulina crassa D'ARCHIAC, 1850, Mém. Soc. Géol. France, ser. 2, vol. 3, pag. 415, pl. 9, figs. 16B-16B'' (*fide* Cat. of Foram.);

Gumbelia aturica PREVER, 1902, Mém. Soc. Pal. Suisse, vol. 29, pp. 52-53, pl. 2, fig. 23;

Nummulites crassus SCHAUB, 1963, Evolutionary trends in Foraminifera, pag. 291, text-fig. 3.

A Form

Pl. 28, figs. 4a, b

Description — Form of small dimensions, globous, with strongly rounded margin. Undulating septal filaments with tubercles placed on the filaments, tangent to them or, more frequently, beside them. In the

specimens of larger dimensions the filaments near the poles intersect themselves forming a romb-shaped network of large dimensions. In the outer parts the tubercles are smaller and scattered. Spire increasing rapidly in the first whorl, remaining constant or increasing only slightly in the next, decreasing thereafter. Spiral lamina strong (100-175 μ), sometimes slightly undulating. The septa are thin and bend back, thickened in their upper part. The chambers are slightly higher than they are long, subsquare in the first whorl. The nucleoconch is anisolepidine (600-750 μ) with globular protoconch and semilunar deuterioconch.

Material available — 17 specimens.

Dimensions — $\frac{D}{T} = \frac{4,6}{1,8} ; \frac{4,1}{1,9} ; \frac{4,0}{1,8} ; \frac{4,0}{1,75} ; \frac{3,6}{1,72} ; \frac{3,6}{1,7}$ mm.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1,3, 6.

B Form

Pl. 28, figs. 5a, b

The microspheric form, recognized in only one specimen of sample 3, shows a swollen elliptic profile with plentiful tubercles lying preferably in the spaces between one filament and another. The spire is regular, increasing up to 2/3 of the radius, then exhibiting a tendency to be more united and irregular. The septa are more oblique and bent than in the macrospheric form.

Dimensions — Diameter mm 13; thickness mm 5,2.

Remarks — *N. crassus* is well characterized not so much by the D/T ratio as by its equatorial section which lacks those irregularities that characterize the more recent species of the *N. perforatus* group. *N. obesus* d'Archiac & Haime is distinguished from this species by its smaller dimensions and by the tighter spire.

Range and distribution — It is a species typically limited to the Middle Lute-

tian. It has been recognized at Potenza (Prever), near Palermo (Checchia-Rispoli), Chalosse, Bastennes (Aquitaine) and Avesa, Malo, Priabona in the Veneto province (Schaub).

Depository — Institute of Paleontology (Modena University) Nos. 6043-6047.

NUMMULITES PRAEATURICUS Schaub

A Form

Pl. 28, figs. 6-7

Nummulites preaturicus SCHAU, 1962b, Ecl. Geol. Helvetiae, vol. 55, n. 2, pp. 536-538, pl. 2, text-fig. 4d.

Description — Lenticular form with slightly rounded margin. The tubercles are tangent to the filaments, often in a vaguely spiral way, and rarely occur in the spaces between one filament and another. Spire increasing rapidly in the first whorl, more slowly in the second, decreasing thereafter. The spiral lamina is irregular with frequent undulations; its thickness (90-150 μ) is almost 1/3 of the light of the spiral canal. The septa slope on the spiral lamina of the former whorl, then, half of two thirds of the way up, bend back in such a way as to meet the spiral lamina at a sharp angle. The chambers are subromboidal, longer than they are high. The nucleoconch is anisolepidine (600-750 μ) with a spheric protoconch and semilunar deuterioconch. In vertical section the border seems pointed in the first whorls, thereafter tending to become rounded. The microspheric form is absent.

Number of septa per whorl:

1st whorl	septa Nos.	8-10
2nd whorl	» »	11-14
3rd whorl	» »	15-18

Remarks — It resembles *N. aturicus* (Joly & Leymerie), of which it is probably an ancestral form, but the following differences are observed: the size is smaller, the tubercles coarser, but less numerous and, in equatorial section, the spire is tighter,

the spiral lamina thinner, the whorls less numerous. Compared with Schaub's types our specimens are smaller and have a smaller number of whorls.

Material available — 24 specimens.

Occurrence — «Molasse di Rio Giordano» (Modenese Northern Apennines). Samples 1-4.

Range and distribution — Middle Lutetian of Orthez and Veneto (Schaub).

Depository — Institute of Paleontology (Modena University) Nos. 6048-6052.

