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UPPER JURASSIC AND LOWER CRETACEOUS MICROFACIES FROM THE BICAZ VALLEY BASSIN (EAST CARPATHIANS)

BUCAREST 1975

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CONTENT

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UPPER JURASSIC AND LOWER CRETACEOUS MICROFACIES FROM THE BICAZ VALLEY BASIN (EAST CARPATHIANS)[1]

BY

OVIDIU DRAGASTAN [2]

Résumé

Microfaciès du Jurassique supérieur et du Crétacé inférieur du bassin de la vallée du Bicaz (Carpates Orientales). La région de la vallée du Bicaz (Carpates Orientales)offre par l'application de la méthode microfaciale des conditions optimales d'étude et de datation des massifs calcaires développés surtout dans le cadre de la Nappe du Hăghimaș. L'ouvrage, qui se limite à l'étude des formations de l'intervalle Kimméridgien-Aptien inférieur qui constituent la Nappe du Hăghimaș, a permis de séparer les suivantes zones microfaciales : la Zone à *„Proloqlobigerinae"*, la Zone à *Saccocoma*, la Zone à *Paalzowella*, la Zone à *„Pianella" pygmaea*, la Zone à *Kurnubia jurassica*, la Zone à *Bankia striata*, la Zone à *Clypeina jurassica*, la Zone à *Calpionella*, la Zone à *Calpionellopsis*, la Zone à *Lorenziella/Salpingoporella annulata*, la Zone à *Ostracodes*, la Zone à *Pseudocyclammina hedbergi*, la Zone à *Likanella? danilovae* et la Zone à *Atopochara* ou à *Palaeodictyoconus arabicus*. On discute la limite Jurassique/Crétacé, ayant trait à certains aspects particuliers soulevés par la région de la vallée du Bicaz et l'on essaie d'éffectuer la séparation de quelques zones dans l'intervalle du Tithonique supérieur-Valanginien à partir de quelques algues de la famille des Dasycladaceae ainsi qu'en vertu de quelques foraminifères de la famille des Lituolidae. On essaie également une corrélation du niveau du Jurassique supérieur-Crétacé inférieur, entre les zones microfaciales séparées dans la région de la vallée du Bicaz (Carpates Orientales) et des secteurs situés dans le cadre du géosynclinal alpin : les klippes pieninnes, le Haut Tatra, les Apennins centraux et les Dinarides externes, les Cévennes, le bassin de l'Aquitaine, la province de Castellon et les environs de Lisbonne.

Before proceeding to the presentation of the paper, I wish to express my thanks to prof. M. G. Filipescu, the leader and the initiator of this paper, for his useful advice during the elaboration of the work. I am much indebted to my colleague M. Diaconu from the Ministry of Mines, Petroleum and Geology for his assistance in talking over some subjects relating to the geological map of the region, as well as to those who gave me, by discussions or on other opportunities, the necessary indications for the clearing up of various subjects. I am also deeply grateful to dr. D. Turnsek from the Academy of Zagreb for his amiability in determining some various types of Hydrozoans and Corals, and to prof. R. Schroeder from the Geneva University for his precious indications on the Orbitolinidae association found in the Bicaz Valley Region (East Carpathians).

All my thanks to Mrs. I. Baltac for her utmost care in carrying out the necessary graphic material for this paper, as well as to I. Mitru, the technical laboratory assistant, who did together with me the photographic material.

INTRODUCTION

The studied area is situated in the central part of the East Carpathians (Fig. 1). The microfacial studies had been limited to six predominantly and difficult calcareous massifs, which gave rise to a lot of problems connected to the selection of the type sections.

[1] This study was presented as subject of the Thesis for my doctor's degree examination to the Scientific Council of the Faculty of Geology-Geography, University of Bucharest, June 21, 1971.

[2] University of Bucharest, Laboratory of Palaeontology, Bd. N. Bălcescu no. 1, Romania.

The investigated area is placed in the central part of the East Carpathians, being crossed by the Bicaz Valley, the most important river, which represents by its defile the most beautiful and impressive sector of the Carpathian Chain.

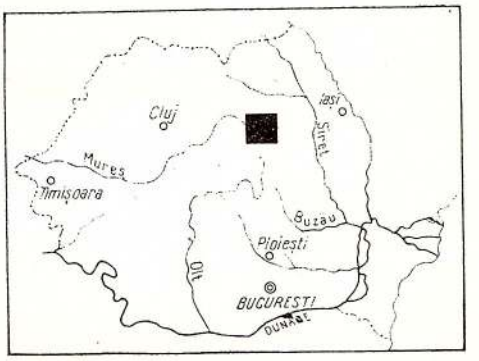

Fig. 1. — Emplacement of the Bicaz Valley Region on the Romanian territory.

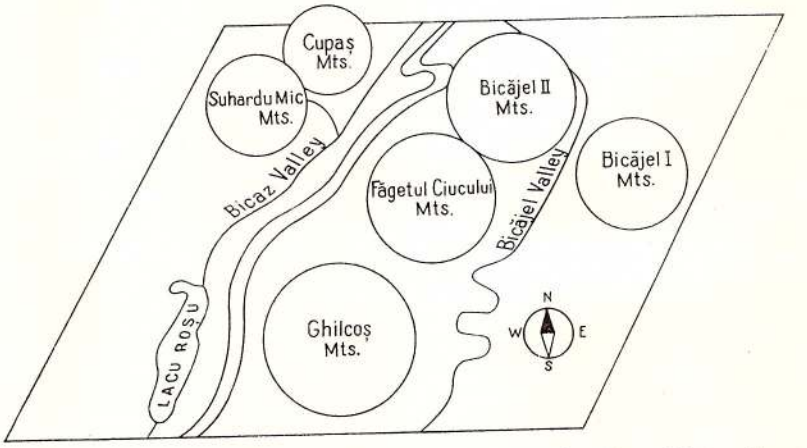

Fig. 2. — Studies of the massif's emplacement on the Bicaz Valley Map.

The investigated massifs are located in the northern part of the Hăghimaș Mts being represented by : southwards, the Ghilcoș massif (1405 m) ; northwards, the Suhardu Mic massif (1352 m), and the Făgetul Ciucului massif (1267 m) and the Bicăjel I, Bicăjel II and Cupaș massifs with variable altitudes from 1,000 to 1,100 m (Fig. 2).

The hydrographical network is subsidiary to the Bicaz river, the main water of the area, whch drains all the western and eastern tributaries that strain squeeze through the calcareous massifs. Hydrographically, the Bicaz is a transversal valley which passes a big synclinorium striking NE—SW, with a typical V section, protected by steep slopes with several overlaps.

HISTORY OF GEOLOGICAL INVESTIGATIONS

The first geological studies relating to the Hăghimaș Mts. date from 1856, when Fr. Hauer pointed to the jasper occurrences at the base of the Stramberg Limestones.

After 1860, Fr. Herbich studied the Tulgheș and Hăghimaș Mountains area, and later on in 1866 he found out the fossiliferous point of the "*Acanthicum* Beds" at the western slope basement of the Ghilcoș massif. The paleontological material collected from various points of the Hăghimaș Mountains was given to M. Neumayr for study. The papers came out in 1871 and 1873. These papers made for "*Acanthicum* Beds" of Ghilcoș a famous fossiliferous point. Stratigraphically, Neumayr reached the conclusion that the whole complex of the "*Acanthicum* Beds" could be related to two horizons or zones : a lower zone with *Phylloceras isotypum* equivalent to the *Oppelia tenuilobata* Zone and an upper zone with *Aspidoceras beckeri.*

In 1878, Fr. Herbich brought up, in a general regional paper, the stratigraphy of the Malm and Tithonian from the Ghilcoș region, distinguishing, like Neumayr, two horizons or zones, but using for the separation of the two zones *Terebratula janitor* Pictet brachiopod as guide mark.

Relying on the data and information given by Fr. Herbich's paper, I sketched the geological section which sums up the first attempt of stratigraphical interpretation for the Malm in this area (Fig. 3).

In 1922 E. Jekelius studying the Mesozoic deposits of the Hăghimaș Mts clarified the position of some index zone ammonites, thus placing *Sutneria platynota* at the lower part of the

"*Acanthicum* Beds". Jekelius also compared the "*Acanthicum* Beds" from this area to those encountered southwards, at Poliţie, in the Bucegi massif.

A new investigation phase of the Bicaz Region began with I. Atanasiu. From 1919 to 1939, Atanasiu minutely studied this region, distinguishing, from the geological viewpoint, three sedimentary cycles with clear unconformabilities among them: the Lower Triassic-Lower

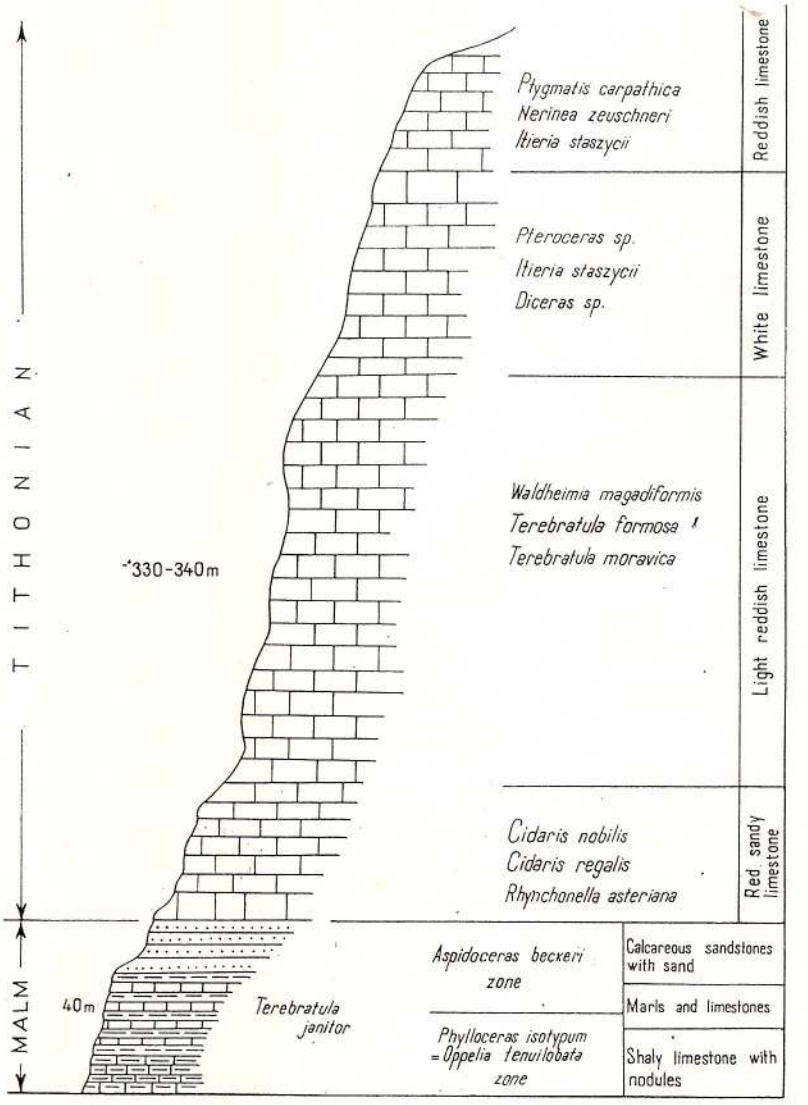

Fig. 3. — Upper Jurassic schematic column from Ghilcoş Mts., after Herbich's information (1878).

Liassic cycle; the Dogger-Portlandian (Lower Cretaceous?) cycle; and Middle Cretaceous cycle (*Orbitolina* Beds).

Atanasiu is also the first researcher who accepted the continuity between the Malm calcareous facies and the Lower Cretaceous (Neocomian) one. I. Atanasiu seems to have no doubt as regards the Neocomian existence. On his map, in the Hăghimaş plateau there are outlined some marly limestone patches considered probably as Lower Cretaceous in age. In his collection I found a gasteropod determined as *Neritopsis*. It comes from yellowish limestones resembling those wherein *Leviathania leviathan* was found in the Ghilcoş and Suhardu Mic massifs and which now represents only *Trochonatica helvetica* (Pictet and Campiche), species typical for the Valanginian age.

A paper with a true petrographical character related to the Bicaz region appeared in 1940 and belonged to M. Frollo. The author described, for the first time, the *Cayeuxia* genus with *moldavica* and *piae* species which were found in the Bardos massifs as type-locality. At the same time, she showed that the absence of the Calpionellids from the Crystalline Mesozoic Zone seemed

to be an inexplicable and exciting fact because they were found in the Flysch zone of the East Carpathians.

W. J. Arkell also made some references to the "*Acanthicum* Beds" from Ghilcoș. In his paper "Jurassic of the World", the author separated within this complex relying on Herbich's and Neumayr's fauna lists, *Phylloceras isotypum* = *Oppelia tenuilobata* Zone which would corres-

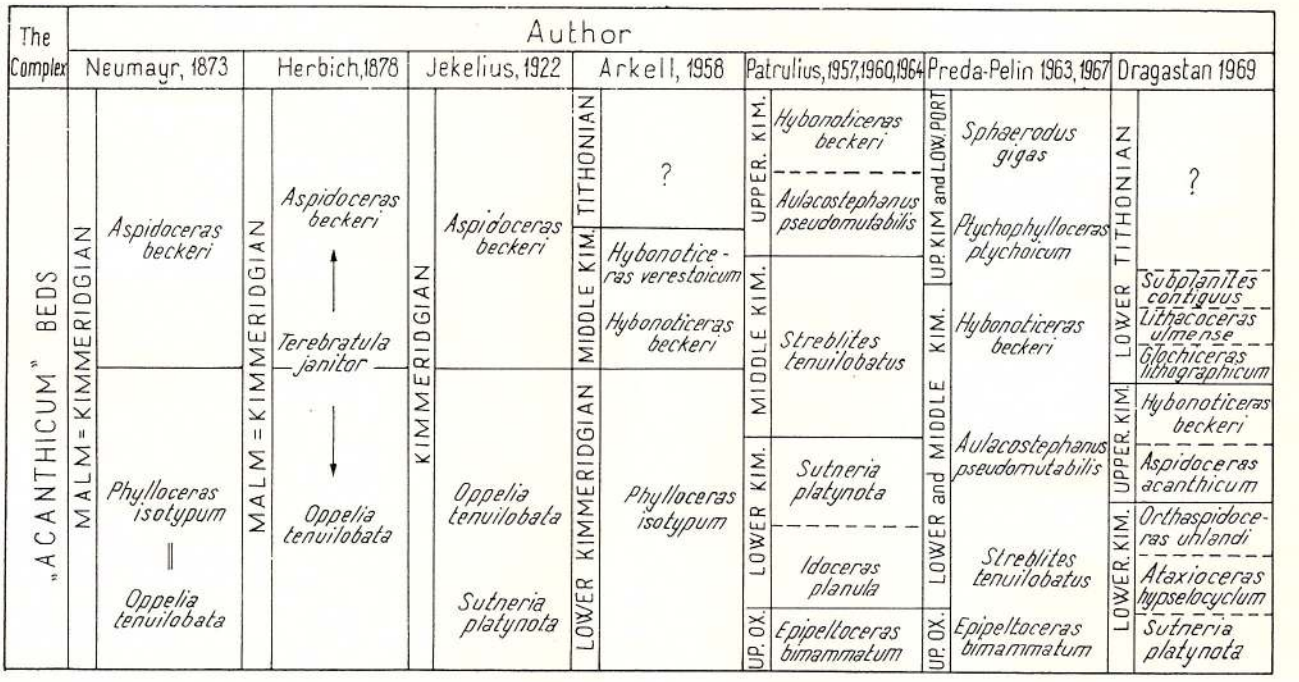

Fig. 4. — Evolution of the ideas with regard to stratigraphy of „*Acanthicum*" Beds from the western slope of the Ghilcoș syncline.

pond to the Lower Kimmeridgian age; Middle Kimmeridgian is represented by two subzones = *Hybonoticeras beckeri* and *H. verestoicum*, being followed in continuation of sedimentation by the Tithonian deposits (Fig. 4). In this way, Arkell considered the "*Acanthicum* Beds" from Ghilcoș Kimmeridgian-Lower Tithonian in age, but he could not define the last interval by faunas.

Studies concerning this region were also done by I. Băncilă (1941, 1958) who, like I. Atanasiu, advocated the continuity of sedimentation between the Jurassic and Cretaceous calcareous formations.

In 1957, D. Patrulius showed that, among the Ghilcoș fauna, namely in the *Streblites tenuilobatus* Zone, the Upper Oxfordian would be included, too. In the same scheme adopted by the author the *Bimmamatum* and *Planula* zones were comprised in the lowermost part of the "*Acanthicum* Beds" complex (Fig. 4). In the subsequent papers from 1960, 1964 and 1969, Patrulius brought up again the Ghilcoș "*Acanthicum* Beds" showing their lithological and paleontological affinities with those of Poliție from the Bucegi Massif. Patrulius also affirmed the discontinuity between the Jurassic and Cretaceous limestones in the Bicaz Region, where the red Tithonian limestones would support marls and sandstones with *Neithea atava* (Roemer), species attesting the Upper Barremian-Lower Aptian age.

From 1962 and then from 1963 to 1965, I. Preda and M. Pelin, investigating the Hăghimaș Region, brought new stratigraphical arguments regarding the Mesozoic formations of the area. Thus, among the "*Acanthicum* Beds", these authors distinguished three horizons: the nodular red limestone horizon, Upper Oxfordian in age; the grey limestone horizon Lower and Middle Kimmeridgian in age; and the calcareous sandstone horizon weakly fossiliferous, Upper Kimmeridgian-Lower Portlandian in age (Fig. 4).

In 1967, M. Pelin brought paleontological arguments and completed the data concerning the stratigraphy of the Upper Jurassic. He even pointed to the Neocomian presence in the Hăghimaș region, without separating it from the Urgonian.

In several papers came out from 1967 to 1971, M. Săndulescu attested the presence of the Upper Tithonian-Valanginian relying on some algae and foraminifera encountered on the eastern slope of the Hăghimaș Syncline; he also argued the superposed overthrust tectonic units such as: the Hăghimaș Nappe, the Bucovinian Nappe and Sub-Bucovinian one of this region. Contrary to this idea, I. Preda published in 1969 a paper with a tectonical character in which he showed that the Mesozoic formations of the Hăghimaș Syncline had a geological structure made up of westward overturned scales.

In several papers published from 1969 to 1971, C. Grasu made considerations regarding the Malm facies of the Tulgheș—Hăghimaș—Ciuc Syncline, as well as to the Neocomian presence in the Hăghimașul Negru massif pointing to *Berriasella* cf. *privasensis* (Pictet) and *Neocomites neocomiensis* (d'Orb.) species. According to C. Grasu these species would indicate an Upper Berriasian-Valanginian age, thus bringing a convincing argument in favour of Atanasiu's assumption who considered the outlier of marly limestones from the Hăghimașul Negru plateau Neocomian in age. Lately, C. Grasu seems to admit, with certain reserves, the Hăghimaș Nappe separated by M. Săndulescu.

Recently, A. Baltreș (1970) has investigated, from the microfacial viewpoint, the limestone elements included within the Wildflysch Formation from the southern part of the Hăghimaș Mts. (the Trotuș springs). He also gave a lot of ecological and stratigraphical remarks regarding the foraminifera and algae assemblages (Codiaceae and Dasycladaceae), which points to the Lower Cretaceous age of these elements. From 1968 to 1971, O. Dragastan presented some paleontological and microfacial data which permit the establishing of a new stratigraphical scale for the Malm-Urgonian interval. At the same time, since 1968, he has pointed to the *Leviathania* and *Ampullospira* association, beside *Calpionellopsis oblonga* (Cadisch), *C. simplex* (Colom) and *Tintinnopsella carpathica* (Murg. et Filip.), Berriasian-Valanginian in age; he also proved the continuity of sedimentation between the Jurassic and Cretaceous limestones in this region.

STRATIGRAPHICAL SCALE

The adopted stratigraphical scale corresponds to the scheme used by W. J. Arkell (1956) and one of the solutions approved at the Jurassic Colloquium from Luxemburg (1962, 1967).

The problem of the Upper Malm stages was partly solved because, depending on provinces, the Kimmeridgian is more widespread than the Portlandian or vice versa. However, in the Mediterranean region or in the southern province of Europe, the lower boundary of the Kimmeridgian is well outlined by the *Platynota* Zone; the Upper boundary between the Kimmeridgian and the Portlandian/Tithonian would be placed, at the same time with the *Gravesiana* Zone appearance — a zone with a large distribution in both provinces, which was unanimously accepted (Fig. 5). Thus, in the southern province of Europe, the Kimmeridgian is reduced to the Crussolian or to the Platynota-Beckeri interval (Fig. 5).

The Dorsetian would be included in the Tithonian and it would reduce the Kimmeridgian stage in comparison with the North-Western Europe province. However, the Tithonian stage remains unitary, well enough defined by faunas and which can be used further especially in the Europe southern province.

The Tithonian stage, according to the International Stratigraphical Nomenclature Rules, relies neither on a type-locality name nor on a well defined stratotype. With all these inadvertances, the fauna association of this stage is well defined, and its lower boundary can be traced and placed at great distances due to *Gravesia* and *Hybonoticeras* faunas. This involves that the vicious name of "Tithonian" stage represents no an impediment for its use, as R. Enay (1970) has quite recently shown. However, it is known that in 1946 Arkell suggested an item which

would allow, in exceptional cases, the abrogation of nomenclature rules, so that the case of the Tithonian stage might be included here. Nevertheless, the Tithonian remains a well defined stage by the faunas and especially the facies which can be used only in the Europe southern province.

As regards the stratigraphical scale of the Kimmeridgian from the Bicaz Region, we distinguish certain characteristics and peculiarities.

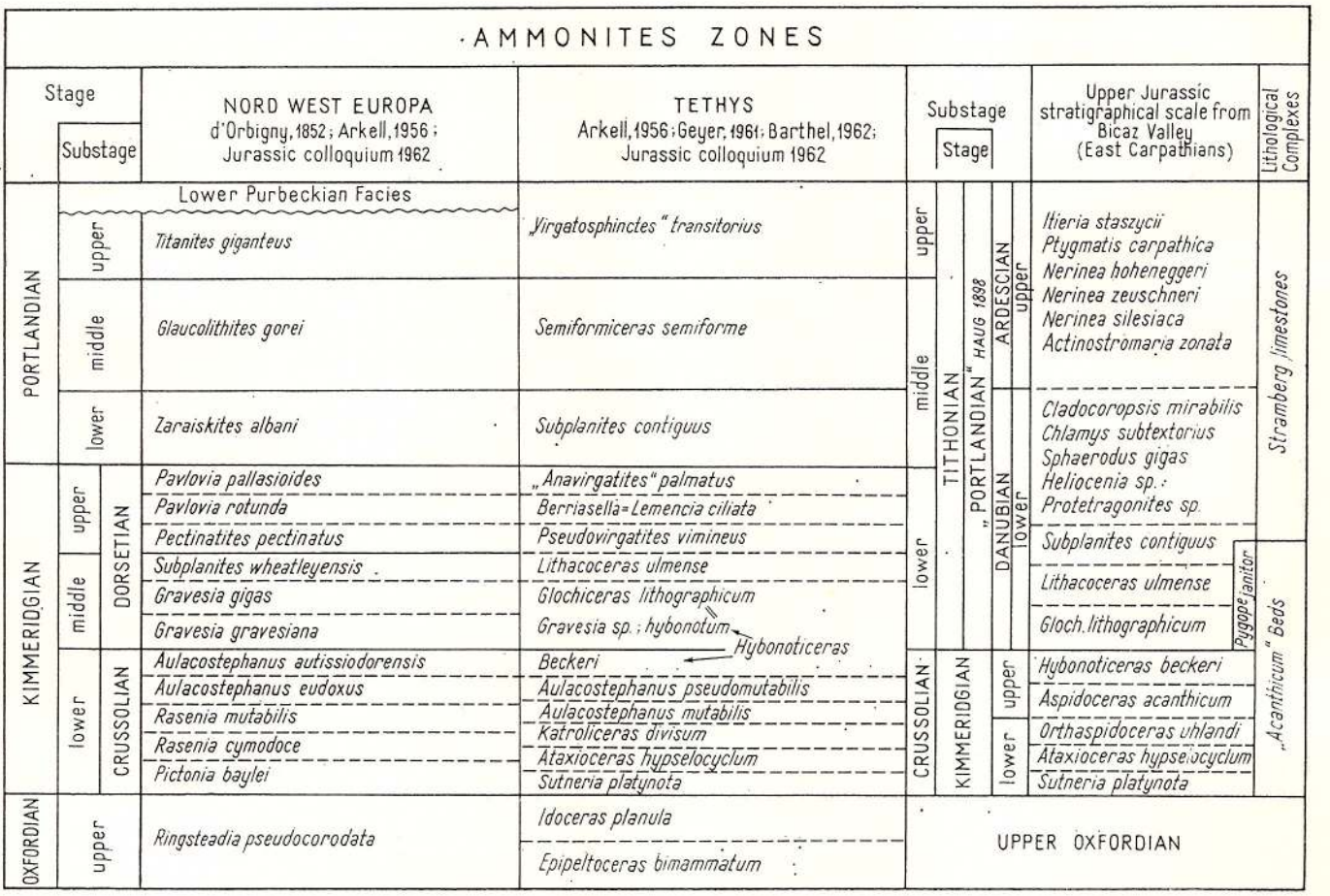

Fig. 5. — Upper Jurassic characteristic Ammonite Zones from the Nord-West Europe province and Tethys province in parallel to the Bicaz Valley region (East Carpathians).

The *Tenuilobatus* Zone, long time considered a well defined zone, was abandoned because, as G e y e r (1961) showed, *Streblites tenuilobatus* does not present a limited evolution interval; it is found in upper zones with *Mutabilis* and even with *Beckeri*. Thus, this zone is replaced by *Hypselocyclum* and *Uhlandi* zones, the latter being of the same value with *Divisum* Zone (Fig. 5).

Another peculiarity of the Ghilcoș fossiliferous deposit ("*Acanthicum* Beds") seems to be the lack of *Mutabilis* and *Pseudomutabilis* zones which can be equated relying on the ammonite faunas found in the framework of the mentioned interval, by the *Acanthicum* Zone (Fig. 5). In this way, there had been found as equivalent elements *Taramelliceras compsum* (O p p e l), *Nebrodites (Mesosimoceras) herbichi* (H a u e r), *Aspidoceras (Physodoceras) acanthicum* (O p p e l), *A. (Ph.) liparum* (O p p e l), *A. (Ph.) contemporaneum* (F a v r e) and *A. (Ph.) wolfi* N e u m. species, relying on the evolution of the ammonites encountered in the interval marked by the *Uhlandi* and *Beckeri* zones. The maximum development of the *Aspidoceras acanthicum* (O p p e l) species, within this interval, allows the replacement of the two zones and of the mentioned interval by the *Acanthicum* Zone (Fig. 5).

The Kimmeridgian, in this sense, is divided into the Lower Kimmeridgian, with *Platynota-Hypselocyclum* and *Uhlandi* zones, and the Upper Kimmeridgian, with the *Acanthicum* and *Beckeri* zones (Fig. 5).

The Tithonian stage is divided into lower (Danubian) and upper (Ardescian). The Lower Tithonian includes the *Lithographicum-Ulmense* and *Contiguus* zones and a characteristic reef fauna (Fig. 5). In the Bicaz Region, the Upper Tithonian with reef-type character towards the upper part of Stramberg Limestone probably correspond to the *Semiforme* and *Transitorius* zones (Fig. 5).

A part of the Lower Tithonian from the Ghilcoș fossiliferous deposit is included in the upper part of the "*Acanthicum* Beds" complex *sensu* N e u m a y r 1873 (Fig. 5).

There is not a real division into zones of the Upper Tithonian besides that established by R e m a n e (1964, 1969, 1971) relying on Calpionellid assemblage which can be applied to the Upper Tithonian from the Bicaz Region, too.

The Lower Cretaceous was divided, in the Bicaz Region, into two series — Neocomian and Urgonian — due to the predominantly calcareous facies with rare ammonite faunas. The Jurassic-Cretaceous boundary presents, in this region, certain peculiar aspects as the ammonite fauna is rare and less represented. The boundary is finally traced taking into account three fundamental microfauna elements : the Calpionelles, Dasycladaceae and Foraminiferae (Lituolidae).

The Urgonian series exibits a calcareous facies with *Requienia ammonia* (G o l d f.) towards the lower part of the series, in the Barremian, and *Toucasia carinata* (M a t h e r o n) frequently occurs towards the boundary with the Aptian stage. The microfacial zones established within this interval had been separated relying on the Dasycladaceae and the Lituolidae and Orbitolinidae elements.

STRATIGRAPHY OF THE REGION

The Bicaz Region belongs to the Crystalline Mesozoic Zone of the East Carpathians. The Mesozoic deposits which make up the units of this zone are assigned to the three series (S ă n d u l e s c u, 1967, 1969) : the Bucovinian Series, the Sub-Bucovinian Series, and the Transylvanian-Hăghimaș Series to which the Bicaz Valley Region also belongs.

We mention that the Sub-Bucovinian Series stratigraphy is not the object of the present paper ; this series appears outside the studied area.

STRATIGRAPHY OF THE BUCOVINIAN SERIES

The Bucovinian Series has been separated by M. S ă n d u l e s c u (1967) ; it is made up of Triassic, Jurassic and Cretaceous deposits (Lunca beds and the Wildflysch Formation).

TRIASSIC

The Werfenian is represented by conglomerates, white and red sandstones, overlaid by grey-yellowish dolomites, wherein *Myophoria costata* Z e n k. was found towards the lower part of the series. This species confers to a part of the dolomites the Campilian age.

The Anisian is included in the Dolomitic series overlaid by Ladinian limestones.

The Ladinian is represented by yellowish-whitish limestones with *Diplopora annulata* (S c h ä f t.).

The Upper Triassic presence remains uncertain. In the Lacul Roșu surroundings the Carnian would be represented by *Halobia* limestones and pinkish dolomites, while the Norian is to be proved.

JURASSIC

The Liass appears with a sporadic distribution in the Lacul Roșu vicinity. It is represented by red ferruginous limestones with *Spiriferina hauerii* S u e s s and *Entolium liassinum* N y s t.,

a Hettangian-Sinemurian-Carixian assemblage. The limy-gritty deposits, sometimes conglomeratic, belong, according to Săndulescu (1969, 1972), to the Domerian stage.

The Dogger is constituted of siliceous, microconglomeratic, grey-greenish slightly yellowish sandstones with plant debris and sandy marls, wherein *Bositra buchi* (Roemer) was found. This complex includes, according to Săndulescu, the Toarcian, Aalenian, Bajocian-Bathonian stages. The siliceous gritty-marly complex has a transgressive character.

The Callovian-Oxfordian overlies in continuity of sedimentation the gritty horizon, represented by siliceous deposits, Radiolarites of 10—14 m thick.

Schistous, siliceous clays, with argillitic interbedding levels of a brown-reddish colour with frequent graded-beddings, are found in the lower part of the siliceous complex. Spicules of *Spongia* are rarely found beside Radiolarians.

The radiolaritic complex has, in the lower part, a grey-greenish colour than a reddish one, and finally a grey-greenish colour with a reddish hue. The Radiolarites are considered Callovian-Oxfordian in age relying on the lack of characteristic fossils in the above mentioned complex because geometrically they are comprised between the Bathonian deposits and the Upper Malm-Neocomian of the Lunca beds.

CRETACEOUS

The Cretaceous is represented by the Lunca beds which are found along the outer slope of the Hăghimaș Syncline.

The *Aptychus* assemblage, studied by I. Turculeț and C. Grasu (1965), is represented by : *Laevaptychus latissimus* (Trauth), *Lamellaptychus beyrichi* (Oppel), *L. mortilleti* (Pictet), *L. lamellosus* (Papp), and *Punctaptychus punctatus* (Voltz). It is considered Kimmeridgian-Neocomian in age.

The Calpionelle association found in this complex, (I. Turculeț and C. Grasu, 1971, M. Săndulescu, 1972) compared to the Standard zones established by Remane (1969), does not seem to pass the Tithonian-Lower Valanginian interval.

WILDFLYSCH FORMATION

The Wildflysch Formation represents the newest deposits of the Bucovinian Series which, in the Bicaz Valley Basin, occurs on the inner or western slope. The latter is less developed compared to the outer or eastern slope where their occurrence is much more developed.

A foraminiferal assemblage represented by *Ammodiscus infimus* Franke, *A. tenuissimus* (Gümbel), *Glomospira charoides* (Jones & Parker), *G. gordialis* (Jones & Parker), *Recurvoides* aff. *contortus* Earland [3] (coprolithes, ostracods, radiolarians) was found on the inner slope at the Lacul Roșu locality, in a clay series of grey-greenish, red or blackish colours, which indicates the Aptian-Albian age.

This microfauna found on the inner slope of the Ghilcoș massif confirms the results obtained on the outer slope by Jana Săndulescu (1968) who, relying on microfauna, considered the Wildflysch Formation Barremian-Albian in age.

A Wildflysch paratypical facies (M. Săndulescu, 1969) made up of grey-greenish or yellowish marly and clay slates develops in the eastern part of the calcareous massifs. In the Bicaz Region this formation is about 300 m thick. The Wildflysch Formation is also associated with calcareous sedimentary Klippes of Tithonian, Neocomian or Urgonian age. Their sizes do not exceed 30—40 m in length. Two outcrops of basic eruptive rock are intruded into the Wildflysch Formation, one of 200 m with calcareous enclaves, probably of the Tithonian age, northwards, and a smaller one of about 10 m, southwards, are found along the Bicaz Valley.

[3] I am deeply indebted to Dr. T. Neagu for his amiability in determining this microfauna.

STRATIGRAPHY OF THE HĂGHIMAŞ SERIES

This series corresponds, according to S ă n d u l e s c u (1967, 1969), to the Hăghimaş Nappe which is fully developed by all the Upper Jurassic and Lower Cretaceous stages only in the Ghilcoş massif. Calcareous deposits, Kimmeridgian-Lower Aptian inclusively in age, belong to this series.

JURASSIC

The Jurassic is limited to the Upper Malm, namely the Kimmeridgian and Tithonian stages.

KIMMERIDGIAN

The Kimmeridgian comprises the great part of the "*Acanthicum* Beds" *sensu* N e u m a y r 1873. This complex is made up of three horizons : the horizon of red nodular limestones (lower); the horizon of grey-greenish limestones with pelitoidal sandstone intercalations (middle); the horizon of pelitoidal sandstones with intercalations of gritty-clay schists of a grey greenish-bluish colour (upper). The total thickness of the "*Acanthicum* Beds" is of 30—32 m ; 20 m of this thickness belong to the Kimmeridgian and 12 m to the Lower Tithonian.

LOWER KIMMERIDGIAN

The horizon of red nodular limestones (lower) correspond to this substage on a thickness of about 8 m. Two zones are distinguished along it : a) *Sutneria platynota* Zone ; b) *Ataxioceras hypselocyclum* Zone (*pro parte*).

a) *Platynota* Zone is about 5 m thick and is represented by calcirudites and coarse and fine calcarenite. Nearby the boundary with *Hypselocyclum* Zone, one may notice a calcarenitic horizon with numerous micritic and pelmicritic intraformational reworked elements. The following macrofaunistic assemblages were found within this zone : *Sutneria* cf. *platynota* (R e i n e c k e), beside *Phylloceras isotypum* (B e n e c k e), *Ph. leptophyllum* (H a u e r), *Ph. saxonicum* (N e u m.), *Calyphylloceras manfredi* (O p p e l), *C. kochi* (O p p e l), *Holcophylloceras bekasense* (O p p e l), *Ataxioceras tantalus* (H e r b i c h) and *Aspidoceras (Physodoceras) circumspinosum* (Q u e n s t.) (Pl. XCVII).

b) *Hypselocyclum* Zone *(pro parte)* occurs at the upper part of the lower horizon, as well as at the lower part of the middle horizon made up of grey-greenish limestones with pelitoidal sandstone intercalations.

This zone develops on a thickness of 4—5 m ; 3 m in the lower horizon and the rest in the middle one. Towards the lower part of this zone one may notice an intraformational calcareous breccia with limestone elements of 1—3 cm in diameter. These elements give a false nodular aspect which, at first sight, was generalized for the whole horizon.

The second horizon of the grey limestones with pelitoidal limestone intercalations (middle) comprises : b) *Ataxioceras hypselocyclum* Zone *(pro parte)* ; c) *Orthaspidoceras uhlandi* Zone (=*Katroliceras divisum* Zone), with which the Lower Kimmeridgian ends.

b) *Hypselocyclum* Zone *(pro parte)* is distributed, in the middle horizon, on a thickness of about 2 m and is lithologically dominated by fine calcarenite with intraformational reworked elements and tubular perforations nearby the boundary with the *Orthaspidoceras uhlandi* Zone. In this zone, the ammonite association is represented by : Phylloceratidae *(Ph. isotypum, Ph. saxonicum, Ph. leptophyllum)* beside *Callyphylloceras kochi* (O p p e l), *C. manfredi* (O p p e l), *Sowerbyceras tortisulcatum* (d'O r b.), then *Taramelliceras trachynotum* (O p p e l), *T. karreri* (N e u m.), *T. holbeini* (O p p e l), *T. pugilis* (N e u m.) and *Streblites tenuilobatus* (O p p e l) ; the last one being frequently found within this zone. The occurrence of Ataxioceratinae, beside Taramelliceratinae and Aspidoceratinae, is the most important event in the *Hypselocyclum* Zone. The Ataxioceratinae are represented by : *Ataxioceras (Parataxioceras) lothari* (O p p e l), *A. (Ataxioceras) polyplocum* (R e i n e c k e),

beside *Aspidoceras (Physodoceras) altenense* (d'Orb.) and *A. (Ph.) circumspinosum* (Quenst.) (Pl. XCVII).

Actaeonina ovalis Zittel, *Pleurotomaria (Leptomaria) phacoides* Zittel, *Laevaptychus (Latuslaevaptychus) longus* (Meyer), *Hibolites semisulcatus* (Münster), *Rhabdocidaris cylindrica* Quenst., *Hybodus striatulus* Hastings and *Hybodus* sp. are found beside the ammonite fauna.

c) *Uhlandi* Zone develops on a thickness from 2 to 3 m only in the middle horizon closing the Lower Kimmeridgian in this region. This zone is made up of fine calcarenites with gritty-clay schist intercalations, and presents some intraformational reworked elements towards the upper part of the zone.

Here, the ammonite association is dominated by: *Aspidoceras (Orthaspidoceras) uhlandi* (Oppel), beside *Katroliceras (Katroliceras) acer* (Neum.), *K. (Torquatisphinctes) plebejum* (Neum.), *Nebrodites (Mesosimoceras) herbichi* (Hauer), *N. (Nebrodites) teres* (Neum.). *Taramelliceras mikoi* (Herbich), *Simocosmoceras nitidulum* (Neum.), "*Perisphinctes*" *haeterus* (Herbich), *Ataxioceras (Ataxioceras) fasciferum* (Neum.), *Caliphylloceras kochi* (Oppel) and *C. manfredi* (Oppel) are added to this fauna, but they are less important (Pl. XCVII).

Now, the most important event in this zone is the predominant occurrence of *Orthaspidoceras uhlandi* (Oppel), beside the species belonging to the *Katroliceras* and *Nebrodites* genera.

We also mention, beside ammonites, *Cuspidaria lorioli* (Neum.), *Laevaptychus latus* (Parkinson) and *Paraisurus* sp. (Pl. XCVII) as new appearances in comparison with the previous zone.

UPPER KIMMERIDGIAN

This substage develops leading in the middle horizon, being formed by grey-greenish calcarenite with pelitoidal sandstone intercalations. Within this interval there were distinguished: d) *Aspidoceras acanthicum* Zone; e) *Hybonoticeras beckeri* Zone.

d) *Acanthicum* Zone has a thickness of 3 m and begins with fine calcarenites, calcilutites with pelitoidal sandstone intercalations with tubular or nodular borings due to the mud-eater organisms associated with lenses or coal traces in places (Pl. XCVII).

The ammonite association is dominated by the Aspidoceratidae family represented by: *Aspidoceras (Physodoceras) contemporaneum* (Farve), *A. (Ph.) liparum* (Oppel), *A. (A.) longispinum* (Sow.), *A. (Ph.) cyclotum* (Oppel), *A. bathori* Herbich and *A. (Pseudowaagenia) haynaldi* (Herbich).

The Phylloceratidae maintain their presence by: *Sowerbyceras tortisulcatum* (d'Orb.), *Nebrodites (Nebrodites) teres*, *Taramelliceras compsum* (Oppel), *Glochiceras fialar* (Oppel) and *Sutneria eumela* (d'Orb.) are rarely encountered.

Astarte minima Phill., *Modiola lorioli* Zittel, *Tellina tenuistriata* Münster, *Pleurotomaria (Leptomaria) carpathica* Zittel, *Tylostoma* sp., *Ceriopora ramosa* Gherasim., *Lamellaptychus beyrichi* (Oppel), *Holectypus* sp. and *Paraisurus* sp. were found at various levels of the zone (Pl. XCVIII).

The occurrence of plant debris represented by: *Palaeocyparis* cf. *elegans* of the family Cupressaceae at the upper part of the zone constitutes a characteristic feature of this zone. The presence of these plants, beside a typical marine fauna, implies an important transport of material followed by a rapid burial. This fact permitted the preserving of these plant debris which probably represented the genetic source of the traces and coal lenses in certain moments of basin oscillations.

e) *Beckeri* Zone is placed at the upper part of the middle horizon on a thickness of about 3 m. The Kimmeridgian stage ends with this zone. Lithologically, this zone is made up of grey-greenish pelitoidal sandstones which have some coal traces.

The ammonite assemblage is poorer than in the previous zones being found at various levels: *Hybonoticeras pressulum* (Neum.), *H. verestoicum* (Herbich), *Sowerbyceras tortisulcatum* (d'Orb.), *Lytoceras* cf. *quadrisulcatum* (d'Orb.), *Glochiceras tenuifalcatum* (Neum.), *Hemihaplo-*

ceras schwageri (N e u m.) and *Virgataxioceras* sp. (Pl. XCVII). Beside ammonite association, the evolution of pelecypods *(Astarte, Modiola, Tellina)*, gastropods *(Pleurotomaria)* and aptychus *(Laevaptychus, Lamellaptychus)* appears less spectacular, with weak frequences outline in this zone.

The new occurrences in the *Beckeri* Zone are due to the following species : *Glossothyris bouei* (Z e u s c h n e r), *Lamellaptychus lamellosus* (P a r k i n.) and *Belemnites beneckei* N e u m., the last species is very frequent only at this interval.

It is also interesting to notice the appearance of some species with "Tithonian" affinities, fact which announces earlier the debut of the immediately overlying stage. One of these species is *Pygope janitor* (P i c t e t), which occurs at the upper part of the zone, without showing the predominant development which is found at the lower part of the Tithonian.

The Kimmeridgian/Tithonian boundary is a biostratigraphic one placed at the upper part of the middle horizon, between *Hybonoticeras beckeri* and *Glochiceras lithographicum* zones (Pl. XCVII).

Sedimentologically, no change is noticed at the level of this boundary, the sedimentation going on slowly, without important disturbances, but with changes in the sedimentation rate and time, fact which is indicated by the large thickness exceeding 1 m of the pelitoidal sandstones.

From the bathymetric viewpoint, taking into account the association with P erisphinctidae beside Oppelidae, Phylloceratidae and Aspidoceratidae for the Lower Kimmeridgian, the depth of the red, nodular limestones built up at 150—200 m, while in the Upper Kimmeridgian, the Aspidoceratidae prevailing in contrast with Perisphinctidae ; this fact is revealed by a decrease of the depth basin at 100 m, which goes on in a gradual decrease in the Tithonian, too.

TITHONIAN

The Tithonian is included within the "*Acanthicum* Beds" complex *sensu* N e u m a y r 1873 and builds up the whole mass of Stramberg Limestones *sensu* H e r b i c h 1878. The total thickness of the Tithonian limestones varies from 200 to 300 m.

LOWER TITHONIAN

This substage begins at the upper part of the middle horizon developed on a thickness of 4—5 m, the rest belonging to the upper horizon on a thickness of 9—10 m ; both horizons being enclosed within the "*Acanthicum* Beds".

In the middle horizon one could distinguish : f) *Glochiceras lithographicum* Zone ; g) *Lithacoceras ulmense* Zone.

f) *Lithographicum* Zone is not so much developed, having a thickness of 1—2 m, lithologically dominated by pelitoidal sandstones. The fauna of this zone is represented by *Glochiceras lithographicum* (O p p e l), *Pygope janitor* (P i c t e t), *Glossothyris bouei* (Z e u s c h n e r) and *Lamellaptychus lamellosus* (P a r k i n.) (Pl. XCVII).

From the biostratigraphic point of view, the *Lithographicum* Zone is extremely important, because it represents the index-zone with which the Tithonian stage begins in this region (Fig. 6).

g) *Ulmense* Zone presents similar lithologic characters, the only difference is given by the presence of *Lithacoceras ulmense* (O p p e l) and *L. geron* (Z i t t e l) beside *Pygope janitor* (P i c t e t) which have an important maximum of frequency at the level of the zone, which may become a characteristic biostratigraphic index fossil of this region (Fig. 6).

The horizon of pelitoidal sandstones with sandy-clayey schist intercalations (upper) is developed in continuation of sedimentation. This horizon represents a passing term to the following Stramberg Limestone complex *sensu* H e r b i c h (1878).

Lithologically, it is dominated by grey-greenish and bluish sandy-clayey schists with tubular perforations impregnated in iron oxides. At the upper part of the horizon, one can see a hard-ground, disposed nearby the calcareous Stramberg complex. This detrital sequence seemed to be violently emplaced it representing the moment when the sedimentary basin underwent an uplift

without exondation, fact which marked the beginning of a new phase made up of calcareous sedimentary deposits.

Fauna of the upper horizon is rather poor being represented by *Pygope janitor* (P i c t e t), *Ceriopora ramosa* G h e r a s i m o v, *Cidaris lineata* C o t t e a u and *Paraisurus* sp.

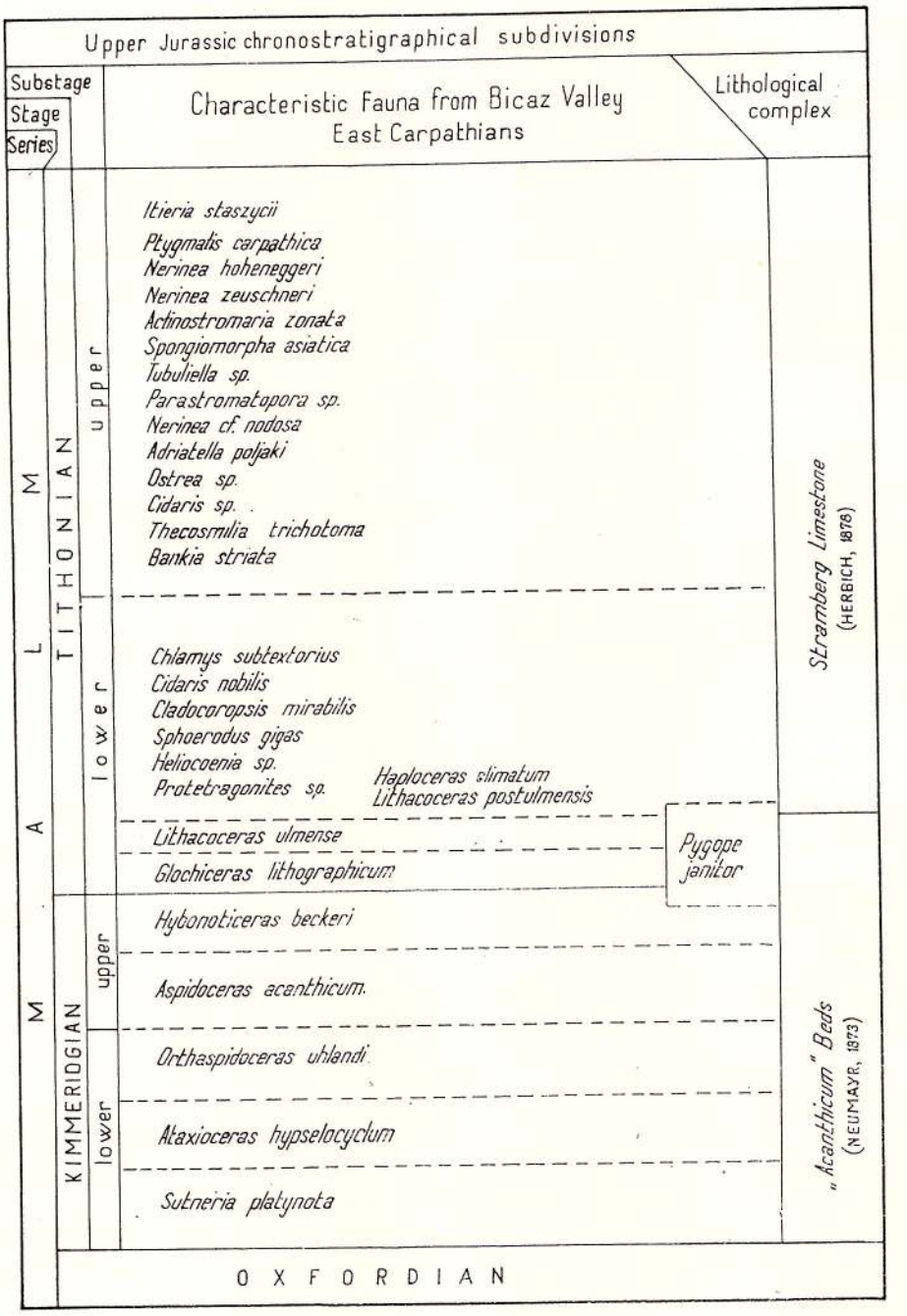

Fig. 6. — Upper Jurassic characteristic fauna from Bicaz Valley Region (East Carpathians).

The complex of Stramberg Limestones is disposed in continuity of sedimentation upon the upper horizon of "*Acanthicum* Beds". The Lower Tithonian is developed 50—60 m in the limestone complex. The passing from the upper horizon to the limestone complex is done by a detrital sequence with intraformational boulders, followed by bisequence formed by pelitoidal sandstones and coarse calcarenites or fine grey-greenish calcarenites (Pl. XCIX).

It follows a rhythmical sequence which presents calcirudites, fine calcarenites and pelitoidal sandstones recurrently and asymmetrically developed.

In the lower calcareous series, there are distinguished two biolithitic masses built up of microoncoliths, hydrozoans, bryozoans and dasycladaceae. Fauna of this interval is represented by *Cladocoropsis mirabilis* Felix, *Heliocoenia* sp., *Cidaris nobilis* Goldf. and *Chlamys subtextorius* (Münster), if we refer to the Ghilcoș massif, and in the Suhardu Mic massif : *Protetragonites* sp., *Cladocoropsis mirabilis* Felix and *Sphaerodus gigas* Agassiz associations mostly developed during Lower Tithonian. In the Cupaș massif, an association made up of *Haploceras elimatum* (Oppel), *Lithacoceras postulmensis* (Blaschke), *Oppelia strambergensis* Blaschke, *Lytoceras* sp. and *Hibolites semisulcatus* has been found in the coarse calcarenites, of a reddish-yellowish to brown colour, which corresponds to the *Subplanites contiguus* Zone or to the upper part of the Lower Tithonian (see Patrulius et al. 1970). In the Făgetul Ciucului massif, in a calcareous series there were found *Cladocoropsis mirabilis* Felix, mostly at the lower part, *Cryptoplocus zitteli* (Goldf.), *Diptyxis bidentatus* (Gemmeralo) and *Pileolus* sp. at the middle part and *Heliocoenia (Decaheliocoenia)* cf. *variabilis* Etallon, *Spongiomorpha* sp. at the upper part.

UPPER TITHONIAN

In the Ghilcoș massif, the Upper Tithonian begins with a highly developed Stromatolitic level, which points to a new change in the evolution of the sedimentary basin and implicitly of the line shore deposition. Fine and coarse reddish calcarenites with intraformational reworked elements are disposed upon this algal-level. Two reef complexes are distinguished within this upper calcareous series; a lower complex of about 20 m thick built up of "microoncoliths", Serpulides, Hydrozoans, Hexacorals, Bryozoans, Algae and Gastropods represented by *Thecosmilia trichotoma* (Goldf.), *Cidaris* sp., *Ostrea* sp., *Heliocoenia* sp., *Adriatella poljaki* Milan and *Nerinea* cf. *nodosa* Goldf. and the second upper reef complex developed on a thickness of 30 m built up of the same fauna and microflora elements. The fauna of this complex is made up mostly of Hydrozoans : *Actinostromaria* sp., *Parastromatopora* sp., *Cladocoropsis mirabilis* Felix, *Tubuliella* sp., *Spongiomorpha asiatica* Yabe and Sugiyama and *Actinostromaria zonata* Turnsek. The series of Upper Tithonian deposits ends with grey-reddish calcilutites with some reworked elements. Bisequences built up of coarse and fine calcarenites are found nearby the boundary of the Cretaceous deposits (Pl. XCIX).

A lenticular biostromite built up of Algae and Nerineas occurs at the terminal part of the Tithonian stage. On the western slope of the Ghilcoș massif, it is found a biostromite made up of Nerineas namely : *Nerinea silesiaca* Zittel, *N. hoheneggeri* Peters, *N. zeuschneri* Peters, *Ptygmatis carpathica* Zeuschner, *Itieria staszycii* Zeuschner, *Tylostoma* sp.; and on the eastern slope another biostromite made up of *Nerinea silesiaca* Zittel, *N. hoheneggeri* Peters, *N. zeuschneri* Peters, *N. lorioli* Zittel and *Adriatella poljaki* Milan has been found.

The Upper Tithonian presents a great thickness varying between 150—180 m.

As the Tithonian stage is very interesting from the organic frame-builder biotops, we tried to interpret and reconstitute the reef environment from this time interval. The reconstitution was carried out in the central part of the sedimentary basin, that is the Făgetul Ciucului massif which presents certain characters that can be generalized and extended to other massifs.