NUMMULITES BRONGNIARTI

d'Archiac & Haime

Nummulites brongniarti D'ARCHIAC & HAIME, 1883, Descr. an. foss. groupe Numm., pp. 110-112, pl. 5, figs. 1-3; BOUSSAC, 1911, Mém. serv. expl. Carte Géol. dét. France, pp. 75-78, pl. 4, figs. 1, 7, 8, 11, 14 (*non* pl. 4, fig. 2); GOMEZ LLUECA, 1929, Com. Inv. Pal. y Preh., N° 36, pp. 198-201, pl. 12, figs. 11-14;

Laharpeia brongniarti PREVER, 1902, Mém. Soc. Pal. Suisse, vol. 29, pp. 46-47, pl. 2, figs. 7-9.

A Form

Pl. 29, fig. 1

Description — Lenticular form, not of large dimensions, with rounded margin. The septal filaments are irregular, forked and with frequent anastomisations and formation of a network of irregular, often open, meshes. Small tubercles lie on the septal filaments or are attached to them. The spire is tight, increasing in the first whorl, constant or decreasing thereafter. The spiral lamina is strong, equal to 1/3-2/3 of the light of the spiral canal. The septa are coarse, bending back slightly, sometimes almost straight and are few in number. The chambers are slightly longer than they are high in the first whorl; in the outer whorls the length is 3-4 times more than the height. The nucleoconch is anisolepidine and of me-

dium size (600-800 μ) with globular protoconch (400-500 μ) and an almost hemispheric deuteroconch. The vertical section shows a slight polar swelling of the specimens.

$$\text{Dimension} — \frac{D}{T} = \frac{5,0}{1,9} ; \frac{4,9}{1,57} ; \frac{3,5}{1,1} ; \frac{2,7}{0,9} ; \frac{2,35}{0,87} \text{ mm.}$$

Number of septa per whorl:

1st whorl	septa Nos.	7- 8
2nd whorl	»	» 9-11
3rd whorl	»	» 11-14
4th whorl	»	» 14-18
5th whorl	»	» 5 in 1/4 of the whorl

Material available — 9 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4.

B Form
Pl. 29, fig. 2

The microspheric form presents an ornamentation with tighter meshes and more numerous tubercles but of smaller dimensions than can be seen in the A Form. In equatorial section the spire increases regularly up to about 1/3 of the radius then tightens and starts undulating. As in the macrospheric form, the whorls are nearer, so that the thickness of the spiral lamina is almost equal to the light of the spiral canal. The septa and chambers are the same as in the macrospheric form.

Material available — 3 specimens.

$$\text{Dimensions} — \frac{D}{T} = \frac{12,4}{4,2} ; \frac{11,0}{4,9} ; \frac{8,1}{2,5} \text{ mm.}$$

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Sample 3.

Remarks — From the available bibliography *N. brongniarti* seems to present in the Lower and Middle Lutetian chambers which are much longer than they are high,

whilst in the Upper Lutetian and in the Bartonian the spire seems to be somewhat wider and the chambers far less long. An accurate study of this characteristic could lead to the confirmation of our findings.

Range and distribution — Lutetian of Roncà (*Loc. tip.*, d'Archiac & Haime) and Rovereto (*vide* Castellarin) in the Veneto province, lower Alps of Lombardy (Vialli), Ventimiglia, Menton and Maritime Alps (Boussac), Priaboniano of Florence (*vide* Azaroli).

Depository — Institute of Paleontology (Modena University) Nos. 6053-6058.