By the types of frame-builders the sedimentation took place on almost flat substratum formed by small basins to a sedimentary deposition between 0—30 m depth (Fig. 7, 8).

The zones made up of "micro-oncoliths", Hydrozoans, Bryozoans and Serpulides constituted the up-talus which were flanked by oolitic masses disposed mostly in the main zone of the ree domain.

Calcareous breccias are rather frequently met in the outer zones (the extra-reef domain). Eastwards, the sedimentary basins present more than 30 m depth with a predominantly calcilutitic sedimentation and the development of open-sea plankton represented by Calpionellids.

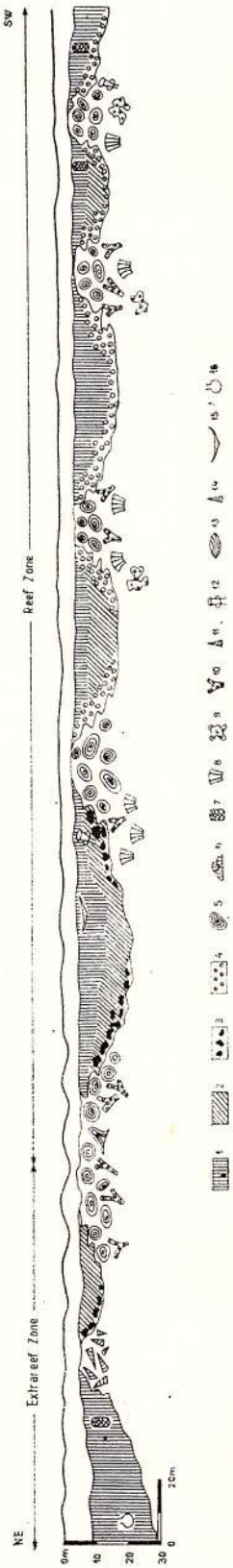

Fig. 7. — Schematic Tithonian reconstitution of reef's environment from the Bicaz Valley Region-Făgetul Ciucului Mts.
1, Calcarenite; 2, calcirudite; 3, breccia; 4, oolite; 5, Micro-oncolithe; 6, *Acervulina* sp.; 7, Dasycladaceae; 8, Hydrozoa; 9, Hexacorals; 10, Bryozoa; 11, Gastropods; 12, *Mercierella dacica*; 13, *Conicospirillina*; 14, *Trocholina*; 15, *Saccocoma*; 16, *Calpionella*.

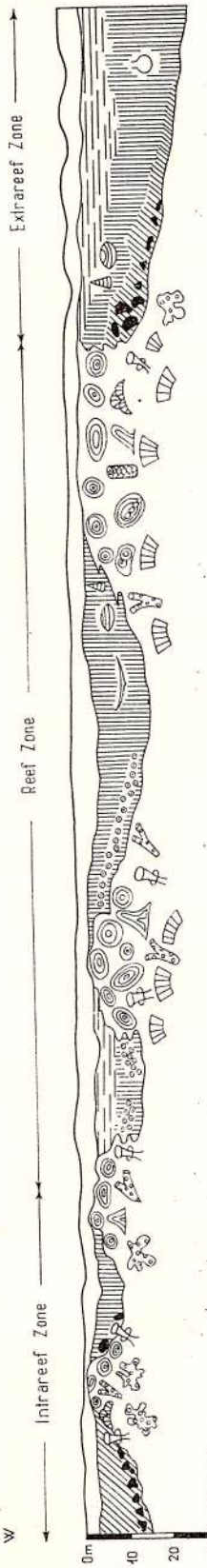

Fig. 8. — Shematic Tithonian reconstitution of reef's environment from the Bicaz Valley Region-Făgetul Ciucului Mts.
1, Calcilutite; 2–16, idem fig. 7 (1–16).

As a conclusion, the Tithonian is made up of a reef calcareous formation with biolithites due to the frame-builders which are to be found mostly at the upper part of the stage. Due to the builder character of the organisms, mainly dominated by hydrozoans and algae beside rare hexacorals, the Tithonian can be included in the Carpathian-type facies.

Sedimentologically, by the percentage study of the Tithonian faunas one may notice a gradual change of the sedimentary conditions, that is a decrease of water depth and setting up of organogenous facies. Following the percentage ratio of the organism groups which form the Tithonian association of the Ghilcoș massif, one may notice that in the Lower Tithonian the Benthonic fauna becomes more significant as compared to that found in the Kimmeridgian. A share of only 35% of the ammonites (the Perisphinctidae family 33%) is observed, while 65% is left to the Benthonic fauna made up of Hydrozoans, Brachiopods and Echinoderms; a tendency of passing towards the reef facies of the Stramberg type being marked. This facies is typically represented in the Upper Tithonian when the faunas are mostly Benthonic ones, being represented by Hydrozoans and Gastropods (60%) followed, in equal shares, by Antozoans and Bryozoans (30%).

The comparative study of the mentioned associations points out a change of the bathymetric conditions from a depth of about 40—70 m during the Lower Tithonian to a depth of 10—30 m during the Upper Tithonian fact demonstrated by the total lack of ammonites and great participation of Hydrozoans, Gastropods (Nerineaceae) and Algae (Dasycladaceae and Codiaceae) as shallow water indicatory organisms.

NEOCOMIAN

The Neocomian is present in all the mentioned massifs. Its thickness varies from 150 to 180 m being disposed in continuity of sedimentation over the Tithonian limestones.

BERRIASIAN

The Berriasian begins with coarse and fine reddish-yellowish calcarenites, followed by cal cirudites, fine and coarse calcarenites and grey-reddish calcilutites.

The series of the Berriasian calcareous deposits ends with grey-greenish or whitish calcilutites. Within the Berriasian three levels with intraformational reworked material are distinguished, the last one being located nearby the Valanginian boundary (Pl. C).

The Berriasian stage is present on the whole by the identification of *Calpionella* and *Calpionellopsis* zones. *Calpionellopsis* Zone is encompassed mostly to the upper part of the stage. Southward the Ghilcoș massif, C. Grasu points out in the Hăghimașul Negru massif, beside the microfauna, well-stratified grey marly-limestones, sometimes sublithographic ones with *Berriasella* cf. *privasensis* (Pictet) and *Neocomites neocomiensis* (d'Orb.), beside *Calpionella alpina* Lorenz and *C. elliptica* Cadisch, assemblage which, according to the author, ascertains the Upper Berriasian-Valanginian age. However, according to G. le Hégarat in his paper on the Upper Tithonian and the Berriasian from Ardèche and Hérault, *Berriasella privasensis* (Pictet) is a Subzone-index species which points to the Middle Berriasian, being disposed under *Dalmasiceras dalmasi* Subzone. This subzone mostly corresponds to the C Zone separated by Remane, in which *Calpionella elliptica* Cadisch dominates beside *Tintinnopsella carpathica* (Murgeanu and Filipescu).

On the other hand, *Neocomites neocomiensis* (d'Orb.) is a typically widespread species for the Valanginian stage and it would correspond to the D_3 Subzone with *Lorenziella hungarica sensu* Remane, with which the Valanginian begins.

Thus, the Berriasian from the Ghilcoș-Hăghimaș Region is complete being represented by all its substages, namely : Lower and Middle Berriasian with the *Calpionella* Zone *(Calpionella alpina, C. elliptica, Crassicollaria parvula* and *Tintinnopsella carpathica)* and the Upper Berriasian with the *Calpionellopsis* Zone *(pro parte), Calpionellopsis oblonga, C. simplex, Tintinnopsella carpathica* and *T. longa.*

The Jurassic and Cretaceous boundary in this case can be placed at the same time with *Tintinnopsella carpathica* (Murgeanu and Filipescu) occurrence, a type with elliptic oval habitus and a greater lorica which differs from the types found in the Tithonian with a small lorica and an elliptic habitus, confused for a long time with species of the *Crassicollaria* Remane genus.

In the Bicaz Valley Region, the Berriasian has a thickness of about 30—40 m.

VALANGINIAN-HAUTERIVIAN

The Valanginian-Hauterivian are treated together as the fauna, as well as microfauna because of the common features, does not allow the separation of the two stages.

Thus, on the western slope of the Ghilcoș massif, the Valanginian-Hauterivian is built up of coarse and fine calcarenites, calcilutites of a grey-whitish colour. At the lower part one may found small algal biolithite built up mostly of *Lithocodium*. Also, one may notice a breccia level due to a intraformational "slumping" type which has brought many calcareous elements of the Valanginian fauna (Pl. C).

The fauna found mostly at the lower part of the calcareous series is represented by *Leviathania leviathan* (Pictet & Campiche), *Ampullospira incerta* Pcelincev, *A. bullimoides* (d'Orb.) and *Trochonatica helvetica* (Pictet & Campiche) assemblage pointing to the Lower Valanginian age (Pl. C). However, *Leviathania leviathan* was also found by C. Grasu in the Hăghimașul Negru massif.

On the eastern slope of the Ghilcoș massif, there have been found the grey-greenish sublithographic calcilutites *Isocardia neocomiensis* (Agassiz), *Pholadomya* cf. *scaphoides* (Aggassiz), *Leviathania leviathan* (Pictet & Campiche), *Cernina pidaceti* (Coquand) and *Trochonatica helvetica* (Pictet & Campiche), assemblage which also indicates the Lower Valanginian age. In the Suhardu Mic massif, in reddish-yellowish calcilutites *Cylindrobullina lata* Pcelincev was also found, a species of the Valanginian age. In the Valanginian there has been also found : *Actinostromaria verticalis* Schnorf, *A. jeanneti* Schnorf, *Astroporina valanginiensis* Schnorf and *Varioparietes lamellosus* Schnorf.

Microfacially, it seems that the *Calpionellopsis* Zone is widely developed during the Valanginian stage of the Bicaz Valley region in comparison with the development of the same zone from the Western Mediterranean Province.

Over the *Calpionellopsis* Zone, the *Lorenziella* Zone is disposed, the latter being, according to our data, the partial equivalent of the *Calpionellite* Zone separated by Remane and typical of the Valanginian stage. However, it is not out of question for the *Leviathania* fauna to come down to the Upper Berriasian and therefore to involve the Lower Valanginian too, according to the microfacial data, as in the *Leviathania* limestones from the eastern slope of the Ghilcoș massif were found *Calpionellopsis simplex* (Colom), *Calpionella elliptica* Cadisch and "*Calpionellites*" *dadayi* Knauer species which proliferated within the before mentioned interval.

Towards the upper part of the calcareous series from the Ghilcoș massif, *Cladocoropsis cretacica* Turnsek was found in reddish or reddish-yellowish calcilutites, species which points to the Hauterivian age (Pl. C).

The total thickness of the Valanginian-Hauterivian is of 130—140 m.

Therefore, in the Bicaz Valley Region the Neocomian is represented by all stages, Berriasian, Valanginian-Hauterivian. The Berriasian is entirely developed mostly in planktonic pelagic facies with *Berriasella* and Calpionellids. Sometimes, at certain levels small algal reefs are to be found which locally give a less pronounced reef character as compared to the planktonic facies which predominates.

However, at the Berriasian level there is a reef neritic facies represented by Dasycladaceae *(Likanella campanensis, Clypeina? solkani, Radoiciciella subtilis)* and Foraminiferae *(Feurtillia frequens, Anchispirocyclina lusitanica, Everticyclammina hensoni, Trocholina alpina, T. elongata)* which is rather well developed as areal in all the studied massifs.

The Valanginian-Hauterivian develops under two facies : pelagic with *Neocomites neocomiensis* and Calpionellids in the lower part, and a neritic-reef facies more developed during this time interval, represented by *Leviathania* and *Cladocoropsis cretacica*. The neritic-reef facies is predominant in the Bicaz Valley Region. However, within this facies, there are to be found some planktonic phases represented by Calpionellids which, by their sporadic and weak presence, are not able to indicate on the whole a typical pelagic facies, as in the evolution of the reef area there are sometimes encountered planktonic episods ; Calpionellids being brought by streams in the respective reef-zones. Thus, they cannot give a type facies character at least for the region of the present study.

URGONIAN (BARREMIAN-LOWER APTIAN)

The Urgonian calcareous deposits are disposed in continuity of sedimentation over the Neocomian series.

In the Ghilcoș massif the Urgonian is made up of grey and grey-whitish calcilutites and red-yellowish or dark grey calcilutites (Pl. CI).

The macrofauna of the Urgonian is dominated by Pachyodontae and by the Hydrozoans namely : *Requienia ammonia* (Goldf.) and *R. pellati* (Paquier), *Chaetetopsis crinita* Neumayr and *Varioparietes* sp., species that may be found during the Barremian, but its maximum of frequency mostly at its upper part. Pachyodontae facies has been already found in the Bicăjel I and Bicăjel II massifs, too. Although they are frequently found at certain levels, they do not build up bioherms as it was believed till now.

The algal species which, made up mostly small biohermes with Codiaceae and encrusted algae, have the role of frame-builders (Pl. CI).

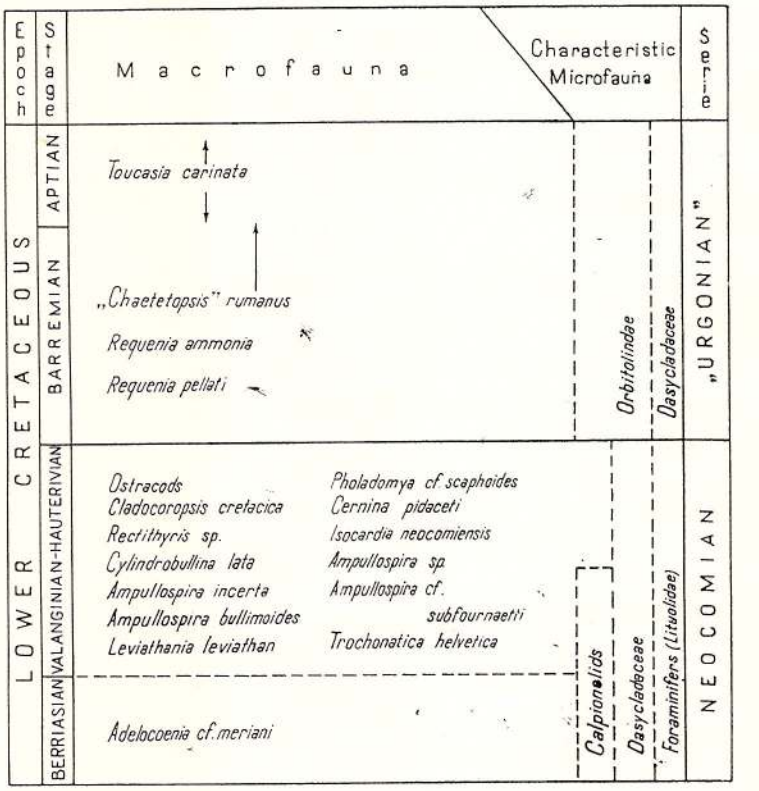

Fig. 9. — Lower Cretaceous characteristic macrofauna from the Bicaz Valley Region (East Carpathians).

The total thickness of the Urgonian varies from 200 to 260 m. The Lower Aptian included in the Urgonian deposits is made up of dark-grey calcilutites which at certain levels present mostly algal biohermes. Within these calcilutites there were found : *Toucasia carinata* (Matheron), "*Chaetetopsis*" *rumanus* (Simionescu), *Actinastraea pseudominima* (Koby), *Mesomorpha*

ornata Morychowa, *Actinostromaria tenuis* Schnorf, and *Cladocoropsis* cf. *cretacica* Turnsek and frequently Orbitolinides, the latter being typical for the eastern facies, the Bicăjel I and Bicăjel II massifs, respectively (Fig. 9).

TECTONICS OF THE REGION

Structurally, the Bicaz Valley Region is part of the Crystalline-Mesozoic Zone of the East Carpathians.

The first tectonic ideas regarding this zone were suggested by V. Uhlig in 1907 who distinguished within this sector two superposed nappes : the Bucovinian Nappe and the Transylvanian one, the latter being the equivalent of the Subtatric nappes.

In contrast with the superposed theory of nappes, E. Vadasz (1915), then I. Atanasiu (1919—1939), I. Băncilă (1941), I. Preda and M. Pelin (1963, 1965), I. Preda (1969), bring arguments concerning the normal structure of the Mesozoic deposits from the Hăghimaș massif, showing that this region has a scale-like structure, with western vergence.

Recently, M. Săndulescu (1967—1970) has separated two series of deposits in the Hăghimaș Syncline which belong to the two different tectonic units : the Bucovinian Series which corresponds to the Bucovinian Nappe and the Hăghimaș Series which corresponds to the Nappe with the same name.

The Bucovinian Nappe comprises the Triassic, Liassic, Dogger, Callovian-Oxfordian deposits, the Lunca Beds (Kimmeridgian-Neocomian) and the Wildflysh Formation (Barremian-Albian) (Pl. XCVI).

The Hăghimaș Nappe is made up of calcareous deposits of the Lower Kimmeridgian-Aptian age. According to Săndulescu the emplacement of the nappe took place during the Albian.

In the Hăghimaș Nappe as a result of the microfacial study the detailed structure of the calcareous massifs was pointed out. Thus, the Ghilcoș, Suhardu Mic, Făgetul Ciucului, Bicăjel I, Cupaș and Bicăjel II massifs present synclinal structures with one of the slopes being faulted (Pl. XCVI). The faults are longitudinal and transversal, the latter being of a greater amplitude. The leap of the faults is 50—200 m, their age being Ante-Cenomanian because the transgressive deposits on the nappe (the Bîrnadu conglomerates) are not afected by the fractures encountered in the region (Pl. XCVI).

MICROFACIAL ZONES CHARACTERISTIC OF THE UPPER JURASSIC AND LOWER CRETACEOUS FROM THE BICAZ VALLEY REGION [4]

The Upper Jurassic and Lower Cretaceous characteristic microfacial zones from the Bicaz Valley Basin (East Carpathians) have a standard distribution in the litho- and biofacial sequence from the Ghilcoș massif.

It is only in this massif that the deposits have a complete development, fact that allowed its selection as a standard.

UPPER JURASSIC

The Upper Jurassic is represented by the Kimmeridgian and Tithonian stages.

The Kimmeridgian, as well as the Lower Tithonian part are included within the complex of the "*Acanthicum* Beds".

The evolution of the microfacial zones for the two stages takes place as follows :

a) The Kimmeridgian stage comprises : I. *Protoglobigerinae* Zone ; II. *Saccocoma* Zone.

[4] Microfacial zones characteristic of the Upper Jurassic and Lower Cretaceous from the Bicaz Valley Region have been established according to the Stratigraphic Nomenclature Rules (preliminary Report on the Biostratigraphic Units — Montreal — Canada 1971), being presented in details in the paper „Les zones microfaciales et la limite Jurassique-Crétacé dans les Carpathes Orientales (Massif du Hăghimaș) et dans la Plate-forme Moessienne" in collaboration with R. Mutiu and C. Vinogradov, which will come out in the volume regarding the Jurassic-Cretaceous boundary as part of the meeting held in Lyon 1973.

b) The Tithonian stage has been divided in substages relying on microfacial elements

Lower Tithonian comprises : III. *Paalzowella* Zone ; IV. "*Pianella*" *pygmaea* Zone ; V. *Kurnubia jurassica* Zone.

Upper Tithonian comprises : VI. *Bankia striata* Zone ; VII. *Clypeina jurassica* Zone ; VIII. *Calpionella* Zone *(pro parte)*.

DESCRIPTION OF THE KIMMERIDGIAN CHARACTERISTIC MICROFACIAL ZONES

I. Protoglobigerinae Zone

Protoglobigerinae Zone corresponds biostratigraphic to the *Platynota* and *Hypselocyclum* Ammonite Zones. This microfacial zone, developed on a thickness of 9—10 m, covers the lower horizon with reddish nodular limestones and the lower part of the middle horizon — grey-greenish limestones with pelitoidal sandstone intercalations (Pl. XCVII).

From the textural viewpoint, the limestones from the lower part have a prevailing biopelmicritic character. These are followed by biomicrite. Towards the upper part of the zone the biopelmicritic character is found with undeveloped biopelsparitic intercalations. Numerous textures of the "open space" type are also found at the upper part of the zone, fact pointing to the existence of an elevation of the sea-bottom, without exondation, after which sedimentation taking again its character more or less changed.

This zone is dominated by Protoglobigerinae beside *Saccocoma* sp., *Cadosina fusca* W a n n e r, *Stomiosphaera minutissima* (C o l o m), *S. colomi* D u r a n d-D e l g a, then the foraminiferae *Lenticulina (Lenticulina) subquadrata* (T e r q u e m), *L. (L.)muensteri* (R o e m e r), *Nodobacularia* sp., the last are species mostly encountered to the upper part of the zone (Pl. XCVII). Calcitized Radiolarians of the *Spherellaria* type are found at the terminal part of the zone.

Within the mentioned association, Protoglobigerinae are important as age index, which are known with maximum of frequency in the Oxfordian-Kimmeridgian interval, sometimes even lower in the Bathonian-Callovian, and rarely in the Tithonian stage. The plates of the planktonic *Saccocoma* crinoid which within the zone interval does not reach the maximum of frequency, beside *Cadosina fusca* W a n n e r and *Stomiosphaera minutissima* (C o l o m) presents a similar Protoglobigerinae evolution.

From the stratigraphic point of view, the *Protoglobigerinae* Zone remains a well defined zone for the Bicaz Valley region being located at the base of the Lower Kimmeridgian. This zone covers the interval of the *Platynota* and *Hypselocyclum* Ammonite Zone being similar in evolution with the *Protoglobigerinae* microfacies separated by B o r z a in the North Carpathians.

II. Saccocoma Zone

Saccocoma Zone is developed only within the middle horizon represented by grey-greenish calcarenites with pelitoidal sandstones intercalations. This horizon corresponds to the *Uhlandi*, *Acanthicum* and *Beckeri* Ammonite zones (Pl. XCVII).

The thickness of the microfacial zone is of 8—9 m. Texturally, this zones is represented by biopelmicrite with rare intercalations of gritty-clayey schists towards the upper part are replaced by biopelsparite with pelitoidal sandstones intercalations.

The zone is completely dominated by the *Saccocoma* planktonic crinoid which at this level presents maximum frequency. Beside this crinoid, *Acicularia jurassica* J o h n s o n, *Globochaete alpina* L o m b a r d, *Eothrix alpina* L o m b a r d, *Lenticulina (Lenticulina) muensteri* (R o e m e r), *L. (L.) subalata* (R e u s s) give a characteristic mark to this zone.

Among the benthonic foraminifera *Paalzowella feifeli feifeli* (P a a l z o w) has an interesting occurrence which presents at the interval a special frequency as compared to the other species, (Pl. XCVII).

Trocholina conica (Schlumberger) also occurs at the upper part of the zone. *Cadosina fusca* Wanner and *Stomiosphaera colomi* Durand-Delga maintain their presence within this zone beside *Cadosina semiradiata* Wanner, which appears and develops only within this zone.

It is noteworthy that as a whole the fauna association (macro and micro), Ammonites, Pelecypods, Bryozoans, Corals beside Crinoids and Algae represents a mixture of planktonic, benthonic and nectonic species; many of these organisms are broken, tornsioned, rolled or fractioned. This fact points to a high energy transport due to some strong bottom currents followed by a fast burial. This fact cannot be extended to the *Protoglobigerinae* zones wherein the deeply dominant pelagic character of the fauna gives a distinct note to the evolution of the sedimentary basin.

Biostratigraphically, the zone is first well defined by the *Saccocoma* planktonic crinoid beside the bethonic species *Acicularia jurassica* Johnson and *Paalzowella feifeli feifeli* (Paalzow) which develop mostly in the Oxfordian-Kimmeridgian or Tithonian interval.

The *Saccocoma* Zone corresponds, regarding the age, (taking into account the ammonite fauna) to the terminal part of the Lower Kimmeridgian and, as a whole, to the Upper Kimmeridgian (Pl. XCVII).

DESCRIPTION OF THE TITHONIAN CHARACTERISTIC MICROFACIAL ZONES

The Tithonian stage comprises the terminal part of the "*Acanthicum* Beds" as well as the Stramberg calcareous complex *sensu* Herbich (1878).

LOWER TITHONIAN

III. Paalzowella Zone

Paalzowella Zone is disposed at the upper part of the "*Acanthicum* Beds". The lowermost part of the zones corresponds to the *Lithographicum* and *Ulmense* Ammonite zones, the rest of the zone being outlined by the presence of *Pygope janitor* (Pictet), species which becomes predominant to the uppermost part of the complex.

The microfacial zone corresponds to the terminal part of the middle horizon and, as a whole, to the upper horizon made up of pelitoidal sandstones with grey-greenish and yellowish gritty-clayey schist intercalations. The thickness of the zone does not exceed 13 m.

If from the macrofaunistic viewpoint this interval is well defined only at the lowermost part, microfaunistically, the zone is well characterized and individualized by the benthonic foraminiferal abundance. The foraminiferal association is dominated by Involutinidae and Nodosariidae family, beside species from Spirillinidae, Discorbidae and Textulariidae families which rarely appear.

The *Paalzowella* genus belonging to the Involutinidae family has a remarkable presence beside *Trocholina* genus. Among the species and subspecies of the *Paalzowella* genus, *Paalzowella feifeli feifeli* (Paalzow) and *P. feifeli elevata* Paalzow have a limited evolution at the lower and middle part of the zone (Pl. XCVII).

Paalzowella feifeli seiboldi Lutze and *Paalzowella* sp. are frequently found at the upper part of the zone.

The frequency of the species belonging to the *Trocholina* genus is rather important, being represented by *Trocholina alpina* (Leupold), *T. elongata* (Leupold), *T. solecensis* Biel. & Pozarysk. and *T.* cf. *nodulosa* E. & I. Seibold. At the upper part of the zone one may found *Trocholina* cf. *delicatissima* Kalantari and *T.* cf. *conica* (Schlumb.).

The species: *Lenticulina (Lenticulina) omphalovorticosa* Farinacci, *L. (L.)* cf. *subalata* (Reuss), *L. (L.) varians* (Bornemann), *L. (L.) quenstedti* (Gümbel) beside *Nodosaria mutabilis* Terquem, *N. nitidana* Brand and *N.* cf. *dispar* Franke (Pl. XCVII) belonging to the Nodosariidae family were found especially at the midlle and upper part of the zone.

The species belonging to the Spirillinidae family are encompassed especially at the upper part of the zone where *Turrispirillina amoena* Dain, *Conicospirillina* sp. and *Spirillina kuebleri* Mjatl. are found. *Protopeneroplis striata* Weynschenk, *Girvanella jurassica* Frémy&Dangeard

and *Cayeuxia moldavica* F r o l l o (Pl. XCVII) algae were more rare found in pelitoidal sandstones at the lower part of the zone.

It is noteworthy the presence of the Discorbidae especially at the terminal part of the "*Acanthicum* Beds". We assigned the types met to the *Discorbis* genus which by morphology and structure is similar to the *Discorbis (Topaludiscorbis) danubiensis* N e a g u, met in Oxfordian-Kimmeridgian of the Central Dobrogea.

If as a whole the foraminiferae microfauna, found within the zone, is rather homogenous being represented by benthonic species sometimes *Globigerina helveto-jurassica* H a u e s s l e r appears very frequently at the midlle part of the zone. This species is a planktonic one indicating open sea recurrences due to the sea currents which favorised the mixture of the two microfauna types. In ensemble the benthonic microfauna type remains the main association within the *Paalzowella* Zone. The presented foraminiferae assemblage comprises numerous species rather strictly located within the Upper Oxfordian-Lower Kimmeridgian interval, as there are the associations found in Jura, South Germany, Poland, Donetz basin and the Central Dobrogea. Some genera as *Paalzowella* have species encompassed especially at the lower part of the Malm, but which are sometimes found at the upper part of the Kimmeridgian or even within the Tithonian. *Trocholina* genus with different species as well as a part of the Spirillinidae species are encompassed within the Oxfordian-Tithonian level.

The *Paalzowella* Zone is a characteristic zone for the Bicaz Valley Region disposed at the lower part of the Tithonian. The presence of the *Paalzowella*, *Trocholina*, *Spirillina* and *Conicospirillina* genera does not represent a strange thing, being well known the fact that the benthonic genera and species can vehiculate within large intervals even within some stages.

IV. „Pianella" pygmaea Zone

"*Pianella*" *pygmaea* Zone is disposed at the lower part of the Stramberg Limestones complex *sensu* H e r b i c h 1878. This zone is developed on a thickness of 30 m, it begins with biomicrite which along the rest of the zone are replaced by biopelsparite (Pl. XCIX). At the middle part of the zone siliceous nodules are frequently found, while at the upper part grade-beddings appear.

The fauna met at the lower part of the zone is represented only by *Cladocoropsis mirabilis* F e l i x hydrozoan.

Microfloristically, the distinctive note is given by the presence of algae : *Clypeina parvula* C a r o z z i, "*C.*" *parvissima* D r a g a s t a n, *Hikorocodium fertilis* E n d o, *Cayeuxia moldavica* F r o l l o, *Girvanella jurassica* F r é m y & D a n g e a r d and *Lithocodium* sp., assemblage dominated especially by "*Pianella*" *pygmaea* (G ü m b e l) (Pl. XCIX).

Among the foraminifera, the species of the Involutinidae and Spirillinidae family as *Trocholina alpina* (L e u p o l d), *T. conica* (S c h l u m b e r g e r) and *T. solecensis* B i e l. & P o z a r y s k., beside *Spirillina tenuissima* G ü m b e l and *Nautiloculina oolithica* M o h l e r are frequently found. "*Mercierella*" *dacica* D r a g a s t a n serpulide, coprolithes represented by *Favreina salevensis* (P a r e j a s), Spongia debris and Cyclostomate bryozoans are found together with Algae and Foraminifera. Different type of micro-oncolithes with some characteristic subtypes are found very frequently within the whole zone. The micro-oncolithes are very important in proving the changes and the fluctuation of the seashore line within the sedimentary basin. Thus defined the "*Pianella*" *pygmaea* Zone is dominated by algae, widely spread only at the regional scale within the Tithonian stage. The first appearence or datum level of the "*Pianella*" *pygmaea* species permits the emplacement of the zone only in the lower Tithonian, thus the zone may become characteristic of this interval.

V. Kurnubia jurassica Zone

Kurnubia jurassica Zone is developed at the terminal part of the Lower Tithonian on a thickness of 15—20 m. The limestones are mostly biopelsparitic or biomicritic, especially at the midlle and upper part of the zone (Pl. XCIX).

The micropalentological association of the zone is dominated by *Kurnubia jurassica* (H e n s o n) beside *Cylindroporella arabica* E l l i o t t "*Pianella*" sp., *Girvanella jurassica* F r é m y & D a n g e a r d, *Acicularia elongata* C a r o z z i, *Lithocodium morikawai* E n d o which form the characteristic elements of the association zone; the presence of the *Conicospirillina basilensis* M o h l e r is rather rare. Different types of "*micro-oncolithes*" are frequently found within the zone as well.

Kurnubia jurassica Zone by its evolution to the terminal part of the Lower Tithonian especially characterized by *Cylindroporella arabica* E l l i o t t and *Acicularia elongata* C a r o z z i algae, may become an important index-zone for the Tithonian stage, if it is redefined and completed with new elements.

UPPER TITHONIAN

The Upper Tithonian has been separeted only by microfacial elements, litologically being mostly calcareous.

VI. Bankia striata Zone

Bankia striata Zone represents the first zone with which the Upper Tithonian begins in the Bicaz Valley Region. The thickness of the zone is of 70 m.

The zone starts with a Stromatolithic level, very important from stratigraphic and sedimentologic point of view, which marks the beginning of a new sedimentary cycle (Pl. XCIX).

This level owed its existence to a phase of raising to the bottom of sedimentary basin, which begun at the end of the Lower Tithonian. This uplift phase allowed to an algolithic facies set up by a myxofitic nature; fixed to the substratum. The substratum morphology as well as the existing "sea streams" within the shore region, permitted the growing and the hemispheroids fusion of the lateral link type (LLH) separated by L o g a n, R e z a k and G i n s b u r g.

The limestones have a predominant biopelsparitic or biopelmicritic texture. Towards the upper part of the zone, oopelsparite are found. They are characteristic of the beach-rock facies from intercotidal zone, being the result of the change basin configuration, which underwent an uplift at the Lower Tithonian end. The oopelsparites represent the first level met in the Tithonian deposits, being developed on a thickness of 5—6 m.

Macrofauna of the zone is formed by: *Thecosmilia trichotoma* (G o l d f.), *Heliocoenia* sp., *Adriatella poljaki* M i l a n, *Nerinea* cf. *nodosa* (d'O r b.),. *Ostrea* sp. and *Cidaris* sp. especially found at the lower part, while at the terminal part of the zone numerous hydrozoans are encountered namely: *Cladocoropsis mirabilis* F e l i x, *Parastromatopora* sp. and *Actinostromaria* sp. (Pl. XCIX).

The microfacial zone is characterized by *Bankia striata* (C a r o z z i) an index-zone Teredinide, which presents at this stage a maximum of frequency, beside the algal species: "*Clypeina*" *parvissima* D r a g a s t a n, *C. parvula* C a r o z z i, *Lithocodium morikawai* E n d o, *Pseudoepimastopora jurassica* E n d o, *Boueina hochstetteri* (T o u l a), "*Pianella*" *johnsoni* D r a g a s t a n, *Globochaete spinosa* D r a g a s t a n, *Cayeuxia piae* F r o l l o and *C. anae* D r a g a s t a n.

Also, the following foraminifera genera represented by *Ammobaculites* sp., *Glomospirella* sp. and *Acervulina* sp. now appear, the last one being frequently found at the terminal part of the zone. A permanent element of the Tithonian limestones is the presence of numerous "micro-oncolithe" types. Among these, the *Spheroidal concentric* type (SS—C) L o g a n et al. and the *Ellipsoidal* type separated by D r a g a s t a n are frequently found within this zone. *Bankia striata* Zone is an Upper Tithonian characteristic zone with a regional value as it was found not only in the Carpathians but also in the Dinarids, Apennines, Cevennes and of the Lisbon surroundings (Portugal). This zone is defined especially by algae which on the whole, have a wider circulation than the interval of *Bankia striata* index species.

VII. Clypeina jurassica Zone

Clypeina jurassica Zone develops on a thickness from to 70 to 75 m. At the lower and midlle part of the zone algal-biolithite of bryozoans, serpulidae and sometimes hydrozoans and hexacorals biolithite are found. The limestones are especially represented at the lower and middle part of the zone by biopelsparites and biopelmicrites, while at the upper part the limestones are biopelsparitic. It is noteworthy that both at the lower part, nearby the *Bankia striata* Zone boundary, and at the upper part, nearby the *Calpionella* Zone boundary graded-beddings (Pl. XCIX) are found.

The macrofauna is present only at the lower part of the series by : *Spongiomorpha asiatica* (Yabe & Sugiyama), *Tubuliella* sp. and frequent serpulides.

Beside *Clypeina jurassica* (Favre) index species, are found *Pseudoepimastopora jurassica* Endo, "*Pianella*" *johnsoni* Dragastan, *Acicularia elongata* Carozzi, *A?minuta* (Maslov), *Ortonela lemoineae* Dragastan, *Diversocallis* n.sp., *Nipponophycus ramosus* Yabe & Toyama, *Thaumatoporella parvovesiculifera* (Raineri) (Pl. XCIX.)

Micro-oncolithes of ellipsoidal type with *nubecularioidal* and *columnoidal* subtypes are very numerous at this level zone. This primitive algal subtypes are sedimentologically very important. The Schyzophytic algae grew within the seashore biotops under tidal influences from the intercotidal to supercotidal zone.

Beside the algae, *Pseudocyclammina lituus* (Yok.), *Ammobaculites* sp., *Nodophtalmidium jurassicum* (Carozzi), *Spirillina* sp., are found too ; and more frequently at the upper part of the zone *Everticyclammina virguliana* (Koechlin) and *Rectocyclammina chouberti* Hottinger, to which *Favreina salevensis* (Parejas) and *Favreina* sp. coprolithes added, the last indicates for certain moments the instalation of a more or less developed lagunar episode.

Clypeina jurassica Zone is a well individualized index zone in the Upper Tithonian with a widespread regional character found in all Carpathian chain.

VIII. Calpionella Zone (pro parte)

Calpionella Zone is placed at the terminal part of the Tithonian stage as well as at the lower part of the Berriasian stage which points the beginning of the Cretaceous series in the region.

Calpionella Zone is developed within the Upper Tithonian on a thickness of 20—25 m and on a thickness of 20—30 m within the Berriasian stage. The whole zone have a thickness of 30—40 m.

The lower part of the zone is represented by light grey calcilutites with a biopelsparitic texture which at the Berriasian boundary become calcarenitic and calcilutitic of red yellowish spots with biopelmicritic texture and open cavity or bird eyes (Pl. XCIX, C). The series goes on with calcirudite-calcarenite-calcilutite sequences with reddish-grey intraformational reworked calcirudite, as in the upper part of the zone yellowish calcilutides are disposed.

The characteristic association of this zone is given by Calpionellids : *Calpionella alpina* Lorenz, beside more rare *Calpionella elliptica* Cadisch, then *Crassicollaria parvula* Remane and *Tintinnopsella carpathica* (Murgeanu & Filipescu) with small lorica and elliptical habitus, species typically for the Upper Tithonian. Beside Calpionellids "*micro-oncolithe*", *Pseudoepimastopora jurassica* Endo, *Likanella* sp. aff. *bartheli* Bernier and miliolidae are found.

After the microfacial assemblage the *Calpionella* Zone comprises the Lower and Middle Berriasian. In Beriassian *Calpionella alpina* still keeps its frequency, beside *Crassicollaria parvula* Remane and *Tintinnopsella carpathica* (Murgeanu & Filipescu) which allows to trace the Jurassic-Cretaceous boundary in the Bicaz Valley Region (East Carpathians). *Tintinnopsella carpathica* (Murgeanu & Filipescu) presents an oval elliptic habitus and it is bigger than the same species found in the Upper Tithonian.

The Middle Berriasian would correspond to the maximum of development reached by *Calpionella elliptica* Cadisch, beside *Tintinnopsella carphathica* (Murgeanu & Filipescu),

a type with elliptic-cylindrical habitus, and a great lorica from the Cretaceous time. The presence of the Middle Berriasian has been demonstrated on the Ammonites basis : *Berriasella* cf. *privasensis* (P i c t e t) found by C. G r a s u in the Hăghimaşul Negru in association with *Calpionella alpina* L o r e n z and *C. elliptica* C a d i s c h. At certain levels of the Beriassian in association with Calpionellids there are found : *Bacinella irregularis* R a d o i c i c, *Lithocodium aggregatum* E l l i o t t, *Eggerella* sp., *Feurtillia frequens* M a y n c, *Favreina cuvillieri* Br ö n n i m a n n, *Everticyclammina virguliana* (K o e c h l i n), *Rectocyclammina chouberti* H o t t i n g e r and *Conicospirillina* sp. (Pl. C).

Calpionella Zone permits by a percentage study of the Calpionellid species, the drawing of the Jurassic-Cretaceous boundary in the Bicaz Valley Region, boundary which can be placed, according to our data, at the first appearance of the *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) species, with an oval-elliptic habitus, and greater lorica typical for the Cretaceous time.

JURASSIC-CRETACEOUS BOUNDARY IN THE BICAZ VALLEY REGION (EAST CARPATHIANS)

The Jurassic-Cretaceous boundary in the Bicaz Valley Region presents some characteristic local-feature, inherent to every region.

Firstly, the lack of a rich Ammonits fauna within Tithonian-Berriasian interval and especially the facial character, inadequate to the development of these organisms do not permit a stratigraphical horizontation in detail. Nevertheless the Uppermost Tithonian developed under a reef or peri-reef facies without Ammonites but with rare Calpionelles, it presents some important characters for the achievement of a biostratigraphic scale. The Berriasian and Valanginian stages in this region are developed under two types facies, one with *Leviathania* is reefy or pery-reefy, and another pelagic with *Berriasella* and *Neocomites*, but both of them with some shorter planktonic Calpionellid phases.

So, at least at the Uppermost Tithonian the lack of the macrofauna may be supplied by Calpionellids, which are present in both facies types within a certain interval and even in the Lower Berriasian-Valanginian. In this way, Calpionelle assembleges are the major elements, common to the Upper Tithonian-Lower Valanginian interval, indifferent to the facies under which the macrofauna develops.

Besides Calpionellids, the Dasycladaceae and the Foraminifera of the Lituolidae family have an almost similar importance but with a larger evolution interval in comparison with the Calpionellid zones.

MICROFACIAL ZONES ON THE BASIS OF CALPIONELLID ASSOCIATIONS

Referring to the Calpionellid associations found in the Bicaz Valley Region, we must point out from the beginning the reduced frequency of the Calpionellid species, in analogy with other regions situated within the whole Carpathian chain. Besides these local characteristic features, it was possible to set out a biostratigraphic scale which corresponds to the standard zones established by A l l e m a n n, C a t a l a n o, F a r è s, and R e m a n e (1971) for the West Mediterranean Province.

The Upper Tithonian-Lower Valanginian characteristic zones from the Bicaz Valley Region separated on the basis of the species succession of the Calpionelles are the following :

VIII. *Calpionella* Zone; IX. *Calpionellopsis* Zone; X. *Lorenziella* Zone.

As one can see, in comparison with the standard zones carried out by A l l e m a n n et al. for the West Mediterranean Province, the lack of the *Crassicolaria* Zone in the Bicaz Valley Region is noticed in the Upper Tithonian level. This zone, which in other regions as Rarău syn-

cline (*Aptychus* beds), Hăghimaș Syncline (Lunca beds) or Bucegi and Trascău Syncline, is present and well developed (Fig. 10).

The simple presence of the *Crassicollaria parvula* R e m a n e species beside *Tintinnopsella remanei* B o r z a, does not allow the identification of the zone. The former mostly proliferates within the *Calpionella* Zone surpassed the Jurassic-Cretaceous boundary according to R e m a n e (1971),

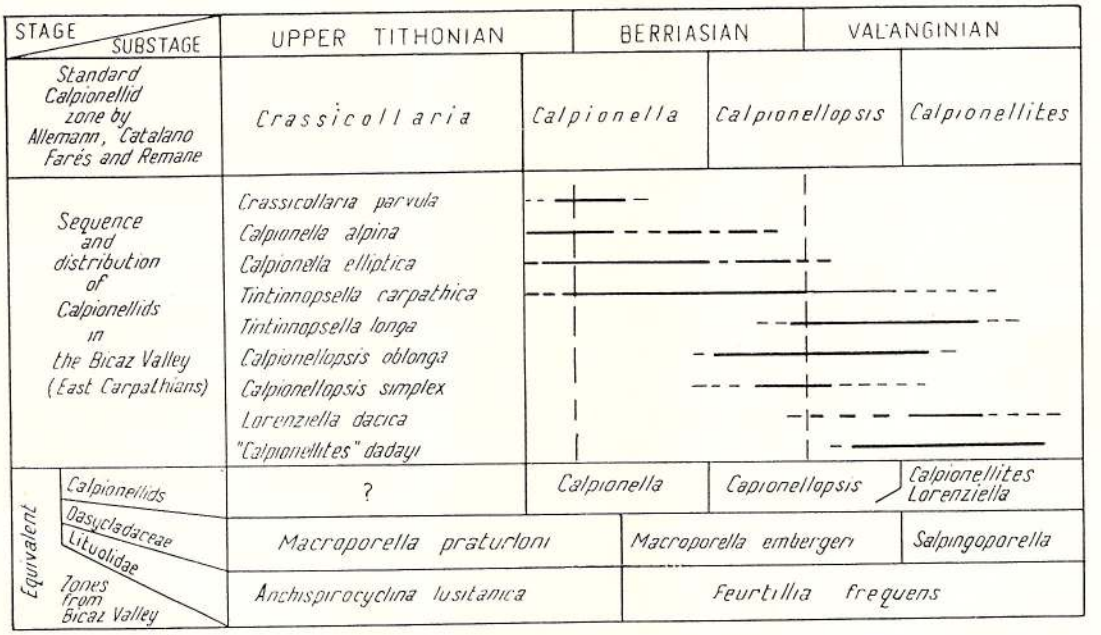

Fig. 10. — Calpionellids Zones and equivalent Zones from the Bicaz Valley Region (East Carpathians).

the latter is encompassed at the lower and middle part of the Upper Tithonian within the *Crassicollaria* Zone. The separation of the zone is hard to be done as the *Crassicollaria intermedia* (D u r a n d-D e l g a) species has not been yet identified [5].

VIII. Calpionella Zone

Calpionella Zone is placed at the upper part of the Tithonian and it is completely dominated by *Calpionella alpina* L o r e n z beside *C. elliptica* C a d i s c h, *Crassicollaria parvula* R e m a n e and *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) (Fig. 10).

The boundary between Tithonian and Berriasian must be traced within *Calpionella* Zone at the same time with the occurence, beside the above mentioned assemblage, of the loricas with oval-elliptical habitus, greater than *Tintinnopsella carpathica*. This type proliferates only nearby the Jurassic-Cretaceous boundary, it representing an important evolutive event, may be a phylogenetic one, which allows to draw the boundary, in the Bicaz Valley region (East Carpathians).

The Lower and Middle Berriasian is included within this zone, especially the lower one and a part of the middle one. This interval is characterized by *Calpionella alpina* L o r e n z beside *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) more frequently, followed by *Calpionella elliptica* C a d i s c h which presents some changes of frequency within this zone. For the Lower and Middle Berriasian there are characteristic : *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) with large-sized lorica and oval-cylindrical habitus frequently found, beside *Calpionella elliptica* C a d i s c h, which becomes more frequently to the upper part of the zone (Fig. 10).

[5] Later on the *Crassicollaria* Zone was identified at the confluence between the Bicăjel and the Bicaz rivers.

Berriasella cf. *privasensis* (P i c t e t) found by C. G r a s u in the Hăghimașul Negru Mts, as well as the presence of the *Calpionella alpina* L o r e n z and *C. elliptica* C a d i s c h species are other proofs in the favour of the Middle Berriasian in the region. At the same time *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) species, with large oval-cylindrical lorica, demostrates the presence of the Lower Berriasian in the region, being known the fact that this type is characteristic of the Cretaceous.

Thus, the evolutive line of the *Tintinnopsella carpathica* presents two important events. The first is placed near the Jurassic-Cretaceous boundary and corresponds to the appearance of the larger oval-elliptical loricas, which in the oral zone presents between the proper lorica and collar a conexion region, which has thinner walls than the rest of the lorica and which, in our oppinion, may be considered as passing types from the Jurassic to the Cretaceous. These types with the conexion zone thinner than the rest of the lorica may be used in the tracing the above mentioned boundary.

The second event is represented by the first occurrence of the large-sized loricas with oval-cylindrical habitus,typical for the Lower and Middle Berriasian (*pro parte*).

Thus defined, the Jurassic-Cretaceous boundary may be drown approximately in the Ghilcoș, Bicăjel I and Bicăjel II massifs (Pl. CII).

IX. Calpionellopsis Zone

Calpionellopsis Zone is a large zone dominated by *Calpionellopsis oblonga* (C a d i s c h) beside a series of satellite types as : *Calpionellopsis simplex* (C o l o m), *Calpionella alpina* L o r e n z, *C. elliptica* C a d i s c h, *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) and *Tintinnopsella longa* (C o l o m) (Fig. 10).

Species characteristic to this zone are : *Calpionellopsis oblonga* (C a d i s c h), *C. simplex* (C o l o m), *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) and *Tintinnopsella longa* (C o l o m) (Fig. 10).

Within this zone, the only species which dominates is *Calpionellopsis oblonga* (C a d i s c h) beside *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) with large cylindrical lorica, while *Calpionellopsis simplex* (C o l om) is more rare found and it seems that the first occurrence moment of this species corresponds to that of *Calpionellopsis oblonga* (C a d i s c h) (Fig. 10).

Calpionellopsis Zone mostly develops within Middle Berriasian-Lower Valanginian interval. It was pointed out in the Ghilcoș, Făgetul Ciucului, Bicăjel I and Bicăjel II massifs, sometimes having a wider spread interval within the Valanginian stage than in the Berriasian (Pl. C).

Regarding the Berriasian-Valanginian boundary in the Bicaz Valley Region, it would take place at the same time with the first appearence of the "*Calpionellites*" *dadayi* K n a u e r species, beside *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u) and *T. longa* (C o l o m), which complete the assemblage (Fig. 10).

X. Lorenziella Zone

Lorenziella Zone develops only in the Lower Valanginian interval marking one of the final group evolution level, after which the Calpionelles dissapear having no importance. Within this zone there are found : *Lorenziella dacica* (F i l i p e s c u & D r a g a s t a n) then satellite species rather rare which carry on their evolution started within the *Calpionellopsis* Zone ; *Calpionellopsis oblonga* (C a d i s c h), *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u), *T. longa* (C o l o m) and "*Calpionellites*" *dadayi* K n a u e r (Fig. 10).

In the Bicaz Valley Region (East Carpathians) at this level the *Calpionellites darderi* (C o l o m) was not found. This is an index-zone species which in our oppinion may be partially replaced by *Lorenziella dacica* (F i l i p e s c u & D r a g a s t a n), species which was found in Banat (Svinița Zone), Crivina marls with *Neocomites neocomiensis* (d'O r b.) specifies the Lower Valanginian age.

UPPER TITHONIAN-LOWER VALANGINIAN MICROFACIAL ZONES SEPARATED ON THE BASIS OF SOME GENERA FROM DASYCLADACEAE FAMILY

Because the Calpionellid facies was sporadically found in the studied massifs, we tried to use, for the Upper Tithonian-Lower Valanginian interval, a scale which has at its statement genera and species of Dasycladacean family (Fig. 11).

Thus within the above mentioned interval there could be distinguished the following zones : VIII. *Macroporella praturloni* Zone ; IX. *Macroporella embergeri* Zone ; X. *Salpingoporella annulata* Zone.

<table>
<tr><td colspan="2">UPPER TITHONIAN</td><td colspan="2">BERRIASIAN</td><td>VALANGINIAN</td><td>STAGE</td></tr>
<tr><td colspan="2">CRASSICOLLARIA</td><td>CALPIONELLA</td><td>CALPIONELLOPSIS</td><td>CALPIONELLITES</td><td>STANDARD CALPIONELLID ZONE</td></tr>
<tr><td colspan="2">MACROPORELLA PRATURLONI</td><td colspan="2">MACROPORELLA EMBERGERI</td><td>SALPINGOPORELLA</td><td>DASYCLA-DACEAE</td></tr>
<tr><td colspan="2">ANCHISPIROCYCLINA LUSITANICA</td><td colspan="3">FEURTILLIA FREQUENS</td><td>LITUOLIDAE</td></tr>
<tr><td colspan="2">FIRST MACROPORELLA AND ANCHISPIROCYCLINA</td><td colspan="2">FIRST MACROPORELLA EMBERGERI AND FEURTILLIA</td><td>FIRST SALPINGOPORELLA</td><td>STRATI-GRAPHIC EVENT</td></tr>
</table>

Fig. 11. — Essay of the correlation of standard Calpionellid Zones (Upper Tithonian-Valanginian) with the equivalent Zones of Dasycladaceae and Lituolidae.

VIII. Macroporella praturloni Zone

Macroporella praturloni Zone especially develops at the Uppermost Tithonian as well as at the lower part of the Berriasian (Fig. 11). Although this zone has a wider interval within Tithonian and less in the Berriasian covering the interval of *Crassicolaria* and *Calpionella* (*pro parte*) zones (Fig. 11).

The identification of this zone was imposed by the practical necessities for the defined Jurassic-Cretaceous boundary by the species-algal abundance at the Upper Tithonian-Berriasian interval. In the majority of the studied massifs, this zone has been defined on the basis of the first moment occurrence of species, moment which permits the separation of the zone from the lower zone with *Clypeina jurassica* (Pl. CII).

The assemblege zone is rather simple: the *Torinosuella peneropliformis* (Y a b e & H a n z a w a), *Pseudocyclammina lituus* (Y o k.), *Everticyclammina virguliana* (K o e c h l i n), *Trocholina alpina* (L e u p o l d) foraminiferae, beside rare Calpionellids represented by : *Calpionella alpina* L o r e n z and *C. elliptica* C a d i s c h, as well as *Cayeuxia moldavica* F r o l l o (Pl. XCIX).

From this assemblage, the species with a rather delimited interval at the Jurassic-Cretaceous level are : *Torinosuella peneropliformis* (Y a b e & H a n z a w a), *Everticyclammina virguliana* (K o e c h l i n), *Rectocyclammina chouberti* H o t t i n g e r, beside *Likanella* sp. (*L.* aff. *bartheli* B e r n i e r), *Calpionella alpina* L o r e n z and *C. elliptica* C a d i s c h which specify with accuracy the age of this zone. It is interesting to note that *Everticyclammina virguliana* (K o e c h l i n) was found in the Upper Tithonian from the Făgetul Ciucului massif and in the Berriasian from the Bicăjel I massifs in assemblage with *Calpionella alpina* and *C. elliptica.*

Macroporella praturloni Zone was found in the Ghilcoș massifs (both slopes) as well as in the Făgetul Ciucului Massifs (Pl. CII). This zone has a wider evolution interval in comparison with the Calpionellid zones and in the future it must have a stratigraphic value for the Jurassic-Cretaceous boundary.

IX. Macroporella embergeri Zone

Macroporella embergeri Zone is also a zone with a wider evolution interval especially within Berriasian and less in the Valanginian (Fig. 11). This zone would correspond to the *Calpionella* Zone *(pro parte)* and on the whole to *Calpionellopsis* Zone.

The lower boundary of the zone is given by the first occurrence of the *Macroporella embergeri* (Bouroullec & Deloffre) species while the upper boundary is marked by the appearance of the *Salpingoporella annulata* Carozzi (Fig. 11). The zonal association is made up of the algae : *Heteroporella lemoinei* Dragastan, *Actinoporella podolica* (Alth), *Radoiciciella subtilis* Dragastan, *Likanella campanensis* Azèmma & Jaffrezo, *Clypeina? solkani* Conrad & Radoicic beside rare Calpionelids, *Calpionellopsis oblonga* (Cadisch), *Tintinnopsella carpathica* (Murgeanu & Filipescu) and *Feurtillia frequens* Maync (Pl. C). The majority of the algae found within this assemblage are characteristic of the *Embergeri* Zone, some of them having wide evolution intervals, which although do not change the base content of the zone. The sporadic presence of the Calpionellids and especially of the *Calpionellopsis oblonga* (Cadisch) species specifies the age of the *Embergeri* Zone (Pl. C).