NUMMULITES cfr. FABIANII (Prever)
B Form
Pl. 29, figs. 3a, b

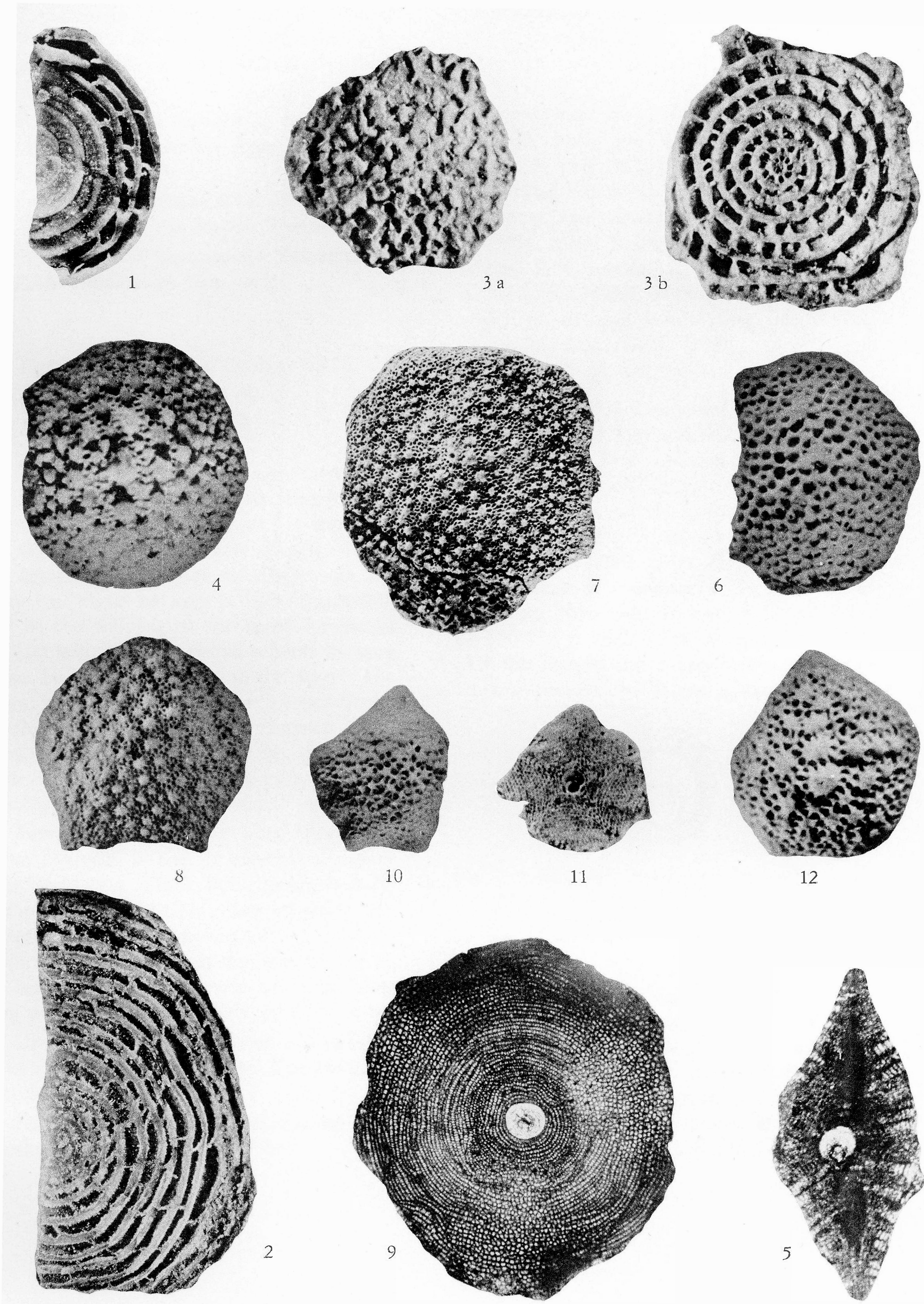
Bruguiera fabianii PREVER in FABIANI 1905, Atti R. Ist. Veneto Sc. Lett. e Arti, vol. 64, n. 2, pp. 1805, 1811 (*vide* Cat. of Foram.).

Since I found only the two equatorial sections of a single specimen, it is impossible to describe the general form and the margin of the specimen. The only section that it was possible to free from incrustations was seen to bulge regularly (diameter 3,25 mm; thickness 0,65 mm). The ornamentation is made up of thickened and evident septal filaments that show an irregular zig-zag behaviour frequently intertwined and dichotomous. At the point of intertwining and of dichotomy of the filaments, thickenings are formed, and sometimes tubercles that get an approximate spiral going near the margin. In equatorial section a slowly unfolding spire with 7 whorls can be seen. The spiral lamina is pretty strong and represents 1/2-1/3 of the light of the spiral canal. The septa are irregularly spaced, bigger at the base, sloping slightly on the spiral lamina of the former whorl and very slightly bent in their upper part. The chambers are subsquare or slightly higher than they are long in the first whorl, become wider than they are high thereafter.

EXPLANATION OF PLATE 29

- Figs. 1 - *Nummulites brongniarti* d'Archiac & Haime (A Form). Equatorial section, Sample 3, x10.
2 - *Nummulites brongniarti* d'Archiac & Haime (B Form). Equatorial section, Sample 3, x6,5.
3a-b - *Nummulites* cfr. *fabianii* (Prever) (B Form). 3a, external view; 3b, equatorial section, Sample 9, x17.
4-5 - *Discocyclina douvillei* (Schlumberger). 4, external view, Sample 1, x14,5; 5, Vertical section, Sample 1, x27.
6 - *Discocyclina chudeaui* (Schlumberger). External view, Sample 9, x16.
7-9 - *Discocyclina scalaris* (Schlumberger). 7,8, external view, Sample 3, x11; 9, equatorial section, Sample 1, x13.
10 - *Asterocyclina stellata* (d'Archiac). External view, Sample 2, x10.
11-12 - *Asterocyclina stella* (Gümbel). 11, equatorial section, Sample 2, x24; 12, external view, Sample 9, x28,3.

A. SIROTTI, NUMMULITIDAE AND ORBITOIDIDAE FROM « MOLASSE DI RIO GIORDANO »



Remarks — The equatorial section is very characteristic and differs from that of *N. fabianii* (Prever) because of the tighter spire and the larger number of whorls, therein resembling *N. problematicus* Tellini (= *N. retatus* Roveda). As only one specimen is available, a more definite classification is impossible.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Sample 9.