Embergeri Zone was found in the Ghilcoş, Făgetul Ciucului and Cupaş massifs.

X. Salpingoporella annulata Zone

Salpingoporella annulata Zone is developed especially within the Valanginian stage. The lower boundary is given by the first occurrence of the *Salpingoporella annulata*, and the upper boundary by the total disappearance of the species (Fig. 11). The characteristic association of this zone is made up of : *Feurtillia frequens* Maync, *Trocholina elongata* (Leupold), *Salpingoporella radoicicae* (Praturlon), *Heteroporella lemoinei* Dragastan, *Likanella campanensis* Azèmma & Jaffrezo, *Clypeina? solkani* Conrad & Radoicic beside rare Calpionellids, *Tintinnopsella carpathica* (Murgeanu & Filipescu) assemblage which mostly resembles that of the previous zone.

Referring to the evolution of the *Salpingoporella annulata* Carozzi species we may say that with the whole regional fluctuation which it recorded, being sometimes found in Oxfordian-Kimmeridgian we think that this species has more Cretaceous than Jurassic affinities.

Annulata Zone was pointed in the Ghilcoş, Făgetul Ciucului and Bicăjel II massifs.

In conclusion we may say that the use of this biostratigraphic scale upon the Dasycladacean zones basis for the Upper Tithonian-Valanginian interval is an attempt which may be extended to other intervals. The zones defined on the Dasycladacean basis have larger temporal values as against those found on the Calpionellid basis. The fact that these zones are founded on the benthonic species does not mean that they can not be used in biostratigraphic zone correlations as their regional distribution, may be at least proved in case of the *Macroporella praturloni* or *M. embergeri* Zones, species already met with in the Murcia region in Spain; the latter being mostly found in the Neocomian (Berriasian-Valanginian) from the Aquitania Basin and Basse Provence region (France). In case of the *Salpingoporella annulata* Zone, the *Annulata* species was found especially in the Neocomian in most of the calcareous massifs of the Mediterranean domain.

UPPER TITHONIAN-VALANGINIAN MICROFACIAL ZONES ON SOME GENERA FROM THE LITUOLIDAE FAMILY BASIS

In comparison with the Dasycladaceae scale algae, the zone scale separated on the basis of some species of the Lituolidae family is very simple, being reduced within the Upper Tithonian-Valanginian interval to the : VIII. *Anchispirocyclina lusitanica* Zone; IX. *Feurtillia frequens* Zone.

VIII. Anchispirocyclina lusitanica Zone

Anchispirocyclina lusitanica Zone has a similar development to *Macroporella praturloni* Zone, being disposed at the terminal part of the Tithonian stage as well as at the lower part of the Berriasian (Fig. 11). Its lower boundary with *Clypeina jurassica* Zone is outlined by the first appearence of the *Anchispirocyclina lusitanica* (Egger). The upper boundary is marked by the predominant occurrence of the *Feurtillia frequens* species (Fig. 11).

The zone association is made up of *Everticyclammna virguliana* (K o e c h l i n), *E. irregularis* n. sp., *E.* aff. *elegans* R e d m o n d, *Pseudocyclammina lituus* (Y o k.), *Trocholina alpina* (L e u p o l d), *T. elongata* (L e u p o l d), the last species being frequently found at this level. Beside foraminifera, there are also found the following algae: *Macroporella praturloni* D r a g a s t a n, *Clypeina? solkani* C o n r a d & R a d o i c i c, *Likanella* sp., *L.* aff. *bartheli* B e r n i e r, *Radoiciciella subtilis* D r a g a s t a n, *Arabicodium* sp., *Actinoporella?* sp. (Pl. C).

Within this zone, there were rarely found *Calpionella alpina* L o r e n z beside *C. elliptica* C a d i s c h, species which outline the evolutive space interval of the zone.

The *Anchispirocyclina lusitanica* Zone was found in the Suhardul Mic and Cupaş massifs (Pl. CII).

The Jurassic-Cretaceous boundary is located in this case to the upper part of the zone, without being able to state "exactly" this boundary.

The *Anchispirocyclina lusitanica* Zone may have a wide regional character as it is known that this species had been found within the Tithonian-Berriasian interval, in the Mediterranean region. According to M a y n c, it is a typical mesogean species which is found in the Green Cap Isles of Cuba and U.S.A.

IX. Feurtillia frequens Zone

Feurtillia frequens Zone is widely developed as compared to the zones previously described, being mostly encompassed in the Cretaceous, at the Berriasian-Lower Valanginian level (Fig. 11).

The lower boundary is given by the occurrence of the *Feurtillia frequens* species, while the upper boundary is given by its sporadic presence (Fig. 11).

The zone association is made up of *Macroporella embergeri* B o u r o u l l e c & D e l o f f r e, rarely *Salpingoporella annulata* C a r o z z i, *Heteroporella lemoinei* D r a g a s t a n, *Clypeina? solkani* C o n r a d & R a d o i c i c, *Likanella* aff. *bartheli* B e r n i e r. Sometimes, as in the Bicăjel I massif, rare specimens of *Calpionellopsis oblonga* (C a d i s c h) were found (Pl. C).

The *Feurtillia frequens* Zone was separated in the Suhardu Mic and Bicăjel massifs, being a zone which proliferates mostly during the Lower Cretaceous.

Therefore, the Jurassic-Cretaceous boundary is located within the *Calpionella* Zone and, from case to case, within the *Macroporella praturloni* Zone or the *Anchispirocyclina lusitanica* Zone.

Considering the three groups of organisms, we notice that no group has such an evolution as to allow the tracing of the Jurassic-Cretaceous boundary, the genera and species continuously developing, without having some important changes near the boundary. In spite of all these considerations, the Calpionellids remain an important group for the defining of the Jurassic-Cretaceous boundary, in comparison with the values of the zones separated relying on the Dasycladaceae algae or on the species of the Lituolidae family which have larger evolution intervals. The standard zones established by A l l e m a n n et al. (1971) for the West Mediterranean Province may be very well applied to the Eastern Provinces too. On the contrary, when the planktonic facies is sporadically developed, there may be used for zoning, benthonic organisms which live in a neritic, perireef and reef environment and which allow the outline of the Jurassic-Cretaceous boundary, when the Calpionellids being partially or totally lacking. However, it is obvious to exist some variations connected to the peculiarities of each sedimentary basin, but there exists a series of common elements which make possible the correlation among zones disposed at long distances in provinces.

CRETACEOUS

The Lower Cretaceous is limited to the two calcareous series: the Neocomian (Berriasian-Valanginian-Hauterivian) and the Barremian-Lower Aptian developed in Urgonian facies.

NEOCOMIAN

The Neocomian presents the following zones: VIII. *Calpionella* Zone *(pro parte);* IX. *Calpionellopsis* Zone; X. *Lorenziella/Salpingoporella* Zone; XI. *Ostracods* Zone.

VIII. Calpionella Zone (pro parte)

Calpionella Zone *(pro parte)* was treated entirely at the Tithonian that is why we do not describe it any more.

IX. Calpionellopsis Zone

Calpionellopsis Zone is located at the upper part of the Berriasian stage (probably the middle part too) as well as the lower part of the Valanginian. The larger development during the Lower Valanginian is a local peculiarity of this zone (Pl. C).

This zone has a thickness of 40—50 m, of which 10—15 m belong to the Berriasian. The series of deposits developed within this zone begins with coarse and fine calcarenites, then calcilutites with frequent intraformational reworked elements disposed nearby the Valanginian boundary. In the lower part, these yellowish limestones become grey-whitish in the rest of the zone. Texturally, limestones are biopelsparitic (Pl. C).

Within the Valanginian stage, the zone starts with coarse calcarenites and calcilutites with micrites. It is interesting to notice that in the calcilutitic series we found a "slumping" which trains the micro and macrofauna from the lower part, sometimes forming brecciated calcareous levels as well (Pl. C).

The encountered fauna is disposed at the lower part of the zone and is represented by *Leviathania leviathan* (Pictet & Campiche), *Ampullospira bullimoides* (d'Orb.) and *A. incerta* Pcelincev, assemblage which attest the Lower Valanginian age. The microfauna is characterized by *Calpionellopsis oblonga* (Cadisch), *C. simplex* (Colom), *Tintinnopsella carpathica* (Murgeanu & Filipescu), *T. longa* (Colom) and rarely by *Calpionella elliptica* Cadisch. Beside Calpionellids at certain levels there are the following algae and foraminiferae : *Lithophyllum? maslovi* Dragastan, *Macroporella embergeri* Bouroullec & Deloffre, *Radoiciciella subtilis* Dragastan, *Clypeina? solkani* Conrad & Radoicic, *Likanella* sp. (*L.* aff. *bartheli* Bernier), *Trocholina infragranulata* Noth, *T. elongata* (Leupold), *Feurtillia frequens* Maync, *Torinosuella peneropliformis* (Yabe & Hanzawa) and *Rectocyclammina* aff. *chouberti* Hottinger (Pl. C). *Favreina cuvillieri* Brönnimann is also found towards the lower part of the zone.

The above mentioned association points to the Middle (?)-Upper Berriassian-Lower Valanginian age. The *Calpionellopsis* Zone was found in the Ghilcoș, Bicăjel I and Bicăjel II massifs.

X. Lorenziella/Salpingoporella annulata Zone

The *Lorenziella/Salpingoporella* Zone is a typical zone for the Valanginian. Lithologically, it is constituted of calcilutites with some levels which presents intraformational reworked nature. Texturally they are represented by biopelsparite, the bioopelsparite being added to them on considerable thickness (5-lo m).

The limestones have grey-whitish, yellowish or reddish colours.

Within this zone, the Calpionellids are rarely being represented by *Lorenziella dacica* (Filipescu & Dragastan), *Tintinnopsella carpathica* (Murgeanu & Filipescu), *T. longa* (Colom) and "*Calpionellites*" *dadayi* Knauer (Fig. 10).

There are also found : *Salpingoporella annulata* Carozzi, *Radoiciciella subtilis* Dragastan, *Salpingoporella radoicicae* (Praturlon), *Clypeina? solkani* Conrad & Radoicic, *C.* aff. *pejovicae* Radoicic, *Likanella campanensis* Azémma & Jaffrezo, *Cayeuxia anae* Dragastan, *Lithocodium aggregatum* Elliott, *Lacrymorphus cataeneformis* Radoicic, *Aeolissacus inconstans* Radoicic, beside the foraminiferae : *Trocholina elongata* (Leupold), *T. alpina* (Leupold), *Feurtillia frequens* Maync and *Pseudocyclammina* aff. *lituus* (Yok.) (Pl. C).

As a whole the assemblage is characteristic of the Valanginian stage. The *Lorenziella/Salpingoporella* Zone has a thickness of 40 m, the *Lorenziella* Zone being found only in the Ghilcoş massif.

XI. Ostracod Zone

Ostracod Zone is located at the upper part of the Neocomian series, having a thickness between 50—60 m.

This zone is built up of calcilutites with frequent levels with reworked intraformational elements (Pl. C).

Texturally, it presents three oopelmicritic levels with thicknesses to 5 m, while at the lower part of the zone there are both oopelsparitic and oopelmicritic levels. The series of deposits ends with biomicrits which frequently present "open cavity" nearby the Barremian boundary. Limestones are reddish, sometimes with yellowish hues and finally being only yellowish.

Macrofauna was found at the middle part of the zone, being represented by *Cladocoropsis cretacica* Turnsek, species met in the Hauterivian deposits from Jugoslavia.

Beside Ostracods, which give the dominant note to the zone, there frequently occur the following algae: *Lithocodium aggregatum* Elliott, *Cayeuxia kurdistanensis* Elliott, *C. moldavica* Frollo, *C. piae* Frollo, *Ortonella lemoineae* Dragastan, *Actinoporella*? sp., *Clypeina*? *solkani* Conrad & Radoicic, *Teutloporella* sp., *Clypeina* aff. *pejovicae* Radoicic and frequent stems of Charophyte. Generally, the microfloristic assemblage already has several Barremian affinities. Beside algae, the foraminiferae are represented by *Ammobaculites* sp., *Pseudocyclammina* sp. and *Choffatella decipiens* Schlumb. According to the proceedings of the Lower Cretaceous Colloquium held in Lyon, the last species begins its evolution in the Hauterivian, fact which is verified in the present case as well.

The Ostracod Zone is mostly developed within the Hauterivian stage having a typical regressive character represented by brackish lagunar facies with Ostracods and Charophyta facies which close the Neocomian cycle in this region. The assemblage of this zone mainly proliferates within the Hauterivian-Barremian interval. The existence of this mixture of types allows the separation of the zone and it announces the beginning of a new cycle of sedimentation corresponding to the Barremian-Lower Aptian interval.

URGONIAN (BARREMIAN-LOWER APTIAN)

As regards the age, the Urgonian corresponds to the Barremian-Lower Aptian. Within the Urgonian the following microfacial zones were separated: XII. *Pseudocyclammina hedbergi* Zone; XIII. *Likanella*? *danilovae* Zone; XIV. *Atopochara* Zone.

XII. Pseudocyclammina hedbergi Zone

Pseudocyclammina hedbergi Zone develops in continuity of sedimentation over the Neocomian Ostracods Zone. The thickness of the zone varies between 80—100 m. Lithologically, there are found calcilutites with a biopelmicritic texture, then a biopelsparitic one and finally with a biomicritic one (Pl. CI).

The assemblage-zone is dominated by *Pseudocyclammina hedbergi* Maync, beside *Actinoporella* aff. *podolica* (Alth), *Lithocodium aggregatum* Elliott, *Arabicodium orientalis* Dragastan, *Lacrymorphus barremianus* Dragastan, "*Dasycladacea*" *laskarevi* Radoicic, and *Cayeuxia piae* Frollo (Pl. CI).

Among foraminifera, a rather frequent presence of the *Choffatella decipiens* Schlumb. species, beside numerous miliolidae and the microproblematic *Aeolissacus* sp., may be noticed.

The age of this zone is dated as Barremian by *Pseudocyclammina hedbergi* Maync, *Choffatella decipiens* Schlumb., *Lithocodium aggregatum* (frequently) and "*Dasycladacea*" *laskarevi* Radoicic.

XIII. Likanella? danilovae Zone

Likanella? danilovae Zone develops over the previous one, having a thickness of 70—80 m. Represented by calcilutites with a biopelmicritic, biomicritic and biopelsparitic texture with "open cavity", this zone is mainly characterized by algae, such as: *Likanella? danilovae* Radoicic beside *Cayeuxia fruticulosa* Johnson, C. *atanasiui* Dragastan, *Acicularia antiqua* Pia, "*Dasycladacea*" *dalmatica* Radoicic and "*D.*" *laskarevi* Radoicic, the last being rarely found within this zone (Pl. CI).

The foraminiferae are represented by *Choffatella decipiens* Schlumb. and frequently miliolids. By the entire association this zone belongs to the Upper Barremian.

XIV. Atopochara Zone

Atopochara Zone corresponds, as regards the age, to the Lower Aptian. Developed on a thickness varying from 20 to 40 m, this zone is mainly represented by biopelmicrites with frequent "open cavity".

Within this zone it is also "*Dasycladacea*" *dalmatica* Radoicic, beside numerous gyrogonites and *Charophyta* stems which mainly belong to the *Atopochara* genus and then to *Acicularia antiqua* Pia, *Cayeuxia atanasiui* Dragastan and "*Dasycladacea*" *dalmatica* Radoicic (Pl. CI).

The *Atopochara* Zone represents a brackish lagunar episode with which the sedimentary cycle of the Urgonian in the Bicaz Valley region ends.

SOME EQUIVALENT MICROFACIAL ZONES WITHIN THE BARREMIAN-LOWER APTIAN INTERVAL

In the Barremian stage, the *Pseudocyclammina hedbergi* and *Likanella? danilovae* zones were separated in the Ghilcoş massif. It is interesting to notice that there were observed zone

Serie	Stage or substage	Zones	Foraminifers	Algae	
Urgonian	Lower Aptian	Equivalent	*Palaeodictyoconus arabicus*	*Atopochara*	*„Pianella" exilis*
	Barremian		?	*Likanella? danilovae*	*Salpingoporella melitae*
			Pseudocyclammina hedbergi	*Salpingoporella dinarica*	*Salpingoporella carpathica*

Fig. 12. — „Urgonian" equivalent Zones from the Bicaz Valley Region (East Carpathians).

variations at a distance of 500 m from the type profile, within another section of the same massif located a little northwards. Thus, the *Salpingoporella dinarica* Zone is the equivalent of the *Hedbergi* Zone both having the following common species: "*Dasycladacea*" *laskarevi* Radoicic, *Lacrymorphus barremianus* Dragastan, *Choffatella decipiens* Schlumb. and *Aeolissacus* sp. (Fig. 12). One may also notice that within the *Hedbergi* Zone the *Salpingoporella dinarica* Radoicic was found, fact proving the equivalence of the two zones. In the Făgetul Ciucului

massif, in the lower part of the Urgonian series, there was distinguished the *Salpingoporella carpathica* Zone which is the equivalent of the *Dinarica* and *Hedbergi* Zones due to the fact that some elements common to all the zones were found within this zone (Fig. 12).

Likanella? danilovae Zone found in the Ghilcoş massif is the equivalent of the "*Pianella*" *melitae* Zone. Both of them were found in the Bicăjel I massif having the following common elements: "*Dasycladacea*" *dalmatica* Radoicic, *Choffatella decipiens* Schlumberger, *Cayeuxia piae* Frollo and *C. moldavica* Frollo. At the level of the Lower Aptian some equivalences cannot be well outlined as the respective zone assemblages differs a lot.

REGIONAL MICROFACIAL CORRELATIONS WITH SPECIAL REFERENCES TO ROMANIA

The outline of some general characteristic features at regional scale imposes a certain degree of prudence because the microfacial variations at local scale are sometimes as important as those related to regional scale. The regional microfacial correlations may be tried on large sedimentation domains with a similar tectonic and geologic evolution.

For the Bicaz Valley Region (East Carpathians) the regional correlations are carried out in comparison with some others developed sectors from the Alpine-Carpathian geosyncline.

These correlations may be achieved at the Upper Jurassic level with the Pieninen Klippen Sector from the North Carpathians (Borza, 1969), with the High Tatra Sector (Lefeld, 1968) with the Central Apennines and Outer Dinarids (Farinacci and Radoicic, 1964) with the Ceveni Mts.-southern part (Bernier, 1968), with the south-western part of the Aquitania basin (Bouroullec and Deloffre, 1970), with the Castellon province-Spain (Bouroullec, Canérot and Déres, 1970) and with the limestone formations from the Lisbon outskirts-Portugal (Ramalho, 1971).

PIENINEN KLIPPEN SECTOR

In the Pieninen Klippen Sector, there are distinguished, according to Borza (1969), in the Upper Jurassic the following microfacies:

The "*Protoglobigerinae*" microfacies which corresponds, in different studied units, to the Bathonian-Oxfordian and Lower Kimmeridgian interval wherein, beside Protoglobigerinae, there are frequently found juvenile pelecypods debris. The microfacies corresponds to the *Protoglobigerinae* Zone, separated in the Bicaz Valley Region (East Carpathians), which is placed upwards in the Lower Kimmeridgian substage (Pl. CIII).

Further on, the *Cadosina* microfacies develops, according to Borza, in the Oxfordian-Kimmeridgian interval. The above mentioned microfacies could not be distinguished in the Bicaz Valley region although *Cadosina* and *Stomiosphaera* were found mostly at the Kimmeridgian-Tithonian level. The "*Lombardia*" microfacies which corresponds, as regards the age, to the Kimmeridgian-Lower Tithonian and overlies the above mentioned microfacies. Together with "*Lombardia*", there were found *Globochaete alpina* Lombard, *Stomiosphaera moluccana* Wanner, *Saccocoma* sp. and *Aptychus*. This microfacies partly corresponds to the *Saccocoma* Zone, found in the Upper Kimmeridgian from the Bicaz Valley.

As regards the Tithonian stage, the zones separated by Borza have a favourable equivalent in the Bicaz Valley Region, only at the terminal part of the Jurassic, at the first time occurrence of the Calpionellid episode. In the Middle Tithonian from the Pieninen Klippen Sector, there was distinguished the *Chitinoidella* microfacies followed, at the upper part of the Tithonian, by the *Crassicollaria* microfacies which, as a matter of fact, were not found in the Bicaz Valley. There may be made correlations between the two sectors at the Jurassic-Cretaceous level by the *Calpionella* microfacies.

However, the microfaunistic non-concordance at the Tithonian level is due to the different facies from both sectors, namely in the Pieninen Klippen Zone, the Tithonian has a planktonic

pelagic facies, while in the Bicaz Valley Region the same interval presents a predominant reef facies, with planktonic pelagic phases.

On the other hand, the *Calpionella* Zone is disposed at the final part of the Jurassic and the beginning of the Cretaceous. This zone can be correlated with *Calpionella* microfacies from Pieninen Klippen Zone but the only difference being that in the first region the *Calpionella* Zone is more developed because it comprises the *Tintinnopsella* Zone as well. The *Tintinnopsella* microfacies was separated by B o r z a and, corresponds according to this author, to the Middle and Upper Berriasian? interval, while in the Bicaz Valley Region the *Calpionella* Zone (which also included *Tintinnopsella* Zone) correspond to the Middle Berriasian.

The *Calpionellopsis* microfacies has, according to B o r z a, an Upper Berriasian-Valanginian age. The assemblage-zone is represented, at the upper part, by *Calpionellopsis oblonga* (C a d i s c h), *C. simplex* (C o l o m), *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u), *T. longa* (C o l o m) and *Calpionellites darderi* (C o l o m). In the Bicaz Valley Region the same zone generally presents a similar assemblage, but without *Calpionellites darderi* (C o l o m), the age of the zone being the Middle *(pro parte)*-Upper Berriasian-Lower Valanginian (Pl. CIII).

Further on in the Pieninen sector, the Valanginian-Hauterivian as well as the Barremian-Albian present some assemblages with different biofacial characters, thus the fine rigurous correlations cannot be carried out for this interval.

HIGH TATRA SECTOR

In the High Tatra Sector the correlations may be carried out for the Upper Tithonian-Valanginian interval, the succession of the microfacies being similar to those of the Pieninen Klippen Zone. The only difference is that the frequency of the Calpionellid species in the Tatra sector is abundant.

For the Upper Tithonian-Berriasian interval, L e f e l d presents the assemblage : *Calpionella alpina* L o r e n z, *C. elliptica* C a d i s c h, *C. austriaca* K r i s t a n - T o l l m a n n, *Crassicollaria parvula* R e m a n e, *C. massutiniana* (C o l o m), *C. intermedia* (D u r a n d - D e l g a), *Calpionellites allemanni* D o b e n, *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u), *T. longa* (C o l o m) beside *Patelloides juvavica* L e i s c h n e r, assemblage which corresponds to the *Crassicollaria* and *Calpionella sensu* R e m a n e zones. In the Osobida region, *Saccocoma* microfacies and *Globochaete alpina* L o m b a r d are developed within the same interval (Pl. CIII).

For the Valarginian, L e f e l d presents the association : *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u), *T. batalleri* C o l o m, *T. cadischiana* C o l o m, *T. longa* (C o l o m), *T. romanica* B o l l e r, *T. oblonga* C a d i s c h, *Calpionellopsis simplex* (C o l o m), beside frequent aberrant Tintinnide *Campbeliella milesi* R a d o i c i c and *Danturellina zetica* R a d o i c i c. The above mentioned assemblage would correspond to the *Tintinnopsella* and *Calpionellopsis sensu* R e m a n e zones.

At the Hauterivian level no analogies can be done as in the High Tatra Sector a neritic facies with echinoids is found, comparable with the facies from South of France, of the *Spatangus* and Cidaride limestones.

The Barremian-Aptian is developed in the High Tatra under Urgonian facies being represented by : *Orbitolina lenticularis* (B l u m.) and *Salpingoporella* cf. *muehlbergii* (L o r e n z). At the same interval in the Bicaz Valley region some comparisons can be done at the level of *Salpingoporella dinarica* and *Palaeodictyoconus arabicus* zones, which would partially correspond to the Orbitolinidae facies found in the High Tatra (Pl. CIII).

CENTRAL APENNINES AND OUTER DINARIDS

In the Central Apennines, F a r i n a c c i and R a d o i c i c (1964) carried out a scale for the Malm (Oxfordian-Kimmeridgian) in which they distinguished : *Cladocoropsis mirabilis* Zone, beside which there are found : *Kurnubia palastiniensis* H e n s o n, *K. wellingsi* (H e n s o n),

Macroporella selli Crescenti and frequent *Girvanella*, while in the Outer Dinarids (Zeta-Skadar Mts) *Nerinea*, *Diceras* beside *Pseudocyclamina* sp. and *Conicospirillina basiliensis* Mohler (Pl. CIII) are found within the same interval zone.

In the Apennines (Lepini Mts) over the *Mirabilis* Zone the *Clypeina jurassica* and *Bankia striata* zones put on, and in the Outer Dinarids (Zeta-Skadar Mts), *Clypeina jurassica (pro parte)* and aberrant *Tintinnidae* Zones are found (Pl. CIII).

In the Apennines, the zone would correspond to the Portlandian being represented by the assemblage with : *Clypeina jurassica* (Favre), *Bankia striata* (Carozzi), *Pianella grudii* Radoicic, *Favreina salevensis* (Parejas), *Kurnubia* sp. and *Girvanella*, while in the Outer Dinarids (Zeta-Skadar Mts) beside *Clypeina jurassica* (Favre), *Teutloporella obsoleta* Carozzi, *Pianella grudii* Radoicic, rare *Kurnubia* sp., Charophyta Ostracods, appear, assemblage which points to the Upper Kimmeridgian-Portlandian age (Pl. CIII).

Microfacial zone correlation cannot be drawn from the Bicaz Valley Region only at Portlandian level by the presence of *Bankia* and *Clypeina jurassica* Zone beside *Kurnubia* sp. and *Teutloporella obsoleta* Carozzi appear. By type species assemblages more affinities are between the Bicaz Valley Region and Outer Dinarids than the same assemblage zone found in the Central Apennines. An important feature for Outer Dinarids is the presence of distinctive assemblage made up of *Clypeina jurassica* (Favre), aberrant Tintinnidae species, *Salpingoporella annulata* Carozzi, *Favreina salevensis* (Parejas), assemblage which points out the Infravalanginian (Berriasian) and even Lower Valanginian age (Pl. CIII).

From this standpoint the zone succesion from the Central Apennines and Outer Dinarids partially correspond only to the zones which are placed at the Jurassic-Cretaceous boundary from the Bicaz Valley region.

Over the two mentioned zones from the Central Apennines and Dinarids, *Salpingoporella annulata* Zone put on : *Munieria baconica* Deecke, *Actinoporella podolica* Alth, *Triploporella neocomiensis* Radoicic and *Cuneolina camposauri* Sartoni & Crescenti, to which at the upper part, Ostracods and Charophyta are added (Pl. CIII). The age of this zone is Neocomian.

In exchange in the Bicaz Valley Region (East Carpathians) over the *Calpionellopsis* Zone, the *Lorenziella/Salpingoporella annulata* Zones are disposed, and which are developed only in the Valanginian. This zone corresponds by age to the *Salpingoporella annulata* Zone separated by Farinacci and Radoicic in the Apennines and Dinarids. The common elements are rather minor except *Salpingoporella annulata* Carozzi extremely frequent in all the regions. *Munieria baconica* Deecke and *Actinoporella podolica* Alth. appear too. The following zone established in Apennines and Dinarids is the *Salpingoporella dinarica* and Orbitolines zones (Pl. CIII).

Within this zone, beside *Salpingoporella dinarica* Radoicic and *Cuneolina* the lateral passings are observed at the brackish facies with *Charophyta* represented by : *Clavator harrisi* Peck, *Atopochara trivolvis* Peck and *A. reticulata* Sirna. At the upper part of the zone, Orbitolines are found beside *Bacinella irregularis* Radoicic and frequent Miliolidae. The age of the zone is Barremian to Albian. *Salpingoporella dinarica* Zone was found in the Bicaz Valley Region in the Barremian beside *Bacinella irregularis* Radoicic and *Lithocodium aggregatum* Elliott and Dasycladaceae. In this region the Orbitolines occur at the Lower Aptian with lateral passing to the *Atopochara* brackish facies, signaled out in the Apennines and Dinarids too (Pl. CIII). Nevertheless, from the presented facts it is pointed out that these regions, by facies but more by the microfacial zones, get some affinities with the distinguished zones from the Bicaz Region (East Carpathians).

CEVENES Mts. SECTOR

Another interesting region is the Cevenola Province (the Serrane and Cagnasses Mts) in which after Bernier's data (1968) the following microfacies are distinguished at the Portlandian stage :

In the lower part, the *Macroporella pygmaea* limestones, with the assemblage made up of: *Nautiloculina oolithica* Mohler, *Pseudocyclammina lituus* (Yok.), *Conicospirillina basiliensis* Mohler, *Cayeuxia piae* Frollo, *Acicularia* sp., *Uragiella* sp. and *Cladocoropsis mirabilis* Felix. This microfacies may be compared by assemblages and stratigraphic position to the "*Pianella*" *pygmaea* Zone established in the Bicaz Valley Region (Pl. CIII).

The second microfacies is represented by the *Vaginella striata* limestones in which there are found: *Pseudocyclammina lituus* (Yok.), *Nautiloculina oolithica* Mohler, *Trocholina alpina* (Leupold), *T. elongata* (Leupold), *Cayeuxia piae* Frollo, *C. moldavica* Frollo, *Clypeina jurassica* (Favre), *Salpingoporella annulata* Carozzi, *S. appenninica* Sartoni & Crescenti, *Arabicodium* sp. This facies corresponds to the *Bankia striata* Zone, separated in the Bicaz Valley Region, by assemblage and position, but with the only difference that *Salpingoporella annulata* Carozzi occurs in the Bicaz Valley region, upper at the Valanginian level-stage (Pl. CIII).

Kurnubia jurassica limestones follow, containing the *Actinoporella podolica* Alth and *Bacinella* sp. algae. This microfacies is not well defined by the assemblages mentioned by Bernier, in parallel with those ones found in the Bicaz Valley Region. At the upper part of the Portlandian, *Anchispirocyclina lusitanica* limestones are found and with the assemblage made up of: *Trocholina alpina* (Leupold), *T. elongata* (Leupold), *Salpingoporella annulata* Carozzi, *Actinoporella podolica* Alth and *Munieria baconica* Deecke (Pl. CIII). In the Bicaz Valley Region, this zone was found at the terminal part of the calcareous series, being of Upper Tithonian-Lower Berriasian age. The identification of this zone may be used in the Jurassic-Cretaceous boundary as their areal distribution is very large and make the possibility of correlations.

AQUITANIA BASIN (SOUTH-WEST PART)

In the south-west part of the Aquitania Basin according to Bouroullec's and Deloffre's data (1970) the Malm starts with Protoglobigerinae *Calcareous Lacq* Formation, which contents an Ammonites fauna of Lower Oxfordian age and d'*Hosta* Marls of Upper Oxfordian age. Beside Protoglobigerinae there are found: *Labyrinthina mirabilis* Weynschenk, *Protopeneroplis striata* (Mohler), *Trocholina* sp., microfilaments especially towards the lower part and *Cladocoropsis mirabilis* Felix. By analogy with the *Protoglobigerinae* Zone met in the Bicaz Valley Region, it is placed at the lower part of *Acanthicum* Beds, being the Lower Kimmeridgian age. In the Aquitania basin, the Lower Kimmeridgian is represented by *d'Ossun Dolosparites* and *Micritic Lacq* Formation in which *Pseudocyclammina jaccardi* (Schrodt), *Everticyclammina virguliana* (Koechlin), *Trocholina* sp., *Cladocoropsis mirabilis* Felix are found. The Upper Kimmeridgian-Portlandian corresponds to the *Hountanette Dolomitic* Formation in which beside *Gravesia gigas*, there were found *Everticyclammina virguliana* (Koechlin) and *Haplophragmium suprajurassicum* (Pl. CIII).

In comparison with the zones distinguished in the Bicaz Region, one may notice the total lack of the Saccocomidae and of many other zone species, but they have in common *Everticyclammina virguliana* (Koechlin) found in the Bicaz Region in the Tithonian-Lower Berriasian interval. In the Neocomian and Lower Barremian many other formations are distinguished at the south-west part of the Aquitania Basin namely: The *Ger Calcareous* Formations in which there were found *Feurtillia frequens* Maync, *Pseudocyclammina* aff. *lituus* (Yok.), *Macroporella embergeri* Bouroullec & Deloffre, *Actinoporella podolica* Alth, *Acicularia elongata* Carozzi, *Cayeuxia piae* Frollo and *C. kurdistanensis* Elliott, assemblage which points out to the Berriasian age. In the *Sandstone and Clay Nay* Formation (Berriasian-Valanginian?) there were found: *Feurtillia frequens* Maync rather rare, and *Anchispirocyclina lusitanica* (Egger) beside crustacean coprolithes.

In the Bicaz Valley Region the *Anchispirocyclina lusitanica* Zone was encountered at the Upper Tithonian-Lower Berriasian interval, fact which would mostly correspond to the position

of this species from the Aquitania Basin (Pl. CIII). In exchange in the Aquitania Basin the *Macroporella embergeri* Bouroullec & Deloffre and *Feurtillia frequens* Maync are found only in the Berriasian, while the Valanginian-Hauterivian was tested here by Déres on the Nannoconidae basis. In the Bicaz Region *Macroporella embergeri* and *Feurtillia frequens* are index zone species, which have an evolutive Berriasian-Valanginian interval.

In the other stratigraphic units as: *Estibette Gritty* Formation, *Estibeaux Charophyta Calcareous* Formations as well as in the *Clermont Algal Calcareous* Formation, it is found an assemblage made up of: *Choffatella decipiens* Schlumberger, *Permocalculus inopinatus* Elliott, *Boueina hochstetteri* (Toula), *Cayeuxia piae* Frollo, *Pianella annulata* (Carozzi), *Marinella lugeoni* Pfender, *Cuneolina hensoni* Dalbiez, *Palaeodictyoconus* sp., ostracodes. These three formations according to Bouroullec & Deloffre have Barremian age.

After the mentioned authors, the Neocomian was schematically divided into three stratigraphic and sedimentologic units namely: N I which would correspond to the Berriasian, after which a gap follows probably at the Valanginian-Hauterivian level, over which N II and N III are disposed, both of them of Barremian age. Although within the last association of the *Clermont* Formation, there is a series of species which can give some indications regarding the presence of the Valanginian and even Hauterivian as: *Pianella annulata* which corresponds to the *Salpingoporella annulata* Zone from the Bicaz Valley Region as well as *Choffatella decipiens* which may be in the Hauterivian or to the beginning of the Barremian. The Algal assemblage, *Cuneolina hensoni* Dalbiez and *Palaeodictyoconus* sp. plead in favour of the Barremian age if not even Lower Aptian (Pl. CIII).

Regarding the Bicaz Region correlations they may be done by the characteristic assemblages found in the South-West part of the Aquitania Basin. One may say that with all the varia facial conditions there are common species which may be used at great distances correlations.

CASTELLON PROVINCE SECTOR (SPAIN)

In the Castellon Province, Bouroullec's, Canèrot's and Déres's studies (1970) pointed out in the Upper Jurassic-Lower Cretaceous interval several lithozones, mostly calcareous or marly ones, wherein there were found the following species very important as regards the dating and correlation: *Everticyclammina virguliana* (Koechlin), *Anchispirocyclina lusitanica* (Egger), *Pseudocyclammina lituus* (Yok.), *Cayeuxia piae* Frollo, assemblage indicating the Lower Kimmeridgian-Portlandian age.

The authors show that *Anchispirocyclina lusitanica* (Egger) is a species which marks the passing from the Jurassic to the Cretaceous (Pl. CIII). As regards the position and the age this fact corresponds to the *Anchispirocyclina lusitanica* Zone separated in the Bicaz Region (East Carpathians).

Further on, in the Castellon Province, it is disposed the series of calcareous-marly deposits of the Valanginian, where there may be found: *Feurtillia frequens* Maync, *Pseudocyclammina lituus* (Yok.), *Actinoporella podolica* Alth, *Clypeina marteli* Emberger, *Macroporella embergeri* Bouroullec & Deloffre, ostracods, and a bit earlier the appearance at this level of *Pianella dinarica* (Radoicic). The above mentioned assemblage comprises numerous elements which, in the Bicaz Region, represents index zone species, such as: *Macroporella embergeri* and *Feurtillia frequens* mainly encompassed in the Berriasian-Valanginian interval (Pl. CIII). The above mentioned assemblage comprises numerous elements which, in the Bicaz Region, represents index-zone species, such as *Macroporella embergeri* and *Feurtillia frequens*, mainly encompassed in the Berriasian-Valanginian interval (Pl. CIII).

At the same time with the beginning of the Hauterivian, in the Castellon Province, a biofacial change took place. It is represented by clayey limestones and marls with *Toxaster* beside frequent *Choffatella decipiens* Schlumberger. The Upper Hauterivian does not appear in this region.

The Barremian is represented by marly limestones wherein *Choffatella decipiens* Schlumberger, *Permocalculus* sp., *Pianella* sp. and *Boueina* sp. were to be found. In the Bicaz Region, as common element there has been found since the Hauterivian *Choffatella decipiens*, species also found in the Barremian.

SURROUNDINGS OF THE LISBON SECTOR (PORTUGAL)

According to Ramalho's data (1971) concerning the calcareous formations from the Lisbon outskirts (Portugal), two regions are more interesting: Sintra, placed northwards, and Arrabida, southwards.

In the Sintra Region, the Murches profile starts with the Upper Oxfordian *S. Pedro* limestones, which are generally metamorphosed, followed by the Upper Oxfordian (?) — Middle Kimmeridgian *Ramalhao* schists, wherein there were found *Prethocoprolithus* sp., Nodosariide and spongia spicules.

The Middle Kimmeridgian-Portlandian is represented by schistous marly limestones with *Conicospirillina basiliensis* Mohler, *Trocholina* sp., *Nodophtalmidium* sp., Cyanophyceae and Stromatholitic structures.

Comparing this profile and the encountered assemblages with those of the Kimmeridgian from the Bicaz Region (East Carpathians) one may notice the existence of some exactly opposite assemblages which cannot be correlated at this level.

However, starting with the Portlandian, separated by Ramalho into two series — Portlandian A and Portlandian B, which lithologically correspond to the *Oncolithe* and *Nodular* limestones represented by: *Pseudocyclammina lituus* (Yok.), *Nautiloculina oolithica* Mohler, "*Vaginella*" *striata* Carozzi, *Everticyclammina virguliana* (Koechlin) beside *Anchispirocyclina lusitanica* (Egger) and *A.* cf. *maynci* Hottinger, (the last species met at the upper part of this series) and by the algal species *Actinoporella podolica* Alth and *Salpingoporella annulata* Carozzi, there can be made partly comparable correlations between the Tithonian of the Bicaz and Sintra regions by a lot of index-zone species common for these two regions. In the same section — Murches — there were separated the Purbeckian and the Valanginian, the latter represented by compact limestones and marly limestones, wherein one may found *Feurtillia frequens* Maync, *Pseudocyclammina lituus* (Yok.), *Anchispirocyclina lusitanica* (Egger), *Trocholina* gr. *alpina-elongata* and *Salpingoporella annulata* Carozzi, Ostracods and Charophyta. As one can see, in this interval there are distinguished several species which have been also found and which designate some index-zones in the Bicaz Region, such as: *Anchispirocyclina lusitanica* (Upper Tithonian-Lower Berriasian) which would correspond to the (Murches) Purbeckian *pro parte*, *Feurtillia frequens* (Berriasian-Valanginian) which *grosso modo* corresponds to the Purbeckian *pro parte* and to the Valanginian (Pl. CIII).

There are also some differences as regards the *Salpingoporella annulata* Zone distinguished in the Bicaz Region; while in the Sintra Region the same species has a large Upper Oxfordian-Valanginian evolution interval in comparison with the Bicaz Region which has a Valanginian interval (Pl. CIII). It is interesting to remark the fact that between the two regions there may be made correlations by macrofauna at the Valanginian level, as in the western part of the Sintra Region, in marly-limestones, there was found *Leviathania leviathan* (Pictet & Campiche), species met at the same level in the Bicaz Region (East Carpathians) as well.

In the Arrabida Region, located southwards, the Upper Oxfordian is constituted by cryptocrystalline limestones wherein *Alveosepta jaccardi* (Schrodt), Ostracods and Charophyta predominate, there follows the Upper Oxfordian-Kimmeridgian wherein *Alveosepta jaccardi*

(Schrodt), *Labyrinthina mirabilis* Weynschenk, *Cayeuxia piae* Frollo and *Salpingoporella annulata* Carozzi predominate. The Kimmeridgian is made up of limestones with *Kurnubia palestiniensis* (Henson), and towards the upper part "*Vaginella*" *striata* Carozzi, *Clypeina jurassica* (Favre), and *Everticyclammina virguliana* (Koechlin). In comparison with the Bicaz Region, some of the species quoted for the Kimmeridgian from the Arrabida Region evoluate in the Carpathians especially during the Tithonian (*Vaginella striata*, *Clypeina jurassica* and *Everticyclammina virguliana*); moreover, they are also found in limestones which correspond to the Portlandian age (Pl. CIII).

In the Arrabida Region, the Cretaceous is represented by coarse conglomerate sandstones which can have the Purbeckian-Valanginian formation as an equivalent. Comparisons between the two regions cannot be seen at this level.

CONCLUSIONS

As a conclusion, the regional microfacial correlations are useful if they are carried out on similar geosyncline domains, the Alpino-Carpathian domain in our case.

These correlations are also possible especially within the similar developed facies formations. The evolutive differences of disappearance and appearance of the microfacial zones are due either to the proper conditions of the sedimentary basin or to the local ones.

Generally, however, the microfacial zones correspond each other as regards the line succession; evolutivelly there are some moments, mostly towards the terminal part of the Jurassic and the beginning of the Cretaceous, when the correlations can be achieved only by approximative equivalences, by Calpionelles, Dasycladaceae and Lituolidae zones.

The facies changes imply important fluctuations which find expression in the appearance and disappearance of certain microfacial zones or of some "index" species. From the viewpoint of the microfacial zone succession, there are already outlined, for the Upper Jurassic-Lower Cretaceous interval, some zones with a regional character, as follows: 1. *Protoglobigerinae* Zone; 2. *Saccocoma* Zone; 3. "*Pianella*" *pygmea* Zone; 4. *Kurnubia jurassica* Zone; 5. *Bankia striata* Zone; 6. *Clypeina jurassica* Zone; 7. *Crassicollaria* Zone, partly equivalent of *Clypeina jurassica*; 8. *Calpionella* Zone *(pro parte)*.

The enumerated zones succeed and evoluate within the Oxfordian-Tithonian/Portlandian interval. However, there are zones which evoluate at the terminal part of the Tithonian and the beginning of the Cretaceous, or they are overlaped on the Jurassic-Cretaceous boundary, such as: *Calpionella* Zone, *Macroporella praturloni* Zone, *Anchispirocyclina lusitanica* Zone, the last two zones having larger evolutive intervals.

During the Lower Cretaceous, the microfacial zones succeed as follows: 1. *Calpionella* Zone *pro parte*; 2. *Calpionellopsis* Zone; 3. *Lorenziella/Salpingoporella annulata* Zone; 4. *Pseudocyclammina hedbergi/Salpingoporella dinarica* Zone.

The above mentioned zones develop during the Berriasian-Barremian interval. The existence of certain zones, such as *Macroporella embergeri* and *Salpingoporella annulata* has to be mentioned as well. These zones develop during the Berriasian-Valanginian interval, may be the Hauterivian, beside the *Feurtillia frequens* Zone which is widespread and developed at the same interval (Middle Berriasian-Valanginian).

At the Aptian level, as well as at the Albian, the separation of the microfacial zones remains a future problem. Within this interval, the occurrences of algae (Dasycladaceae), Charophyta (*Atopochara*) and Orbitolinidae are characteristic. The last ones have different interval evolutions from one region to another, being important from the stratigraphic viewpoint as well.

SYSTEMATIC DESCRIPTIONS

Class RHIZOPODEA von Siebold 1845
Order FORAMINIFERIDA Eichwald 1830
Family NODOSARIIDAE Ehrenberg 1838
Genus **Lenticulina** Lamarck 1804

Lenticulina (Lenticulina) muensteri (Roemer)

Robulina münsteri n. sp. Roemer 1839, p. 48, taf. 20, fig. 29; *Lenticulina münsteri* — Bielicka & Pozaryski 1954, p. 33, pl. IV, fig. 12; *Lenticulina (Lenticulina) münsteri* — E. & I. Seibold, 1955, p. 104, pl. 4, fig. a—c; *L. (L.) münsteri* — Lutze 1960, p. 448, fig. 10 a—e.; *L. (L.) münsteri* — Farinacci 1965, p. 240, fig. 21; *Lenticulina muensteri* — Neagu 1970, p. 110; *L.* gr. *muensteri* — Ramalho 1971, p. 156.

Hypotypes: L.P.B.9366, Kimmeridgian-Tithonian, Ghilcoș Mts. (western slope).

Dimensions: Diameter 0,47—0,75 mm; Width 0,27—0,40 mm.

Occurrence: Jurassic and Lower Cretaceous of Europe (Dogger, Suabia), Malm (Kimmeridgian-Tithonian), Poland, Oxfordian, Donetz and Dobrogea, Middle Kimmeridgian-Portlandian-Lower Valanginian, Portugal.

Lenticulina (Lenticulina) subquadrata (Terquem)

Pl. XI, Fig. 2—3

Lenticulina (Lenticulina) subquadrata (Terquem) — Tollmann 1964, p. 109, pl. 19, fig. 1—2, 13, pl. 20, fig. 7; *L. (L.) subquadrata* — Farinacci 1965, p. 243, fig. 26.

Hypotype: L.P.B.9367, Lower Kimmeridgian, Ghilcoș Mts. (western slope).

Dimensions: Diameter 0,65 mm; Width 0,35 mm.

Occurrence: Upper Triassic from the Alps, Liassic from Germany and France, Malm from the South and Central Appennines.

Lenticulina (Lenticulina) subalata (Reuss)

Lenticulina subalata (Reuss)-Bielecka & Pozaryski 1954, p. 35, pl. IV, fig. 14; *L. (L.) subalata* — Lutze 1960, p. 451; *L. (L.) subalata* — Kaptarenko-Cernousova 1963, p. 34, fig. 9—10.

Hypotype: L.P.B.9368, Upper Kimmeridgian, Ghilcoș (western slope).

Dimensions: Diameter 0,53—0,63 mm; Width 0,36—0,43 mm.

Occurrence: Lower Jurassic and Cretaceous of Europe (Poland, Kimmeridgian-Tithonian).

Lenticulina (Lenticulina) danzayensis Payard

Pl. XII, Fig. 7—8

Lenticulina (Lenticulina) danzayensis — Farinacci 1965, p. 239, fig. 19.

Hypotype: L.P.B.9369, Lower Tithonian, Ghilcoș Mts. (western slope).

Dimensions: Diameter 0,52—0,77 mm; Width 0,20—0,46 mm.

Occurrence: Upper Liassic of France, Malm from the Appeninnes (Italy).

Lenticulina (Lenticulina) quenstedti (Gümbel)

Lenticulina quenstedti — E. & I. Seibold 1955, p. 105, pl. 13, fig. 3; *L. quenstedti* — Farinacci 1965, p. 242, fig. 24; *L. quenstedti* — Neagu 1970, p. 110, pl. I, fig. 20.

Hypotype: L.P.B.9370, Lower Tithonian, Ghilcoș Mts. (western slope).

Dimensions: Diameter 0,40—0,76 mm; Width 0,19—0,26 mm.
Occurrence: Oxfordian of Germany, Malm from the Central Appennines, Upper Oxfordian-Lower Kimmeridgian, Dobrogea.

Lenticulina (Lenticulina) varians (B o r n e m a n n)
Pl. XV, Fig. 12—13

Lenticulina varians — B i e l e c k a & P o z a r y s k i 1954, p. 32, pl. IV, fig. 11; *L. (Lenticulina) varians* — F a r i n a c c i 1965, p. 244, fig. 28—29.
Hypotype: L.P.B. 9372, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Diameter 0,45—0,55 mm; Width 0,27—0,35 mm.
Occurrence: Malm of Poland and Italy (Appennines).

Lenticulina (Lenticulina) omphalovorticosa F a r i n a c c i
Pl. XIV, Fig. 10—11, 14—15

Lenticulina (Lenticulina) omphalovorticosa n. sp. F a r i n a c c i 1965, p. 240, fig. 22.
Hypotype: L.P.B. 9371, Lower Tithonian, Ghilcoş Mts., (western slope).
Dimensions: Diameter 0,52—0,65 mm; Width 0,32—0,35 mm.
Occurrence: Malm of the Central Appennines (Italy).

Genus **Nodosaria** L a m a r c k 1812
Nodosaria mutabilis T e r q u e m
Pl. XII, Fig. 16

Nodosaria mutabilis T e r q u e m-L u t z e 1960, p. 475, taf. 28, fig. 21—22.
Hypotype: L.P.B. 9429, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Width 0,15—0,20 mm; Height 0,16—0,22 mm.
Occurrence: Callovian-Oxfordian-Germany, Jurassic of Alpine province.

Nodosaria nitidana B r a n d
Pl. XII, Fig. 17

Nodosaria nitidana B r a n d-E. & I. S e i b o l d 1955, p. 166, pl. 2, fig. h—i, pl. 1, fig. 13; *N. nitidana* — F a r i n a c c i 1965, p. 233, fig. 5.
Hypotype: L.P.B. 9430, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Lenght 0,41—0,50 mm; Width 0,12—0,15 mm.
Occurrence: Upper Triassic of North calcareous Alps, Malm from Germany and Italy (Appennines).

Nodosaria cf. *dispar* F r a n k e
Pl. XII, Fig. 9—10

Hypotype: L.P.B. 9431, Lower Tithonian, Ghilcoş Mts. (western slope).

Family SPIRILLINIDAE R e u s s 1862
Genus **Conicospirillina** C u s h m a n 1927
Conicospirillina basiliensis M o h l e r
Pl. XIII, Fig. 7—8; Pl. XL, Fig. 1; Pl. XLVI, Fig. 2; Pl. LI, Fig. 4

Conicospirillina basiliensis M o h l e r-B i e l e c k a & P o z a r y s k i 1954, p. 69, pl. XI, fig. 56; „*C.*" *basiliensis* — R a m a l h o 1971, pl. XXI (14).
Hypotype: L.P.B. 9373, Tithonian-Berriasian, Ghilcoş Mts. and Făgetul Ciucului Mts.

Dimensions: Diameter 0,55—0,86 mm; Height 0,35—0,57 mm.
Occurrence: Oxfordian-Tithonian-Purbeckian in the Alpine province.

Conicospirillina trochoides (Berthelin)
Pl. XII, Fig. 4—6

Conicospirillina trochoides (Berthelin)-Bielecka & Pozaryski 1954, p. 68, pl. XI, fig. 55.
Hypotype: L.P.B. 9374, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Diameter 0,40 mm; Height 0,35 mm.
Occurrence: Jurassic, Oxfordian-Tithonian of Poland.

Conicospirillina cf. *basiliensis* Mohler
Pl. LX, Fig. 3

Hypotype: L.P.B. 9376, Berriasian-Lower Valanginian, Ghilcoş Mts., (western slope).

Genus **Spirillina** Ehrenberg 1843
Spirillina kuebleri Mjatliuk
Pl. XII, Fig. 18—19

Spirillina kübleri Mjatliuk-Kaptarenko-Cernousova 1963, p. 4, pl. X, fig. 11 a, b.; *S. kübleri* — Farinacci 1965, p. 250, fig. 44.
Hypotype: L.P.B. 9877, Lower Tithonian, Ghilcoş Mts., (western slope).
Dimensions: Diameter 0,65 mm; Width 0,25 mm.
Occurrence: Oxfordian-Kimmeridgian from the Russian Platform; Malm from the Central Apennines.

Spirillina tenuissima Gümbel
Pl. XV, Fig. 14—15

Spirillina tenuissima (Gümbel)-E. & I. Seibold 1955, p. 125, fig. S, n, 114, *S. tenuissima* — Neagu 1971, p. 111.
Hypotype: L.P.B. 9378, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Diameter 0,27 mm; Width 0,12 mm.
Occurrence: Malm of Germany, Oxfordian-Kimmeridgian from Dobrogea (Romania).

Genus **Turrispirillina** Cushman 1927
Turrispirillina amoena Dain
Pl. XII, Fig. 2—3; Pl. XV, Fig. 5—7

Turrispirillina amoena Dain-Kaptarenko-Cernousova 1963, p. 50, pl. XI, fig. 10 a—V.; *T. amoena* Farinacci 1965, p. 251, fig. 45; *T. amoena* — Neagu 1970, p. 112, pl. 1, fig. 12—14.
Hypotype: L.P.B. 9380, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Diameter 0,45—0,90 mm; Height 0,30—0,37 mm.
Occurrence: Upper Oxfordian-Kimmeridgian-Don Region, Central Appennines, Dobrogea (Romania).

Family Involutinidae Bütschli 1880
Genus **Paalzowella** Cushman 1933
Paalzowella feifeli elevata (Paalzow)
Pl. XI, Fig. 9—10; Pl. XV, Fig. 1—4

Trocholina elevata n. sp. Paalzow — 1932, S. 140, pl. 11, fig. 4; *Paalzowella feifeli elevata* — E. & I. Seibold 1960, p. 379, text fig. 8 (22), pl. 7, fig. 3; *P. feifeli* aff. *elevata* — Lutze 1963, p. 487, pl. 33, fig. 11; *P. feifeli elevata* — Neagu 1970, p. 112, pl. 3, fig. 12—17.