Range and distribution — *N. fabianii* is well known from the Upper Eocene.

Depository — Institute of Paleontology (Modena University) Nos. 6059.

Gen. OPERCULINA d'Orbigny 1826

OPERCULINA sp.

Pl. 28, fig. 8

Description — A single specimen from sample 1, in equatorial section. The form is generally flat (diameter mm 0,95; thickness mm 0,40). The outer surface does not show the trace of any structure. Only near the poles can there be seen a little depression due to the welding of the spiral lamina of the last whorl. In equatorial section we note three incomplete whorls of the spire. The septa, in their lower part, are perpendicular to the spiral lamina of the former whorl then, two thirds of the way up, they bend back strongly. The nucleoconch, of very small dimensions, is isolepidine.

Remarks — It differs from *Operculina alpina* Douvillé in that it presents a tighter spire and septa which bend more strongly in their upper part. The shape of septa and growth of the spire are similar to *O. formai* Parisch, but from the photographs by the A. we may note that *O. formai* has more plentiful septa and a completely involute spire.

Occurrence — « Formazione di Rio Giordano » (Modenese Northern Apennines). Sample 1.

Depository — Institute of Paleontology (Modena University) Nos. 6060.

Fam. ORBITOIDIDAE

Subfam. ORTHOPHRAGMININAE

Neumann 1958

Gen. DISCOCYCLINA Gümbel 1870

DISCOCYCLINA DOUVILLEI (Schlumberger)

Pl. 29, figs. 4, 5

Text-fig. 7

Ortophragmina douvillei SCHLUMBERGER, 1903, Bull. Soc. Géol. France, ser. 4, vol. 3, pag. 283, pl. 9, figs. 21-24 (*fide* Cat. of Foram.);

Discocyclina douvillei SCHWEIGHAUSER, 1954, Mém. Suisses Pal., vol. 70, pl. 12, figs. 3, 4, text-fig. 53; NEUMANN, 1958, Mém. Soc. Géol. France, vol. 37, pp. 92, 93, pl. 11, figs. 4-9, text-fig. 26; BIEDA, 1963b, Inst. Geol. Prace, vol. 37, pp. 117, 118, pl. 18, fig. 1.

Description — Lenticular form with diameter of 2,5-3,5 mm and thickness of about 1,2-1,5 mm. The specimens present a strongly developed median thickening that occupies approximately 3/4 of the diameter. The apex of this is occupied by a big tubercle of 180-220 μ in diameter, around which there is a rosette with 9-10 lateral chambers. Near this we note 8-10 tubercles of 100-120 μ with 8 lateral chambers; towards the margin the tubercles become smaller and present 5-7 lateral chambers.

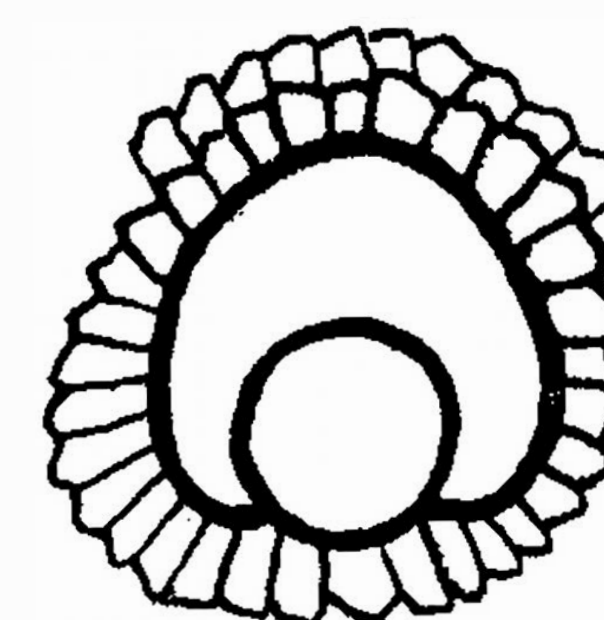


Fig. 7 — Schematic drawing of the embryonic apparatus in *D. douvillei* (Schlumberger) x 45. In all drawings, relationship between thicknesses of the walls is respected.

The equatorial section shows an embryonic eudiscodina apparatus with a rounded protoconch of about 140 μ diameter tangent to a globular deuteroconch 200-250 $\times$ 250-280 μ in diameter. The nepionic stage presents 25-30 rectangular chambers (60 $\times$ 40 or 50 $\times$ 35 μ) slightly larger than

the next chamberlets. In the peripheric part we note chamberlets of $70 \times 40 \mu$; all chamberlets have a strong tendency to hexagonality. The annular chambers are generally undulating and thus resemble in equatorial section the behaviour of *Asterocyclina*. In vertical section the equatorial chambers near the embryo are $25-30 \mu$ high, $70-80 \mu$ towards the border.