Hypotype : L.P.B. 9381, Upper Kimmeridgian-Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions : Diameter 0,25—0,76 mm ; Height 0,50—1,05 mm.
Occurrence : Lower Oxfordian-Hanovra ; Upper Oxfordian-Lower Kimmeridgian-Topalu (Dobrogea).

Paalzowella feifeli feifeli (P a a l z o w)
Pl. XIII, Fig. 5—6

Trocholina feifeli n. sp. P a a l z o w — 1932, S. 140, pl. 11, fig. 6—7 ; *Paalzowella feifeli feifeli* — L u t z e 1960, p. 485, text fig. 19 (5—15) ; *P. feifeli feifeli* — N e a g u 1970, p. 112, pl. 2, fig. 8—13.
Hypotype : L.P.B. 9382, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions : Diameter 0,25—0,50 mm ; Height 0,25—0,83 mm.
Occurrence : Oxfordian from Germany, Upper Oxfordian-Lower Kimmeridgian Topalu (Dobrogea).

Paalzowella feifeli seiboldi L u t z e
Pl. XIV, Fig. 5—6

Paalzowella feifeli seiboldi n. ssp. — L u t z e 1960, p. 486, pl. 33, fig. 12, text fig. 19 (20—34) ; *P. feifeli seiboldi* — N e a g u 1970, p. 115, pl. 3, fig. 7—11.
Hypotype : L.P.B. 9383, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions : Diameter 0,45—0,46 mm ; Height 0,36—0,42 mm.
Occurrence : Middle and Upper Oxfordian-Hanovra and Upper Oxfordian-Lower Kimmeridgian Topalu (Dobrogea).

Paalzowella sp.
Pl. XI, Fig. 11—12 ; Pl. XIV, Fig. 16—17

Specimens : L.P.B. 9386, Lower Tithonian, Ghilcoş Mts. (western slope).
Description : Test subconical or plate shaped with large-wide border formed by 2 or 6 spiral tubular whorls. Umbilical zones involute. Aperture simple sub circular.
Dimensions : Diameter 0,47—1,37 mm ; Height 0,22—0,25 mm ; Width of border zone 0,10—0,30 mm.

Genus **Trocholina** P a a l z o w 1922
Trocholina conica (S c h l u m b e r g e r)
Pl. XI, Fig. 7—8 ; Pl. XIII, Fig. 1—4

Trocholina conica (S c h l u m b e r g e r)-W i c h e r 1950, S. 264, Abb. 3, fig. 3, Abb. 4 fig. 4 ; *T. conica* — R e i c h e l 1955, p. 403, pl. XIV, fig. 1 a—c, 3—4 ; *T. conica* — L u t z e 1960, p. 488, pl. 33, fig. 14.
Hypotype : L.P.B. 9388, Upper Kimmeridgian-Lower Tithonian, Ghilcoş Mts.
Dimensions : Diameter 0,45—0,55 mm ; Height 0,37—0,40 mm.
Occurrence : Callovian-Oxfordian-Germany, Upper Jurasic and Lower Cretaceous from France.

Trocholina nodulosa E. & I. S e i b o l d
Pl. XIII, Fig. 19—20 ; Pl. XIV, Fig. 1—2

Trocholina nodulosa n. sp. E. & I. S e i b o l d — 1960, p. 376, pl. 7, fig. 1, text fig. 7 (i.m.n.) ; *T. nodulosa* — N e a g u 1970, p. 115, pl. 2, fig. 20—21.
Hypotype : L.P.B. 9389, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions : Diameter 0,35—0,52 mm ; Height 0,12—0,30 mm.
Occurrence : Middle Oxfordian-Germany, Upper Oxfordian-Lower Kimmeridgian-Topalu (Dobrogea).

Trocholina solecensis B i e l e c k a & P o z a r y s k i
Pl. XIII, Fig. 13—16 ; Pl. XIV, Fig. 3—4

Trocholina solecensis n. sp. B i e l e c k a & P o z a r y s k i — 1954, p. 69, pl. XI, fig. 57.
Hypotype : L.P.B. 9391, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions : Diameter 0,45—0,55 mm ; Height 0,17—0,32 mm.
Occurrence : Upper Kimmeridgian from Poland.

Trocholina alpina (Leupold)

Pl. XV, Fig. 10–11; Pl. XXXIII, Fig. 2; Pl. XL, Fig. 3

Coscinoconus alpinus n. sp. Leupold – 1935, p. 610, taf. XVIII, fig. 1–11; *Trocholina alpina* – Reichel 1955, p. 448, pl. XV, fig. 1 a, 3; *T. alpina* – Guillaume 1963, p. 260, pl. 3–pl. 4.

Hypotype: L.P.B. 9392, Lower Tithonian, Ghilcoş Mts. and Upper Tithonian, Făgetul Ciucului Mts.

Dimensions: Diameter 0,72–0,80 mm; Height 0,65–0,70 mm.

Occurrence: Kimmeridgian from Krimeia, Tithonian and Valanginian of Jura Mts. and other alpine region.

Trocholina aff. *alpina* (Leupold)

Pl. XV, Fig. 10–11; Pl. XXI, Fig. 3; Pl. LIX, Fig. 4

Specimens: L.P.B. 9393, Lower Tithonian, Ghilcoş Mts., Berriasian-Lower Valanginian, Ghilcoş Mts. (western slope).

Trocholina elongata (Leupold)

Pl. XIII, Fig. 9–12; Pl. XIV, Fig. 12–13; Pl. XXXVIII, Fig. 2; Pl. XLI, Fig. 2; Pl. XLVI, Fig. 3; Pl. XLIX, Fig. 3–4; Pl. LXXIII, Fig. 1; Pl. LXXVI, Fig. 3

Hypotype: L.P.B. 9394, Lower Tithonian, Upper Tithonian-Berriasian, Valanginian-Hauterivian, Ghilcoş Mts. and Făgetul Ciucului Mts.

Dimensions: Diameter 0,27–0,62 mm; Height 0,12–0,43 mm.

Occurrence: Tithonian-Hauterivian from Jura Mts and Jurassic-Cretaceous boundaray in the Alpine region.

Trocholina cf. *delicatissima* Kalantari

Pl. XII, Fig. 13–14

Specimens: L.P.B. 9395, Lower Tithonian, Ghilcoş Mts. (western slope).

Trocholina friburgensis (Guillaume & Reichel)

Pl. LXXXV, Fig. 1–4

Specimens: L.P.B. 9398, Barremian, Făgetul Ciucului Mts. and Bicăjel I. Mts.

Trocholina aptiensis Iovtcheva

Pl. XCIV, Fig. 4

Specimens: L.P.B. 9399, Lower Aptian, Bicăjel I. Mts.

Genus **Protopeneroplis** Weynschenk 1950

Protopeneroplis striata Weynschenk

Pl. XVI, Fig. 1

Protopeneroplis striata n. sp. Weynschenk – 1950, p. 13; t. II, fig. 13–14; *P. striata* – Farinacci 1964, p. 44, fig. 2–5; *P. striata* – Sartoni 1965, p. 166 tav. XV fig. 1–3.

Hypotype: L.P.B. 9400, Lower Tithonian, Ghilcoş Mts. (western slope).

Occurrence: Middle Dogger and Malm from Tyrol, Malm of the Alpine province and Tithonian-Valanginian of Turkey.

Family Nubecularidae Jones 1875

Genus **Nodophthalmidium** Macfayden 1939

Nodophthalmidium jurassicum (Carozzi)

Pl. VIII, Fig. 3–4

Nodophthalmidium jurassicum n. sp. Carozzi – 1953, p. 86, p. 87, fig. 1; *Nodophthalmidium* sp. – Patrulius 1969, p. 84, fig. 14, 3.

Hypotype: L.P.B. 9402, Lower Kimmeridgian, Ghilcoş Mts. (Western slope).

Occurrence: Tithonian from Jura Mts. and Bucegi Mts.

Genus **Nodobacularia** Rhumbler 1895
Nodobacularia sp.
Pl. VIII, Fig. 2

Specimens: L.P.B. 9403, Lower Kimmeridgian, Ghilcoş Mts. (western slope).

Family LITUOLIDAE de Blainville 1825
Genus **Choffatella** Schlumberger 1904
Choffatella decipiens Schlumberger
Pl. LXXXIII, Fig. 1; Pl. LXXXVII, Fig. 3

Choffatella decipiens n. sp. Schlumberger 1904, fig. 97–99, pl. 24, fig. 1–4; *Ch. decipiens* – Tobler 1928, p. 214, fig. 4–6; *Ch. decipiens* – Conrad 1969, p. 46, fig. 10 d, e; *Ch. decipiens* – Neagu 1970, p. 39, pl. VI, 14–17;

Hypotype: L.P.B. 9410, Barremian, Suhardu Mic Mts. and Bicăjel II Mts.
Occurrence: Valanginian to Albian; frequent in Urgonian limestone (Jura Mts.), Lower Aptian, Valea Carelor Creek, East Carpathians.

Genus **Feurtillia** Mayne 1958
Feurtillia frequens Mayne.

Pl. LVII, Fig. 2; Pl. LXVIII, Fig. 1, 4, 2, 3; Pl. LXX, Fig. 1

Feurtillia frequens n. gen n. sp. – Mayne 1958, pl. 1, fig. 1–5, pl. 2, fig. 1–10; *F. frequens* – Dragastan 1970, pl. I, fig. 10; *F. frequens* – Ramalho 1971, pl. XIV (7–8); *F. frequens* – Fourcade 1972, lam. 9, fig. 7.

Hypotype: L.P.B. 9411, Berriasian-Valanginian, Ghilcoş Mts.
Occurrence: Portlandian and Lower Valanginian from Switzerland, Portlandian-Purbeckian-Valanginian from Portugal, Berriasian from Murches region, Spain.

Genus **Pseudocyclammina** Yabe & Hanzawa 1926
Pseudocyclammina lituus (Yokoyama)
Pl. XVII, Fig. 3–4; Pl. XLIV, Fig. 2

Cyclammina lituus n. sp. Yokoyama 1890, p. 26, t. V, fig. 7; *Pseudocyclammina lituus* – Yabe & Hanzawa 1926, p. 9–10, t. II, fig. 3–7; *P. lituus* Sartoni 1965, p. 168, tav. XV, fig. 5–6; *Pseudocyclammina* sp. – Patrulius 1969, p. 135, fig. 35, 1; *P. lituus* Dragastan 1970, pl. I, fig. 8; *P. lituus* – Ramalho 1971, pl. XIV (5–6).

Hypotype: L.P.B. 9412, Lower Tithonian, Upper Tithonian-Berriasian, Ghilcoş Mts.
Occurrence: Kimmeridgian-Tithonian-Valanginian from Spain, France, Italy, Turkey, Arabian, Japan and Cuba.

Pseudocyclammina hedbergi Mayne
Pl. LXXXI, Fig. 1; Pl. LXXXIII, Fig. 2

Pseudocyclammina hedbergi n. sp. Mayne 1953, p. 101, pl. 16, fig. 1–8; *P. hedbergi* – Mayne 1959, pl. 3, fig. 3, pl. 23, fig. 1–2.

Hypotype: L.P.B. 9413, Barremian, Ghilcoş Mts. and Făgetul Ciucului Mts.
Occurrence: Barremian-Middle Albian, France.

Genus **Torinosuella** Mayne 1959
Torinosuella peneropliformis (Yabe & Hanzawa)
Pl. XXXVI, Fig. 2; Pl. LV, Fig. 4; Pl. LVII, Fig. 1

Choffatella peneropliformis n. sp. Yabe & Hanzawa 1926, p. 9–11, pl. 2 text fig. 1; *T. peneropliformis* – Mayne 1959, pl. 1, fig. 6–10, 12–13; *T. peneropliformis* – Ramalho 1971, p. 146.

Hypotype: L.P.B. 9416, Upper Tithonian, Berriasian-Lower Valanginian, Ghilcoş Mts.
Occurrence: Upper Jurassic from Torinosu (Japan), Kimmeridgian-Portlandian from Portugal, Jurassic-Cretaceous boundary, Switzerland.

Genus **Anchispirocyclina** Jordan&Applin 1952
Anchispirocyclina lusitanica (Egger)
Pl. XLVII, Fig. 1–2; Pl. LVII, Fig. 4

Anchispirocyclina lusitanica – Mayne 1959, p. 5, fig. 5–7, pl. 7, fig. 7; *A. lusitanica* – Ramalho 1971, pl. VIII (2), pl. X (1), pl. XV (4–9), pl. XVI (1–2).

Hypotype: L.P.B. 9417, Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Occurrence: Kimmeridgian from Yugoslavia, Upper Jurassic from Turkey, Algeria, Kimmeridgian-Valanginian from Portugal, Jurassic-Cretaceous from France, Switzerland.

Genus **Rectocyclammina** Hottinger 1967
Rectocyclammina chouberti Hottinger
Pl. XXXVI, Fig. 3; Pl. XLVI, Fig. 1; Pl. LVII, Fig. 3; Pl. LXV, Fig. 2

Rectocyclammina chouberti Hottinger-Ramalho 1971, pl. XIV (1–4).
Hypotype: L.P.B. 9874, Upper Tithonian-Berriasian, Făgetul Ciucului Mts., Berriasian-Lower Valanginian, Ghilcoş Mts.
Occurrence: Kimmeridgian from Maroc, Portlandian-Purbeckian from Portugal.

Genus **Everticyclammina** Redmond 1964
Everticyclammina virguliana (Koechlin)
Pl. XLI, Fig. 3; Pl. L, Fig. 3–4; Pl. LXXVIII, Fig. 1, 4.

Everticyclammina virguliana (Koechlin)-Ramalho 1971, pl. XII (3), pl. XVIII (1–6, 10).

Hypotype: L.P.B. 9875, Upper Tithonian-Berriasian, Făgetul Ciucului Mts. and Bicăjel I Mts.
Dimensions: Diameter 0,90–1,5 mm; Lenght 1,8–2,3 mm.
Occurrence: Upper Kimmeridgian-Berriasian from Algeria, Kimmeridgian-Purbeckian of Portugal.

Everticyclammina aff. *elegans* Redmond
Pl. LII, fig. 3

Specimens: L.P.B. 9877, Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Dimensions: Diameter 0,60–0,80 mm; Lenght 1,2–1,5 mm.
Remarks: Similar to *Everticyclammina elegans* Redmond by test morphology but with an inner different structure.

Everticyclammina aff. *virguliana* (Koechlin)
Pl. XXXI, Fig. 1

Specimens: L.P.B. 9876, Upper Tithonian, Făgetul Ciucului Mts.
Dimensions: Diameter 0,50–1,10 mm; Lenght 1,0–2,3 mm.

Everticyclammina irregularis n. sp.
Pl. XLIX, Fig. 2; Pl. LIII, Fig. 1–4

Holotypes: L.P.B. 9878, Pl. LIII fig. 1–3, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Paratypes: L.P.B. 9879, Pl. XLIX, Fig. 2, Pl. LIII, Fig. 4, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Derivatio nominis: "*irregularis*" from shape of the test and chambers.
Dimensions: Diameter of planispiral stage 0,9–1,6 mm; Lenght of specimens 1,5–3,1 mm; Thickness of wall 0,15–0,62 mm.
Description: Test initially planispiral, involute with 3–4 large chambers which are irregularly or lobulated in shape especially in the uniserial stage. An important character is the irregularly development of the uncoiling stage. The chambers are great and simple. The wall is subepidermal undivided but with a very large rounded pores or alveoles which give the thickness of the test. Aperture not observed.

Remarks: *Everticyclammina irregularis* n. sp. differ from all species of *Everticyclammina* by shape, disposition of chambers and by the structure of the test wall. The new species is similar by inner structure and disposition of chambers with *Everticyclammina contorta* Redmond and *E. eccentrica* Redmond, but the later species have an important asymmetrical developments.

Genus **Ammobaculites** Cushman 1910
Ammobaculites agglutinans (d'Orbigny)
Pl. XI, Fig. 13–14

Ammobaculites agglutinans (d'Orbigny)-Bielecka & Pozaryski 1954, p. 24, pl. II, fig. 3.
Hypotype: L.P.B. 9418, Lower Tithonian, Ghilcoş Mts.
Occurrence: Kimmeridgian-Tithonian of Poland.

Family Textulariidae Ehrenberg 1838
Genus **Textularia** Defrance 1824
Textularia foeda Reuss
Pl. XII, Fig. 15

Textularia foeda n. sp. Reuss 1846, S. 109, taf. 43, fig. 12–13; *T. foeda* – Lutze 1960, p. 443, taf. 27, fig. 10–11.
Hypotype: L.P.B. 9421, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Lenght 0,52–0,64 mm; Width 0,15–0,19 mm.
Occurrence: Upper Callovian, Oxfordian from Germany, Jurassic and Cretaceous of Europe.

Textularia cf. *cordiformis* Schwager
Pl. XII, Fig. 11–12

Specimens: L.P.B. 9422, Lower Tithonian, Ghilcoş Mts. (western slope).

Family Fischerinidae Millett 1898
Genus **Nautiloculina** Mohler 1938
Nautiloculina oolithica Mohler
Pl. XVI, Fig. 2; Pl. XXXIX, Fig. 4; Pl. XL, Fig. 4; Pl. LI, Fig. 4

Nautiloculina oolithica Mohler-Viotti 1965, pl. X, fig. 12; *N. oolithica* – Ramalho 1971, pl. XIII (12–13).
Hypotype: L.P.B. 9428, Upper and Lower Tithonian, Ghilcoş Mts., Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Occurrence: Dogger and Malm from Alpine province, Oxfordian-Valanginian of Portugal.

Family Pavonitinidae Loeblich & Tappan 1961
Genus **Kurnubia** Henson 1948
Kurnubia jurassica (Henson)
Pl. XXIII, Fig. 1

Kurnubia jurassica (Henson)-Smout & Sugden 1961, p. 589, pl. 73, fig. 19.
Hypotype: L.P.B. 9432, Lower Tithonian, Ghilcoş Mts. (western slope).
Occurrence: Oxfordian-Tithonian from Arabia, Algeria and Alpine province.

Family Discorbidae Ehrenberg 1838
Genus **Discorbis** Lamarck 1804
Discorbis sp.
Pl. XIII, Fig. 17–18; Pl. XV, Fig. 8–9

Specimens: L.P.B. 9433, Lower Tithonian, Ghilcoş Mts. (western slope).
Dimensions: Maximal diameter 1,05–1,20 mm; Height 0,15–0,20 mm, Umbilical diameter 0,20–0,30 mm.
Remarks: Similar by test morphology with *Discorbis (Topaludiscorbis) danubiensis* Neagu 1970 from Upper Oxfordian-Lower Kimmerdigian of Dobrogea but differ by mode of disposition of radial grooves in umbilical zone.

Family ATAXOPHRAGMIIDAE Schwager 1877
Genus **Pseudotextulariella** Barnad 1953 emend Brönnimann
Pseudotextulariella? scarsellai (De Castro)
Pl. LXXXVI, Fig. 2

Cuneolina scarsellai n. sp. De Castro 1964, pl. 1, fig. 1 a–d, fig. 2, 5, 8, fig. 6–7, 9–10 (1), pl. 2, fig. 1–2; *Pseudotextulariella? scarsellai* — Brönnimann & Conrad, text fig. 1–4, pl. I, pl. II, fig. 6, 8, 9; *P.? scarsellai* — Conrad 1969, p. 49, fig. 13 a, b; *P.? scarsellai* — Stillă, Dragastan & Dumitru 1972, pl. III, fig. 3.

Hypotype: L.P.B. 9434, Barremian, Ghilcoş, Lower Aptian, Bicăjel Mts.
Occurrence: Barremian-Lower Aptian from Italy, Spain, Switzerland and Romania.

Family GLOBIGERINIDAE Carpenter, Parker & Jones 1862
Genus **Globigerina** d'Orbigny 1826
Globigerina helveto-jurassica Hauessler
Pl. XII, Fig. 20–25

Globigerina helveto-jurassica Hauessler-E. & I. Seibold 1960, S. 380, taf. 1, fig. 18.

Hypotype: L.P.B. 9435, Lower Tithonian, Ghilcoş Mts. (western slope).
Occurrence: Malm of Alpine province.

"*Protoglobigerinae*"
Pl. VII, Fig. 1

„*Protoglobigerinae*" Colom 1966 — p. 30, text fig. 1, pl. I, pl. II; „*P.*" — Borza 1969, p. 41, taf. XLII, fig. 1–6.

Hypotype: L.P.B. 9436, Lower Kimmeridgian, Ghilcoş Mts. (western slope).
Occurrence: Bathonian-Tithonian with maximum in the Oxfordian, Subbetic Zone, Prealps, central Appennines, Sicily, Upper Oxfordian of Aquitan Basin, Pieniny Zone (North Carpathians).

Family ORBITOLINIDAE Martin 1890
Genus **Palaeodictyoconus** Moullade 1966
Palaeodictyoconus arabicus (Henson)
Pl. XCII, Fig. 3; Pl. XCIII, Fig. 1–2

Dictyoconus arabicus n. sp. Henson 1948, p. 35, pl. I, fig. 5–8, pl. XIV, fig. 1–12; *Palaeodictyoconus arabicus* — Saint Marc 1970, p. 229, pl. I, fig. 12–15.

Hypotype: L.P.B. 9437, Lower Aptian, Bicăjel I Mts.
Occurence: Aptian from Iran, Lower Aptian from Liban and Barremian ?-Aptian from Dinarids Mts. (Jugoslavia).

Genus **Orbitolinopsis** Silvestri 1932
Orbitolinopsis simplex (Henson)
Pl. XCIII, Fig. 3–4

Iraqia simplex n. sp. Henson 1948, p. 70, pl. I, fig. 1–3; *I. simplex* — Bassoullet & Moullade 1962, p. 110, pl. I, fig. 16–19.

Hypotype: L.P.B. 9438, Lower Aptian, Ghilcoş Mts.
Occurrence: Aptian from Iraq and Spain.

Family ACERVULINIDAE Schultze 1854
Genus **Acervulina** Schultze 1854
Acervulina sp.
Pl. XXX, Fig. 2

„*Section multicellulaires*" — Cuvillier & Deloffre, p. 8, pl. 3, fig. 1–3, *Acervulina* sp. non *Acervularia* — Dragastan 1970, pl. XXII, fig. 5.

Hypotype: L.P.B. 9440, Lower Tithonian, Ghilcoş Mts., Upper Tithonian, Făgetul Ciucului Mts.
Occurrence: Malm of Dinarid, Bathonian of Paris basin and Upper Aptian of Aquitan basin.

Phylum **THALOPHYTA** Unger 1838
Class CHLOROPHYCEAE Kützing 1843
Order DASYCLADALES Pascher 1931
Family DASYCLADACEAE Kützing 1843
Genus **Acicularia** d'Archiac 1843
Acicularia jurassica Johnson

Acicularia jurassica n. sp. Johnson, 1961, p. 149, pl. 32, fig. 6–7.
Hypotype: L.P.B. 9441, Lower Tithonian, Ghilcoș Mts.
Occurrence: Upper Jurassic of Alabama and Texas (U.S.A.).

Acicularia elongata Carozzi

Pl. XXV, Fig. 4; Pl. XXVI, Fig. 2; Pl. XXXIV, Fig. 4; Pl. LXXVIII, Fig. 2

Acicularia elongata n. sp. Carozzi 1948, p. 155, fig. 52, 53, tab. VI, fig. 6; *A. elongata* – Carozzi 1955, p. 62, fig. 18, tab. VI, fig. 8, 9; *A. elongata* – Nikler & Sokac 1967, p. 119, tab. VI, fig. 1–5; *A. elongata* – Nikler & Sokac 1968, pl. XII, fig. 4; *A.* cf. *elongata* – Bouroullec & Dellofre 1968 p. 238, pl. 7, fig. 9–10, 13; *A. elongata elongata* – Bouroullec & Deloffre 1970, p. 5, pl. 8, fig. 8.
Hypotype: L.P.B. 9442, Upper Tithonian, Ghilcoș Mts. and Făgetul Ciucului.
Dimensions: Diameter of disc (D) 0,26–0,35 mm; Number of sporangial cavities (n) 10–16; Diameter of cavities 0,020–0,050 mm.
Occurrence: Kimmeridgian-Tithonic of Jura Mts.; Kimmeridgian of Velebit Kapela (Yugoslavia), Portlandian and Neocomian of Aquitan basin.

Acicularia? minuta (Maslov)
Pl. XXXII, Fig. 3–4

Coscinoconus minutus n. sp. Maslov 1958, p. 547, text fig. 3 a.
Hypotype: L.P.B. 9443, Upper Tithonian, Ghilcoș Mts.
Dimensions: D 0,20–0,30 mm; n 5–8.
Occurrence: Kimmeridgian-Tithonic of the Krimeia (Soviet Union).

Acicularia intermedia Dragastan
Pl. XCI, Fig. 2, 4; Pl. LXXXVIII, Fig. 2

Acicularia intermedia n. sp. Dragastan 1967, p. 446, pl. III, fig. 22–26.
Hypotype: L.P.B. 9444, Barremian-Lower Aptian, Bicăjel I Mts.
Dimensions: D 0,15–0,22 mm; n 10–13; d 0,015–0,030 mm.
Occurrence: Barremian, Pădurea Craiului Mts. (Romania).

Acicularia antiqua Pia
Pl. XC, Fig. 4

Acicularia antiqua Pia-Elliott 1968, p. 16, pl. I, fig. 1, 3.
Hypotype: L.P.B. 9445, Lower Aptian, Ghilcoș Mts.
Dimensions: D 0,28–0,35 mm; n 10–18; d 0,040–0,060 mm.
Occurrence: Cenomanian of Libia, Neocomian, Aptian-Albian of Iraq, Barremian-Aptian of Arabia.

Some Observations on the Macroporella, Salpingoporella and Pianella Genera Group

As regards to the reinstatement of the genus *Salpingoporella* Pia 1918, the authors of this note (M. Conrad, A. Praturlon & R. Radoicic, 1973) relying on the I.C.B.N. rules, showed that this genus is valid in comparison with the *Pianella* genus created by Radoicic in 1963, without taking into account what we ascertained since 1971 in the paper: "*New Algae in the Upper Jurassic and Lower Cretaceous from the Bicaz Valley-East Carpathians*" at pages 166, 169, namely: "*as regards with the inclusion of the genus Salpingoporella* Pia *into the new genus Pianella* Radoicic, *a series of characteristic features should be taken into account, and this fact determined us to*

TABLE 1

Comparative Table with Species belonging to the Macroporella, Salpingoporella and "Pianella" Genera

Number	Genus & species	Outer diameter mm	Inner diameter mm	Branches number per verticil	Distal diameter of pores mm	Distance between verticils mm	Remarks	Age
1	*Gyroporella pygmaea* nov. sp. Gümbel, 1891 = *Macroporella pygmaea* (Gümbel) Pia 1925	0,42—0,90	0,13—0,30	16—25	0,09—0,18	0,18—0,37	The *pygmaea* species is not a true *Macroporella* it may assigned to the new evolutive line	Upper Jurassic (Tithonian)
2	*Macroporella tosaensis* Yabe & Toyama 1949	0,71	0,41	30	0,05	—	Branches *phloiophorous*(?) and *euspondyle*	Upper Jurassic (Torinosu Limestone)
3	*Diplopora mühlbergii* nov. sp. Lorenz, 1902 = *Salpingoporella muehlbergii* (Lorenz) Pia 1918	0,3—0,5	0,1—0,2	8	—	0,2—0,4 in Radoicic	Short branches *phloiophorous* and *euspondyle endospore*	Barremian — Aptian
4	*Salpingoporella annulata* nov. sp. Carozzi 1955	0,30—0,64	0,10—0,25	8—12	—	0,15—0,20	Short branches *phloiophorous* and *euspondyle, endospore*	Portlandian Berriasian Valanginian
5	*Macroporella gigantea* nov. sp. Carozzi 1955	1,2—1,75	0,8—1,2	30—40	0,09—0,20	—	Similar with ,,*Pianella*'' *pygmaea* Gümbel according to Praturlon 1966	Portlandian
6	*Macroporella sellii* nov. sp. Crescenti 1959	0,24—0,44	0,06—0,16	25—27	0,016—0,12	0,018	Branches *phloiophorous aspondyle* and *euspondyle*(?)	Middle and Upper Kimmerid.
7	*Salpingoporella dinarica* nov. sp. Radoicic 1959	0,240—0,560	0,128—0,400	8—10?	—	0,048	Short branches *phloiophorous, euspondyle*	Barremian-Aptian
8	*Macroporella* sp. Endo 1961	0,608	0,230	—	0,068	—	By sizes and morphology very similar to *Macroporella tosaensis* Yabe & Toyama	Upper Jurassic (Torinosu Limestones)
9	*Salpingoporella apenninica* nov. sp. Sartoni & Crescenti 1962	0,19—0,32	0,097—0,22	8—14	—	0,08—0,16	By size of inner diameter, distance between verticils and number of branches per verticil similar to *S. annulata* but disimilar by outer diameter, Possibly a valid species	Portlandian Berriasian Valanginian
10	*Pianella grudii* nov. sp. Radoicic 1963	0,128—0,480	0,064—0,24	12—20	0,032—0,12	—	Branches *phloiophorous* and *euspondyle* = *Salpingoporella grudii* (Radoicic)	Upper Kimmeridgian
11	*Acroporella radoicici* nov. gen. nov. sp. Praturlon 1964	0,55 (0,36—0,70)	0,25 (0,10—0,33)	8—12	0,06	0,10 (0,085—0,110)	Branches *acrophorous* and *euspondyle* = *Salpingoporella radoicicae* (Praturlon)	Berriasian — Hauterivian
12	*Salpingoporella texana* nov. sp. Johnson 1965	0,580—0,900	0,270—0,315	8	0,085	—	—	Albian

13	*Pianella turgida* nov. sp. Radoicic	1—1,5	1/3 from outer d'am.	13—15	0,05—	—	*Salpingoporella turgida* (Radoicic)	Cenomanian
14	*Macroporella (Pianella) istriana* nov. sp. Gusic 1966	0,25—0,74	0,14—0,41	16—28	0,012—0,27	0,03—0,04	Short tiny, dense branches, *phloiophorous* but not compressed in the horizontal and vertical plane, *euspondyle* arrangement "*Pianella*" *istriana* Gusic	Berriasian — Valanginian
15	*Macroporella (Pianella) adriatica* nov. sp. Gusic 1966	1,36—2,62	0,26—0,50	20—22	0,20—0,40	0,30—0,35	I belive that this species is a *Macroporella* with *phloiophorous* branches but doubtful *euspondyle* arrangement *Macroporella adriatica* (Gusic)	Berriasian — Valanginian
16	*Salpingoporella melitae* nov. sp. Radoicic 1967	0,48—1,252	0,320—0,960	16(?)—24, 18—20	—	—		Uppermost Barremian — Lowermost Aptian
17	*Salpingoporella arabica* nov. sp. Elliott 1968	0,31—0,73	0,21—0,47	8—10	0,065—0,078	0,104		Aptian-Albian Cenomanian
18	*Pianella atlantica* nov. sp. Johnson 1968	0,71	0,36—0,375	—	0,042—0,055	0,050—0,075	Branches tiny and not widenet distally, *phloiophorous* to *acrophorous*, is a typical species for new evolutive line	Neocomian — Aptian
19	*Salpingoporella oceania* nov. sp. Johnson 1968	0,375—0,50	0,20—0,22	8	0,015—0,028	0,091—0,24	Synonyme with *Salpingoporella muehlbergii* (Lorenz)	Neocomian — Aptian
20	*Pianella cemi* nov. sp. Radoicic 1968	1,1—1,6	0,44—0,53	10—15	0,16—0,24	—	*Salpingoporella cemi* (Radoicic)	Upper Barremian — Lower Aptian
21	*Macroporella embergeri* nov. sp. Bouroullec & Deloffre 1968	0,90—0,975	0,35—0,357	9—10	0,275—0,70	—	Branches large *phloiophorous* with *aspondyle* arrangement	Neocomian
22	*Pianella genevensis* nov. sp. Conrad 1969	0,6—1,0	0,27—0,51	6—9 and more (11—12)	—	0,09—0,11	Cladospore, similar to the *Salpingoporella melitae* Radoicic	Lower Barremian
23	*Salpingoporella carpathica* nov. sp. Dragastan 1969	0,15—0,18	0,06—0,09	4—8	0,03—0,06	0,04—0,07	According to Conrad, Praturlon, Radoicic this species is not an *endospore* type, but it is not possible to exist *cladospore* type spore at this species because the thallus is very small and branches too. I believe that spore can easilly formed in the central cavity than into the branches or upon the branches	Barremian
24	"*Macroporella*" *praturloni* nov. sp. Dragastan 1971	1,2—4,0	0,6—1,6	20—40	0,07—0,30	—	Branches large *phloiophorous* with *mesospondyle* arrangement *Macroporella praturloni* Dragastan 1971	Uppermost Portlandian Berriasian

(continuation) tab. 1

25	*Macroporella (Macroporella) espichelensis* nov. sp. Deloffre & Ramalho 1971	1,17–1,90	0,225–0,310	24	0,180–0,240	–	Branches large *phloiophorous* with *mesospondyle* arrangement *Cladospore*	Upper-Portlandian
26	*Pianella johnsoni* nov. sp. Dragastan 1971	0,20–0,31	0,10–0,15	14–20	0,02–0,04	0,033 0,045	Branches tiny *phloiophorous* not compressed, *euspondyle* arrangement	Lower Portlandian
27	*Pianella exilis* nov.sp. Dragastan 1971	0,60–0,80	0,20–0,30	–	0,060–0,10	0,015 0,030	Branches *phloiophorous* not compressed	Upper Barremian Lower Aptian
28	*Macroporella incerta* nov. sp. Sokac & Nikler 1973	1,0–1,60	0,41–0,63	20–30	0,08–0,18	0,03–0,11	Branches *phloiophorous* with tendency of *euspondyle* arrangement	Barremian-Aptian
29	*Macroporella verticillata* nov. sp. Sokac & Nikler 1973	0,45–1,18	0,21–0,56	22–30	0,05–0,12	0,04–0,105		Barremian-Aptian
30	*Salpingoporella steinhauseri* nov. sp. Conrad, Praturlon & Radoicic 1973	0,26–0,33	d/D 0,35–0,40	7–8	–	0,08–0,11		Lower and Middle Berriasian

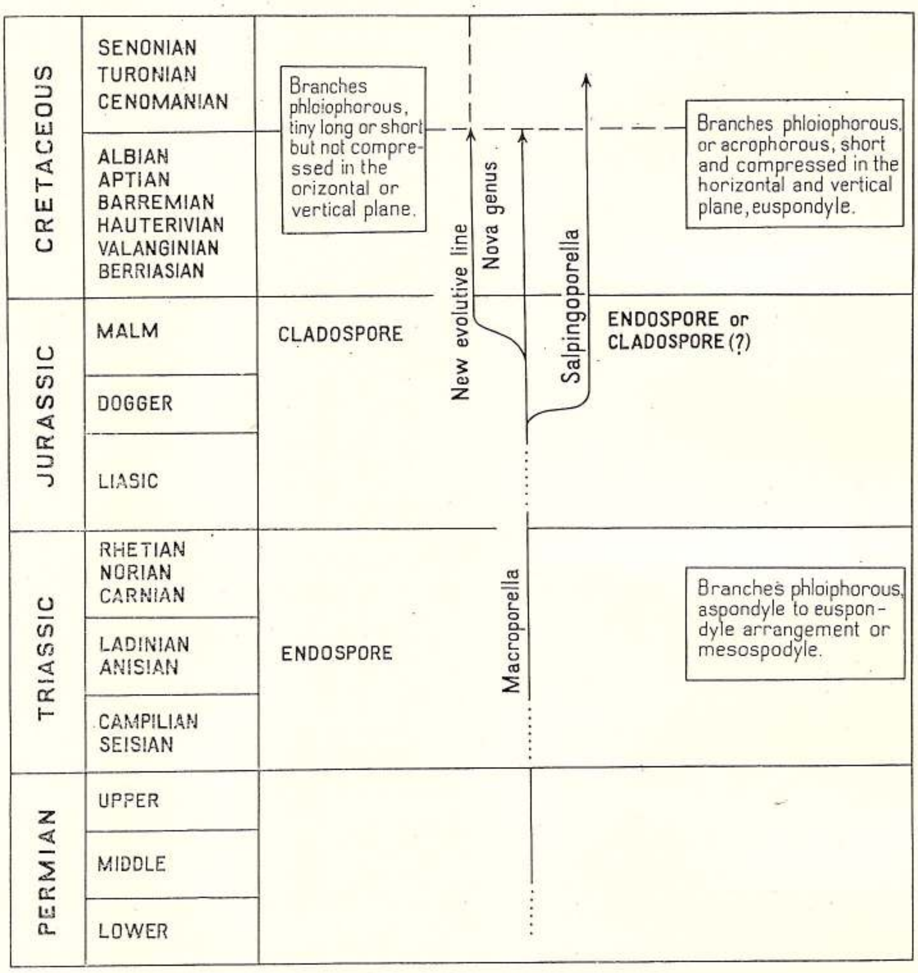

Fig. 13. – Evolutionary trend line of some genera from the Macroporellinae sub-tribe.

have some reserve with regard to this problem. Radoicic *and* Praturlon *concluded in 1967 from morphological studies on the species, Salpingoporella muehlbergii* (Lorenz) *that the branches were forming on the outer part a continuous cortical layer due to an external membrane. According to* Pia, *the branches have an arrangement without touching each other on their distal side. Nevertheless, in spite of this morphologic-structural "error", there occur a series of features remitting to make a distinction between the two genera. First of all, Salpingoporella is an alga having a small thallus with a number of low, short, and narrow branches of discrete arrangement. Moreover, as remarked by* Johnson *(1968), there exists a complete transition between Salpingoporella and Pianella. And what is more, the evolution of the genera is variable, but at the same time it is also limited, so that some conclusions of a "phylogenetic" order may be drawn. While Pianella evolves in the Carboniferous-Cretaceous interval, Salpingoporella develops from the Middle Jurassic through the Lower Cretaceous. In my opinion, the genus Salpingoporella is endosporous (see* Dragastan, *1969), what is an important character denoting the primitivenesse of the genus as against the genus Pianella which is only cladosporous. However, the phylogenetic importance of the position of the sporangia cannot be denied in the generic level, and this makes it impossible to limit the importance of the sporanges to the level of the species only. As regards the genus Salpingoporella, I believe that this genus may possess both phloiophorous and acrophorous branches in the sense of* Pia, *a fact that would permit to separate some subspecies of distinct and well known areas, somewhat similar to the evolution of some Triassic subspecies which belong to the genus Diplopora. On the other hand, it was unnecessary to cancel a genus which I consider of being inexistent, when in the protolog according to I.C.B.N. rules (1966) various types have been figured and described as a whole. If some errors occured in the original description, the genus may nevertheless be maintained, and a new rigurous description could be made. In fact the taxon is more than 50 years old and thus well know in the literature. The maintenance of both genera is of a considerable practical importance as their evolution (as I have shown before) is chronologically limited, thus permitting to draw some important conclusions of chronostratigraphic character".*

Referring to the same note it is shown, as a conclusion, that the *Salpingoporella* Pia 1918, is a valid genus, and the *Pianella* Radoicic 1963, is this time considered its synonym. Therefore, *Salpingoporella* Pia (a genus with *phloiophorous* and *euspondyle*? branches arrangement according to Conrad, Praturlon & Radoicic) and *Macroporella* Pia 1912 (a genus with *phloiophorous* and *aspondyle* branches arrangement) are considered valid genera.

Considering all the species described till now and attributed to the *Macroporella* Pia, *Salpingoporella* Pia and *Pianella* Radoicic genera found within the Jurassic-Cretaceous interval, we ascertain the existence of certain morphologic differentiations as regards the form and disposition of the branches as well as characters and types of dispositions of spores at some already mentioned species.

From the evolutive viewpoint, the problem of this group of Algae *(Macroporella-Salpingoporella-"Pianella")* cannot be treated in a simplistic manner by the reinvestment of the *Salpingoporella* genus validity which, although being well characterized by J. Pia, had been supressed (however this tendency was not unanimously accepted-see J. H. Johnson, G. F. Elliott, I. Gusic), and comprises more than 14 species assigned after the creation of the *Pianella* genus in 1963 and then included in 1967 all species in this new genus by Praturlon and Radoicic, without taking into account the morphologic and evolutive characters at almost 30 species described in the Jurassic-Cretaceous interval and confered to the *Macroporella*, *Salpingoporella* or "*Pianella*" genera (Table 1).

On the other hand, we distinguish, within this generic group of the *Macroporellinae Subtribe*, several evolutive lines or directions, as follows :

The main evolutive line corresponding to the genus Macroporella Pia 1912, which starts its development since the Permian and continues it with a maximum development during the Anisian-Ladinian-Carnian-Rhaetian interval, having a new recurrence in the Malm-Valanginian interval (Fig. 13).

In the Permian-Anisian-Carnian-Rhaetian interval for the main evolutive line we distinguish the existence of some species with long or moderate *phloiophorous* branches disposed in the aspon-

dyle arrangement. Beginning with the Kimmeridgian and up to the Valanginian a renewal of the species of the *Macroporella* genus takes place, which has long, large and widened distally phloiophorous branches, and aspondyle arrangement, sometimes, with passing to euspondyle or with a disposition called by us of *mesospondyle* type. This mesospondyle arrangement is found at *Macroporella praturloni* Dragastan, *M. espichelensis* Deloffre & Ramalho, *M. adriatica* Gusic.

According to J. Pia (1920) the *Macroporella* genus is an endosporous type, fact which points to its primitive character. It seems that at the Kimmeridgian-Tithonian level, there is a change in the disposition type of the branches on the thallus, which may correspond to a new evolutive moment of the genus.

The evolutive line of the Salpingoporella genus which continues to its evolution to the Cenomanian is datached, as the Bajocian-Bathonian level from the main evolutive line which corresponds to the *Macroporella* genus. This line includes species which have short, suddenly widened distally phloiophorous and acrophorous branches and which can be vertically or horizontally compressed, regularly disposed within the euspondyle type arrangement (Fig. 13).

Generally, the thallus of the *Salpingoporella* genus is much smaller in comparison with that of the *Macroporella* genus. If we take into account the sizes of the maximum limit in diameter of various species belonging to this genus does not exceed 1,5 mm. The *Macroporella* genus has a variable thallus diameter which may reach to 4,0 mm. We consider the *Salpingoporella* genus as a "regressive" reduced evolutive line in the sense of size decrease, shortening of branches, lenght and of the reduced number of branches per verticil and, according to our opinion, of the endosporous character of the species included in this line with the possibility of the existence of certain isolated cladosporous species. Logically, we consider that at least the most of the species having short suddenly widened distally branches can be elaborate spores in the central cavity, than in the case of much too small branches to allow the spore formation in the inner part or on the branches.

In our opinion, the third evolutive line is a new evolutive one which begins its appearence in the Tithonian and continues to the Albian. Within this line there may be already included several species which have been described in the *Pianella* invalid Genus. The types which can be included in this line have intermediary thallus, some of them reaching 1 mm diameter, the branches are phloiophorous long or short-without being horizontally or vertically comprimated with euspondyle arrengement and probably cladosporous. As the *Pianella* genus has as *Grudii* type species, now included in the genus *Salpingoporella* Pia 1918 -it is necessary the designation of a new genus which should correspond to this new evolutive line. This line is a reality by the few already described species which cannot be yet included in the *Macroporella* and *Salpingoporella* genera as they have certain distinct features which I mentioned before. The accepting of this line by the researchers means a true biostratigraphic help at the Tithonian and to the Cretaceous level. From several standpoints especially the ethical ones I hope this genus to be created.

If we sum up the data presented within the mentioned evolutive lines there result the following valid species :

1. In the main evolutive line are included : *Macroporella tosaensis* Yabe & Toyama 1949, *M. selii* Crescenti 1959, *Macroporella* sp. (aff. *M. tosaensis* Yabe & Toyama), 1961, *M. adriatica* Gusic 1966, *M. embergeri* Bouroullec & Deloffre 1968, *M. praturloni* Dragastan 1971, *M. espichelensis* Deloffre & Ramalho 1971, *M. incerta* Sokac & Nickler 1973, *M. verticillata* Sokac & Nickler 1973, the latter species cannot be easilly recognized.

2. In the evolutive line of *Salpingoporella* genus can be included *Salpingoporella muelhbergii* (Lorenz) 1902 which included as synonym *S. oceania* Johnson 1968, *S. annulata* Carozzi 1955, *S. dinarica* Radoicic 1959, *S. appenninica* Sartoni & Crescenti 1962, *S. grudii* (Radoicic) 1963, *S. radoicicae* (Praturlon) 1963, *S. texana* Johnson 1965, *S. turgida* (Radoicic) 1965, *S. melitae* Radoicic 1967, which included as synonym *Pianella genevensis* Conrad 1969, *Salpingoporella arabica* Elliott 1968, *S. carpathica* Dragastan 1969, *S. steinhauseri* Conrad, Praturlon & Radoicic, 1973.

3. The new evolutive line which have not designated a Genus up to now include some species of the invalided genus *Pianella* namely : "*Pianella*" *pygmaea* (G ü m b l e) 1891, "*P*". *istriana* G u s i c 1966, "*P*". *atlantica* J o h n s o n 1968, "*P*". *exilis* D r a g a s t a n 1971, ,'*P*". *johnsoni* D r a g a s t a n 1971.

Till the accepting of this evolutive line I wished to point to the appurtenance of numerous described species from the Jurassic-Cretaceous interval in order to avoid as much as possible the confusion existing within this group of Algae.

"*Pianella*" *pygmaea* (G ü m b e l)
Pl. XVII, Fig. 1–2; Pl. XXI, Fig. 1, 3

Gyroporella pygmaea n. sp. G ü m b e l 1891, p. 306, text fig. 6–7; *Macroporella pygmaea* – P i a 1925 p. 84, pl. I, fig. 4–7; *M. pygmaea* – C a r r o z z i p. 43, fig. 7, pl. VI, fig. 4; *M. gigantea* n. sp. – C a r r o z z i 1955, p. 43, fig. 8; *M. pygmaea* – D u f a u r e 1958, pl. 3, fig. 16; *Pianella pygmaea* – R a d o i c i c 1963, p. 190 fig. 4; *Macroporella pygmaea* – P a t r u l i u s 1965, p. 35, pl. II, fig. 2a, b; *Macroporella* sp., – P a t r u l i u s 1965, p. 165, pl. XV, fig. 7; *Pianella pygmaea* – S a r t o n i 1965, p. 116, pl. X, fig. 1; *P. pygmaea* – P r a t u r l o n 1966, p. 177, fig. 5 a, b; *P. pygmaea* – D r a g a s t a n 1968, p. 61, pl. I, fig. 8; *P. pygmaea* – E l l i o t t 1968, p. 66, pl. 17, fig. 6–8; *Macroporella pygmaea* – N i k l e r & S o k a c, pl. XII, fig. 6; *M. pygmaea* – B a s s o n & E d g e l l 1971, pl. 5, fig. 1–3; *Pianella pygmaea* – S t i l l ă, D r a g a s t a n & D u m i t r u 1972, pl. II, fig. 1–2.

Hypotype: L.P.B. 9446, Lower Tithonian, Ghilcoş Mts., Făgetul Ciucului Mts., Cupaş Mts.
Dimensions: Outer Diameter 0,42–1,3 mm; Inner diameter (d) 0,15–0,90 mm; Diameter of branches (p) 0,07–0,20 mm; Lenght of branches (l) 0,15–0,20 mm; Number of branches per whorls (w) 18–40.
Occurrence: Portlandian or Tithonian in the Alpine province, Valanginian from Garagu Formation-Iraq, Tithonian, Liban and Romania.

"*Pianella*" *johnsoni* D r a g a s t a n
Pl. XX, Fig. 4; Pl. XXII, Fig. 2; Pl. XXVIII, Fig. 4

Pianella johnsoni n. sp. D r a g a s t a n 1971, p. 165, pl. III, fig. 1–11.
Hypotype: L.P.B. 9326, Lower and Upper Tithonian, Ghilcoş Mts, Suhardu Mic Mts., Făgetul Ciucului Mts.
Dimensions: D 0,20–0,31 mm; d 0,10–0,15 mm; l 0,05–0,07 mm?; p 0,02–0,04 mm w 14–20.

"*Pianella*" *exilis* D r a g a s t a n
Pl. XCI, Fig. 2; Pl. XCII, Fig. 1; Pl. XCIV, Fig. 3

Pianella exilis n. sp. D r a g a s t a n 1971, p. 169, pl. IV, fig. 1–2.
Hypotype: L.P.B. 9327, Lower Aptian, Bicăjel I Mts.
Dimensions: D 0,60–0,80 mm, d 0,20–0,30 mm, l 0,20–0,25 mm, p 0,060–0,10 mm.

Genus **Salpingoporella** P i a 1918
Salpingoporella melitae (R a d o i c i c)
Pl. LXXXVI, Fig. 1

Salpingoporella melitae n. sp. R a d o i c i c 1967, p. 121, fig. text 1–2, pl. I–IV; *Pianella melitae* – P r a t u r l o n 1967, p. 141, fig. 4; *P. melitae* – F o u r c a d e, A z é m a & J a f f r e z o 1972, lam. 1, fig. 6–7.

Hypotype: L.P.B. 9448, Barremian, Bicăjel I Mts.
Dimensions: D 1,8 mm, d 0,78 mm, l 0,60 mm, p 0,080–0,14 mm, h 0,18–0,30 mm.
Occurrence: Upper Barremian-Lower Aptian from Jugoslavia, Spain (Murches province).

Salpingoporella turgida (R a d o i c i c)
Pl. XCIV, Fig. 1

Pianella turgida n. sp. R a d o i c i c 1965, p. 195–198, pl. 1–4.
Hypotype: L.P.B. 9449, Lower Aptian, Bicăjel I Mts.
Dimensions: D 1,4–1,5 mm, d 0,6 mm, l 0,37 mm, p, 0,060 mm.
Occurrence: Albian to Cenomanian from Jugoslavia and Italy.

Salpingoporella annulata Carozzi

Pl. LXX, Fig. 2–3; Pl. LXXI, Fig. 4; Pl. LXXIV, Fig. 3; Pl. LXXVI, Fig. 3

Salpingoporella annulata n. sp. Carozzi 1955, p. 55–57, fig. 15, pl. 6, fig. 6–7; *S. annulata* – Patrulius 1965, p. 32, pl. I, fig. 1 a, b, e.; *Pianella annulata* – Praturlon & Radoicic 1967, p. 140, fig. 3; *S. annulata* – Elliott 1968, p. 72, pl. 20, fig. 3, 4, 6, 7; *S. annulata* – Basson & Edgell 1971, pl. 4, fig. 3; *S. annulata* – Ramalho 1971, pl. VIII (2) X (2) XII (2) XXX (1–3); *Pianella annulata* – Fourcade, Azéma & Jaffrezo 1972, lam 1, fig. 4–5.

Hypotype: 9459, Middle-Upper Berriasian-Lower Valanginian. Ghilcoş Mts., Făgetul Ciucului Mts., Bicăjel II Mts.

Occurrence: Upper Jurassic and Neocomian from Switzerland, south of France, Italy, Jugoslavia and Arabia, Portlandian-Valanginian of Portugal, Portlandian-Berriasian of Spain, Lower Cretaceous of Liban.

Salpingoporella dinarica Radoicic

Pl. LXXXI, Fig. 2; Pl. LXXXIII, Fig. 3

Salpingoporella dinarica n. sp. Radoicic 1959, p. 33, pl. 3–5; *Hensonella cylindrica* n. sp. Elliott 1960, p. 229, pl. 8, fig. 7; *Salpingoporella dinarica* – Sartoni & Crescenti 1963, p. 268, tav. XXVII, XXVIII, XLV, fig. 1–3; *S. dinarica* – Dragastan 1967, p. 443, pl. I, fig. 1–4; *Pianella dinarica* – Praturlon & Radoicic, 1967, p. 13, fig. 2; *Salpingoporella dinarica* – Elliott, 1968, p. 75, pl. 21, fig. 4, pl. 22; *Pianella dinarica* – Basson & Edgell 1971, pl. 3, fig. 5–8.

Hypotype: L.P.B. 9460, Barremian-Lower Aptian, Ghilcoş, Bicăjel I Mts.

Occurrence: Barremian-Aptian of Jugoslavia, Italy, France, Liban.

Salpingoporella radoicicae (Praturlon)

Pl. LXXII, Fig. 1, 3

Acroporella radoicici n. sp. – Praturlon 1964, p. 177, fig. 8–11.

Hypotype: L.P.B. 9474, Valanginian-Hauterivian, Ghilcoş Mts.

Dimensions: D 0,54 mm; d 0,25 mm; p 0,090–0,10 mm; h 0,080–0,15 mm; w 12.

Occurrence: Neocomian of Appennines Mts. (Italy).

Salpingoporella carpathica Dragastan

Pl. LXXXI, Fig. 3; Pl. LXXXII, Fig. 1, 3

Salpingoporella sp. Dragastan 1967, p. 441, pl. I, fig. 5–6; *Salpingoporella carpathica* n. sp. Dragastan 1969, p. 54, pl. I, fig. 1–6, *S. carpathica* – Basson & Edgell 1971, pl. 4, fig. 1.

Hypotype: L.P.B. 9461, Barremian, Suhardu Mic Mts., Făgetul Ciucului Mts., Bicăjel II Mts.

Dimensions: D 0,12–0,15 mm, d 0,05–0,08 mm, l 0,025–0,045 mm, p 0,03 mm.

Occurrence: Lower Aptian of Liban.