Remarks — Our specimens present longer and more numerous nepionic chambers than the specimens of *D. douvillei* described by Neumann (1958), herein resembling that figured by Schweighauser (1954).

Material available — 21 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4, 8.

Range and distribution — Paleocene, Ypresian and Lutetian of Mossano and M. Baldo (Schweighauser); Ypresian and Lutetian of Aquitaine (Neumann); Middle Lutetian of Hungary (Kecskemeti); Upper Lutetian and Bartonian of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6061-6063.

DISCOCYCLINA CHUDEAUI (Schlumberger)
Pl. 29, fig. 6

Orthophragmina chudeaui SCHLUMBERGER, 1903, Bull. Soc. Géol. France, ser. 4, vol. 3, pag. 282, pl. 9, figs. 18-20 (*vide* Cat. of Foram.);

Discocyclina chudeaui SCHWEIGHAUSER, 1954, Mém. Suisses Pal., vol. 70, pp. 51, 52, pl. 9, figs. 4, 7, 12, text-fig. 20; NEUMANN, 1958, Mém. Soc. Géol. France, vol. 37, pp. 87, 88, pl. 13, figs. 1-6, pl. 34, fig. 1, text-fig. 23.

Description — Specimens of small dimensions with only a little part of the border thinned.

The diameter is 1,8-2,5 mm, the thickness 1,2-1,5 mm. The central tubercles are of small dimensions and are surrounded by 6, very occasionally 7 rhomboidal chambers

with sides of about 100μ , the same as the distance between one tubercle and another. In the peripheric zone the tubercles are of smaller dimensions ($50-60 \mu$) and present a rosette with 4-5 lateral chambers. In equatorial section we note an eudiscodine nucleconch with spheric protoconch ($200-250 \mu$) internally tangent to an elliptic deuteroconch of $400-450 \mu$. The nepionic stage is represented by an auxiliary protoconchal chamber ($50 \times 45 \mu$), two auxiliary primary chambers ($45 \times 60 \mu$) and by 18-22 auxiliary chambers slightly higher than they are long ($50 \times 40 \mu$) with the upper part pointed.

The chamberlets of the first cycles are subsquare (about $40 \times 40 \mu$); in the last parts it is sometimes possible to observe chamberlets which are excessively high and narrow. In vertical section the equatorial chambers are 25μ high near the embryo, $50-60 \mu$ by the border. The lateral chambers are large clefts $80-100 \mu$ long and 30μ high near the poles.

Remarks — Our specimens present an embryonic apparatus of smaller dimensions than *D. chudeaui* Neumann, and this agrees with what was noted by Schweighauser (1954).

Material available — 11 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4, 9.

Range and distribution — Upper Paleocene - Middle Lutetian of Mossano and M. Baldo in the Veneto province (Schweighauser); Middle Lutetian of Hungary (Kecskemeti); Upper Lutetian and Bartonian of Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6064, 6065.

DISCOCYCLINA SCALARIS (Schlumberger)
Pl. 29, figs. 7-9
Text-fig. 8

Orthophragmina scalaris SCHLUMBERGER, 1903, Bull. Soc. Géol. France, ser. 4, vol. 3, pag. 277, pl. 8, fig. 4, pl. 9, figs. 12, 13 (*vide* Cat. of Foram.);

Discocyclina scalaris NEUMANN, 1958, Mém. Soc. Géol. France, vol. 37, pp. 104-106, pl. 21, figs. 1-6, pl. 25, figs. 3,4, text-fig. 32; BIEDA, 1963b, Inst. Geol. Prace, vol. 37, pp. 122, 123, pl. 20, figs. 2-4.

Description — Specimens of medium size, lenticular, with thickness regularly increasing from the border to the middle. The surface is covered by tubercles decreasing in diameter from the middle (180-200 μ) to the periferic parts (80-100 μ). The rosette around every tubercle is formed by 10-11 lateral chambers of lenghtened form. The diameter is 2,2-5 mm, the thickness 1-1,9 mm.

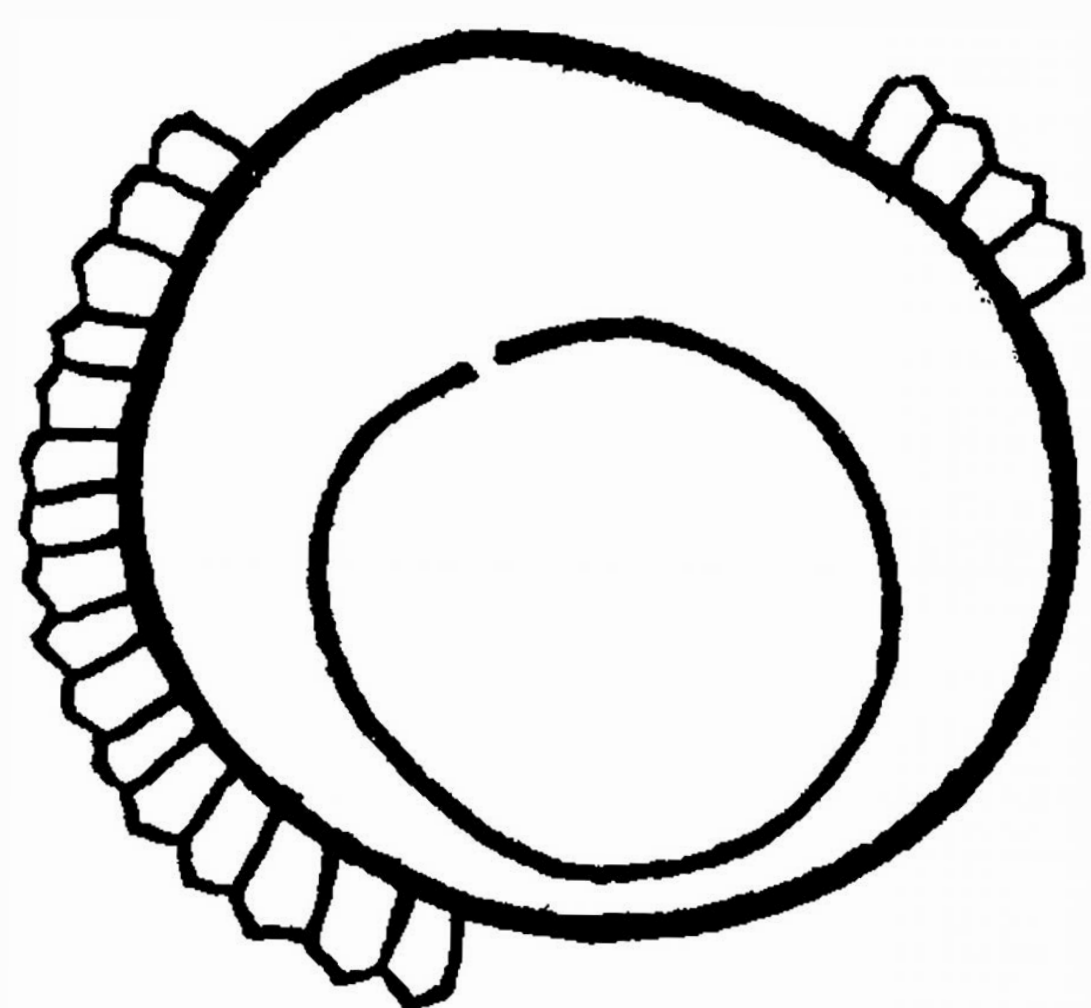


Fig. 8 — Schematic drawing of the embryonic apparatus in *D. scalaris* (Schlumberger) $\times 62,3$.

The nucleoconch is eudiscodine with a spheric protoconch (200-235 μ) totally internal to the deuteroconch (400-450 $\times$ 440-480 μ). The nepionic stage is characterized by a large number (30-38) of subsquare (35 $\times$ 40 μ) or rectangular (35 $\times$ 50 μ) chambers. Chamberlets are rectangular (50 $\times$ 40 μ at half the radius) and their length tends to increase towards the peripheric parts where we see chamberlets which are excessively high and narrow (85 $\times$ 35 μ).

Remarks — Schweighauser (1954) and Kecs-kemeti (1959) have found that *D. scalaris* can present an embryonic trybliolepine apparatus. With such an embryonic apparatus it may be confused with *D. archiaci* (Schlumberger) (see Vialli, 1951). We note, however, that *D. archiaci* presents a lower number of chambers in the rosette.

Material available — About 80 specimens.

Occurrence — « Molasse di Rio Giorda-

no » (Modenese Northern Apennines). Common in every sample.

Range and distribution — Ypresian and Lower Lutetian of M. Postale and Valdeforte, in the Veneto province (Schweighauser); Middle Lutetian of Hungary (Kecs-kemeti); Upper Lutetian and Bartonian of Aquitaine (Neumann) and of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6066-6073.

DISCOCYCLINA FORTISI (d'Archiac)

Text-fig. 9

Orbitolites fortisii D'ARCHIAC, 1850, Mém. Soc. Géol. France, vol. 3, pag. 404, pl. 8, figs. 10-12 (*fide* Cat. of Foram.);

Discocyclina fortisi NEUMANN, 1958, Mém. Soc. Géol. France, ser. 4, vol. 3, pp. 94-97, pl. 15, figs. 3-6, pl. 16, figs. 1-5, pl. 28, figs. 1, 2, text-fig. 27.