Genus **Clypeina** Michelin 1845

Clypeina jurassica (Favre)

Pl. XXXV, Fig. 2–4; Pl. XL, Fig. 2

Organism X – Joukowski & Favre –1913, p. 315, fig. 6, pl. 14, fig. 2; *Clypeina jurassica* n. sp. – Favre 1927, p. 34, fig. 10, pl. 1, fig. 2, 3, fig. 10b, g, i, l, o, t, r, u, pl. 1, fig. 1; *C. jurassica* – Emberger 1957, p. 545, fig. 1; *C. jurassica* 1958 – Dufaure, pl. 3, fig. 7–8; *C. jurassica* – Gianotti 1958, pl. 2, fig. 5; *C. jurassica* – Radoicic 1959, pl. 8, fig. 1; *C. jurassica* – Farinacci & Radoicic 1964, pl. 8, fig. 2; *C. jurassica* – Patrulius 1965, p. 33, fig. 2; *C. jurassica* Colacicchi 1967, fig. 13; *C. jurassica* – Ramalho 1971, pl XII (1, 2) XXX (4–5); *C. jurassica* – Fourcade, Azéma & Jaffrezo 1972, lam. 1 fig. 1.

Hypotype: L.P.B. 9450, Upper Tithonian, Ghilcoş Mts., Făgetul Ciucului Mts., Bicăjel I and Bicăjel II Mts.

Dimensions: D 0,50–0,98 mm, d 0,08 mm, p 0,15–0,42 mm, w 8–18.

Occurrence: Kimmeridgian-Portlandian or Tithonian of Alpine province, Portlandian-Berriasian of Spain.

Clypeina catinula Carozzi
Pl. XXXII, Fig. 2

Clypeina catinula n. sp. Carozzi 1956, p. 471—477, fig. 2; *C. cantinula* — Nikler & Sokac 1968, tab. XIII, fig. 2.
Hypotype: L.P.B. 9450 a, Upper Tithonian, Bicăjel I Mts.
Dimensions: D 0,10—0,45 mm, d 0,080—0,20 mm, w 5—10.
Occurrence: Portlandian of Jura Mts, Kimmeridgian of Velebit-Croatia, Jugoslavia.

Clypeina aff. *pejovicae* Radoicic
Pl. LXXII, Fig. 2
Specimens: L.P.B. 9452, Valanginian-Hauterivian, Ghilcoș Mts.

Clypeina parvula Carozzi

Clypeina parvula Carozzi 1955, fig. 13, 14, pl. VI, fig. 2; *C. parvula* — Elliott 1968, p. 33, pl. 5, fig. 5—6; *C. parvula* — Basson & Edgell 1971, pl. 6, fig. 3.
Hypotype: L.P.B. 9454, Tithonian, Ghilcoș Mts. and Făgetul Ciucului Mts.
Occurrence: Upper Jurassic and Lower Cretaceous from Europa, Aptian-Albian, Jugoslavia, Valanginian of Iraq.
Remarks: Radoicic (1969) considers this type of species, that other genus of Dasycladaceae or even Charophyta.

Clypeina? *solkani* Conrad & Radoicic
Pl. LVII, Fig. 4; Pl. LXI, Fig. 2; Pl. LXXIII, Fig. 2—4

Clypeina? *solkani* n. sp. Conrad & Radoicic 1971, p. 9, text fig. 1—3, pl. I, fig. 4, pl. II, fig. 1—4; *C.*? *solkani* — Fourcade, Azéma & Jaffrezo 1972, lam. 1, fig. 2.
Hypotype: L.P.B. 0010, Upper Tithonian-Berriasian, Făgetul Ciucului Mts and Valanginian-Hauterivian, Ghilcoș Mts.
Dimensions: Diameter of the stipe 0,15—0,30 mm, w 8—12.
Occurrence: Berriasian-Valanginian of Geneve basin, Lower Cretaceous of Cerna Gora, Dinaric and Adriatic platform, Spain.

"*Clypeina*" *parvissima* Dragastan
Pl. XXII, Fig. 4

Clypeina parvissima n. sp. Dragastan 1966, p. 45, pl. I, fig. 2—7; Calcareous Algae (?) — Radoicic 1969, p. 73, fig. 5 (A—e); *C. parvissima* — Remane 1969, p. 108.
Hypotype: L.P.B. 9352, Tithonian, Ghilcoș Mts.
Occurrence: Kimmeridgian-Portlandian of Trascău Mts., Upper Jurassic and Lower Cretaceous of Serbia (Jugoslavia).

Genus **Cymopolia** Lamouroux 1816
Cymopolia jurassica Dragastan
Pl. XLV, Fig. 2—3

Cymopolia jurassica n. sp. — Dragastan 1968, p. 64, pl. III, fig. 6—7.
Hypotype: L.P.B. 9455, Upper Tithonian-Berriasian, Făgetul Ciucului Mts. and Ghilcoș Mts.

Cymopolia aff. *longistila* Sokac & Nikler
Pl. XCI, Fig. 4

Specimens: L.P.B. 0011, Lower Aptian, Bicăjel I Mts.
Dimensions: D 0,8—1,2 mm, d 0,3—0,5 mm, lenght of primary branches 0,11—0,20 mm, lenght of secondary branches 0,08—0,12 mm.
Remarks: Thallus with primary branches shorter than of *Cymopolia longistila* Sokac & Nikler.

Genus **Cylindroporella** Johnson 1954

Cylindroporella arabica Elliott

Pl. XXIII, Fig. 4

Cylindroporella arabica n. sp. Elliott 1957, p. 227, pl. I, fig. 13–16; *C. arabica* – Elliott 1968, p. 38, pl. 6, fig. 1–2; *C.* cf. *arabica* – Ramalho 1971, pl. XXIX (4, 5).

Hypotype: L.P.B. 9456, Lower Tithonian, Ghilcoş Mts.

Occurrence: Upper Jurassic of Arabia, Portlandian-Purbeckian of Portugal.

Cylindroporella sugdeni Elliott

Pl. LXXIX, Fig. 2

Cylindroporella sugdeni n. sp. Elliott 1957, p. 227, pl. I, fig. 1–6; *C. sugdeni* – Patrulius 1965, *C. sugdeni* – Elliott 1968, p. 38, pl. I, fig. 6, fig. 5–7.

Hypotype: L.P.B. 9457, Valanginian-Hauterivian, Făgetul Ciucului Mts.

Occurrence: Lower Cretaceous of Arabia, Hauterivian of Iraq, Upper Sinaia Beds (V. Tîrlungului), East Carpathians.

Genus **Chinianella** Ott 1967

Chinianella sp.

Pl. LXXVII, fig. 4

Specimens: L.P.B. 9458, Valanginian-Hauterivian, Făgetul Ciucului Mts.

Dimensions: Diameter of primary branches 0,35–0,40 mm, Diameter of secondary branches 0,15 mm, Number of secondary branches 4, Distance between whorls 0,58 mm.

Remarks: By morphology of thallus similar with *Chinianella zankli* Ott from Upper Triassic of North Alps.

Genus **Teutloporella** Pia 1912

Teutloporella obsoleta Carozzi

Pl. XXV, Fig. 4; Pl. LX, Fig. 4

Teutloporella obsoleta n. sp. Carozzi 1955, p. 33; *T. obsoleta* – Dufaure 1958, p. 104, pl. 3, fig. 11–12.

Hypotype: L.P.B. 9462, Tithonian, Ghilcoş Mts. and Făgetul Ciucului Mts.

Dimensions: D 1,5–2,3 mm, d 0,62–1,3 mm, l 0,10–0,45 mm, p proximal 0,075 mm, distal 0,020–0,030 mm.

Occurrence: Portlandian of Jura Mts. and Serrane Mts. (France).

Teutloporella socialis Praturlon

Pl. LV, Fig. 2

Teutloporella socialis n. sp. Praturlon 1963, p. 199; *T. socialis* – Remane 1968, p. 685–686, Abb. 1; *T. socialis* – Radoicic 1969, p. 183, pl. L–5.

Hypotype: L.P.B. 9463, Upper Tithonian, Cupaş Mts.

Dimensions: D 2,4 mm, d 0,38 mm, p 0,048–0,070 mm, h 0,45 mm.

Occurrence: Upper Jurassic from Italy, Tithonian from Romeyer (Drôme) France, Upper Jurassic of Tisnica (Jugoslavia).

Teutloporella sp.

Pl. XXVII, Fig. 1

Specimens: L.P.B. 9464, Upper Tithonian, Ghilcoş Mts.

Remarks: Thallus with proximal oval elongate branches but suddenly narrowed distal that *Teutloporella gallaeformis* Radoicic from Upper Dogger.

Teutloporella n. sp.
Pl. LXXV, Fig. 2

Specimens: L.P.B. 9465, Valanginian-Hauterivian, Ghilcoş Mts.
Dimensions: D 0,63—0,91 mm; d 0,22—0,37 mm; l 0,30 mm; proximal pores 0,015 mm; distal pores 0,060 mm.
Remarks: Thallus cylindrical with elongate segments from terminal zones. Branches typical for *Teutloporella* genus with narrowed distal pores and dilated proximal pores. By shape of the branches it is similar with *Teutloporella obsoleta* Carozzi than *T. socialis* Praturlon.

Genus **Radoiciciella** Dragastan 1971
Radoiciciella subtilis Dragastan
Pl. XLVIII, Fig. 1; Pl. LX, Fig. 1; Pl. LXIII, Fig. 2; Pl. LXVII, Fig. 2; Pl. LXX, Fig. 4

Radoiciciella subtilis n. gen n. sp. Dragastan 1971, p. 170, pl. IV, fig. 3—8, pl. V, fig. 1—5.
Hypotype: L.P.B. 9328, Upper Tithonian-Berriasian, Valanginian-Hauterivian, Ghilcoş Mts.
Dimensions: Maximum diameter 1,2—1,4 mm; axial diameter 0,70—1,0 mm; diameter of cortical cells 0,060—0,080 mm; lenght of cortical cells 0,20—0,37 mm; lenght of primary branches 0,50—0,62 mm; diameter of primary branches 0,15—0,30 mm; lenght of secondary branches 0,20—0,38 mm; diameter of secondary branches 0,12—0,14 mm number of primary branches 8—14; number of secondary branches 6—8.

Genus **Pseudoepimastopora** Endo 1960
Pseudoepimastopora jurassica Endo
Pl. XXIII, Fig. 2; Pl. XXVIII, Fig. 3; Pl. XXXVII, Fig. 3

Pseudoepimastopora jurassica n. sp. Endo — 1961, p. 61, pl. 14, fig. 1—2, pl. 15, fig. 3—4; *P. jurassica* — Dragastan 1968, p. 64, pl. II, fig. 5.
Hypotype: L.P.B. 9466, Upper and Lower Tithonian, Ghilcoş Mts. and Făgetul Ciucului Mts.
Occurrence: Upper Jurassic from Torinosu limestone (Japan).

Pseudoepimastopora cretacea Dragastan
Pl. LI, Fig. 2

Pseudoepimastopora cretacea n. sp. Dragastan 1967, p. 448, pl. IV, fig. 32—33, 37—39.
Hypotype: L.P.B. 9467, Upper Tithonian-Berriasian and Barremian, Făgetul Ciucului Mts.
Occurrence: Barremian, Brazi Valley (Vîrciorog), Apuseni Mountains.

Genus **Macroporella** Pia 1912
Macroporella embergeri Bouroullec & Deloffre
Pl. LXI, Fig. 1; Pl. LXII, Fig. 1; Pl. LXVI, Fig. 1; Pl. LXVIII, Fig. 2, 3

Hypotype: L.P.B. 9468, Berriasian-Valanginian, Ghilcoş and Făgetul Ciucului Mts.
Dimensions: D 1,3—1,5 mm; d 0,50—0,62 mm; l 0,42—0,60 mm; height of branches 0,30—0,70 mm; w 10—12.
Occurrence: Neocomian of Aquitan basin, Upper Berriasian-Lower Valanginian of south Provence (France).

Macroporella praturloni Dragastan
Pl. XLV, Fig. 1; Pl. LI, Fig. 2

Pianella pygmaea — Dragastan 1968, pl. I, fig. 1—8, pl. II, fig. 1—4; *Macroporella parturloni* n. sp. Dragastan 1971, p. 161, pl. I, fig. 5—6; pl. II, fig. 1—6, „*M.*" *praturloni* — Fourcade, Azéma & Jaffrezo — 1972, lam. 3, fig. 1—3.
Hypotype: L.P.B. 9322, Upper Tithonian-Lower Berriasian, Ghilcoş and Făgetul Ciucului Mts.
Dimensions: D 1,2—4,0 mm; d 0,6—1,6 mm; l 0,15—0,90 mm; p 0,07—0,30 mm: w 20—40.
Occurrence: Berriasian-Lower Valanginian of Murches (Spain).

Genus **Actinoporella** Gümbel 1882

Actinoporella podolica (Alth)

Pl. XXXIII, Fig. 3; Pl. XXXVI, Fig. 4; Pl. XXXVII, Fig. 1, 4; Pl. XXXVIII, Fig. 1; Pl. LI, Fig. 2; Pl. LII, Fig. 2, 4; Pl. LXXI, Fig. 2

Gyroporella podolica n. sp. Alth 1878 p. 83, pl. 6, fig. 1–8; *Actinoporella podolica* – Pia 1920, p. 95, fig. 19, pl. 7, fig. 1–7; *A. podolica* – Elliott 1958, p. 255, pl. 45, fig. 1, pl. 47, fig. 5; *A. podolica* – Patrulius 1965, p. 33, fig. 1, pl. I, fig. 3–4; *A. podolica* – Nikler & Sokac 1968, pl. XII, fig. 5; *A. podolica* – Bouroullec & Deloffre 1968, p. 229, pl. 5; *A. podolica* – Dragastan, p. 72 pl. 1, fig. 1–3, 5; *A. podolica* – Elliott 1968, p. 19, pl. I, fig. 2, 4, 7; *A. podolica* – Ramalho 1971, pl. XXIX (8); *A podolica* – Basson & Edgell 1971, pl. 3, fig. 1–2.

Hypotype: L.P.B. 9471, Upper Tithonian-Berriasian, Valanginian-Hauterivian, Ghilcoș Mts. and Făgetul Ciucului Mts.

Occurrence: Portlandian and Neocomian from Italy, France, Jura Mts (Switzerland), Kimmeridgian-Portlandian of Velebit Mts (Jugoslavia), Tithonian from North Carpathians (Poland), Valanginian-Hauterivian from Iraq, Portlandian of Portugal, Upper Jurassic from Lebanon, Malm of Putnei Valley drilling (Moldova).

Actinoporella? krymensis Maslov

Actinoporella (?) *krymensis* n. sp. Maslov 1958, p. 354, fig-text 1 a–d 2 g.

Hypotype: L.P.B. 9472, Neocomian, Ghilcoș Mts.

Genus **Likanella** Milanovic 1966

Likanella campanensis Azéma & Jaffrezo

Pl. LXI, Fig. 4

Likanella campanensis n. sp. – Azéma & Jaffrezo 1972, pl. I, fig. 1–2; *L. campanensis* – Fourcade, Azéma & Jaffrezo – 1972, lam. 2, fig. 9.

Hypotype: L.P.B. 0012, Berriasian-Lower Valanginian, Ghilcoș Mts.

Dimensions: D 0,60–1,2 mm; d 0,28–0,43 mm; w 10.

Occurrence: Portlandian-Berriasian?, Puig Campana, Alicante Province (Spain).

Likanella? danilovae Radoicic

Pl. LXXXIV, Fig. 3

Likanella? danilovae n. sp. Radoicic 1968, p. 187, fig. 1–2, pl. 1–VIII; *L.? danilovae* – Conrad 1969, pl. V, fig. 4.

Hypotype: L.P.B. 9478, Barremian, Ghilcoș Mts.

Occurrence: Upper Barremian?-Lower Aptian from Muntenegro, Dalmatia, Middle and Upper Barremian from Genève basin (Switzerland).

Likanella sp.

Pl. XXIII, Fig. 1; Pl. XXXVIII, Fig. 3; Pl. XLI, Fig. 2–3; Pl. XLVIII; Fig. 3–4; Pl. XLIX, Fig. 1, 3–4; Pl. LX, Fig. 2; Pl. LXII, Fig. 3; Pl. LXV, Fig. 4; Pl. LXXI, Fig. 1

Specimens: L.P.B. 0013, Upper Tithonian-Berriasian, Valanginian, Ghilcoș, Făgetul Ciucului Mts.

Description: Thallus simple, cylindrical with two verticils, formed by 4–6 cylindrical elongate branches, obliques disposed to the ax. The stipe of thallus is inflated at verticils region. In the longitudinal section, thallus presented, a cylindrical central stem with two verticils composed by 4–6 elongate branches. In the tangential section, the branches are circular or ovoidal such as *Actinoporella* or *Clypeina? solkani* but in a cross section 4 branches are disposed into a rosette.

Dimensions: Diameter of the stipe 0,56–0,60 mm; diameter of the stipe between verticils 0,26–0,30 mm; diameter of the verticils 0,75–1,0 mm; number of verticils at node 2; number of branches per verticil 4–6; lenght of branches 0,60–0,90 mm; diameter of pores 0,15–0,60 mm (common 0,28–0,30 mm).

Remarks: *Likanella* sp. is very similar with *Likanella bartheli* Bernier by morphological feature of thallus but dissimilar by the shape branches and the general dimensions of the thallus.

In analogy with all described species of *Likanella* this type is very different by morphology and stratigraphical evolution (see index representation of *Likanella* species (Table 2).

TABLE 2

Index representation of Likanella species character

Species of *Likanella* Dimensions in mm	*L. spinosa* Milanovic 1966	*L. bartheli* Bernier 1971	*L. campanensis* Azéma & Jaffrezo 1972	*L? danilovae* Rad. 1968	*Likanella* sp.
Diameter of the stipe	0,38—1,3	0,20—0,46	0,32—0,50	0,40—0,75	0,56—0,60
Diameter of the stipe between verticilis	—	—	—	—	0,20—0,30
Diameter of the verticilis	—	—	0,9—1,4	0,95—1,45	0,75—1,0
Number of verticils at node	3	2	2	6—8—10 or numerous	2
Number of branches per verticils	8—20	6	12	60—100?	4—6
Lenght of branches	—	0,36—0,72	0,25—0,45	—	0,60—0,9
Diameter of pores	—	distal 0,1 proximal 0,22	0,2—0,3	0,16—0,30	0,15—0,60
Distance between verticils	—	—	0,5—0,7	1,45—1,60	—
Age	Permian	Kimmeridgian-Portlandian	Portlandian-Berriasian	Barremian-Aptian	U. Tithonian-Berriasian, L. Valangin.
Locality	Velebit & Lika (Jugoslavia)	Chaumusse (Jura) (France)	Puig Campana (Spain)	Western Montenegro	East Carpathians

Genus **Heteroporella** Praturlon 1967 emend Ott 1968
(=**Heteroporella** Cross & Lemoine)
Heteroporella lemoinei Dragastan
Pl. LXVI, Fig. 2

Heteroporella lemoinei n. sp. Dragastan 1970, p. 122, pl. I, fig. 1—7.
Hypotype: L.P.B. 9187, Valanginian-Hauterivian, Ghilcoș Mts.
Dimensions: D 0,60—0,85 mm; d 0,26—0,31 mm; p of primary branches 0,075—0,090 mm; p of secondary branches 0,030—0,045 mm; l_1 0,090 mm; l_2 0,11 mm; w 10—12.

Genus **Griphoporella** Pia 1915
Griphoporella piae Dragastan
Pl. XXXIX, Fig. 3; Pl. XLV, Fig. 2—3

Griphoporella piae n. sp. Dragastan 1971, p. 160, pl. I, fig. 1—4.
Hypotype: L.P.B. 9321, Upper Tithonian, Făgetul Ciucului Mts.
Dimensions: D 1,2—1,5 mm; d 0,50—0,75 mm; l_1 0,28—0,37 mm; l_2 0,12—0,15 mm; p_1 0,030—0,045 mm; p_2 0,045—0,050 mm; w per mm² 14—20.

Genus **Petrascula** Gümbel 1873
Petrascula bursiformis (Etallon)
Pl. XL, Fig. 3; Pl. LV, Fig. 3

Conodictyum bursiformis n. sp. Etallon 1858, p. 530; *Petrascula bursiformis* — Pia, p. 123, pl. 6, fig. 6—14; *P. bursiformis* — Dufaure 1958, pl. 3, fig. 17.
Hypotype: L.P.B. 9479, Upper Tithonian, Făgetul Ciucului Mts.

Dimensions: D 1,8 mm; d 1,2 mm; l_1 0,090 mm; l_2 0,23 mm; l_3 0,075 mm; p_1 0,010 — 0,014 mm; p_2 0,075 mm; p_3 0,030 mm.
Occurrence: Upper Jurassic from the Jura Mts., Portlandian of Causse (Provence).

Genus **Diplopora** Schafhäult 1863
Diplopora johnsoni Praturlon
Pl. LXVII, Fig. 3

Diplopora johnsoni n. sp. Praturlon 1964, p. 180, text fig. 12—16.
Hypotype: L.P.B. 9480, Berriasian-Lower Valanginian, Ghilcoș Mts.
Dimensions: D 3,1 mm; d 1,5 mm; p distal 0,030 mm; p proximal 0,15 mm; number of branches in tufs 4—7.
Occurrence: Lower Neocomian of Central Appeninnes (Italy).

Genus **Harlanjohnsonella** Elliott 1968
Harlanjohnsonella sp.
Pl. LXXV, Fig. 3

Specimens: L.P.B. 9482, Valanginian-Hauterivian, Bicăjel II Mts.
Dimensions: Width of wall 0,33 mm; diameter of branches 0,15 mm.
Remarks: Similar to *Harlanjohnsonella annulata* Elliott from Upper Cretaceous of Serbia (Jugoslavia).

Dasycladaceae?
Genus **Carpathoporella** Dragastan 1967 emend. Dragastan 1971
Carpathoporella fontis (Patrulius)
Pl. LXXXIX, Fig. 1—2

Coptocampylodon fontis n. sp. Patrulius 1966, p. 392, fig. 1, p. 393, fig. 2, pl. I a—f; *Carpathoporella occidentalis* n. gen n. sp. Dragastan 1967, pl. I, fig. 7, pl. II, fig. 10—16; *C. occidentalis* — Angelucci & Praturlon p. 435, fig. 8; *Salpingoporella* cf. *muhelbergii* — Lefeld 1968, pl. VI, fig. 3; *Carpathoporella occidentalis* — Johnson 1969, pl. 36, fig. 1—7; *C. occidentalis* — Saint-Marc 1970, pl. 2, fig. 10—11; *Coptocampylodon fontis* — Sokac & Nikler 1971, pl. II, fig. 5—7; *Carpathoporella occidentalis* — Masse & Poignant 1971, pl. 1, fig. 7; *C. occidentalis* — Basson & Edgell 1971, pl. 4, fig. 6—8.

Hypotype: L.P.B. 9332, Barremian-Lower Aptian, Bicăjel I Mts.
Occurrence: Barremian-Lower Aptian, Jugoslavia, Lower Aptian of Liban and Lebanon, Neocomian of France, Upper Jurassic from Lebanon (for *Carpathoporella* genus).

„Dasycladacea"
"Dasycladacea" dalmatica
Pl. LXXXVIII, Fig. 3—4

Specimens: L.P.B. 9477, Upper Barremian-Lower Aptian, Ghilcoș Mts. and Bicăjel I Mts.
Dimensions: Lenght of branches 0,18 mm; number of branches 18—22; diameter of the stipe 0,40—0,52 mm.
Occurrence: Uppermost Barremian-Lowermost Aptian, Montenegru, Dalmatia (Jugoslavia).

„Dasycladacea" laskarevi

Specimens: L.P.B. 9476, Upper Barremian, Ghilcoș Mts.
Dimensions: Diameter of secondary branches 0,16—0,22 mm.
Occurrence: Barremian, Eastern Serbia (Jugoslavia).

"Dasycladacea"
Pl. XLIX, Fig. 1; Pl. LXII, Fig. 3—4; Pl. LXIII, Fig. 1, 3—4; Pl. LXIV, Fig. 2, 4; Pl. LXX, Fig. 1; Pl. LXXV, Fig. 1; Pl LXXXI, Fig. 3

Specimens: L.P.B.0014, Upper Tithonian-Berriasian, Berriasian-Valanginian-Hauterivian, Barremian, Ghilcoș Mts., Făgetul Ciucului Mts.

Descriptions: Isolated verticils, with numerous branches, what in the longitudinal sections, are and have a vestibular pore, which is in connection with central stem and with distal part of branches. The branches are cylindrical and elongate. In the distal zone, the branches are narrowed with the contact of vestibular pore. (Pl. LXIII, Fig. 1, Pl. LXIV, Fig. 4). This is an important character for this type of alga. In the oblique cross sections, the thallus presented both vestibular and cylindrical part of branches (Pl. LXIII, Fig. 3—4, Pl. LXIV, Fig. 2). The branches in tangential sections are circular, beeing very similar to *Actinoporella podolica* Alth. (Pl. LXII, Fig. 3).

Dimensions: Diameter of central stem 0,30—0,62 mm; diameter or lenght of vestibular chamber 0,10—0,30 mm; diameter of verticil 1,8—2,3 mm; lenght of branches 0,75—1,2 mm; diameter of branches 0,30—0,42 mm; number of branches per verticil 12—14—16.

Remarks: This type of alga is similar with *Actinoporella podolica* Alth, but the presence of vestibular chambers impose an other species or a new taxonomical agreement.

Order **SIPHONALES** Wille in Warming 1884
Family CODIACEAE (Trevisan) Zanardini 1843
Genus **Cayeuxia** Frollo 1938
Cayeuxia moldavica Frollo

Pl. XVIII, Fig. 1; Pl. XXXVII, Fig. 2; Pl. XXXVIII, Fig. 2; Pl. XLVI, Fig. 4; Pl. LV, Fig. 1

Cayeuxia moldavica n. sp. Frollo 1938, p. 269, pl. 18, fig. a; *C. moldavica* — Dufaure 1958, pl. 4, fig. 10—11; *C. moldavica* — Patrulius 1965, pl. 2, fig. 5 a—b, pl. 3, fig. 1—2; *C. moldavica* — Dragastan — 1968, pl. 2, fig. 3; *C. moldavica* — Johnson p. 43, pl. 10, fig. 2—3.

Hypotype: L.P.B. 9484, Tithonian, Neocomian, Barremian-Lower Aptian, Ghilcoș Mts., Făgetul Ciucului, Bicăjel I and Bicăjel II Mts.

Occurrence: Upper Jurassic and Lower Cretaceous from Mesogean province.

Cayeuxia piae Frollo

Pl. LI, Fig. 3; Pl. LXXXII, Fig. 4

Cayeuxia piae n. sp. Frollo, 1938, p. 269, pl. 18, fig. b; *C. piae* — Ramalho — 1971, pl. IX (1), XXVII (3, 4, 6), XXIX (1); *C. piae* — Basson & Edgell 1971, pl. 1, fig. 4—7.

Hypotype: L.P.B. 9485, Barremian-Lower Aptian, Ghilcoș Mts., Bicăjel II Mts.

Occurrence: Lias to Aptian from mesogean province.

Cayeuxia fruticulosa Johnson

Pl. LXXV, Fig. 4

Cayeuxia fruticulosa n. sp. Johnson 1960, pl. 1, fig. 2—4.

Hypotype: L.P.B. 9486, Barremian-Lower Aptian, Ghilcoș Mts.

Occurrence: Barremian to Albian from Honduras.

Cayeuxia aff. *kurdistanensis* Elliott

Pl. XXXVIII, Fig. 2

Specimens: L.P.B. 9487, Upper Tithonian, Făgetul Ciucului Mts.

Cayeuxia anae Dragastan 1971

Pl. XXXII, Fig. 1; Pl. LIV, Fig. 3, Pl. LVII, Fig. 2; Pl. LXVII, Fig. 1; Pl. LXXIV, Fig. 2; Pl. LXXVII, Fig. 3

Technitella legumen Norman in Pfender — 1938, p. 238, pl. XIV, fig. 7; *Cayeuxia anae* n. sp. Dragastan 1971, p. 183, pl. VIII, fig. 5, pl. IX, fig. 1—3; *Cayeuxia anae* — Stillă, Dragastan, Dumitru 1972, pl. III, fig. 1,

Hypotype: L.P.B. 9339, Upper Tithonian, Berriasian-Valanginian, Ghilcoș Mts, Făgetul Ciucului Mts., Bicăjel II Mts.

Occurrence: Neocomian from Dreptului Hill, Pui Zone, South Carpathians.

Cayeuxia elliotti Dragastan
Pl. XXXIX, Fig. 1; Pl. LXXI, Fig. 3

Cayeuxia elliotti n. sp. Dragastan 1971, p. 187, pl. X, fig. 1–4.
Hypotype: L.P.B. 9340, Upper Tithonian, Făgetul Ciucului Mts., Valanginian-Hauterivian-Barremian, Ghilcoș Mts.

Cayeuxia atanasiui Dragastan
Pl. LIV, Fig. 2, 4; Pl. XCI, Fig. 1

Cayeuxia atanasiui n. sp. Dragastan 1971, p. 184, pl. IX, fig. 4–10.
Hypotype: L.P.B. 9341, Upper Tithonian-Berriasian, Ghilcoș Mts., Lower Aptian, Ghilcoș Mts.

Genus **Hikorocodium** Endo 1952
Hikorocodium fertilis Endo
Pl. XVIII, Fig. 3

Hikorocodium fertilis n. sp. Endo, 1961, p. 66, pl. 10, fig. 1, pl. 14, fig. 5, pl. 17, fig. 5.
Hypotype: L.P.B. 9488, Lower Tithonian, Ghilcoș Mts.
Occurrence: Upper Jurassic from Torinosu limestone (Japan).

Genus **Stenoporidium** Yabe & Toyama 1928
Stenoporidium chaetetiformis Yabe & Toyama

Stenoporidium chaetetiformis n. sp. Yabe & Toyama 1928, p. 150, pl. 12, fig. 2–4; *S. chaetetiformis* – Endo 1961, p. 66, pl. 14, fig. 5, pl. 9, fig. 1–3, pl. 10, fig. 2–3.
Hypotype: L.P.B. 9419, Upper Tithonian, Făgetul Ciucului Mts.
Occurrence: Upper Jurassic from Torinosu limestone (Japan).

Genus **Lithocodium** Elliott 1956
Lithocodium morikawai Endo
Pl. LIV, Fig. 1

Lithocodium morikawai n. sp. Endo 1961, p. 64, pl. 12, fig. 1–4, pl. 13, fig. 3–4.
Hypotype: L.P.B. 9490, Upper Tithonian, Făgetul Ciucului Mts.
Occurrence: Upper Jurassic from Torinosu limestone (Japan).

Lithocodium aggregatum Elliott
Pl. LX, Fig. 4; Pl. LXII, Fig. 2; Pl. LXXIV, Fig. 1; Pl. LXXX, Fig. 2; Pl. XCII, Fig. 2.

Lithocodium aggregatum n. sp. Elliott 1956, p. 331, pl. 1, fig. 2, 4–5; *L. aggregatum* – Elliott 1960, p. 222–223; *L. aggregatum* – Patrulius 1964, p. 191 fig. 28–29; *L. aggregatum* – Johnson 1968, p. 44, pl. 10, fig. 4; *L. aggregatum* – Ramalho 1971, pl. IX(1) XXVIII(3–5) XXIX (1); *L. aggregatum* – Basson & Edgell 1971, pl. 1, fig. 1.
Hypotype: L.P.B. 9491, Berriasian-Lower Valanginian, Ghilcoș Barremian-Lower Aptian, Ghilcoș Mts., Făgetul Ciucului Mts., Bicăjel I Mts.
Occurrence: Barremian-Lower Aptian from Iraq, Lebanon, Upper Oxfordian-Purbeckian (Portugal).

Genus **Boucina** Toula 1883
Boucina hochstetteri (Toula)
Pl. XXVII, Fig. 1

Hypotype: L.P.B. 9492, Upper Tithonian, Ghilcoș Mts.
Occurrence: Jurassic and Cretaceous of Mesogean province.

Genus **Ortonella** Garwood 1914
Ortonella lemoineae Dragastan
Pl. XXXIV, Fig. 1

Ortonella lemoineae n. sp. Dragastan 1971, p. 187, pl. X, fig. 5, 6–8.
Hypotype: L.P.B. 9345, Upper Tithonian, Ghilcoș Mts.

Genus **Arabicodium** Elliott 1957

Arabicodium jurassicum Dragastan

Pl. XXXV, Fig. 1; Pl. LXI, Fig. 1

Arabicodium jurassicum n. sp. Dragastan 1971, p. 179, pl. VI, fig. 4–9.

Hypotype: L.P.B. 9333, Upper Tithonian, Făgetul Ciucului Mts.

Arabicodium elongatum Dragastan nom. correct.

Pl. LXXXVII, Fig. 1–2

Arabicodium elongatus n. sp. Dragastan 1971, p. 179, pl. VII, fig. 1–9.

Hypotype: L.P.B. 9335, Barremian, Ghilcoș Mts.

Arabicodium orientalis Dragastan

Arabicodium orientalis n.sp. Dragastan 1971, p. 180, pl. VIII, fig. 1–4.

Hypotype: L.P.B. 9338, Barremian-Lower Aptian, Ghilcoș Mts.

Arabicodium sp.

Pl. LXV, Fig. 1

Specimens: L.P.B. 0015, Barremian-Lower Valanginian, Ghilcoș Mts.

Description: Thallus cylindrical with a central medullary cavity. The outer cortical zone is formed by coarse radial threads.

Dimensions: Diameter 1,8–2,0 mm; inner diameter 0,9–1,2 mm; diameter of pores 0,060–0,075 mm.

Remarks: It is very similar with *Arabicodium* sp. found by Ramalho in the Middle Kimmeridgian-Portlandian from Portugal.

Order PROTOCOCCALES

Family PROTOCOCCACEAE

Genus **Globochaete** Lombard 1945

Globochaete alpina Lombard

Pl. XXVI, Fig. 3

Globochaete alpina n. sp. Lombard 1945, p. 232, pl. I, fig. 1–10; *G. alpina* – Dufaure 1958, p. 111, pl. 5, fig. 26; *G. alpina* – Gianotti 1958, p. 13, text-fig. 3, pl. 1; *G. alpina* – Dragastan 1964, p. 96; pl. I; *G. alpina* – Borza 1969, p. 41, taf. XLV, fig. 1–13, taf. XLVI, fig. 1–11, taf. XLVII, fig. 1–6, taf. XLVIII, fig. 1–4.

Hypotype: L.P.B. 9494, Upper Tithonian-Neocomian, Ghilcoș Făgetul Ciucului Mts.

Occurrence: Devonian from Sahara, Jurassic and Cretaceous in Mesogean province.

Globochaete spinosa Dragastan

Globochaete spinosa n. sp. Dragastan 1971, p. 175, pl. V, fig. 6–8.

Hypotype: L.P.B. 9331, Tithonian, Ghilcoș Mts.

Class RHODOPHYCEAE Ruprecht 1951

Family CORALLINACEAE Harvey 1849

Genus **Archaeolithothamnium** Rothpletz 1891

Archaeolithothamnium somensis Endo

Pl. XVIII, Fig. 4

Archaeolithothamnium somensis n. sp. Endo 1961, p. 56, pl. 3, fig. 1–2, pl. 4, fig. 1–4, pl. 17, fig. 1; *A. somensis* – Dragastan 1968, p. 65, pl. II, fig. 6–7.

Hypotype: L.P.B. 9027, Tithonian, Ghilcoș.

Occurrence: Upper Jurassic of Torinosu limestone (Japan).

Lithophyllum? maslovi Dragastan

Pl. XXVII, Fig. 3; Pl. LXXII, Fig. 4

Lithophyllum? maslovi n. sp. Dragastan 1971, p. 188, pl. XI, fig. 1–5.

Hyopotype: L.P.B. 9347, Upper Tithonian, Valanginian-Hauterivian, Ghilcoș Mts.

Genus **Amphiroa** Lamouroux 1816
Amphiroa carpiana (Dragastan)
Pl. XCV, Fig. 2, 4

Archamphiroa? carpiana n. sp. Dragastan 1969, p. 60, pl. 3, fig. 4–8.
Hypotype: L.P.B. 9349, Vraconian-Cenomanian, Făgetul Ciucului Mts.

Family Solenoporaceae Pia 1927
Nipponophycus aff. *ramosus* Yabe & Toyama
Pl. XXX, Fig. 4; Pl. XLIV, Fig. 1

Specimens: L.P.B. 9497, Upper Tithonian-Berriasian, Ghilcoș Mts.

Genus **Thaumathoporella** Pia 1927
Thaumathoporella parvovesiculifera (Raineri)
Pl. LXXVII, Fig. 2; Pl. LXXXVI, Fig. 3

Gyroporella parvovesiculifera n. sp. Raineri 1922, p. 83, pl. 13, fig. 17–18; *Thaumathoporella parvovesiculifera* – Pia 1938, p. 491, pl. 1, fig. 1–5, pl. 2, fig. 6–14; *Lithoporella melobesioides* – Elliott 1956, pl. 2, fig. 8–9; *Polygonella incrustata* – Elliott 1957, p. 230, pl. I, fig. 11–12; *Thaumathoporella parvovesiculifera* – Radoicic 1960, p. 136–140, pl. 1–2; *Polygonella incrustata* – Patrulius 1965, p. 38, pl. 4, fig. 1 a, 1 b; *Thaumathoporella parvovesiculifera* – Dragastan 1966, pl. II, fig. 1; *Th. parvovesiculifera* – Johnson, p. 7–8, pl. 1, fig. 1–2; *Th. parvovesiculifera* – Ramalho 1971, pl. XXVI (5–6).
Hypotype: L.P.B. 9498, Valanginian-Hauterivian, Făgetul Ciucului Mts, Barremian, Bicăjel I Mts.
Occurrence: Upper Jurassic and Lower Cretaceous from Iraq, Italy, Algeria, Jugoslavia, Texas (USA), Oxfordian-Purbeckian from Portugal.

Family Gymnocodiaceae Elliott 1955
Genus **Permocalculus** Elliott 1955
Permocalculus geticus Dragastan

Permocalculus geticus n.sp. Dragastan 1970, pl. 126, pl. II, fig. 1–5.
Hypotype: L.P.B. 9190, Barremian-Lower Aptian, Ghilcoș Mts.

Permocalculus sp.
Pl. LII, Fig. 1

Specimens: L.P.B. 0016, Upper Tithonian-Berriasian, Făgetul Ciucului Mts.
Description: Thallus cylindrical or in finger-like form. Calcification massive but not complete. Pores small and cortical.
Dimensions: Diameter of thallus 1,5–3,8 mm; inner diameter 0,20 mm; pores diameter 0,030 mm.
Remarks: Similar to *Permocalculus inopinatus* Elliott from Barremian-Aptian of Iraq and with *P. elliotti* Johnson from Lowermost Cretaceous and latest Jurassic of Guatemala.

Genus **Diversocallis** Dragastan 1967 non 1969
Diversocallis n.sp
Pl. XXV, Fig. 3; Pl. XXXI, Fig. 4

Specimens: L.P.B. 0017, Upper Tithonian, Făgetul Ciucului Mts.
Description: Thallus crustose, tubular or in the fan shape, stratified with 1–3 layers of growth, fixed by substrat. Medullary zone can presented or not a central orifice. Lateral walls of the thallus have the pores extremely small but approximately of the same size, radially disposed from the medullary zone. Ovoid or sphaerical cavities, possibly sporangia are presented in the external layers of the thallus. Thallus in cross section presented an elliptic or tubular shape with central cavities corresponding to the medullary zone.
Dimensions: Diameter of thallus 2,3–3,6 mm; diameter of medullary zone 0,045–0,074 mm; thickness of layers in the center of thallus 0,90–1,2 mm; in the outer zone of thallus 0,15–0,30 mm; diameter of pores 0,015–0,030 mm.

Remarks: *Diversocallis* n.sp. is similar with *D. undulatus* from Lower Cretaceous of Romania, but is different by the shape and the inner structure of the thallus.

Family SQUAMARIACEAE Zanardini 1841
Genus **Ethelia** Weber van Bosse 1913
Ethelia alba (Pfender)
Pl. XCIV, Fig. 2

Pseudolithothamnium album n. sp. Pfender 1936, p. 303, pl. 19, fig. 1–5; *P. kahetli* Maslov 1962, p. 68–69, text fig. 4, pl. 7, fig. a, d.; *Ethelia alba* – Elliott 1963, p. 293, pl. 47, fig. 1–3; *E. alba* – Praturlon 1966, p. 185, fig. 13–14.

Hypotype: L.P.B. 9500, Barremian-Lower Aptian, Bicăjel I Mts.
Occurrence: Barremian to Eocene from Europe, Arabia, Cuba, Guatemala.

Class SCHYZOPHYCEAE Cohn 1880
Section POROSTROMATA Pia 1927
Genus **Girvanella** Nicholson & Etheridge 1880
Girvanella jurassica Frémy & Dangeard
Pl. X, Fig. 3

Hypotype: L.P.B. 9501, Lower Tithonian, Ghilcoș Mts.
Occurrence: Jurassic from France.

Section STROMATOLITHA Pia 1927
Stromatolithe-type (*LLH*) Logan, Rezak & Ginsburg
Pl. XXIV, Fig. 1

Specimen: L.P.B. 9503, Upper Tithonian, Ghilcoș Mts.

Stromatolithe sphaeroidale-type (SS–C) Logan, Rezak & Ginsburg
Pl. XXI, Fig. 2; Pl. XXXII, Fig. 3–4

Specimens: L.P.B. 9035 and 9042, Tithonian, Ghilcoș Mts. and Făgetul Ciucului Mts., Bicăjel Mts.

Stromatolithe sphaeroidale-type (*SS–C*)-*subtype* (*SS–J*) *joint* Dragastan 1969
Pl. XXII, Fig. 1

Specimen: L.P.B. 9038, Tithonian, Ghilcoș Mts and Făgetul Ciucului Mts.

Stromatolithe ellipsoidale-type (*ELL*) Dragastan 1969
Pl. XX, Fig. 1

Specimen: L.P.B. 9035, Tithonian, Ghilcoș Mts. and Făgetul Ciucului Mts.

Stromatolithe ellipsoidale-type (*ELL*)-*subtype columnoidale* (*ELL-C*) Dragastan 1969
Pl. XX, Fig. 2; Pl. XXXIII, Fig. 1

Specimens: L.P.B. 9035, Tithonian, Ghilcoș Mts., Făgetul Ciucului Mts., Bicăjel Mts.

Stromatolithe ellipsoidale-type(*ELL*)-*subtype nubecularioidale* (*ELL-N*) Dragastan 1969
Pl. XXIV, Fig. 2; Pl. XXV, Fig. 1

Specimens: L.P.B. 9037, 9046, Tithonian, Ghilcoș Mts., Făgetul Ciucului Mts.

ENCRUSTED ALGAE
Genus **Bacinella** Radoicic 1959
Bacinella irregularis Radoicic
Pl. LXXX, Fig. 1

Bacinella irregularis – Dragastan 1968, p. 74, pl. 2, fig. 1; *B. irregularis* Nikler & Sokac 1968, pl. XI, fig. 1; *B. irregularis* – Ramalho 1971, pl. IX (1) XXIX (1, 2).

Hypotype: L.P.B. 9502, Upper Tithonian-Barremian-Lower Aptian, Ghilcoș Mts., Făgtul Ciucului Mts. and Bicăjel Mts.
Occurrence: Jurassic and Lower Cretaceous from Alpine province.

Class CILIATA Perty 1852
Order SPIROTRICHIDA Bütschli 1889
Suborder TINTINNINA Claparède & Lachmann 1858
Genus **Calpionella** Lorenz 1902
Calpionella alpina Lorenz
Pl. XLII, Fig. 1–2; Pl. XLIII, Fig. 1

Calpionella alpina n. sp. Lorenz 1902, p. 60, taf. 9, fig. 1; *C. alpina* – Colom, p. 241, pl. II, fig. 22–26, 31–33, 35–41 43–46; *C. alpina* – Bonet 1956, p. 31, pl. 14, fig. 1–2; *C. alpina* – Durand-Delga 1957, fig. 1 A, pl. 1, fig. 6; *C. alpina* – Remane 1962, fig. 2–9; *C. alpina* – Filipescu & Dragastan 1963, pl. 2, fig. 132–133; *C. alpina* – Nagy 1964, taf. 1, fig. 7; *C. alpina* – Geroch & Morychowa 1966, pl. 24, fig. 1; *C. alpina* – Durand-Delga & Gutnic, pl. I, fig. 3–7; *C. alpina* – Remane 1968, p. 31, pl. 6, fig. 4–10, 18–21, pl. 8, fig. 2–5, pl. 9, fig. 21.; *C. alpina* – Dragastan 1968, p. 72, pl. I, fig. 12; *C. alpina* – Borza p. 82, taf. LXX, fig. 13–16, taf. LXXI, fig. 1–16.

Hypotype: L.P.B. 9507, Upper Tithonian-Berriasian, Ghilcoș and Făgetul Ciucului Mts.
Occurrence: Upper Tithonian-Berriasian-Lower Valanginian from Tethys province.

Calpionella elliptica Cadisch
Pl. LXIII, Fig. 2; Pl. LVI, Fig. 2–3

Calpionella elliptica n. sp. Cadisch 1932, p. 249, abb. 3, nr. 10–11, 17; *C. elliptica* – Colom 1948, p. 242, pl. 11, fig. 2, 53–54, 56–58.

Hypotype: L.P.B. 9871, Upper Tithonian-Berriasian, Ghilcoș Mts. and Bicăjel II Mts.

Genus **Crassicollaria** Remane 1962
Crassicollaria parvula Remane
Pl. XLII, Fig. 3–4

Calpionella elliptica – Colom 1948, fig. 11, no. 70; *Crassicollaria parvula* n. sp. Remane, p. 19, fig. 36–40, 41–45; *Cr. parvula* – Remane 1968, p. 31, pl. 6, fig. 1–3; *Cr. parvula* – Borza 1969, p. 90, taf. LXXVI, fig. 1–16.

Hypotype: L.P.B. 9508, Upper Tithonian-Berriasian, Ghilcoș Mts. and Bicăjel II Mts.
Occurrence: Upper Tithonian-Lower Berriasian from Tethys province.

Genus **Tintinnopsella** Colom 1948
Tintinnopsella carpathica (Murgeanu & Filipescu)
Pl. XLII, Fig. 2; Pl. XLIII, Fig. 3; Pl. LVI, Fig. 1; Pl. LVIII, Fig. 1; Pl. LIX, Fig. 3

Calpionella carpathica n. sp. Murgeanu & Filipescu 1933, p. 62, fig. 1 c; *Tintinnopsella carpathica* – Colom 1948, p. 245, fig. 2, fig. 13, no. 10–31, 53–54; *T. carpathica* – Durand-Delga 1957, p. 169, pl. 1, no. 5; *T. carpathica* – Filipescu & Dragastan 1963, pl 4, fig. 147–150; *T. carpathica* – Remane – 1966, fig. 2, nr. 1–6; *T. carpathica* – Dragastan 1968, p. 72, pl. 1, fig. 14–15; *T. carpathica* – Borza 1969, p. 92, taf. LXXVII, fig. 1–16, taf. LXXVIII fig. 1–8.

Hypotype: L.P.B. 9509, Upper Tithonian-Berriasian-Lower Valanginian Ghilcoș, Bicăjel I Mts. Făgetul Ciucului and Bicăjel II Mts.
Occurrence: Upper Tithonian-Valanginian from Tethys province.

Tintinnopsella remanei Borza
Pl. XLII, Fig. 3

Tintinnopsella remanei n. sp. Borza 1969, p. 96, taf. LXXX, fig. 7–16.

Hypotype: L.P.B. 9872, Upper Tithonian, Bicăjel I Mts.
Occurrence: Upper Tithonian from Klippen Zone (Rudnik), North Carpathians.

Tintinnopsella longa (Colom)

Calpionella longa n. sp. Colom 1939, p. 5, pl. 2, fig. 9, pl. 3, fig. 3; *Tintinnopsella longa* Colom 1948, p. 246, fig. 14; *T. longa* — Remane 1968, p. 32, pl. 7, fig. 16, pl. 9, fig. 12, pl. 10, fig. 12; *T. longa* — Borza 1969, p. 94, taf. LXXIX, fig. 9—16.

Hypotype: L.P.B. 9510, Upper Berriasian-Lower Valanginian, Ghilcoș Mts.

Occurrence: Berriasian-Valanginian from Tethys province.

Genus **Calpionellopsis** Colom 1948

Calpionellopsis oblonga (Cadisch)

Pl. LVIII, Fig. 2—3; Pl. LIX, Fig. 1

Calpionella oblonga n. sp. Cadisch 1923, p. 252, fig. 3, no. 20; *C. thalmanni* n. sp. Colom 1939, p. 243, fig. 11, no. 7; *Tintinnopsella oblonga* Colom 1948, pl. 32, fig. 5; *Calpionellopsis oblonga* — Knauer 1961, p. 156, pl. 1, 2, 6, 7, 9, 10, 14, 15, 19, 20; *C. oblonga* — Remane 1965, p. 38, fig. 2, 4, 6, taf. 5, 5, taf. 6, fig. 16; *C. oblonga* — Dragastan 1968, p. 72, pl. 1, fig. 16; *C. oblonga* 1969 Borza, p. 100, taf. LXXXII, fig. 1—16.

Hypotype: L.P.B. 9016, Lower Valanginian, Middle and Upper Berriasian Ghilcoș Mts. and Bicăjel II Mts.

Occurrence: Berriasian-Valanginian from Tethys province.

Calpionellopsis simplex (Colom)

Pl. LVIII, Fig. 4; Pl. LIX, Fig. 2

Calpionella oblonga n. sp. Colom 1939, p. 820, pl. 2, fig. 11; *Calpionellopsis simplex* — Colom 1948, fig. 11, no. 10; *Calpionelites neocomiensis* — Colom 1950, p. 134, taf. 32, fig. 1—4; *Calpionellopsis simplex* — Remane 1965, abb. 2 f—i; *C. simplex* — Dragastan 1968, p. 72, pl. 1, fig. 17; *C. simplex* — Borza 1969, p. 99, taf. LXXXI, fig. 9—16.

Hypotype: L.P.B. 9016, Upper Berriasian-Lower Valanginian, Ghilcoș Mts.

Occurrence: Berriasian-Valanginian from Tethys province.

Genus **Lorenziella** Knauer & Nagy 1964

Lorenziella dacica (Filipescu & Dragastan)

Pl. LXIX, Fig. 1, 3

Tintinnopsella dacica n. sp. Filipescu & Dragastan 1970, p. 234—236, pl. 1, fig. 1—5.

Hypotype: L.P.B. 9185, Lower Valanginian, Ghilcoș Mts. and Crivina marls, Svinița, Banat.

Genus **Calpionellites** Colom 1948

"Calpionellites" dadayi Knauer

Pl. LIX, Fig. 2

Hypotype: L.P.B. 9873, Lower Valanginian, Ghilcoș Mts.

Occurrence: Berriasian-Valanginian from Tethys province.

Genus **Durandella** Dragastan 1970

Durandella helentappani Dragastan

Pl. XXIII, Fig. 3; Pl. XLIII, Fig. 4

Durandella helentappani n. gen. n. sp. Dragastan 1970, pl. XL, fig. 1—2.

Hypotype: L.P.B. 9353, Tithonian, Făgetul Ciucului Mts. and Trascău Mts. (Apuseni Mountains).

OTHER TAXA

SPONGIA

Genus **Barroisia** Steinmann

Barroisia sp.

Pl. XIX, Fig. 1—2, 4; Pl. XXVIII, Fig. 2

Barroisia(?) sp. — Ramalho 1971, pl. XXXVIII(3).

Specimens: L.P.B. 3285, Tithonian, Ghilcoș Mts., Bicăjel II Mts.

Description : Calcareous body elongate, oval to ellipsoidal in shape, branched or unbranched, with central hollow surrounded by many "vestibular" oval-trapezoidal chambers. The "vestibular" septa chamber, is calcareous with fibrous structure. The wall is double, outer layer has two openings ; both in lower part and in upper part of the vestibules. The septa have one, or numerous perforations which make connection with vestibules. In tangential section the calcareous body is perforated by numerous circular pores.
Dimensions : Hight of vestibular chamber 0,75—0,80 mm ; width of vestibular chamber 1,2—1,5 mm ; thickness of septa 0,075—0,090 mm ; thickness of wall 0,45—0,50 mm ; diameter of pores 0,15—0,20 mm.
Remarks : By shape and inner structure of calcareous body, this type of *Spongia* is very similar to Steinmann's genus *Barroisia* from Sphinctozoa, which have been encountered in Aptian-Albian age. Likely this type of *Spongia* is a new species of the genus *Barroisia* to come down in the Jurassic.

HYDROZOA

Genus **Parastromatopora** Yabe & Sugiyama 1935

Parastromatopora sp.

Pl. XXIX, Fig. 4

Specimens : L.P.B. 3289, Tithonian, Ghilcoș Mts.
Dimensions : Diameter of tubes 0,23—0,35 mm ; width of wall 0,10—0,15 mm.

Genus **Cladocoropsis** Felix 1906

Cladocoropsis mirabilis Felix

Pl. XXVIII, Fig. 1 ; Pl. XXIX, Fig. 1

Cladocoropsis mirabilis n. sp. Felix 1906, p. 3—10, fig. 1—5 ; *C. mirabilis* — Radoicic 1957, p. 158, tab. 1—2 ; *C. mirabilis* — Turnsek 1966, p. 367, tab. 19, sl. 6.
Hypotype : L.P.B. 3290, Tithonian, Ghilcoș, Făgetul Ciucului, Bicăjel Mts.
Occurrence : Upper Jurassic from Dalmatia, Oxfordian-Lower Kimmeridgian from Jugoslavia, Malm of France, Italy, Grece, Japan, Spain.

Cladocoropsis cretacica Turnsek

Pl. LXXIX, Fig. 4 ; Pl. LXXXI, Fig. 2

Cladocoropsis cretacica n. sp. Turnsek 1968, p. 368, pl. 5.
Hypotype : L.P.B. 3291, Hauterivian-Barremian, Ghilcoș Mts.
Occurrence : Hauterivian from Niksic, Montenegru (Jugoslavia).

Cladocoropsis sp.

Pl. XXXVI, Fig. 1

Specimens : L.P.B. 3293, Upper Tithonian, Ghilcoș Mts.