Description — The species has been recognized in some fragments and in a whole specimen (diameter 7,6 mm) in sample 1. The specimen is flattenend with a slight median swelling more marked on one face than on the other. The surface is covered by granules of 140-160 μ around which are disposed 4-6 lateral chambers. The embryonic apparatus presents a protoconch of 675 $\times$ 550 μ

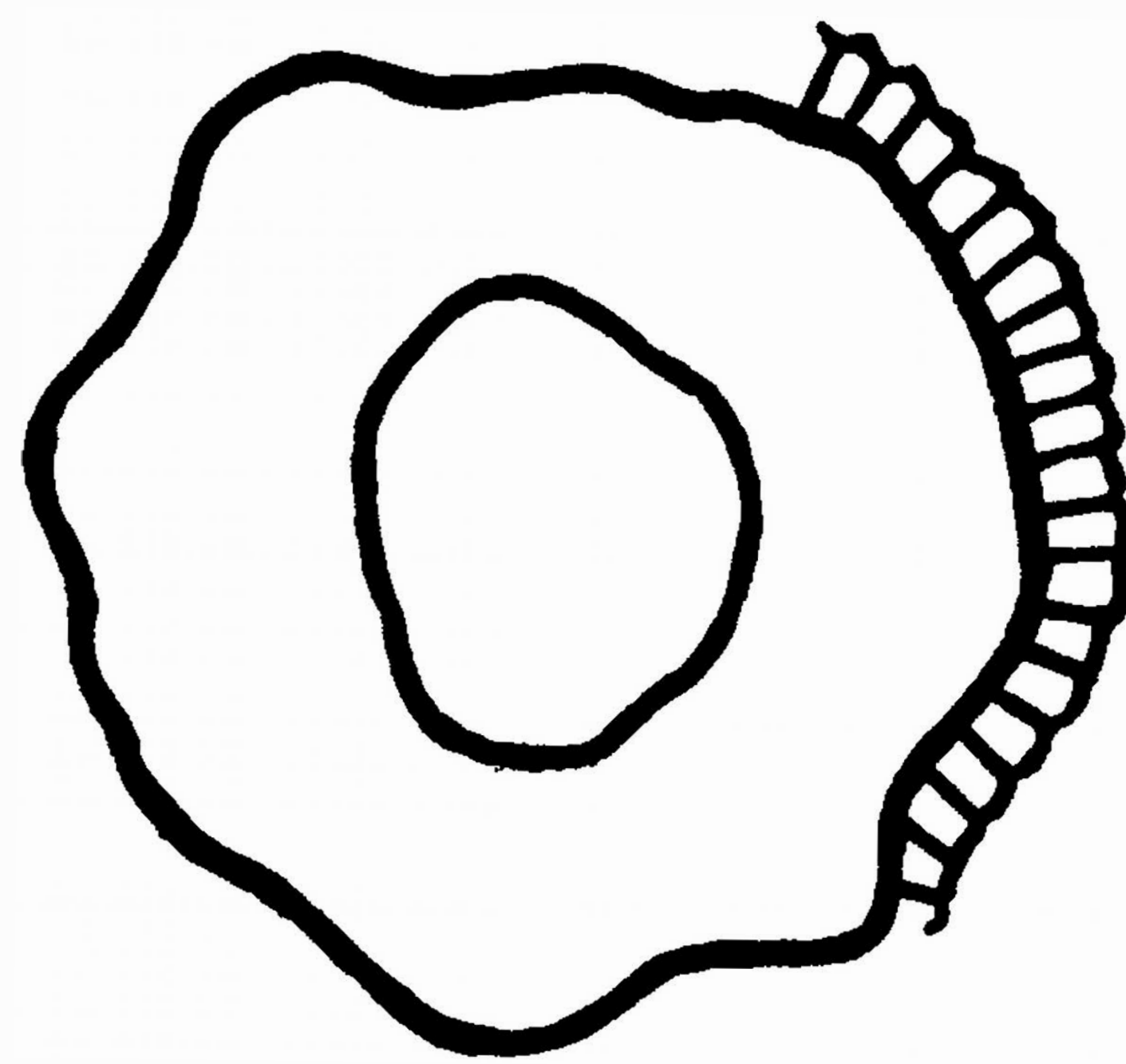


Fig. 9 — Schematic drawing of the embryonic apparatus in *D. fortisi* (dArchiac) $\times 26,6$.

totally internal to the deuteroconch (1000 $\times$ 1500 μ). The chambers of the nepionic stage are numerous, high and narrow (100 $\times$

$\times 25 \mu$). At half the radius the chamberlets are about $75 \times 50 \mu$.

Remarks — The character of the embryonic apparatus, similar to that represented by Neumann (1958) in tab. 26, fig. 2, means that the specimen belongs without doubt to *D. fortisi*.

Range and distribution — Lower Eocene of India (Nuttal, *sub D. archiaci* var. *balucistanensis*); Lower Lutetian of Aquitaine (Neumann); Upper Lutetian and Bartonian of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) No. 6074.