Genus **Spongiomorpha** Frech 1890

Spongiomorpha asiatica Yabe & Sugiyama

Pl. XXXI, Fig. 3

Hypotype : L.P.B. 3294, Upper Tithonian, Ghilcoș Mts.
Occurence : Upper Jurassic from Torinosu limestone (Japan).

TABULATA

Genus **Chaetetopsis** Neumayr 1890

Chaetetopsis rumanus (Simionescu)

Pl. LXXXIV, Fig. 1—2

Pseudostromatopora rumana n. sp. Simionescu 1940, p. 2—3, text fig. 1—2 pl. I, fig. 1—3, pl. III, fig. 1 ; *Solenopora rumana* — Filipescu 1953, p. 178—179, text fig. 1—3 ; *Chaetetopsis zonata* n. sp. Patrulius 1965, p. 26, pl. I—III, pl. IV, fig. 1 ; *Chaetetes rumanus* — Dragastan 1967, p. 514—515.

Hypotype : L.P.B. 3297, Barremian-Lower Aptian, Ghilcoș Mts., Bicăjel I Mts.
Occurrence : Lower Cretaceous from Cernavodă (Dobrogea), Aptian from Ciucaș Mts. and Rarău Mts.

COPROLITHE

Genus **Favreina** Brönnimann
Favreina salevensis (Parejas)
Pl. XXXIV, Fig. 3

Coprolithus salevensis n. sp. Parejas 1948, p. 512, pl. I ; *C.* cf. *salevensis* — Dufaure 1958, p. 113, pl. 6, fig. 8—17 ; *C. salevensis* — Radoicic 1960, p. 50, pl. VIII, fig. 1 ; *Favreina salevensis* — Bernier 1968, pl. 16, fig. 6 ; *F.* cf. *salevensis* — Ramalho 1971, pl. XXXIV (4).

Hypotype : L.P.B. 9504, Upper Tithonian, Ghilcoș Mts.
Occurrence : Upper Jurassic and Neocomian from Alpine province.

Favreina cuvillieri Brönnimann
Pl. LXI, Fig. 3

Favreina cuvillieri — Cuvillier, Bassoulet & Fourcade 1969, p. 185, pl. I, fig. 9.

Hypotype : L.P.B. 9505, Berriasian-Lower Valanginian, Ghilcoș Mts.
Occurrence : Kimmeridgian-Neocomian or Barremian-Aptian from Spain, Cuba, Guatemala.

TEREDINIDAE

Genus **Bankia** Gray 1842
Bankia striata (Carozzi)
Pl. XXVI, Fig. 1

Organism C — Favre & Richard 1927, p. 36—37, fig. 13—14, pl. 1 ; *Vaginella striata* n. sp. — Carozzi 1954, p. 107, text fig. 1, pl. 1, fig. 1—38 ; *V. striata* — 1960 — Sartoni & Crescenti, p. 293, tav. XX, fig. 2, tav. XXI, tav. LII, fig. 5 ; *Bankia striata* — Farinacci 1963, p. 151—178, text fig. 6, tav. I—V ; *Vaginella striata* — Bernier 1968, pl. 15, fig. 2 ; *„Vaginella" striata* — Ramalho 1971, pl. XXXIV (4) ; *Bankia striata* — Stilla, Dragastan & Dumitru 1972, pl. II, fig. 3.

Hypotype : L.P.B. 9511, Upper Tithonian, Ghilcoș Mts. and Cupaș Mts.
Occurrence : Kimmeridgian pro parte-Portlandian B from Spain, Tithonian from Alpine province.

SERPULIDAE

Genus **Mercierella** Fauvel 1923
"Mercierella" dacica Dragastan
Pl. XVI, Fig. 3 ; Pl. XXIII, Fig. 2 ; Pl. XXX, Fig. 1

Mercierella(?) *dacica* n. sp. Dragastan 1966, p. 147, fig. 1—3 ; *M.*(?). *dacica* — Stilla, Dragastan & Dumitru 1968, p. 297, pl. I, e—f ; *„M." dacica* — Radoicic, p. 198.

Hypotype : L.P.B. 9512, Tithonian, Ghilcoș Mts.
Occurrence : Kimmeridgian-Tithonian from Ciclovina zone, Tithonian from Trascău (Apuseni Mountains), Portlandian-Berriasian from Kopaonic (Yugoslavia).

CRINOIDEA

Saccocoma sp.
Pl. VII, Fig. 3 ; Pl. IX, Fig. 4 ; Pl. X, fig. 1 ; Pl. XIV, Fig. 7—9 ; Pl. XV, Fig. 16

Specimens : L.P.B. 9513, Kimmeridgian-Lower Tithonian from Ghilcoș Mts.
Occurence : Oxfordian-Valanginian from Tethys province with a maximum in the Upper Kimmeridgian-Lower Tithonian.

MICROPROBLEMATICAE

Genus **Aeolisaccus** Elliott 1958
Aeolisaccus inconstans Radoicic
Pl. LXXXII, Fig. 2 ; Pl. LXIV, Fig. 3

Aeolisaccus inconstans n. sp. Radoicic 1966/1967, p. 277, pl. 7.

Hypotype: L.P.B. 9518, Berriasian-Lower Valanginian, Ghilcoş Mts.
Occurrence: Kimmeridgian-Portlandian-Albian-Cenomanian from Jugoslavia.

Genus **Lacrymorphus** E l l i o t t 1958
Lacrymorphus barremianus D r a g a s t a n
Pl. LXXXIV, Fig. 4; Pl. LXXXVIII, Fig. 1–2

Lacrymorphus barremianus n. sp. D r a g a s t a n 1971, p. 189, pl. XII, fig. 1–5.
Hypotype: L.P.B. 9350, Barremian, Ghilcoş Mts. and Bicăjel Mts.

X Organism
Pl. XXVII, Fig. 2

Specimen: L.P.B. 9520, Tithonian, Ghilcoş Mts. and Făgetul Ciucului Mts.
Description: Test calcareous with oval-ellipsoidal or cylindrical shape. In longitudinal section, central part, has one or many oblique -median "septa". The test presents, in the oral? region, one lateral projection which forms collar zone. Between "septa" may be observed many oval or circular cavities. Septa and outer and inner layers of wall are formed by fibrous calcite and by calcite plates. Calcareous wall is perforate by little tubular pores, which come in contact to surrounded cavities of septa.
Dimensions: Hight of test 0,46 mm; width of test 0,28—0,67 mm; diameter of cavities 0,15 mm; width of fibrose calcite layer 0,045—0,095 mm; width of calcite plates layer 0,015—0,025 mm.
Affinities: By shape and disposition of cavities these organisms are probably similar to Coccolithoporida. The morphological characters show that these organisms were planktonic and corresponding probably to larval stage of Spongia, Hexacorals or Bryozoa.

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* * * Les zones du Jurassique en France-par le Groupe Francais d'etude du Jurassique. *C. R. somm. des Sean. de la Soc. géol. de France*, 2, 1971, Paris.

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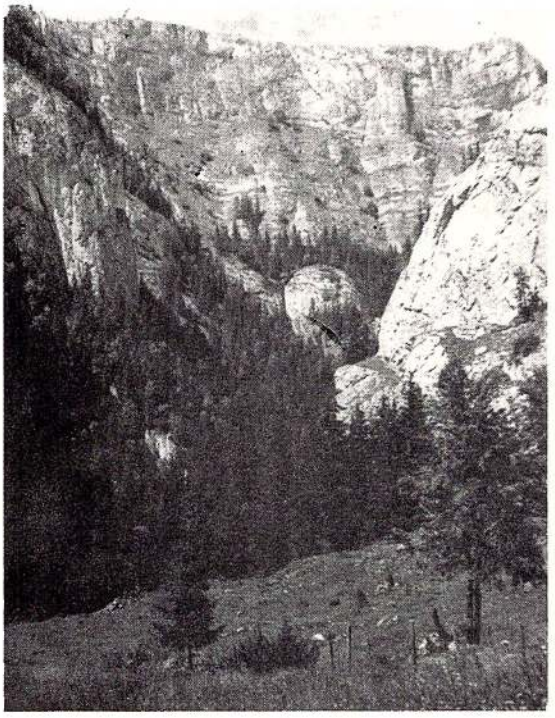
PLATE I

PLATE 1

Fig. 1—2. — General view of the Tithonian, Neocomian and Urgonian limestone from the Suhardu Mic Mountains.

Fig. 3. — Eastern slope of the Ghilcoș syncline seeing from Hăghimaș side (on the right Bicăjel Valley).

Fig. 4. — Eastern slope of the Ghilcoș syncline seeing from Făgetul Ciucului side.



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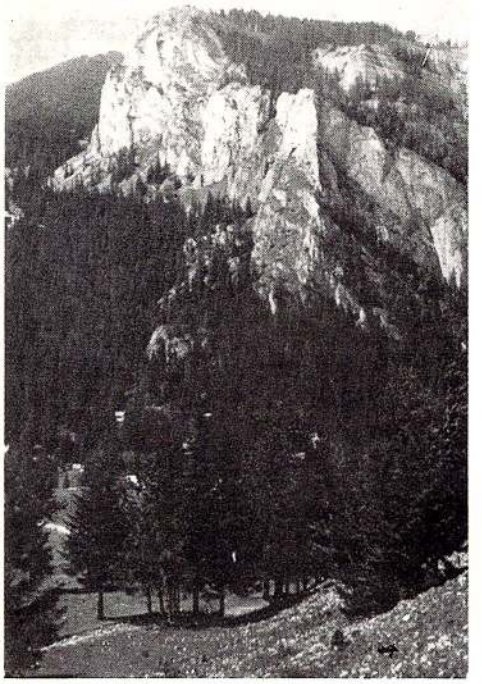

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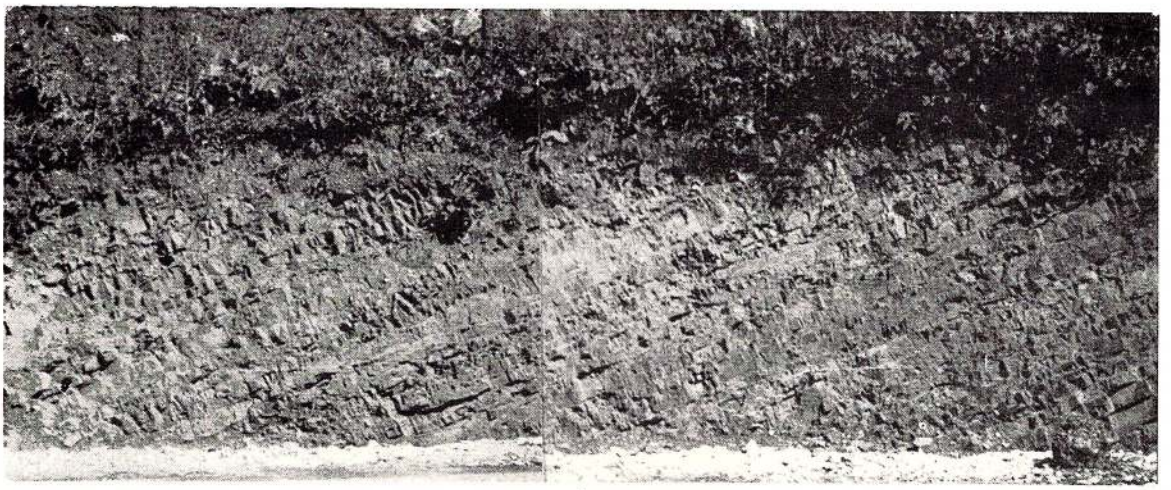
PLATE II

Fig. 1. — Callovian-Oxfordian Radiolarites Beds from western slope of Ghilcoș Mts.
Fig. 2. — Upper Tithonian biostromite with *Nerinea* and *Algae* (western slope of Ghilcoș Mts.).
Fig. 3. — Barremian-Albian Wildflysch Formation (western slope of Ghilcoș Mts).
Fig. 4. — Neocomian limestone with *Leviathania leviathan* (western slope of Ghilcoș Mts.).



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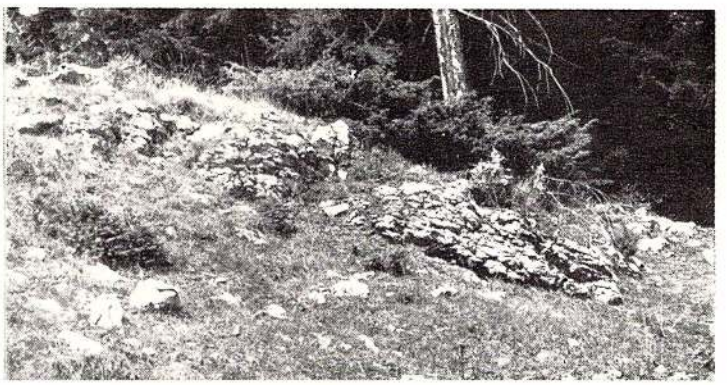

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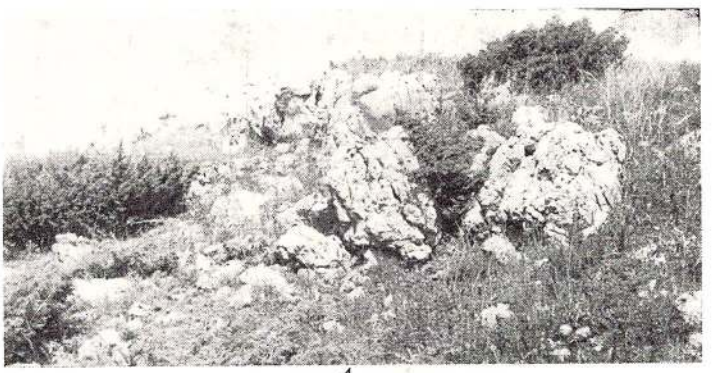

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PLATE III

Fig. 1—2. — *Sutneria* cf. *platynota* (Reinecke), *Platynota* Zone, Lower Kimmeridgian, hypotype L.P.B. 3284, natural size.

Fig. 3. — *Aspidoceras (Physodoceras) contemporaneum* (Favre), *Acanthicum* Zone, Upper Kimmeridgian, hypotype L.P.B., Atanasiu Collection, 1/2.

Fig. 4—6. — *Taramelliceras holbeini* (Oppel), *Uhlandi* Zone, Lower Kimmeridgian, hypotype L.P.B. 3280, fig. 4—5, natural size, fig. 6, 1/2.

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Fig. 8. — *Laevaptychus (Latuslaevaptychus) longus* (Meyer), *Hypselocyclum* Zone, Lower Kimmeridgian, L.P.B. 3322, 1/2.

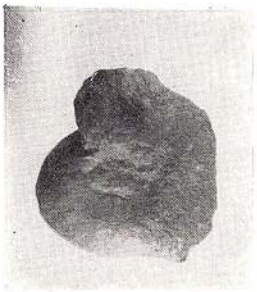
Fig. 9. — *Holcophylloceras bekasense* (Herbich), *Uhlandi* Zone, Lower Kimmeridgian, Atanasiu Collection's, 1/2.

Fig. 10. — *Lithacoceras geron* (Zittel), *Ulmense* Zone, Lower Tithonian, Atanasiu Collection's, 1/2.

Fig. 11. — *Aspidoceras (Physodoceras) bathori* Herbich, *Acanthicum* Zone, Upper Kimmeridgian, Atanasiu Collection's, 1/2.

Fig. 12. — *Taramelliceras mikoi* (Herbich), *Acanthicum* Zone, Upper Kimmeridgian, L.P.B. 3281, 1/2.

All species from western slope of Ghilcoș Mts.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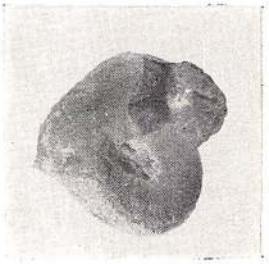
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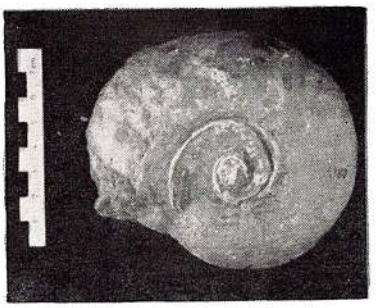
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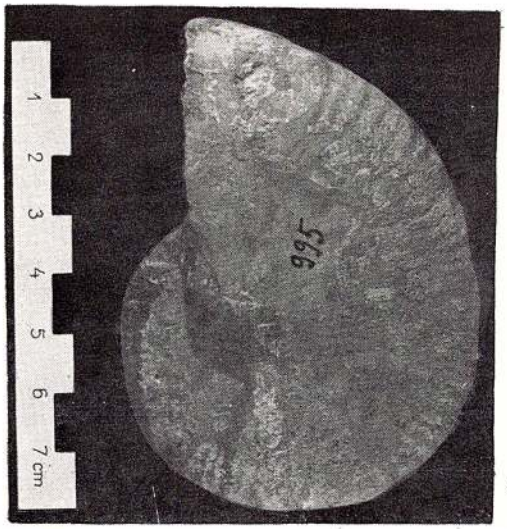
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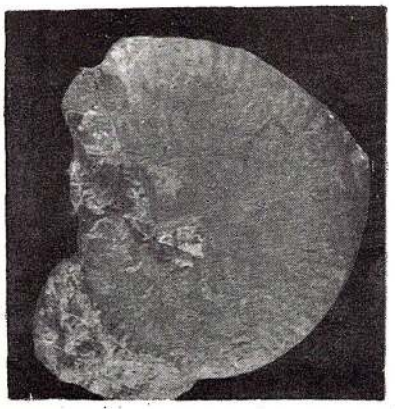
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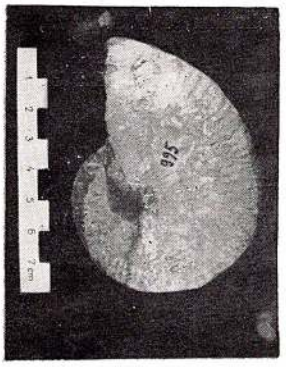
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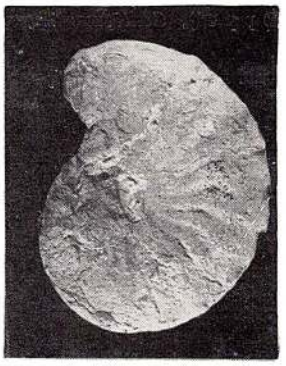
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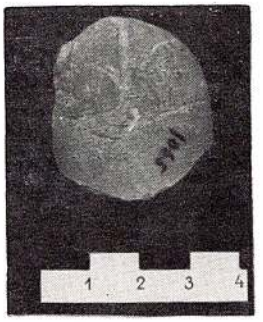
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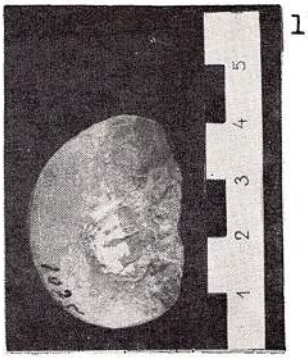
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PLATE IV

Fig. 1. — *Palaeocyparis* cf. *elegans* (S a p o r t a), *Acanthicum* Zone, Upper Kimmeridgian, L.P.B. 3322, Ghilcoş Mts., nat. size.

Fig. 2—3. — *Pygope janitor* (P i c t e t), *Ulmense* Zone, Lower Tithonian, L.P.B. 3300, Ghilcoş Mts., nat. size.

Fig. 4—5. — *Lithacoceras postulmensis* (B l a s c h k e), *Contiguus* Zone, Lower Tithonian, L.P.B. 3282, Cupaş Mts. 1/2.

Fig. 6. — *Haploceras elimatum* (O p p e l), *Contiguus* Zone, Lower Tithonian, L.P.B. 3273, Cupaş Mts., nat. size.

Fig. 7. — *Oppelia strambergensis* B l a s c h k e, *Contiguus* Zone, Lower Tithonian, L.P.B. 3279, 1/2.

Fig. 8. — *Heliocoenia* sp., Lower Tithonian, Ghilcoş Mts., nat. size.

Fig. 9. — *Protetragonites* sp., Lower Tithonian, L.P.B. 3277, Suhardu Mic Mts., nat. size.

Fig. 10. — *Chlamys subtextorius* (M ü n s t e r), Lower Tithonian, Ghilcoş Mts., nat. size.

Fig. 11. — *Sphaerodus gigas* A g a s s i z, Lower Tithonian, L.P.B. 3301, Suhardu Mic Mts., nat. size.

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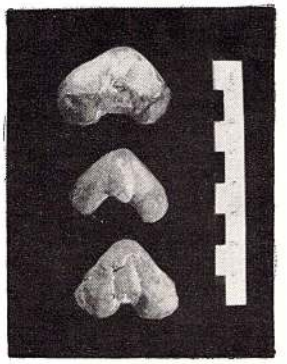

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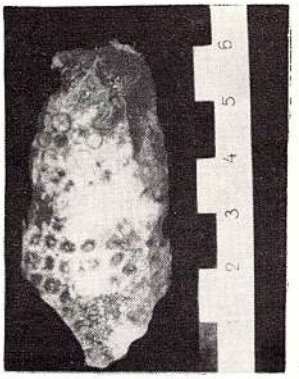

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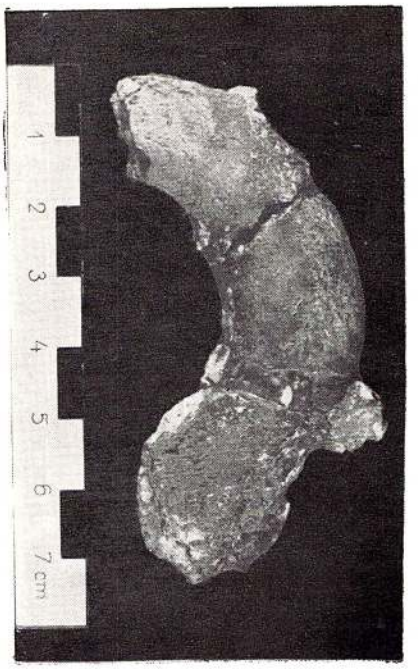

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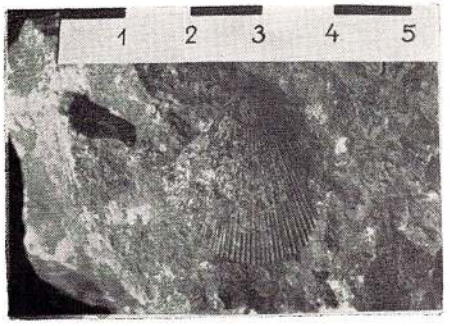

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PLATE V

Fig. 1. — Biostromite with *Nerinea hoheneggeri* Peters and *Macroporella praturloni* Dragastan, Upper Tithonian, L.P.B. 3308, Ghilcoș Mts., × 1.
Fig. 2. — *Nerinea* cf. *nodosa* (d'Orb.), Upper Tithonian, L.P.B. 3311, Ghilcoș Mts., 1/2.
Fig. 3—4. — *Nerinea zeuschneri* Peters, Upper Tithonian, L.P.B. 3307, Ghilcoș Mts., 1/2.
Fig. 5—6. — *Nerinea hoheneggeri* Peters, Upper Tithonian, L.P.B. 3308, Ghilcoș Mts., 1/2.
Fig. 7. — *Sphaeroidal Macro-oncolithes* (SS—C), Logan, Rezak & Ginsburg, Upper Tithonian, Suhardu Mic Mts., 1/2.
Fig. 8, 10. — *Nerinea silesiaca* Zittel, Upper Tithonian, L.P.B. 3309, Ghilcoș Mts., 1/2.
Fig. 9. — *Diptyxis bidentatus* (Gemmeralio) and *Pileolus* sp., Upper Tithonian, L.P.B. 3312, Făgetul Ciucului Mts., nat. size.

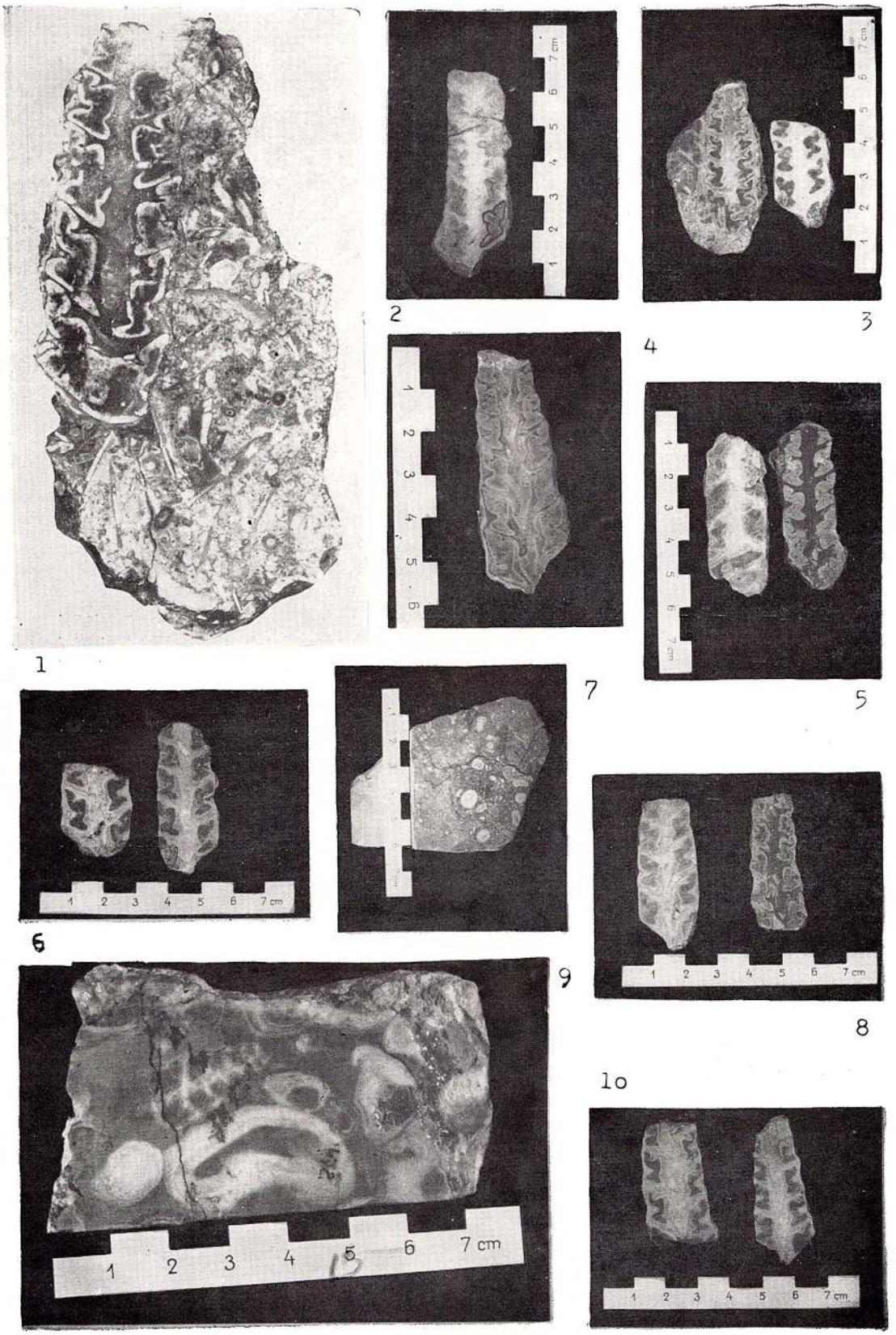


PLATE VI

Fig. 1—2, 6—7. — *Leviathania leviathan* (P i c t e t & C a m p i c h e), Neocomian, L.P.B. 3316, Ghilcoş Mts. (western and eastern Slope), fig. 1—2, 1/2; fig. 6—7, nat. size.

Fig. 3. — *Ampullospira bullimoides* (d' O r b.), Neocomian, L.P.B. 3318, Ghilcoş Mts., nat. size.

Fig. 4—5. — *Trochonatica helvetica* (P i c t e t & C a m p i c h e), Neocomian, A t h a n a s i u Collection's, Hăghimaş Mts., nat. size.

Fig. 8. — *Ampullospira incerta* (P c e l i n c e v), Neocomian, L.P.B. 3317, Ghilcoş Mts., nat. size.

Fig. 9—10, 15. — *Cernina pidaceti* (C o q u a n d), Neocomian, L.P.B. 3320, Ghilcoş Mts., nat. size.

Fig. 11—12. — *Cyllindrobullina lata* P c e l i n c e v, Neocomian, Suhardu Mic Mts., L.P.B. 3315, nat. size.

Fig. 13. — *Pholadomya* cf. *scaphoides* (P i c t e t & C a m p i c h e), Neocomian, L.P.B. 3306, Ghilcoş Mts., nat.s ize.

Fig. 14, 16. — *Isocardia neocomiensis* (d'O r b.), Neocomian, L.P.B. 3305, Ghilcoş Mts. (eastern slope), nat. size.

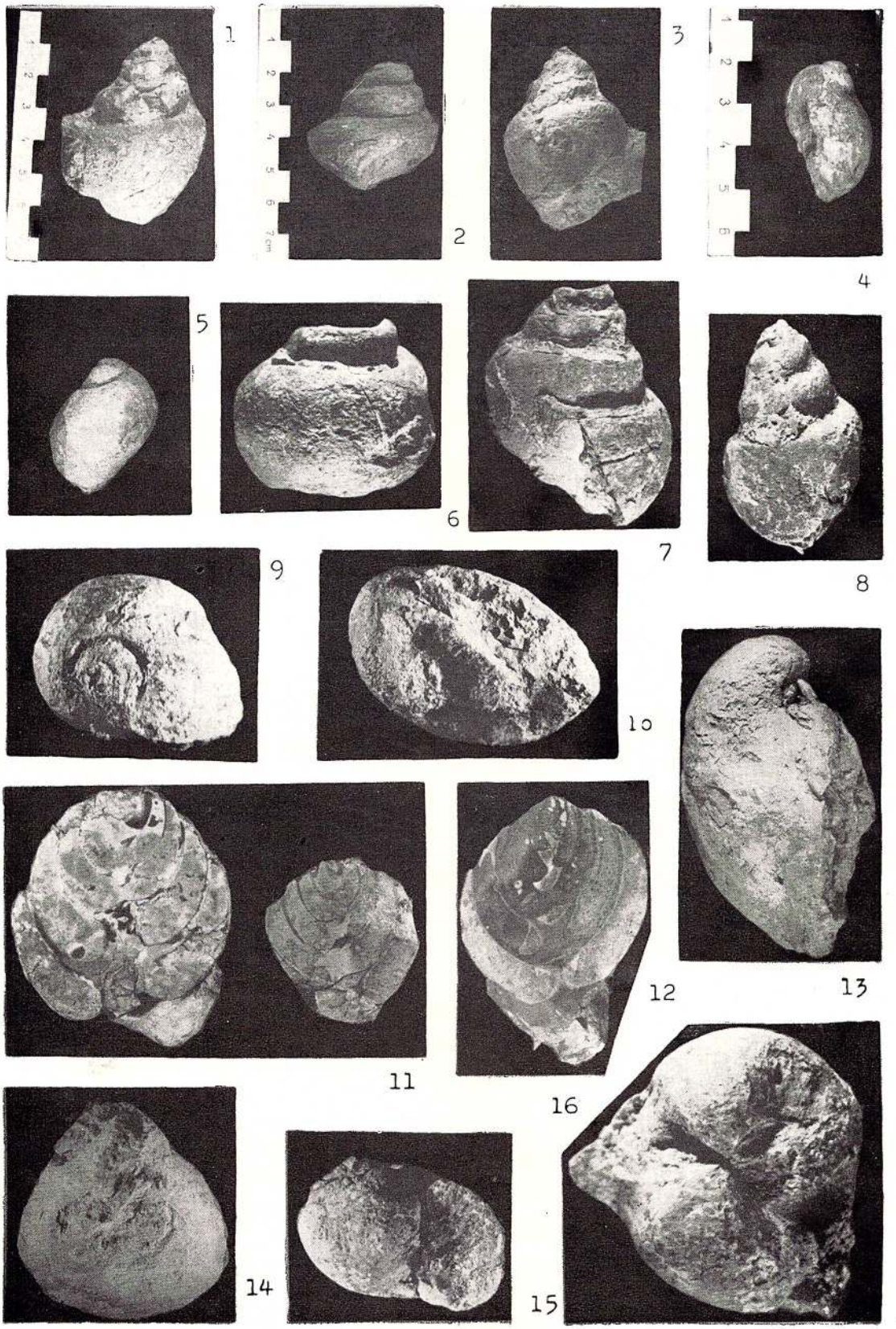
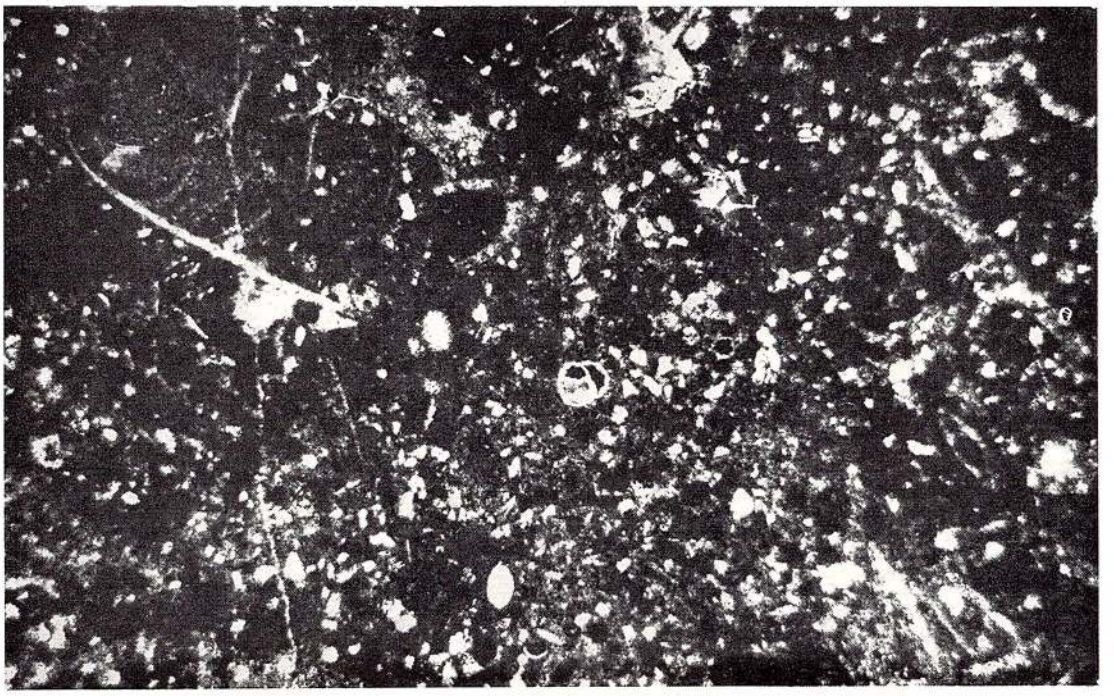


PLATE VII

Fig. 1. — Biopelmicrite with *Protoglobigerinae* and calcified *Radiolaria*, *Protoglobigerinae* Zone, Lower Kimmeridgian, L.P.B. 9436, Ghilcoș Mts. × 30.

Fig. 2. — Calcareous breccia formed by reworked intraformational calcareous nodules, Red nodular limestone horizon, *Protoglobigerinae* Zone, Lower Kimmeridgian, Ghilcoș Mts., nat. size.

Fig. 3. — Biopelmicrite with *Saccocoma* sp. (fragments of secundibrachialia plates), *Protoglobigerinae* Zone, Lower Kimmeridgian, L.P.B. 9513, Ghilcoș Mts., × 30.



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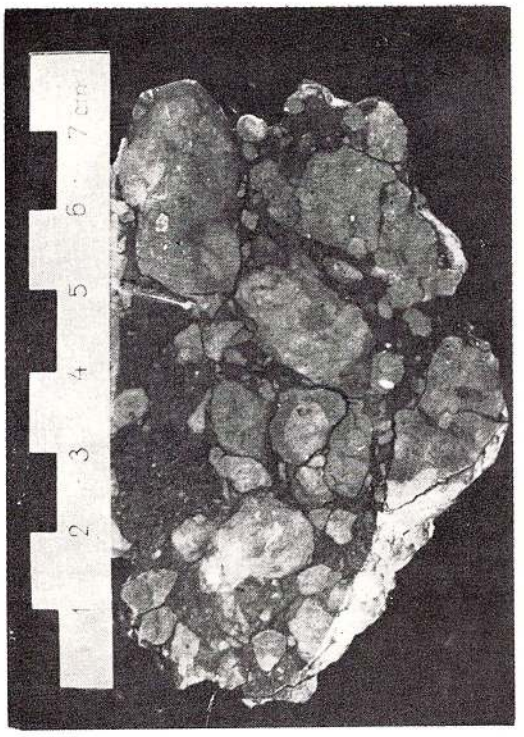

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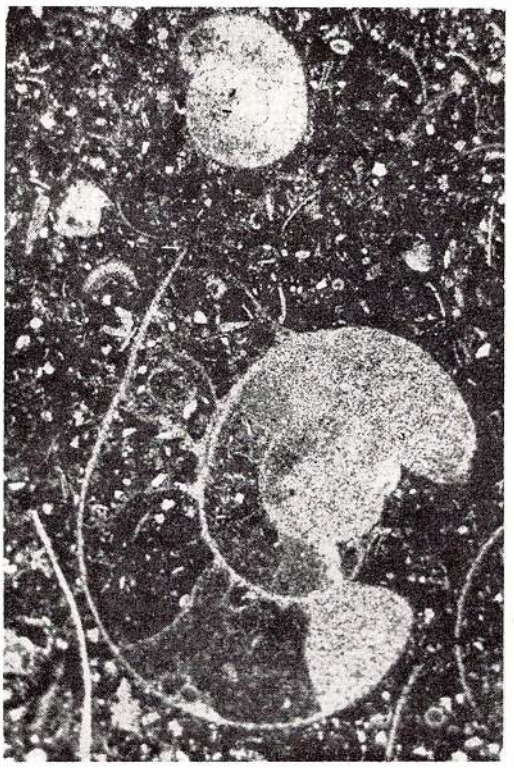
PLATE VIII

Fig. 1. — Biopelmicrite with longitudinal section in Ammonite shells, *Protoglobigerinae* Zone, Lower Kimmeridgian, Ghilcoş Mts., × 30.

Fig. 2. — Biopelmicrite with *Nodobacularia* sp., *Saccocoma* sp. and reworked biopelmicrite, *Protoglobigerinae* Zone, Lower Kimmeridgian, L.P.B. 9403, Ghilcoş Mts., × 30.

Fig. 3—4. — Biopelmicrite with *Nodophtalmidium jurassicum* (C a r o z z i) and *Lenticulina* sp., *Protoglobigerinae* Zone, Lower Kimmeridgian, L.P.B. 9402, Ghilcoş Mts., × 30.



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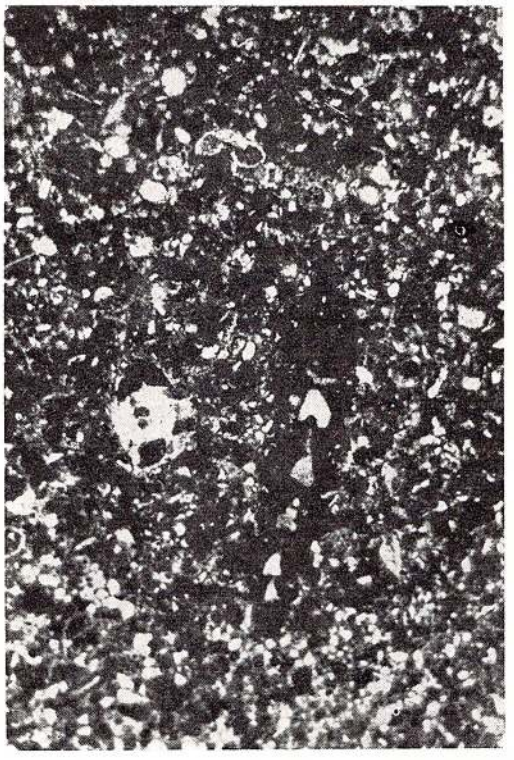

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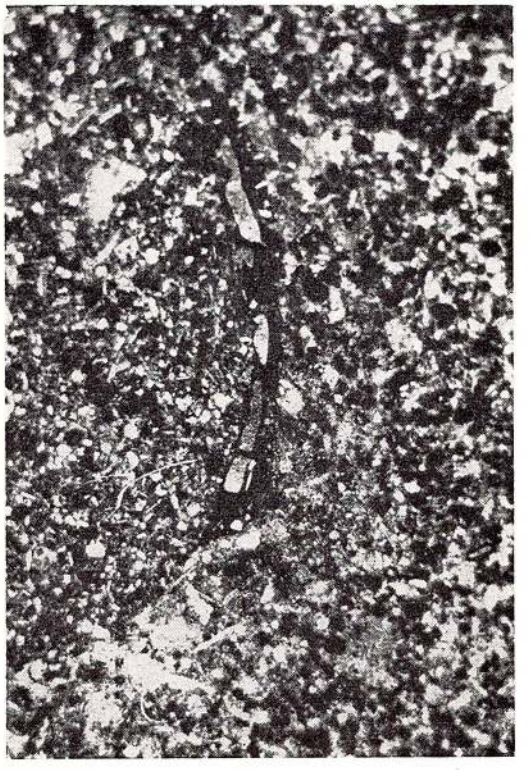

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PLATE IX

Fig. 1. — Pelitoid sandstone with Crinoid plates *(Saccocoma ?)*, *Protoglobigerinae* Zone, Lower Kimmeridgian, Ghilcoș Mts., × 15.

Fig. 2. — Biopelmicrite with solitar Coral and Crinoids filaments, *Protoglobigerinae* Zone, Lower Kimmeridgian, Ghilcoș Mts., × 15.

Fig. 3. — Biopelmicrite with *Lenticulina* sp. and Crinoids filaments, *Saccocoma* Zone, Upper Kimmeridgian, Ghilcoș Mts., × 15.

Fig. 4. — Biopelsparite with *Saccocoma* sp. (fragments of ramuli and secundibranchialia), *Saccocoma* Zone, Upper Kimmeridgian, L.P.B. 9513, Ghilcoș Mts., × 15.

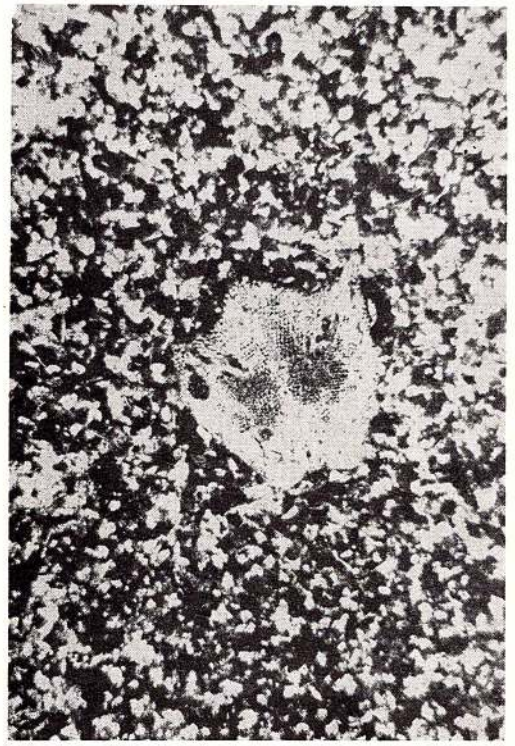

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PLATE X

Fig. 1. — Biopelsparite with reworked fragments of *Saccocoma* sp. and foraminifers, *Saccocoma* Zone, Upper Kimmeridgian, I.P.B. 9513, Ghilcoș Mts., × 15.

Fig. 2. — Pelitoid sandstone, *Saccocoma* Zone, Upper Kimmeridgian, Ghilcoș Mts., × 15.

Fig. 3. — Biopelsparite with *Girvanella jurassica* Frémy & Dangeard and *Trocholina* gr. *alpina* (Leupold), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9501 and L.P.B. 9393, Ghilcoș Mts., × 30.

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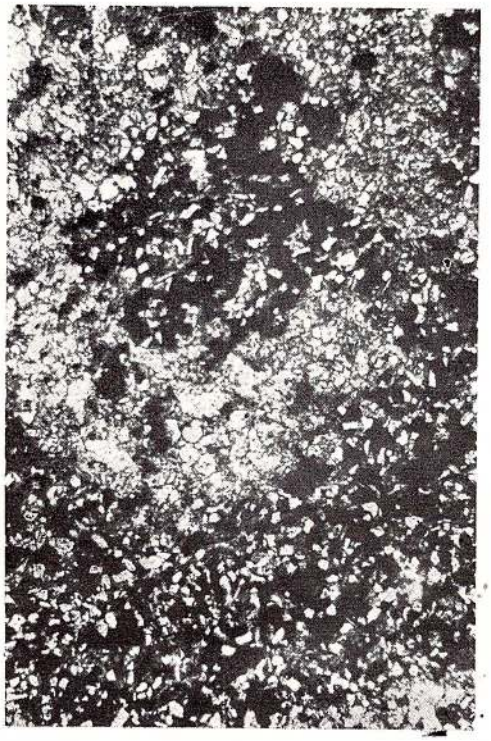

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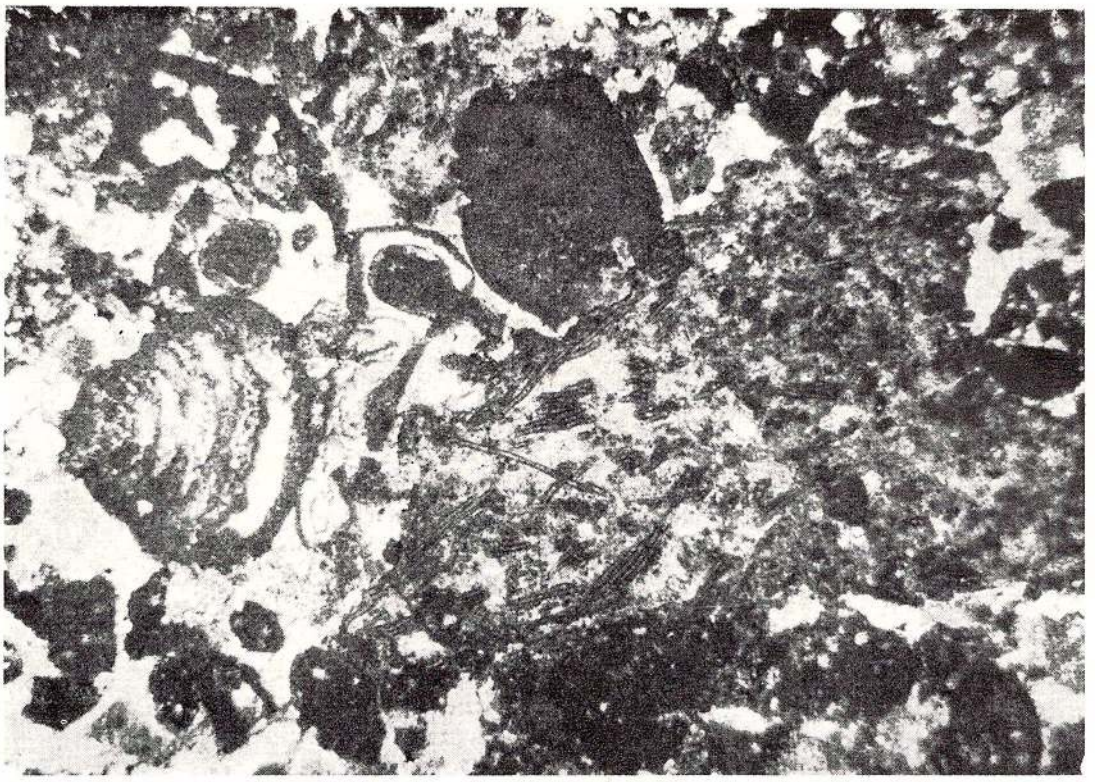

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PLATE XI

Fig. 1. — *Actaeonina ovalis* Zittel, *Hypselocyclum* Zone, Lower Kimmeridgian, L.P.B. 3314, Ghilcoș Mts., × 16.

Fig. 2—3. — *Lenticulina (Lenticulina) subquadrata* (Terquem), *Hypselocyclum* Zone, Lower Kimmeridgian, L.P.B. 9367, × 56.

Fig. 4. — *Paraisurus* sp. (= *Oxyrhina macrorhiza* Pictet), *Uhlandi* Zone, *Acanthicum* Zone, Lower and Upper Kimmeridgian, L.P.B. 3304, Ghilcoș Mts., × 32.

Fig. 5. — *Hybodus striatulus* Hastings, *Hypselocyclum* Zone, Lower Kimmeridgian, L.P.B. 3302, Ghilcoș Mts., × 32.

Fig. 6. — *Hybodus* sp., *Hypselocyclum* Zone, Lower Kimmeridgian, L.P.B. 3303, Ghilcoș Mts., × 32.

Fig. 7—8. — *Trocholina conica* (Schlumberger), *Beckeri* Zone, Upper Kimmeridgian, L.P.B. 9388, Ghilcoș Mts., × 56.

Fig. 9—10. — *Paalzowella feifeli elevata* (Paalzow), *Beckeri* Zone, Upper Kimmeridgian, L.P.B. 9381, Ghilcoș Mts., × 56.

Fig. 11—12. — *Paalzowella* sp., *Lithographicum* Zone, Lower Tithonian, L.P.B. 9387, Ghilcoș Mts., × 56.

Fig. 13—14. — *Ammobaculites agglutinans* (d'Orb.), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9418, Ghilcoș Mts., × 56.

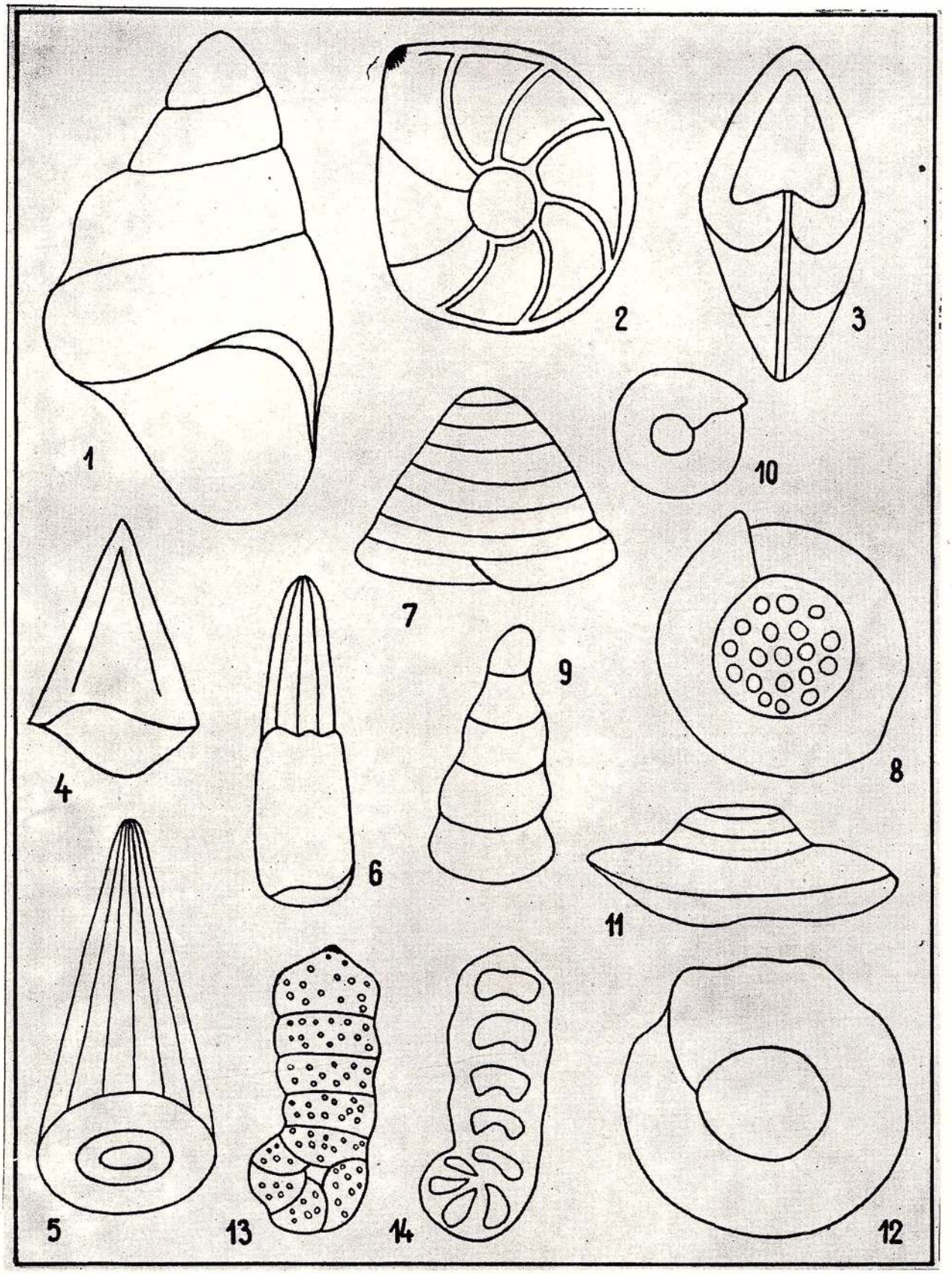


PLATE XII

Fig. 1. — Stelleroids pieces, *Paalzowella* Zone, Lower Tithonian, Ghilcoș Mts., × 50.

Fig. 2—3. — *Turrispirillina amoena* Dain, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9380, Ghilcoș Mts., × 50.

Fig. 4—6. — *Conicospirillina trochoides* (Berthlin), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9374, Ghilcoș Mts., × 50.

Fig. 7—8. — *Lenticulina (Lenticulina) danzayensis* Payard, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9369, Ghilcoș Mts., × 50.

Fig. 9—10. — *Nodosaria* cf. *dispar* Franke, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9431, Ghilcoș Mts., × 50.