Gen. ASTEROCYCLINA Gümbel, 1870
 ASTEROCYCLINA STELLA Gümbel
 Pl. 29, figs. 11, 12
 Text-fig. 10

Orbitoides stella GÜMBEL, 1868, K. Bayer. Akad. Wiss., vol. 10, fasc. 2, pag. 716, pl. 2, figs. 8-10, 17, 19 (*vide* Cat. of Foram.);

Asterocyclina stella SCHWEIGHAUSER, 1954, Mém. Suisses Pal., vol. 70, pp. 90, 91, pl. 13, figs. 6, 8, text-fig. 59; KECSKEMETI, 1959, Ann. Hist. Nat. Musei Nationalis Hungarici, vol. 51, pp. 70, 71, pl. 5, figs. 9, 12, text-fig. 28.

Asterodiscus stella NEUMANN, 1958, Mém. Soc. Géol. France, vol. 37, pp. 112-114, pl. 28, figs. 1-6, text-fig. 36.

Description — Pentagonal specimens, with one arm slightly more developed. The dimensions are small, reaching a diameter of

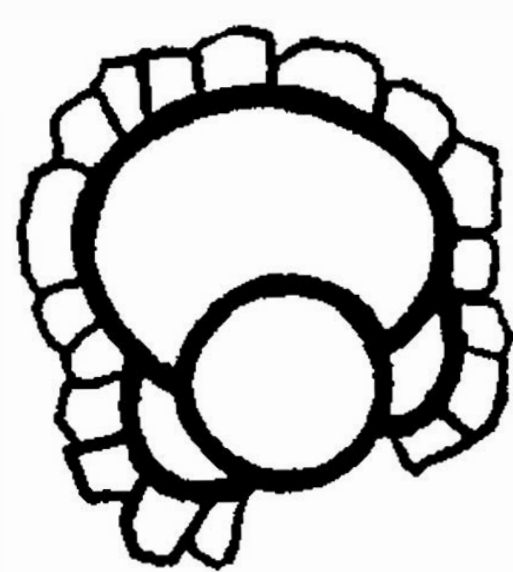


Fig. 10 — Schematic drawing of the embryonic apparatus in *A. stella* Gümbel $\times 63,6$.

no more than 1,7 mm and thickness of 0,9 mm. The central granules present 100-120 μ and are surrounded by 10-11 lateral cham-

bers. Sometimes amongst them there are granules 40-50 μ in diameter. The equatorial section is on the whole similar to that of *A. stellata* (d'Archiac), but with chamberlets slightly smaller.

Remarks — Among the sections carried out we did not find specimens with an embryonic apparatus of the type illustrated by Schweighauser (1954) in fig. 59".

Material available — 18 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-4.

Range and distribution — Paleocene and Eocene of Veneto province (Schweighauser); Lutetian and Priabonian of Aquitaine (Neumann); Middle Lutetian of Hungary (Kecskemeti); Upper Lutetian and Bartonian of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6075-6078.

ASTEROCYCLINA STELLATA (d'Archiac)
 Pl. 29, fig. 10

Calcarina ? stellata D'ARCHIAC, 1846, Mém. Soc. Géol. France, ser. 2, vol. 2, pag. 199, pl. 8, figs. 1, 1a (*vide* Cat. of Foram.);

Asterodiscus stellatus NEUMANN, 1958, Mém. Soc. Géol. France, vol. 37, pp. 116-118, pl. 30, figs. 1-7, text-fig. 38;

Asterocyclina stellata KECSKEMETI, 1959, Ann. Hist. Nat. Musei Nationalis Hungarici, vol. 51, pp. 68-70, pl. 5, figs. 8, 11, text-fig. 27.

Description — Pentagonal specimens with pronounced bulging and one arm more developed than the others. The ornamentation is similar to that of *D. chudeaui* (Schlumberger) with a few central tubercles about 100 μ in diameter and a rosette of 5-6 lateral chambers. The other granules (diameter 50-60 μ) present 4-5 lateral chambers and are 50-60 μ apart, closer together and smaller than in *D. chudeaui*. The dimensions of the specimens are 2-2,5 mm in dia-

meter and 1-1,3 mm in thickness. The nucleoconch is nephrodiscodine with a spheric protoconch (110 μ) half internal to the deuterioconch (about 150 $\times$ 180 μ). The equatorial chambers lying on the radii measure 30 $\times$ 50 μ .

Material available — 25 specimens.

Occurrence — « Molasse di Rio Giordano » (Modenese Northern Apennines). Samples 1-3, 9.

Range and distribution — Lower Lutetian of the lower Alps of Lombardy (Vialli); Middle Lutetian of Hungary; Upper Lutetian of Aquitaine (Neumann); Lutetian and Priabonian of Mossano, M. Baldo and M. Vagina (Schweighauser) and of southern Poland (Bieda).

Depository — Institute of Paleontology (Modena University) Nos. 6079-6082.

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