Fig. 11—12. — *Textularia* cf. *cordiformis* Schwager, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9422, Ghilcoș Mts., × 50.

Fig. 13—14. — *Trocholina* cf. *delicatissima* Kalantari, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9395, Ghilcoș Mts., × 50.

Fig. 15. — *Textularia foeda* Reuss, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9421, Ghilcoș Mts., × 50.

Fig. 16. — *Nodosaria mutabilis* Terquem, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9429, Ghilcoș Mts., × 50.

Fig. 17. — *Nodosaria nitidana* Brand, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9430, Ghilcoș Mts., × 50.

Fig. 18—19. — *Spirillina kuebleri* Mjatliuk, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9377, Ghilcoș Mts., × 50.

Fig. 20—25. — *Globigerina helvelo-jurassica* Hauessler, *Paalzowella* Zone, Lower Tithonian, L. P. B. 9435, Ghilcoș Mts., x 50.

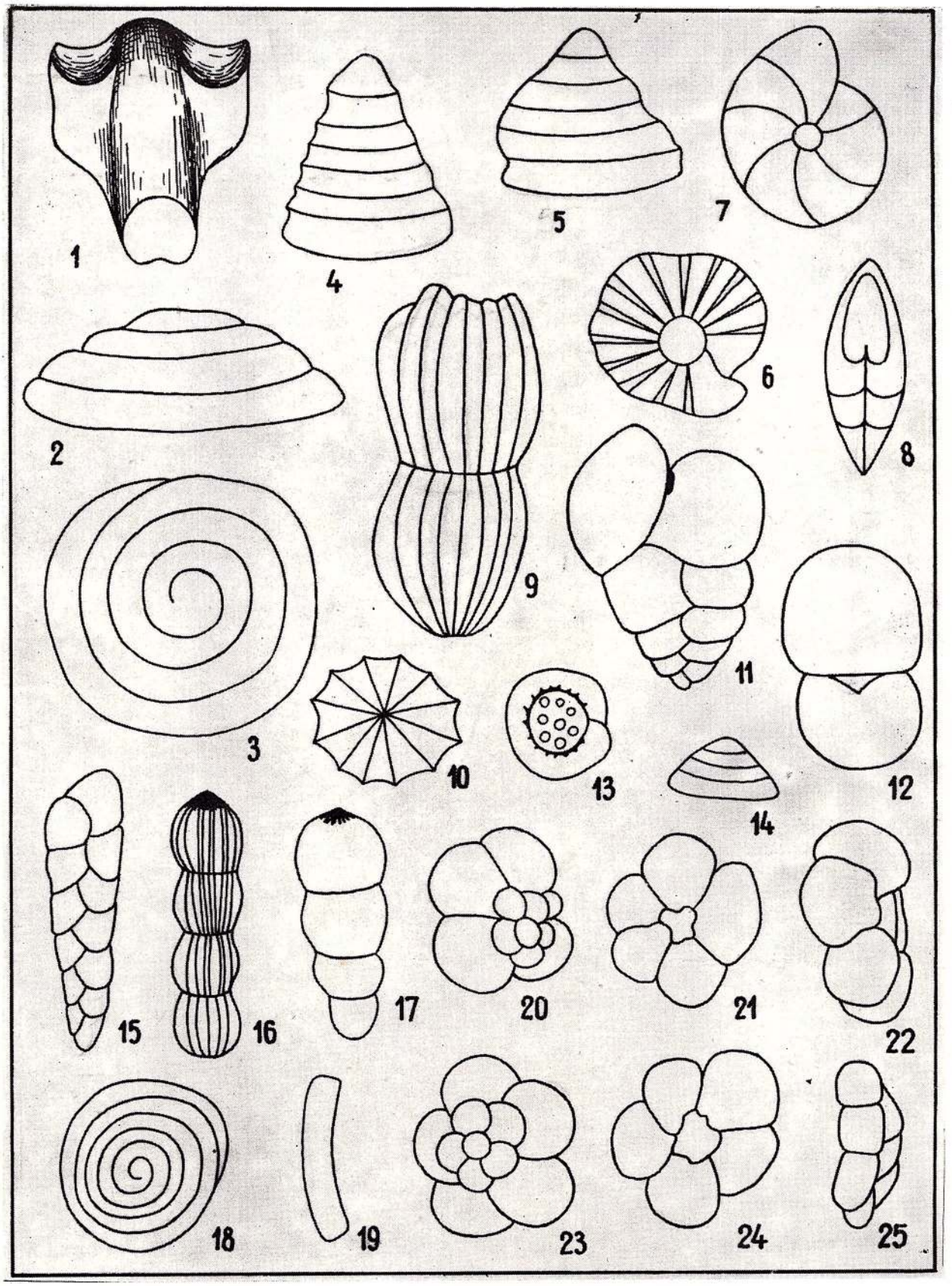


PLATE XIII

Fig. 1—4. — *Trocholina conica* (Schlumberger), *Paalzowella Zone*, Lower Tithonian, L. P. B. 9388, Ghilcoş Mts., x 50.

Fig. 5—6. — *Paalzowella feifeli feifeli* (Paalzow), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9382, Ghilcoş Mts., × 50.

Fig. 7—8. — *Conicospirillina basiliensis* Mohler, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9373, Ghilcoş Mts., × 50.

Fig. 9—12. — *Trocholina elongata* (Leupold), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9394, Ghilcoş Mts., × 50.

Fig. 13—16. — *Trocholina solecensis* Bielicka & Pozaryski, *Paalzowella* Zone, Lower Tithonian, L.P.B 9391, Ghilcoş Mts., × 50. .

Fig. 17—18. — *Discorbis* sp. [cf. *D. (Topaludiscorbis) danubiensis* Neagu], *Paalzowella* Zone, Lower Tithonian, L.P.B. 9433, Ghilcoş Mts., × 50.

Fig. 19—20. — *Trocholina nodulosa* Seibold & Seibold, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9389, Ghilcoş Mts., × 50.

Fig. 21. — Stelleroids pieces, *Paalzowella* Zone, Lower Tithonian, Ghilcoş Mts., × 50.

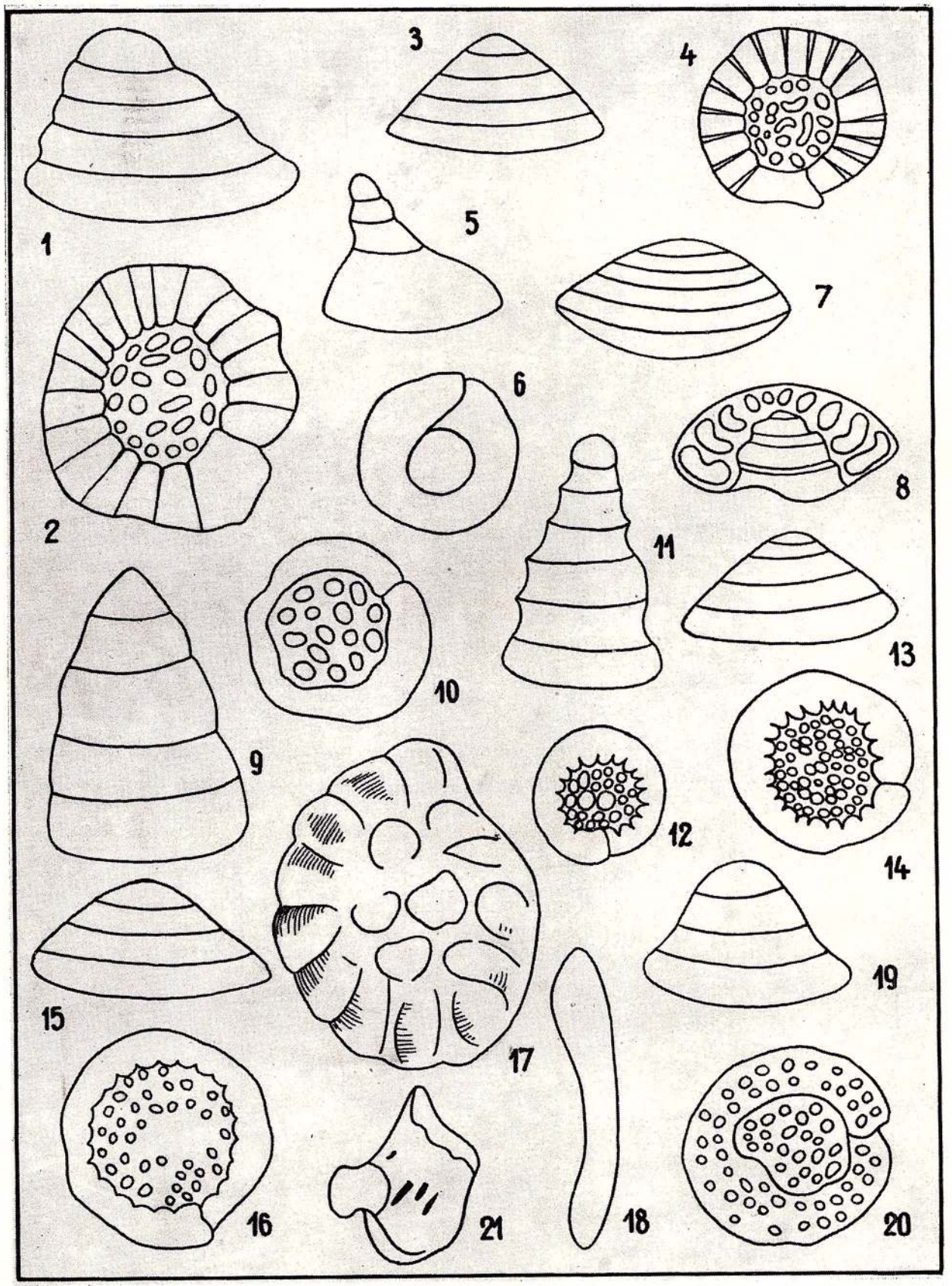


PLATE XIV

Fig. 1—2. — *Trocholina nodulosa* Seibold & Seibold, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9389, Ghilcoș Mts., × 50.

Fig. 3—4. — *Trocholina solecensis* Bielicka & Pozaryski, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9391, Ghilcoș Mts., × 50.

Fig. 5—6. — *Paalzowella feifeli seiboldi* Lutze, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9383, Ghilcoș Mts., × 50.

Fig. 7—9. — Plates of *Saccocoma* sp., *Paalzowella* Zone, Lower Tithonian, L.P.B. 9513, Ghilcoș Mts., × 50.

Fig. 10—11, 14—15. — *Lenticulina (Lenticulina) omphalovorticosa* Farinacci, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9371, Ghilcoș Mts., × 50.

Fig. 12—13. — *Trocholina elongata* (Leupold), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9394, Ghilcoș Mts., × 50.

Fig. 16—17. — *Paalzowella* sp., *Paalzowella* Zone, Lower Tithonian, L.P.B. 9387, Ghilcoș Mts., × 50.

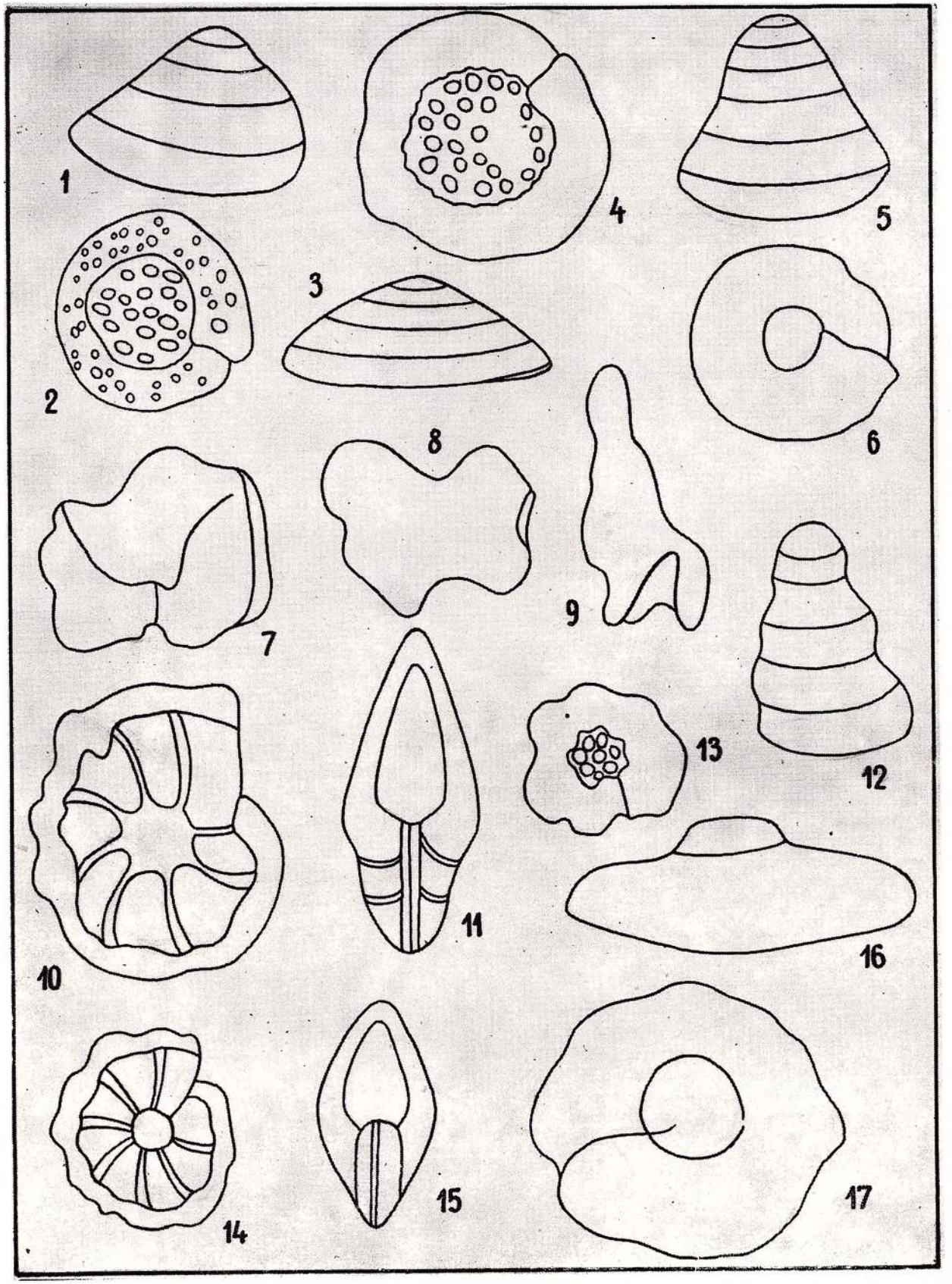


PLATE XV

Fig. 1—4. — *Paalzowella feifeli elevata* (P a a l z o w), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9381, Ghilcoș Mts., × 50.

Fig. 5—7. — *Turrispirillina amoena* D a i n, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9380, Ghilcoș Mts., × 50.

Fig. 8—9. — *Discorbis* sp. [cf. *D. (Topaludiscorbis) danubiensis* N e a g u], *Paalzowella* Zone, Lower Tithonian, L.P.B. 9433, Ghilcoș Mts., × 50.

Fig. 10—11. — *Trocholina alpina* (L e u p o l d), *Paalzowella* Zone, Lower Tithonian, L.P.B. 9392, Ghilcoș Mts., × 50.

Fig. 12—13. — *Lenticulina (Lenticulina) varians* (B o r n e m a n n), *Paalzowella* Zone. Lower Tithonian, L.P.B. 9372, Ghilcoș Mts., × 50.

Fig. 14—15. — *Spirillina tenuissima* G ü m b e l, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9378, Ghilcoș Mts., × 50.

Fig. 16. — Plates of *Saccocoma* sp., *Paalzowella* Zone, Lower Tithonian, L.P.B. 9513, Ghilcoș Mts., × 50.

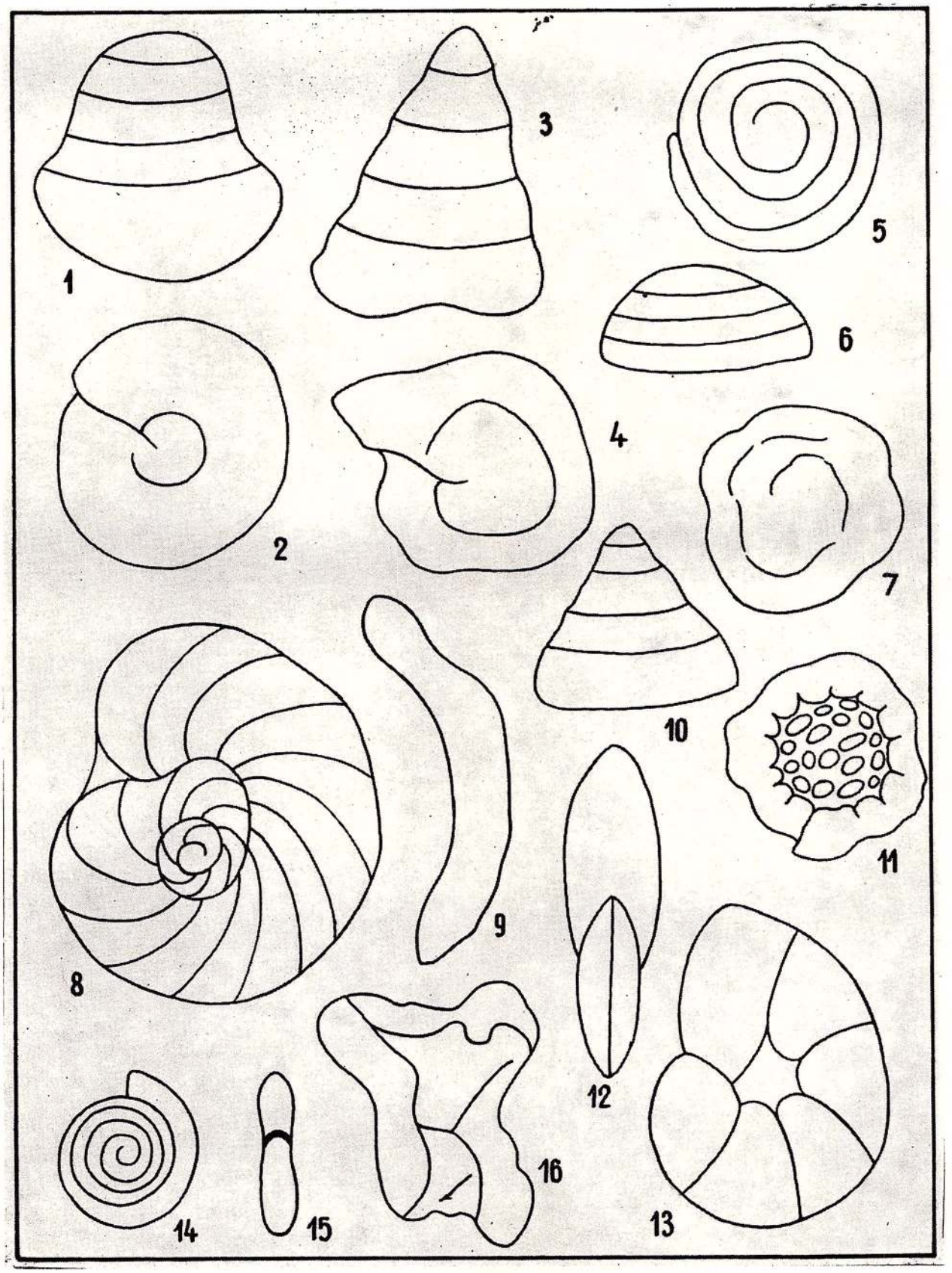
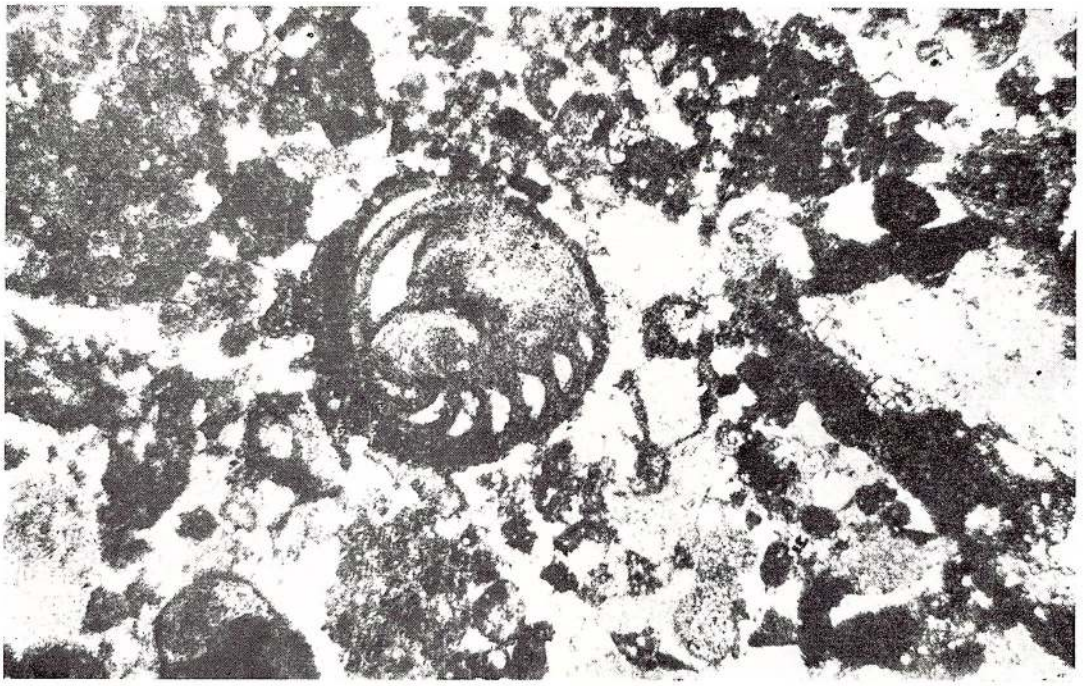


PLATE XVI

Fig. 1. — Biopelsparite with *Protopeneroplis striata* Weynschenk, *Paalzowella* Zone, Lower Tithonian, L.P.B. 9400, Ghilcoş Mts., × 30.

Fig. 2. — Biopelsparite with *Nautiloculina oolithica* Mohler, ,,*Pianella*'' *pygmaea* (Gümbel), gastropods and echinoid fragments, *Pianella pygmaea* Zone, Lower Tithonian, L.P.B. 9428 L.P.B. 9446, Ghilcoş Mts., × 30.

Fig. 3. — Biopelsparite with ,,*Mercierella*'' *dacica* Dragastan and *Globochaete alpina* Lombard, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9512 and L.P.B. 9494, Ghilcoş Mts., × 30.



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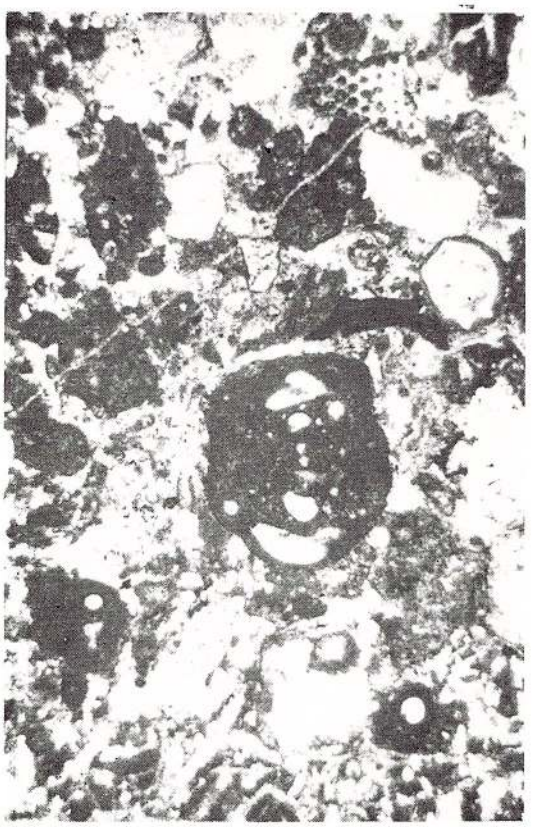

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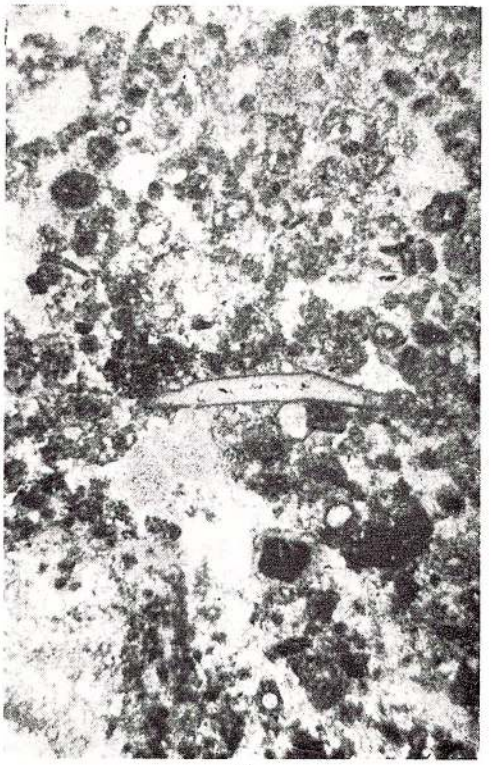

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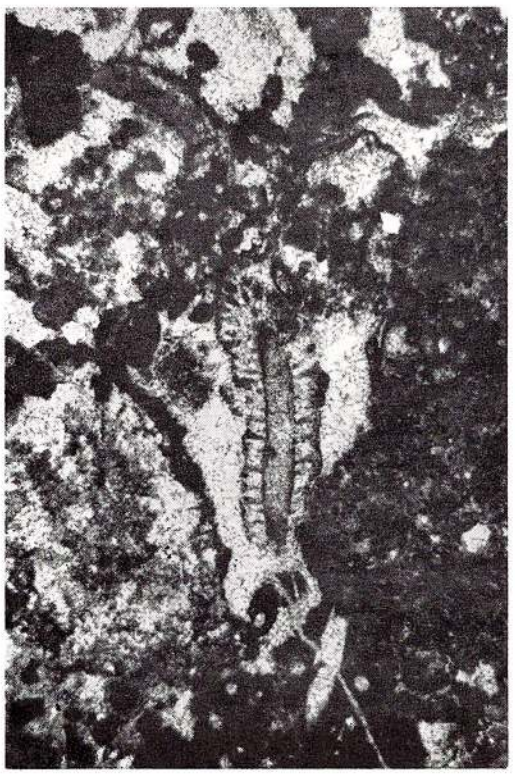
PLATE XVII

Fig. 1—2. — Biopelsparite with ,,*Pianella*'' *pygmaea* (G ü m b e l), and coral fragments, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9446, Ghilcoș Mts., × 15.

Fig. 3—4. — Biopelsparite with *Pseudocyclammina lituus* (Y o k.), ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9412, Ghilcoș Mts., × 15.



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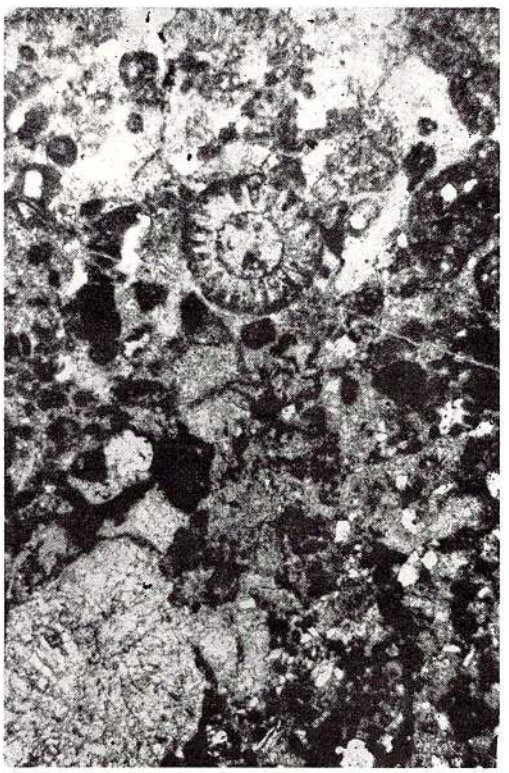

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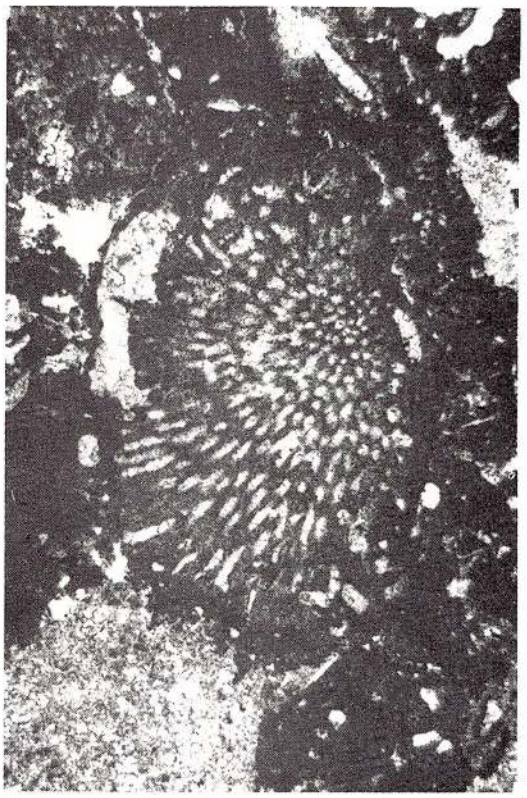
PLATE XVIII

Fig. 1. — Biopelsparite with *Cayeuxia moldavica* F r o l l o, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9484, Ghilcoş Mts., × 30.

Fig. 2. — Bry-algal, sphaeroidal ,,*Micro-oncolithes*'' —SS—C, L o g a n, R e z a k & G i n s b u r g, covering by cyclostomate Bryozoa, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoş Mts., × 30.

Fig. 3. — Biopelmicrite with *Hikorocodium fertilis* E n d o, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9488, Ghilcoş Mts., × 30.

Fig. 4. — Bry-algal with *Arcaeolithothamnium somensis* E n d o, bryozoa and pelecypods, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9027, Ghilcoş Mts., × 30.



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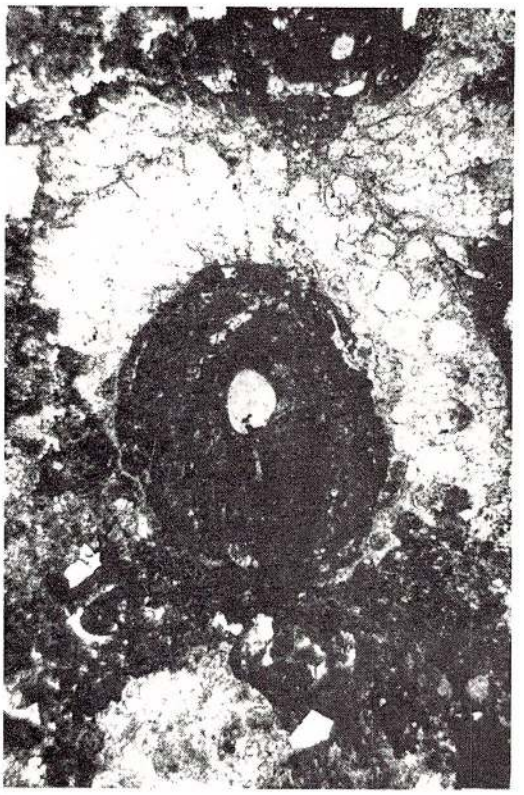

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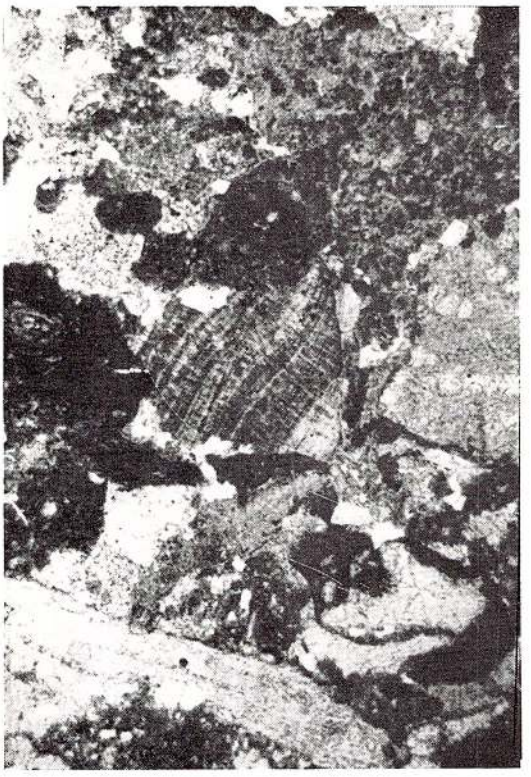

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PLATE XIX

Fig. 1—2. — *Barroisia* sp., ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 3285, Ghilcoș Mts., × 30.

Fig. 3. — Bry-algal with cyclostomate *Bryozoa*, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoș Mts., × 30.

Fig. 4. — *Barroisia* sp., ,,*Pianella pygmaea*'' Zone, Lower Tithonian, L.P.B. 3285, Ghilcoș Mts., × 30.

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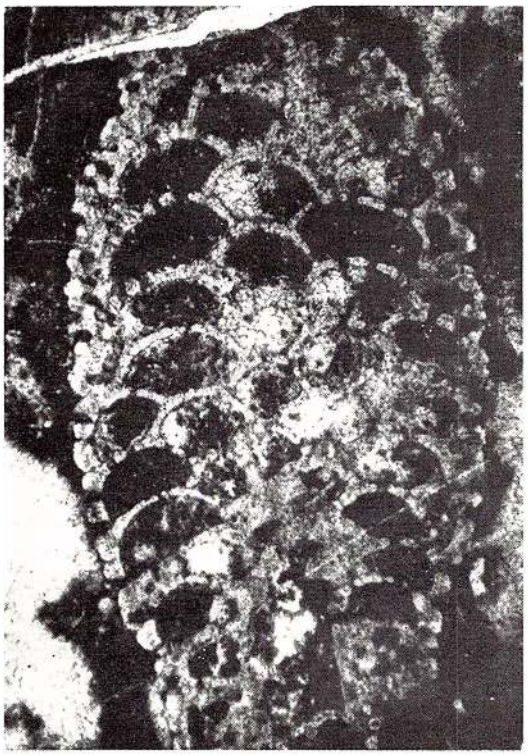

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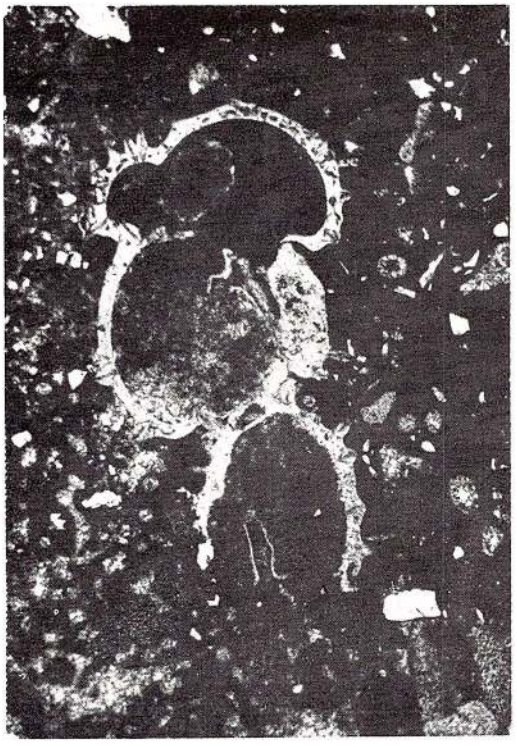

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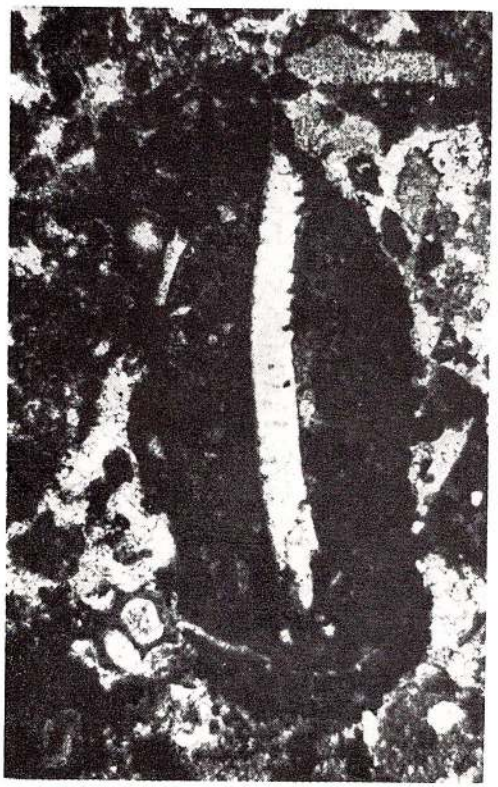
PLATE XX

Fig. 1. — Biopelsparite with ellipsoidal ,,*Micro-oncolithes*'' (ELL.), D r a g a s t a n, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with columnoidal ,,*Micro-oncolithes*'' (ELL-C.), D r a g a s t a n, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with silicified nodules, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with ,,*Pianella*'' *johnsoni* D r a g a s t a n, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9326, Ghilcoș Mts., × 30.



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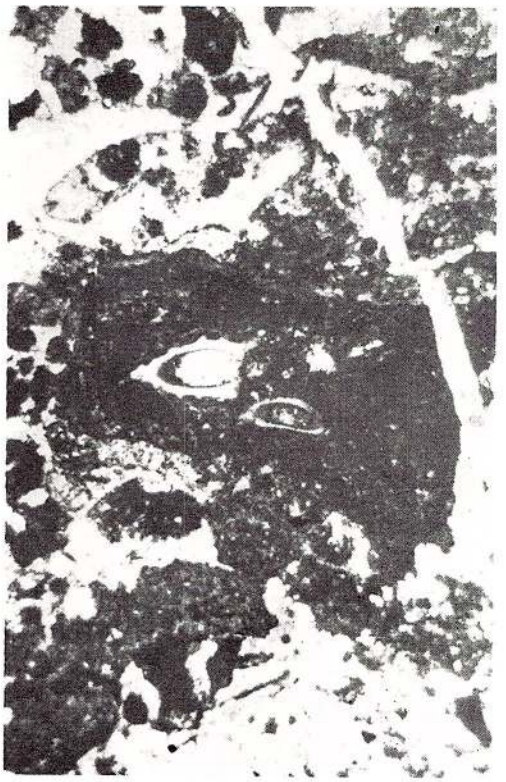

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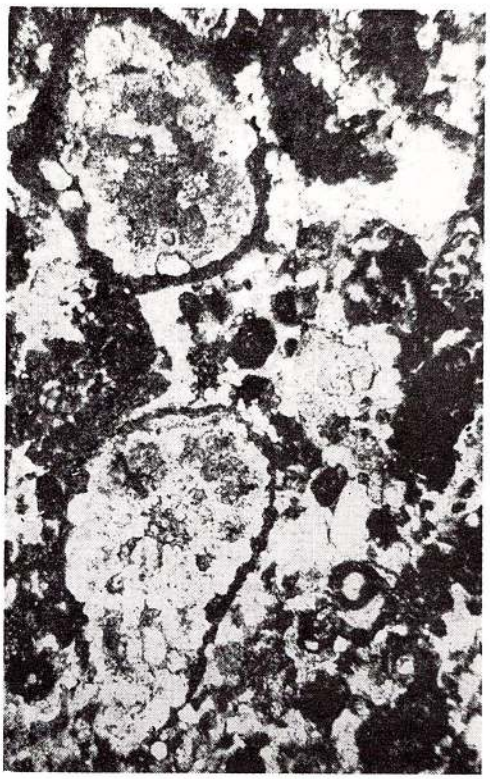

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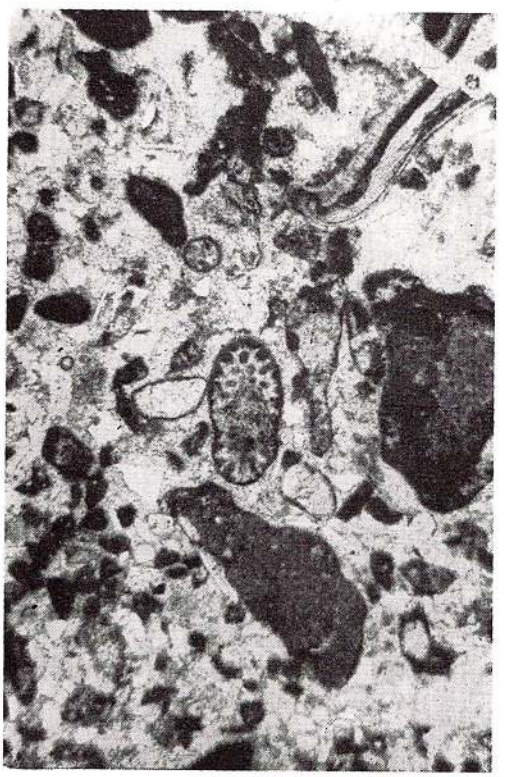

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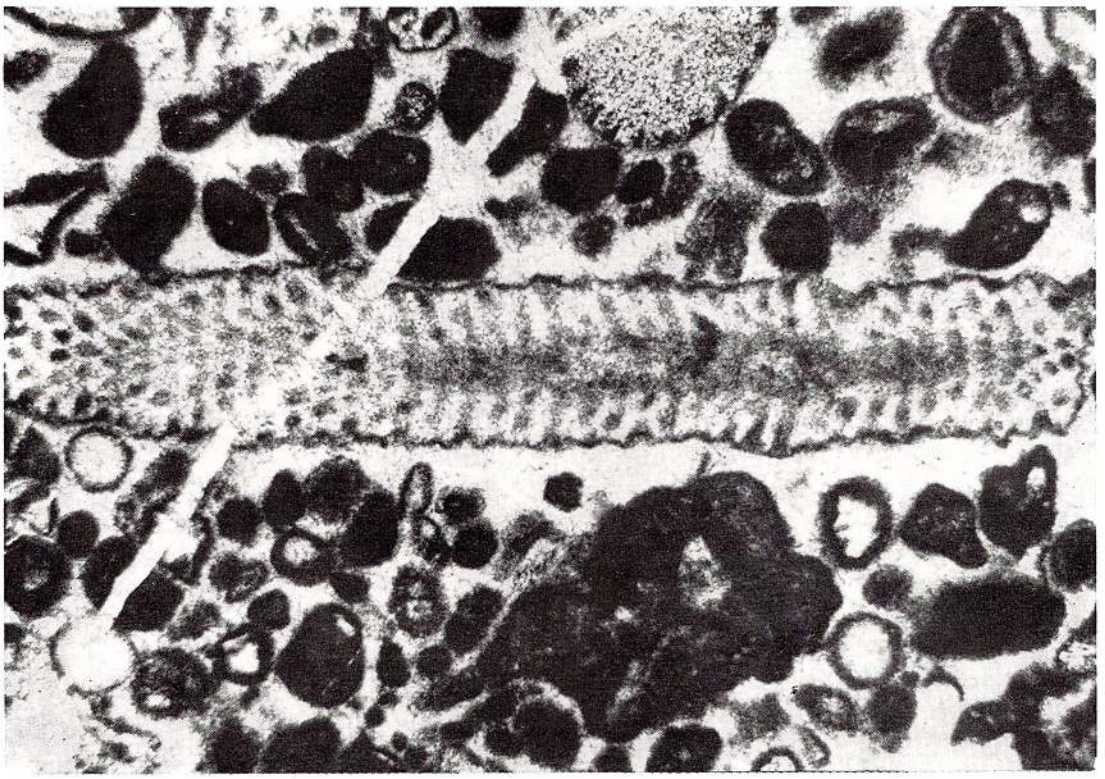
PLATE XXI

Fig. 1. — Biopelsparite with ,,*Pianella*'' *pygmaea* (G ü m b e l), echinoid fragments and reworked oopellets. ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9446, Ghilcoş Mts., × 30.

Fig. 2. — Biopelsparite with sphaeroidal ,,*Micro-oncolithes*'' (SS—C), L o g a n, R e z a k & G i n s b u r g, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, Ghilcoş Mts., × 30.

Fig. 3. — Biopelsparite with ,,*Pianella*'' *pygmaea* (G ü m b e l) and *Trocholina* aff. *alpina* (L e u p o l d), ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9446, Ghilcoş Mts., × 30.



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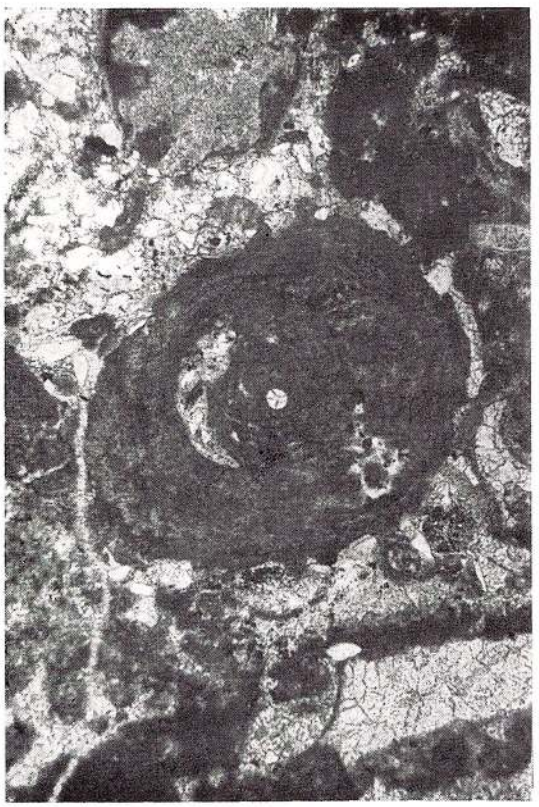

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PLATE XXII

Fig. 1. — Biopelsparite with sphaeroidal-joint "*Microoncolithes*", (SS – J.), D r a g a s t a n, „*Pianella*" *pygmaea* Zone, Lower Tithonian, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelsparite with „*Pianella*" *johnsoni* D r a g a s t a n, *Pianella*" *pygmaea* Zone, Lower Tithonian, L.P.B. 9326, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Bryozoa* ?, „*Pianella*" *pygmaea* Zone, Lower Tithonian, Făgetul Ciucului Mts., × 30.

Fig. 4. — Biopelmicrite with „*Clypeina*" *parvissima* D r a g a s t a n, and calcified spicules of *Spongia*, „*Pianella*" *pygmaea* Zone, Lower Tithonian, L.P.B. 9352, Ghilcoș Mts., × 30.

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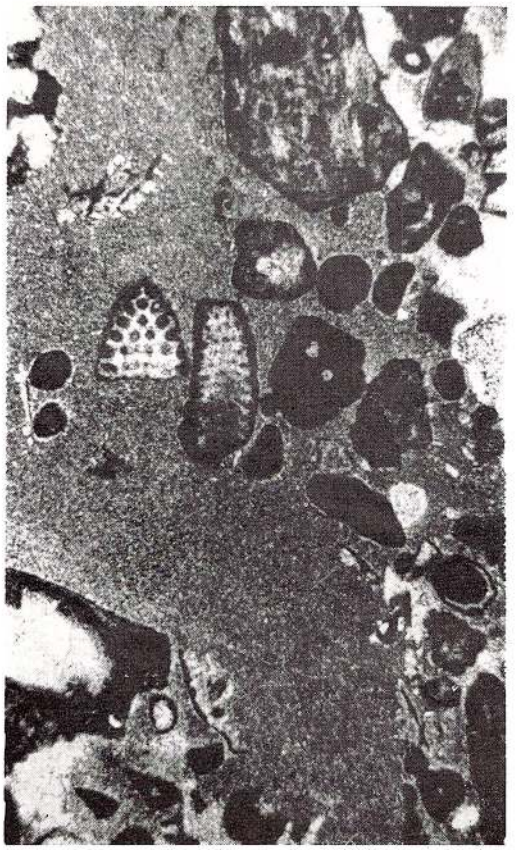

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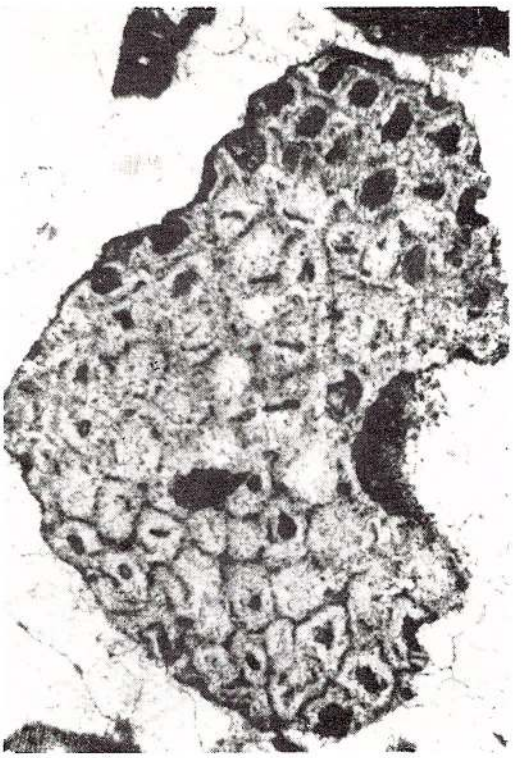

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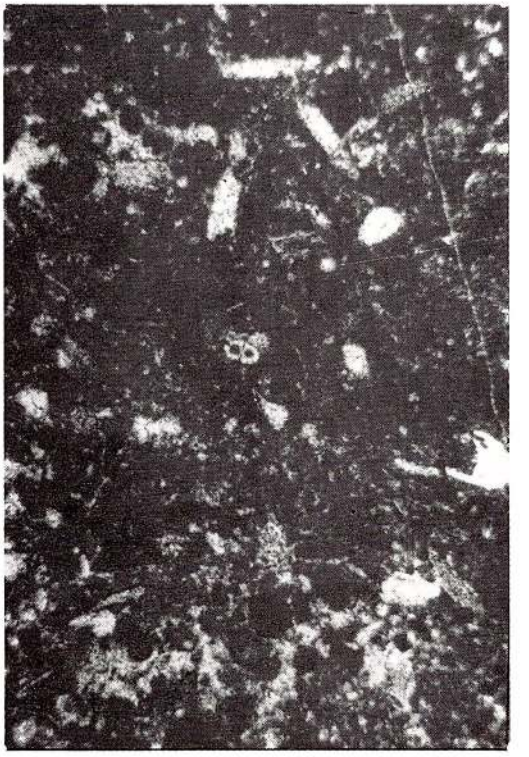

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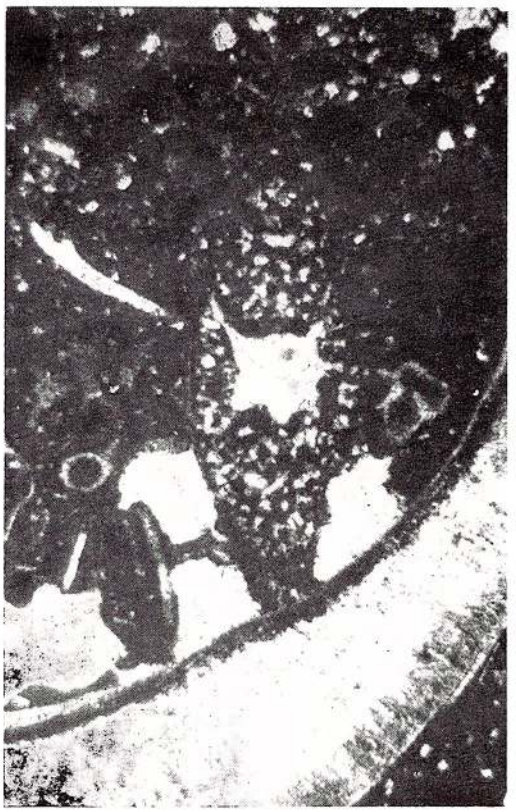
PLATE XXIII

Fig. 1. — Biopelmicrite with *Kurnubia jurassica* (H e n s o n), *Likanella* sp. and pelecypods, fragments, *Kurnubia jurassica* Zone, Lower Tithonian, L.P.B. 9432, Ghilcoș Mts. × 30.

Fig. 2. — Biopelsparite with ,,*Mercierella*'' *dacica* D r a g a s t a n, *Pseudoepimastopora jurassica* E n d o, and ,,*Microoncolithes*'', *Kurnubia jurassica* Zone, Lower Tithonian, L.P.B. 9512 and L.P.B. 9466, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Durandella helentappani* D r a g a s t a n, ,,*Pianella*'' *pygmaea* Zone, Lower Tithonian, L.P.B. 9353, Făgetul Ciucului Mts., × 30.

Fig. 4. — Biopelmicrite with *Cylindroporella arabica* E l l i o t t and different sections of *Kurnubia*, *Kurnubia jurassica* Zone, Lower Tithonian, L.P.B. 9456, Ghilcoș Mts., × 30.



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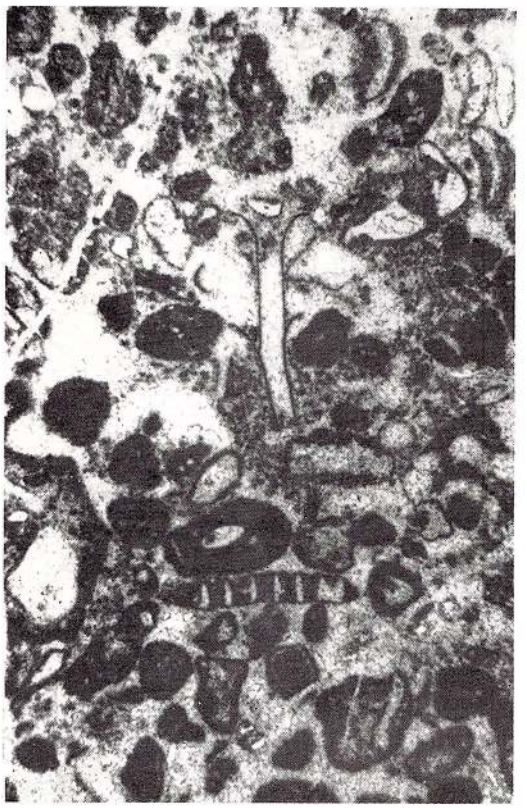

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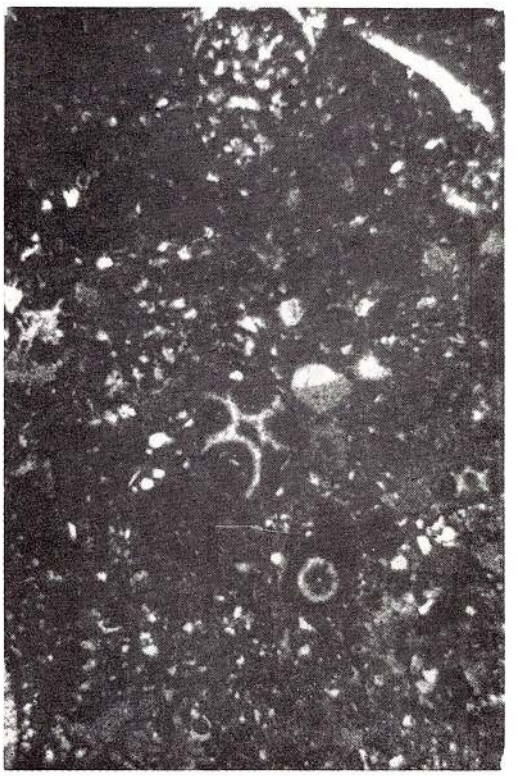

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PLATE XXIV

Fig. 1. — Bry-algal with lateral-link hemisphaeroid *Stromatolithe* (LLH—C), Logan, Rezak & Ginsburg, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

Fig. 2. — Biopelsparite with nubecularioidal "*Microoncolithe*", *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Ammobaculites* sp. and crinoid fragments, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9419, Ghilcoș Mts., × 30.

Fig. 4. — Calcarenite with graded-bedding, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

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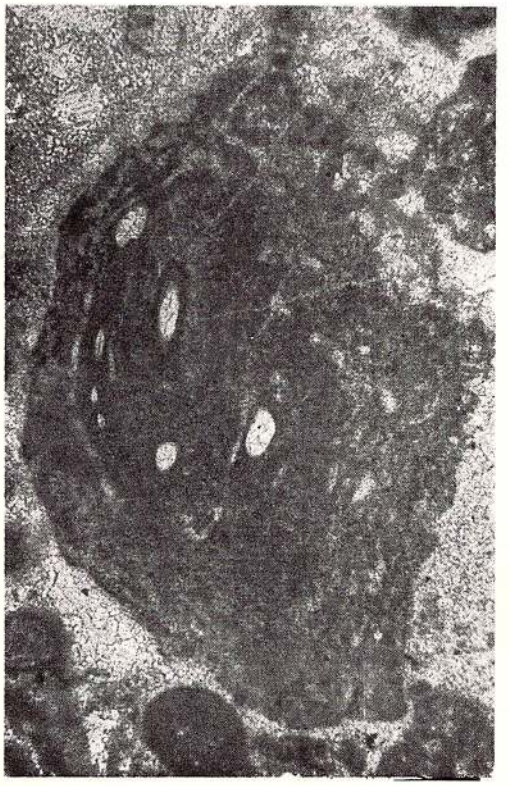

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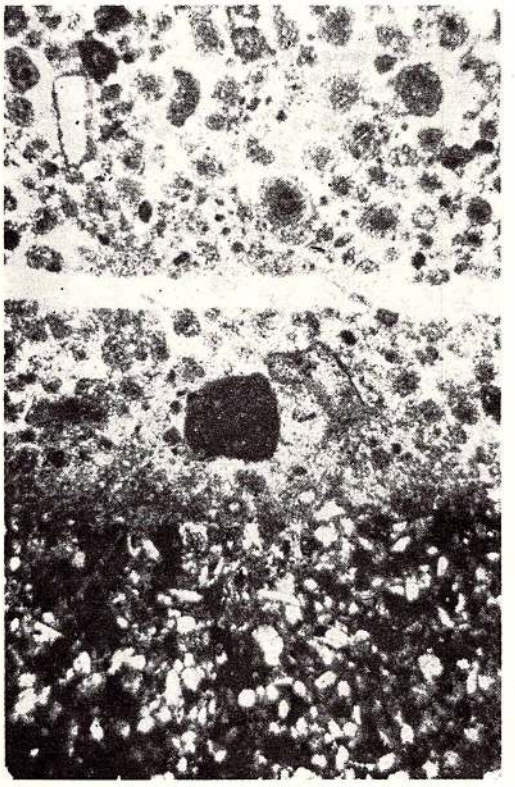

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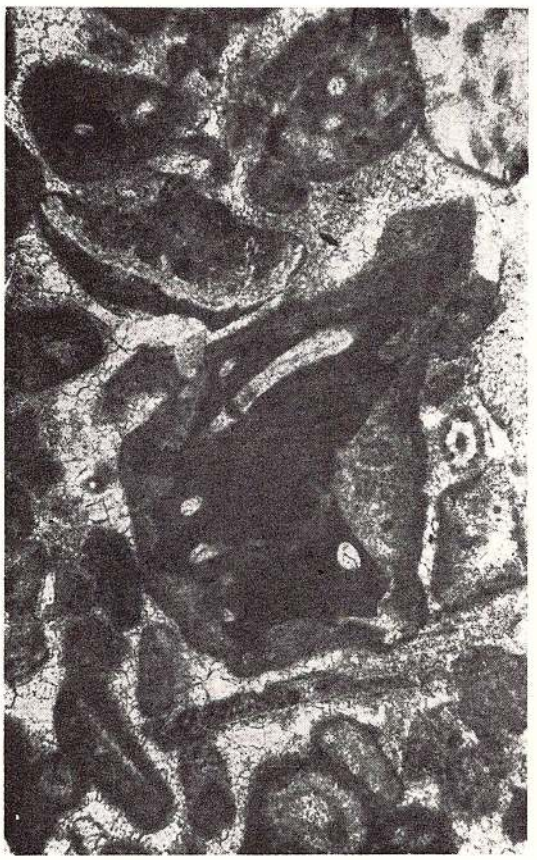
PLATE XXV

Fig. 1. — Biopelsparite with nubecularioidal "*Microoncolithe*", *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

Fig. 2. — Bry-algal with cyclostomate *Bryozoa*, *Bankia striata* Zone, Upper Tithonian, Făgetul Ciucului Mts., × 15.

Fig. 3. — Biopelsparite with *Diversocallis* nov. sp., *Bankia striata* Zone, Upper Tithonian, L.P.B. 0017 Făgetul Ciucului Mts., × 15.

Fig. 4. — Biopelsparite with *Teutloporella obsoleta* Carozzi, *Acicularia elongata* Carozzi and Textularidae, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9462 and L.P.B. 9442, Ghilcoș Mts., × 15.



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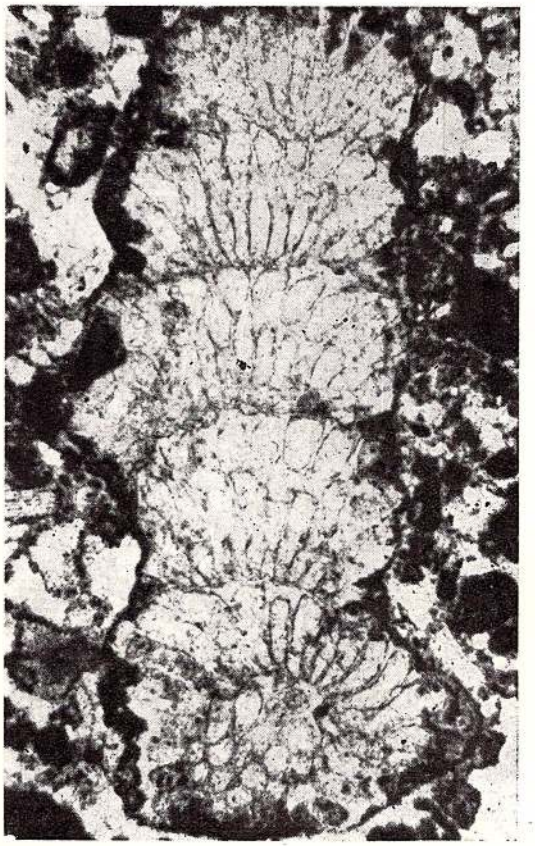

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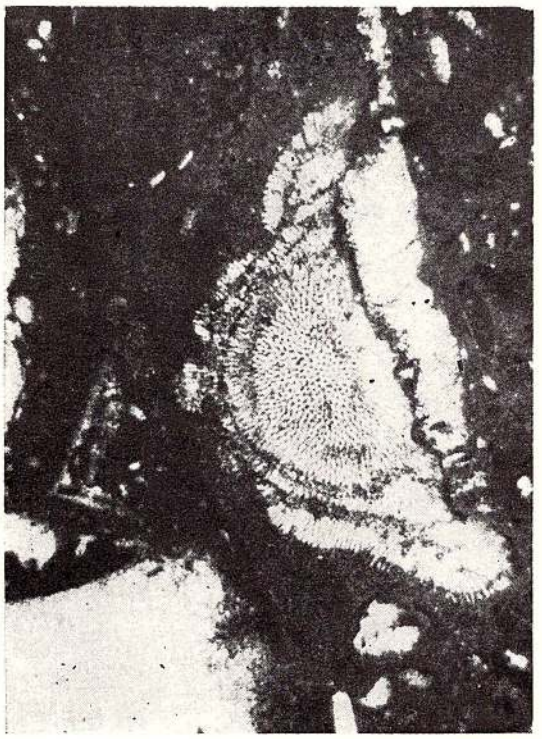

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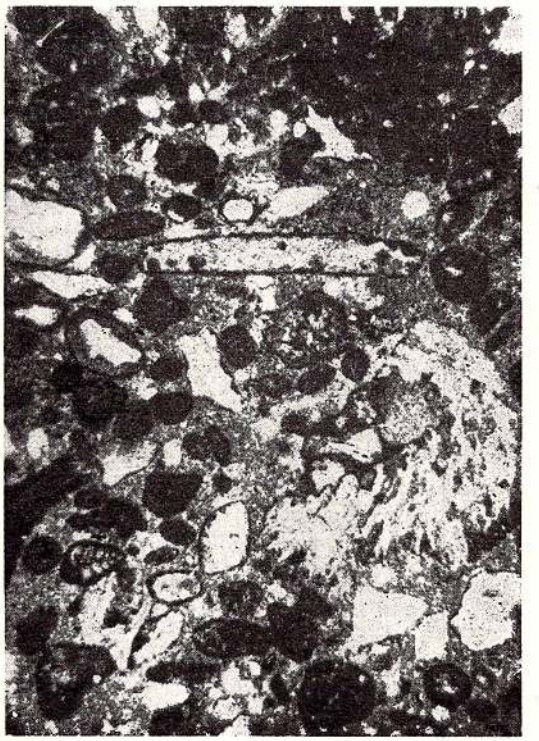

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PLATE XXVI

Fig. 1. — Biopelsparite with *Bankia striata* (C a r o z z i), *Bankia striata* Zone, Upper Tithonian, L.P.B. 9511, Ghilcoș Mts., × 15.

Fig. 2. — Biopelsparite with *Acicularia elongata* C a r o z z i, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9442, Ghilcoș Mts., × 15.

Fig. 3. — Biopelsparite with epiphytic zoospores of *Globochaete alpina* L o m b a r d, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9494, Ghilcoș Mts., × 15.

Fig. 4. — Bioopelsparite with reworked oopelmicrite and oolites, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

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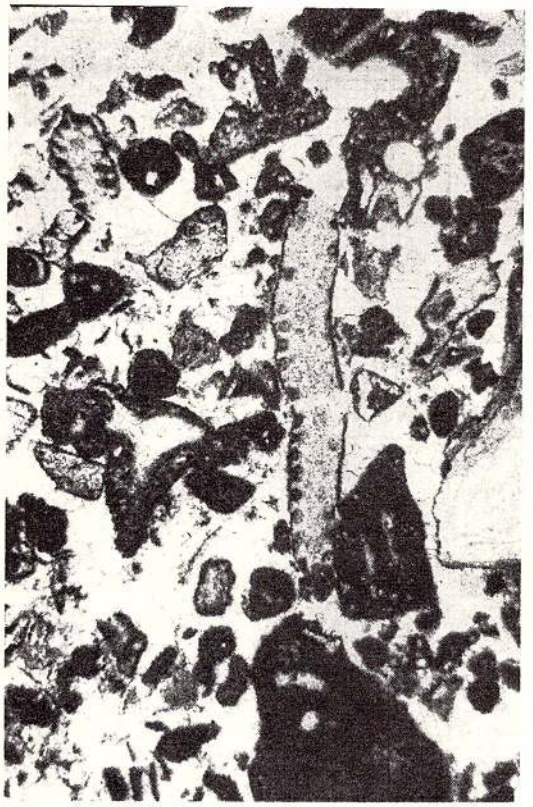

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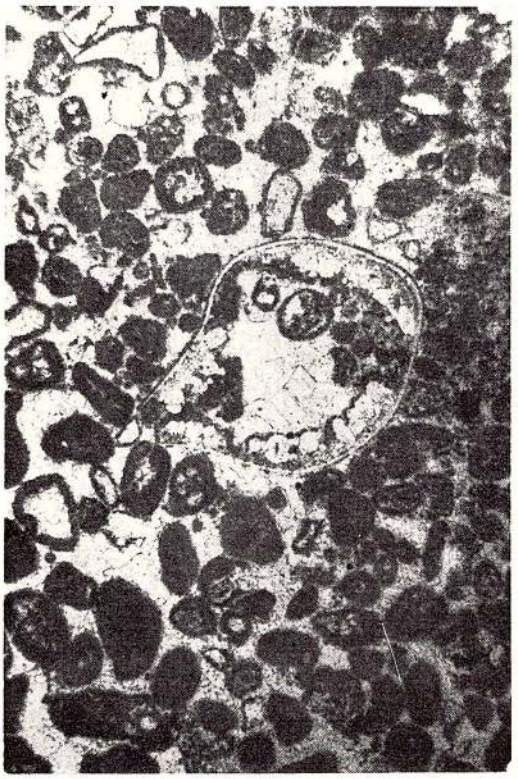

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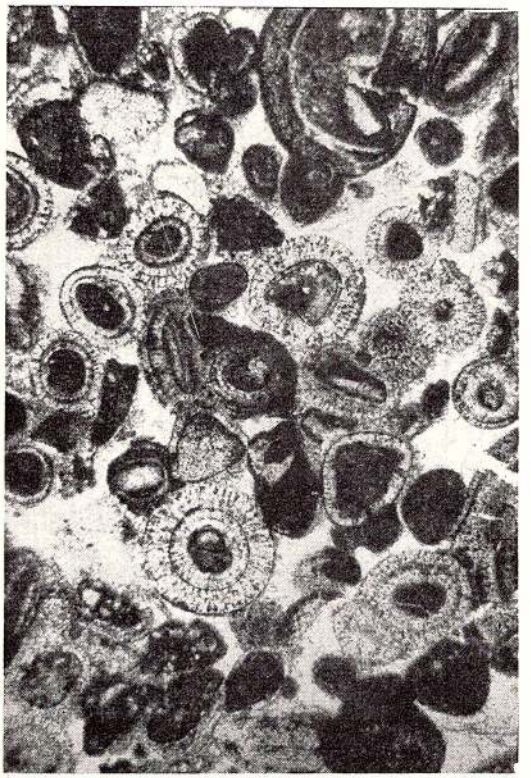

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PLATE XXVII

Fig. 1. — Biopelsparite with *Boueina hochstetteri* (T o u l a), *Textuloporella* sp. and echinoid spicules, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9492 and L.P.B. 9464, Ghilcoş Mts., × 30.

Fig. 2. — Biopelsparite with "*X Organism*", *Bankia striata* Zone, Upper Tithonian, L.P.B. 9520, Ghilcoş Mts., × 30.

Fig. 3. — Biopelsparite with *Lithophyllum* ? *maslovi* D r a g a s t a n, *Bankia striata* Zone, Tithonian, L.P.B. 9347, Ghilcoş Mts., × 30.

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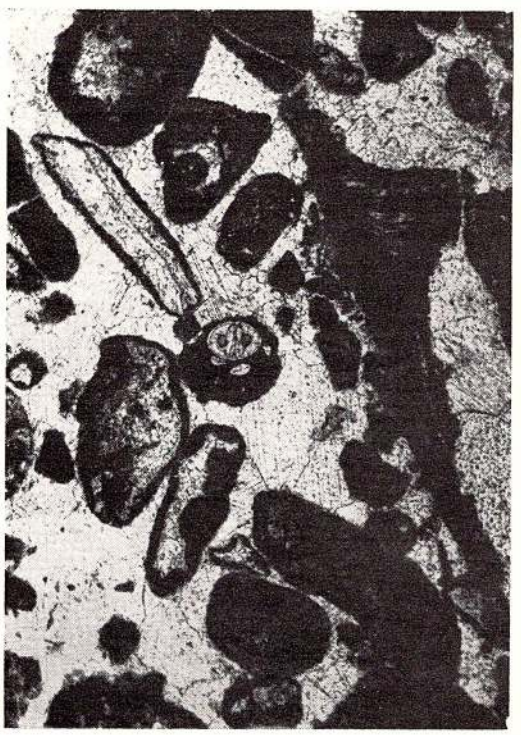

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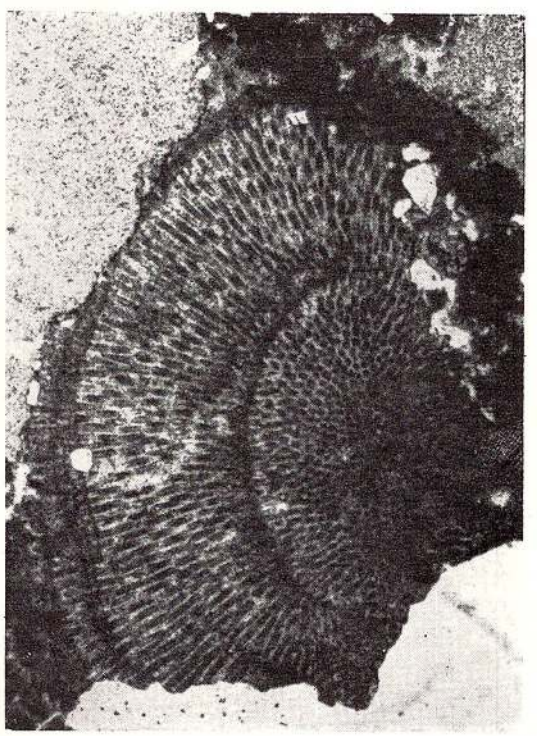

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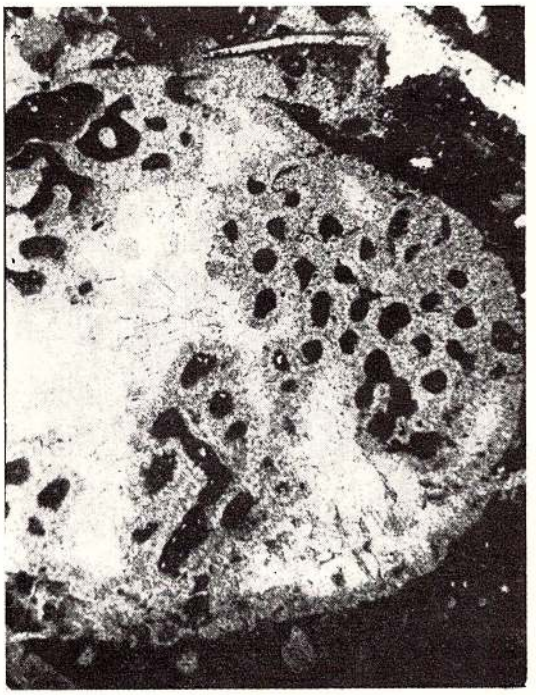
PLATE XXVIII

Fig. 1. — Biopelsparite with *Cladocoropsis mirabilis* Felix, *Bankia striata* Zone, Upper Tithonian, L.P.B. 3290, Ghilcoș Mts., × 15.

Fig. 2. — Biopelsparite with *Barroisia* sp., *Bankia striata* Zone, Upper Tithonian, L.P.B. 3285, Ghilcoș Mts., × 15.

Fig. 3. — Biopelsparite with *Pseudoepimastopora jurassica* Endo, reworked biopelmicrite and a beginning graded bedding, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., L.P.B. 9466, × 15.

Fig. 4. — Biopelsparite with *Parachaetetes* sp. and "*Pianella*" *johnsoni* Dragastan, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9326, Ghilcoș Mts., × 15.



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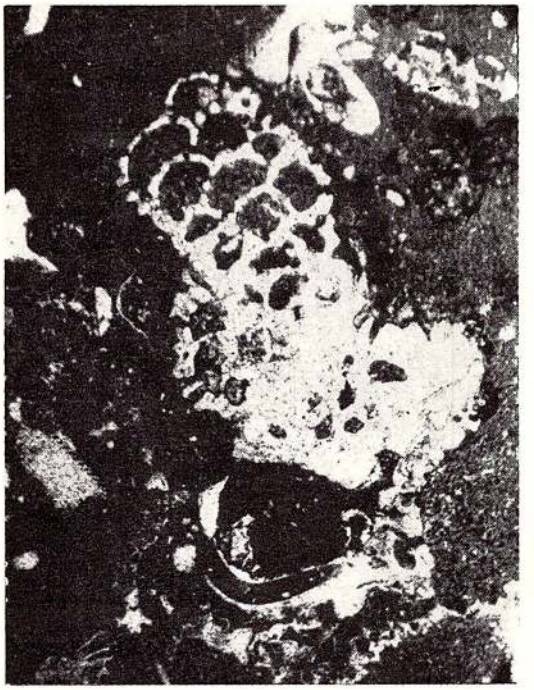

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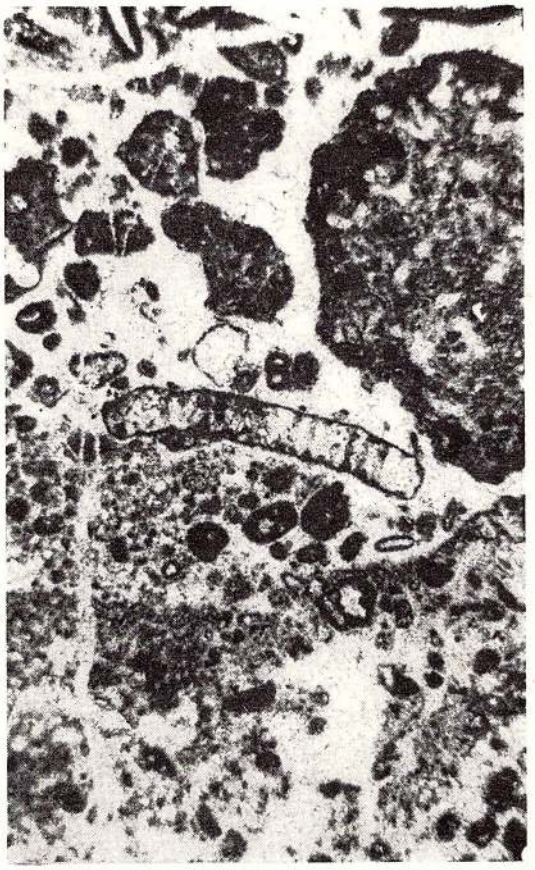

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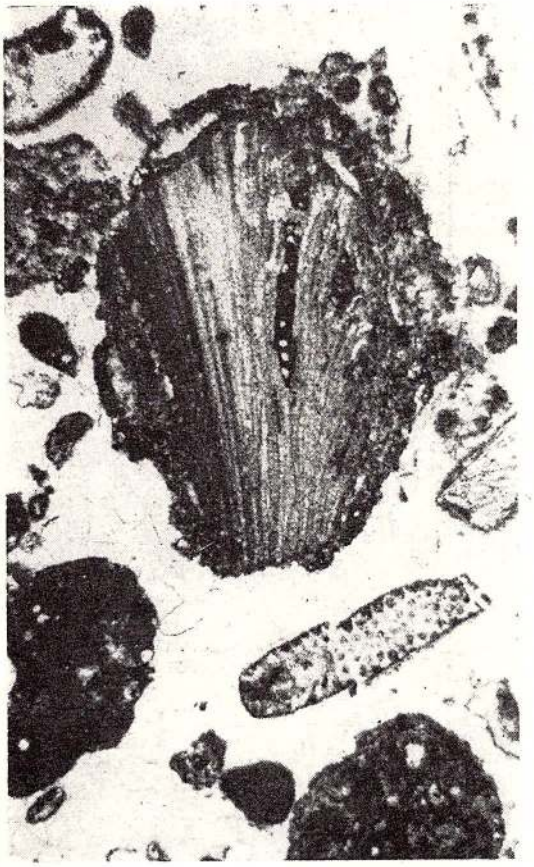

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PLATE XXIX

Fig. 1. — Biopelsparite with *Cladocoropsis mirabilis* Felix, *Bankia striata* Zone, Upper Tithonian, L.P.B. 3290, Ghilcoș Mts., × 15.

Fig. 2. — Bry-algal with cyclostomate bryozoa and calcified spicules of *Spongia*, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

Fig. 3. — Biopelsparite with Serpulids tubes, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

Fig. 4. — Biolitithe with *Parastromatopora* sp., *Bankia striata* Zone, Upper Tithonian, L.P.B. 3289, Ghilcoș Mts., × 15.

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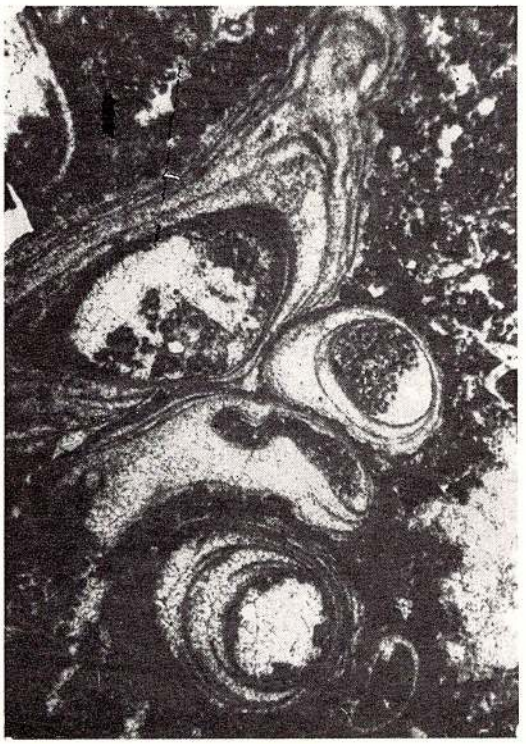

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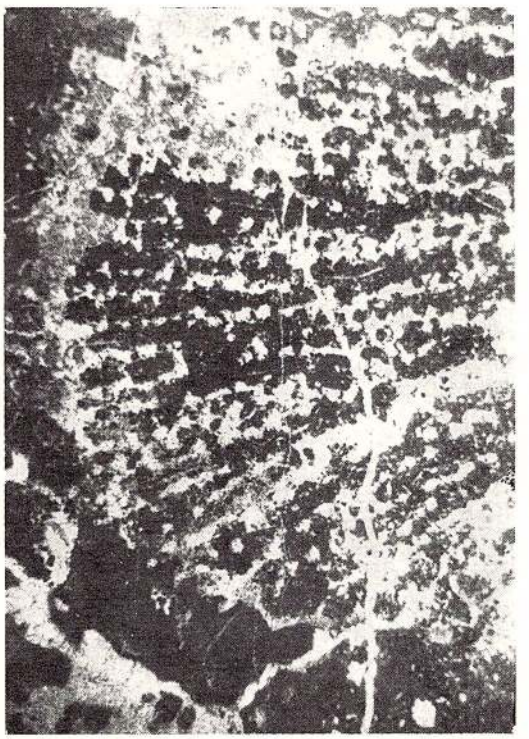

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PLATE XXX

Fig. 1. — Biopelsparite with "*Mercierella*" *dacica* Dragastan, *Bankia striata* Zone, Upper Tithonian, L.P.B. 9512, Ghilcoș Mts., × 30.

Fig. 2. — Pelitoid sandstone with *Acervulina* sp., *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., L.P.B. 9440, × 15.

Fig. 3. — Bioopelsparite with reworked *oopelmicrite*, *Bankia striata* Zone, Upper Tithonian, Ghilcoș Mts., × 15.

Fig. 4. — Biopelsparite with *Nipponophycus* aff. *ramosus* Yabe & Toyama, *Clypeina jurassica* Zone, Upper Tithonian, Ghilcoș Mts., L.P.B. 9497, × 30.

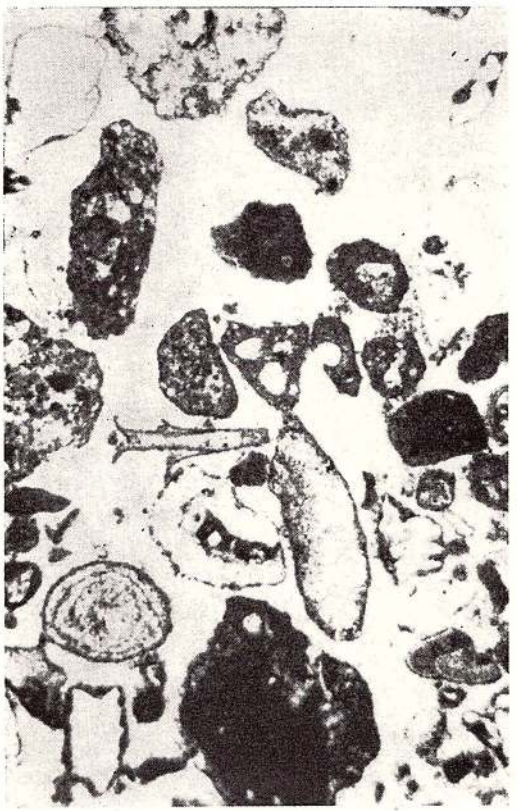

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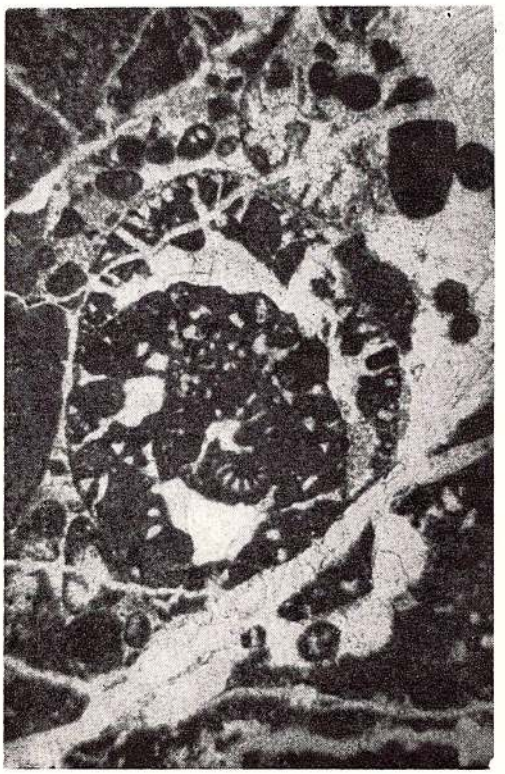
PLATE XXXI

Fig. 1. — Biopelsparite with *Everticyclammina* aff. *virguliana* (K o e c h l i n), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9876, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelsparite with *Turrispirillina* sp., *Clypeina jurassica* Zone, Upper Tithonian, Ghilcoș Mts., × 30.

Fig. 3. — Coral-biolititthe with *Spongiomorpha asiatica* Y a b e & S u g i y a m a and hexacorals, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 3294, Ghilcoș Mts., × 15.

Fig. 4. — Biopelsparite with *Diversocallis* n.sp., *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 0017, Făgetul Ciucului Mts., × 30.



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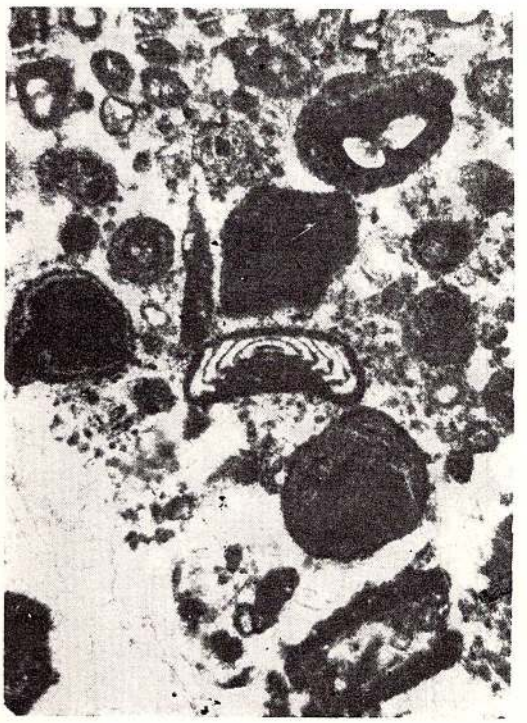

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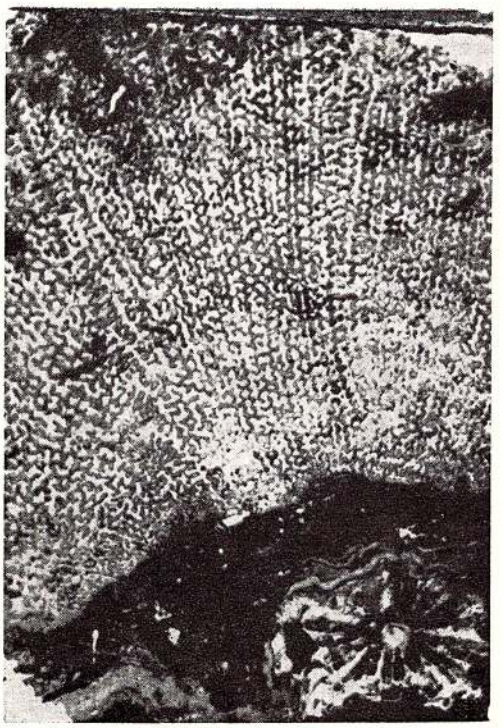

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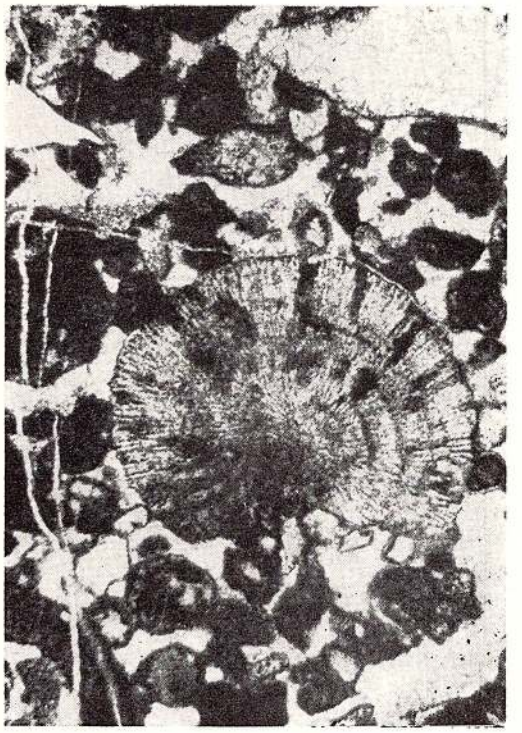

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PLATE XXXII

Fig. 1. — Biopelsparite with *Cayeuxia anae* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9339, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelmicrite with *Clypeina catinula* Carozzi, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9450 a, Bicăjel I Mts., × 30.

Fig. 3—4. — Biopelmicrite with *Acicularia* ? *minuta* (Maslov) and sphaeroidal "*Micro-oncolithe*" (SS—C), Logan, Rezak & Ginsburg, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9443, Ghilcoș Mts., × 30.

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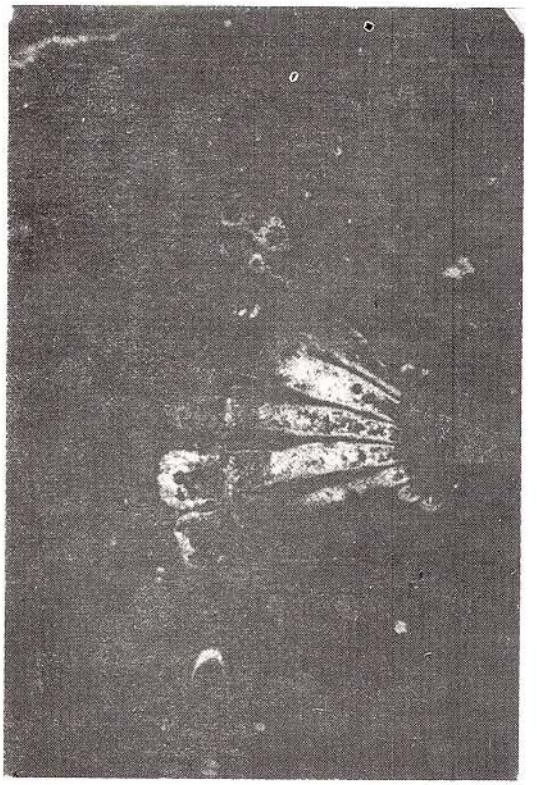

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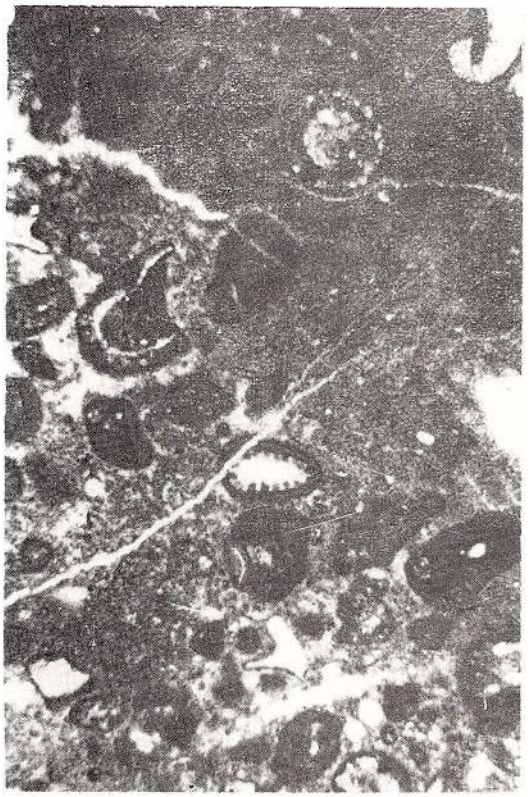

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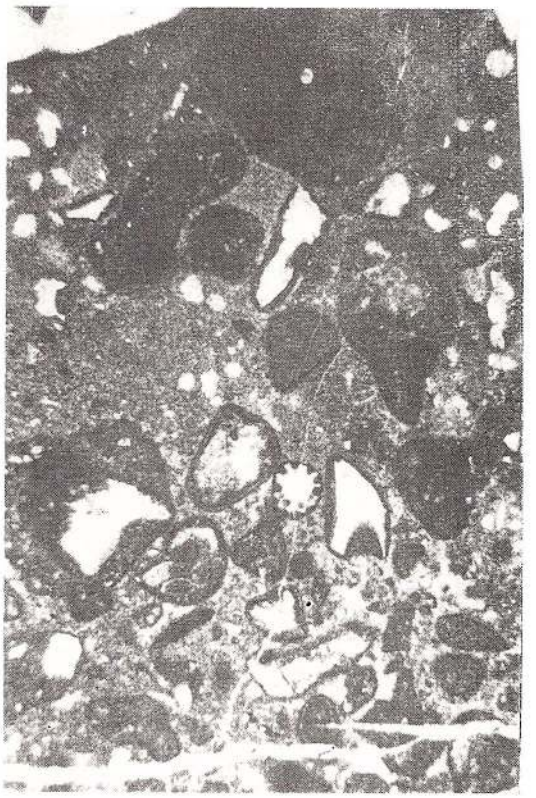

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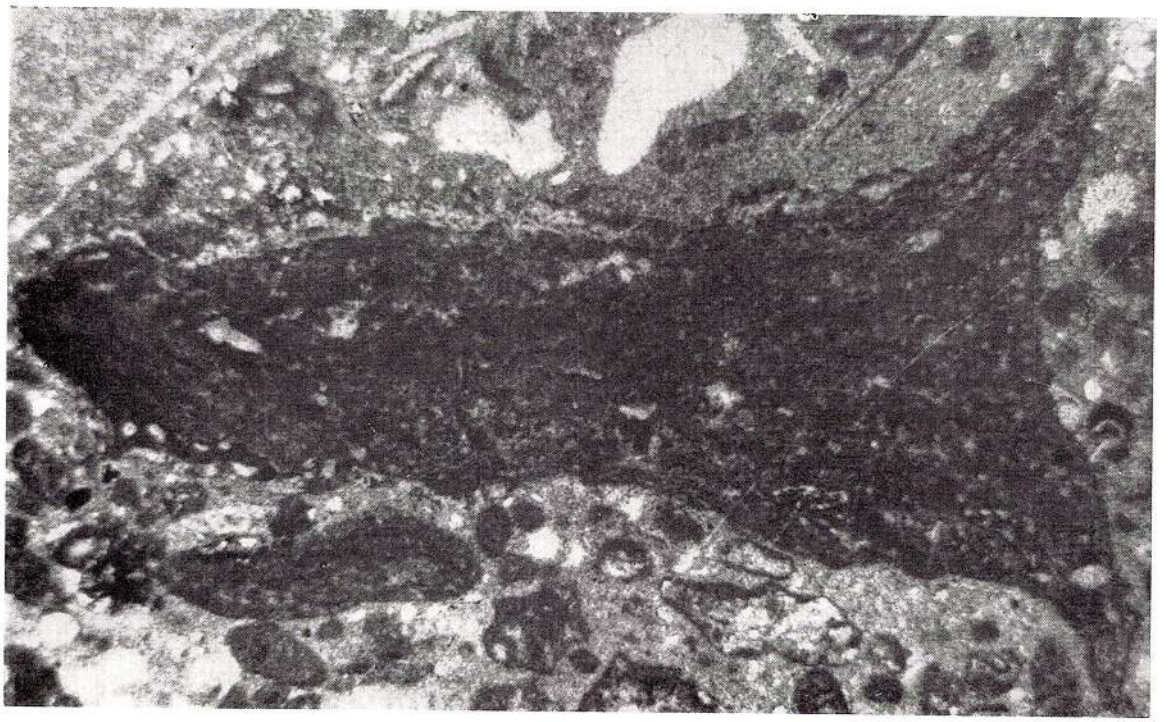
PLATE XXXIII

Fig. 1. — Algal-biolitithe with columnoidal "*Micro-oncolithe*" (ELL—C), Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, Ghilcoș Mts., × 50.

Fig. 2. — Biopelsparite with *Trocholina alpina* (Leupold), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9392, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Actinoporella podolica* (Alth), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9471, Făgetul Ciucului Mts., × 30.



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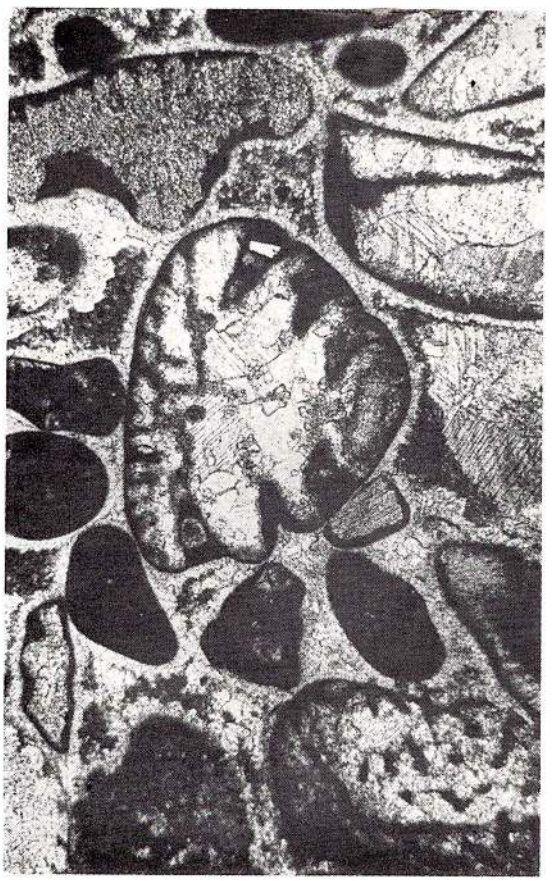

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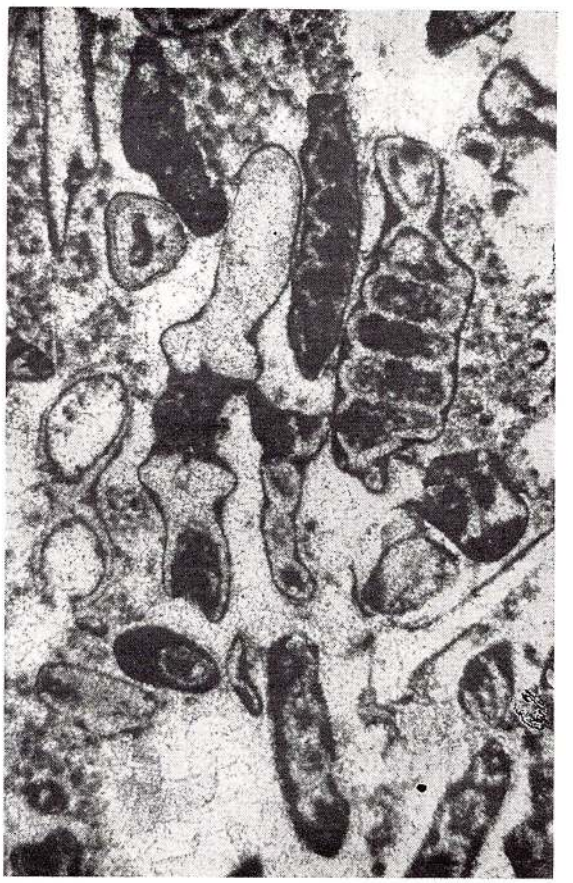

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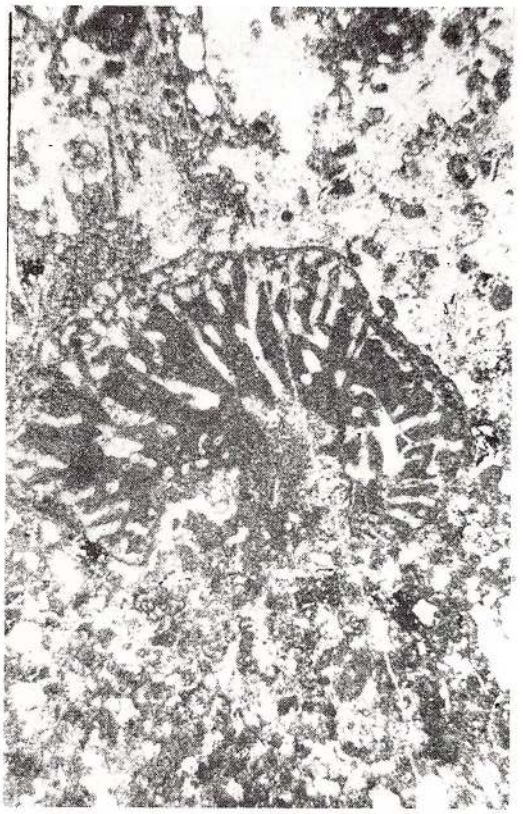
PLATE XXXIV

Fig. 1. — Biopelsparite with *Ortonella lemoineae* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9345, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with echinoid spines, *Clypeina jurassica* Zone, Upper Tithonian, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Favreina salevensis* (Parejas) and *Chitinoidella* sp., *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9504, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with *Acicularia elongata* Carozzi, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9442, Ghilcoș Mts., × 30.



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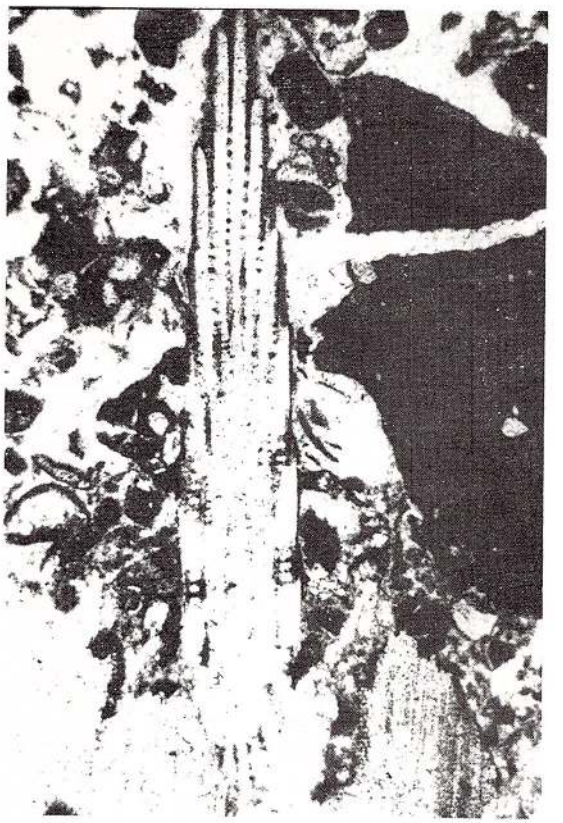

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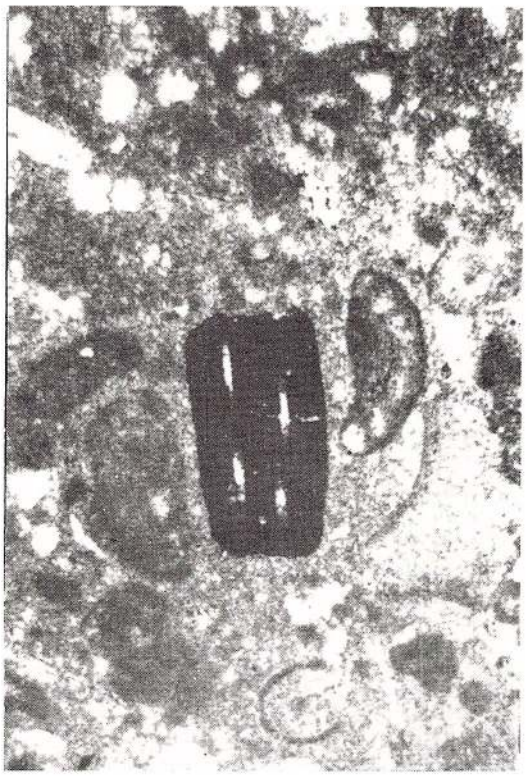

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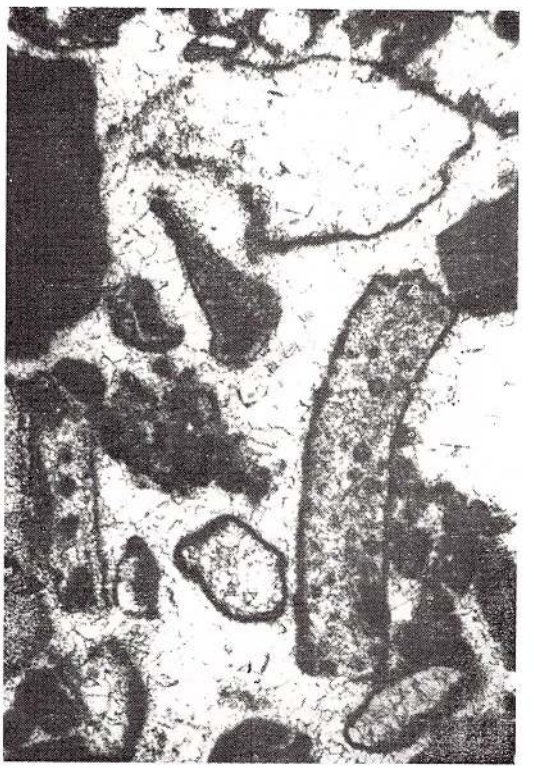

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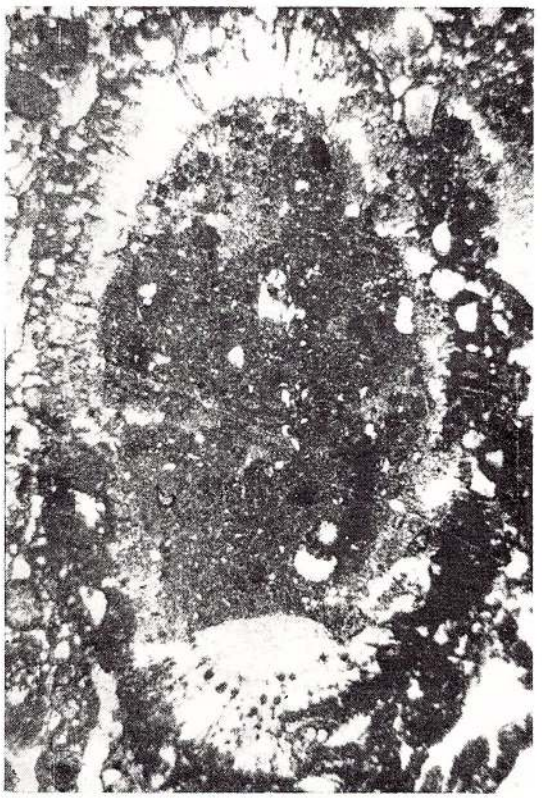
PLATE XXXV

Fig. 1. — Biopelsparite with *Arabicodium jurassicum* D r a g a s t a n, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9333, Făgetul Ciucului Mts., × 30.

Fig. 2—3. — Biopelsparite with *Clypeina jurassica* (F a v r e), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9450, Făgetul Ciucului and Bicăjel I Mts., × 30.

Fig. 4. — Bioopelsparite, *Clypeina jurassica* Zone, Upper Tithonian, Ghilcoș Mts., × 15.



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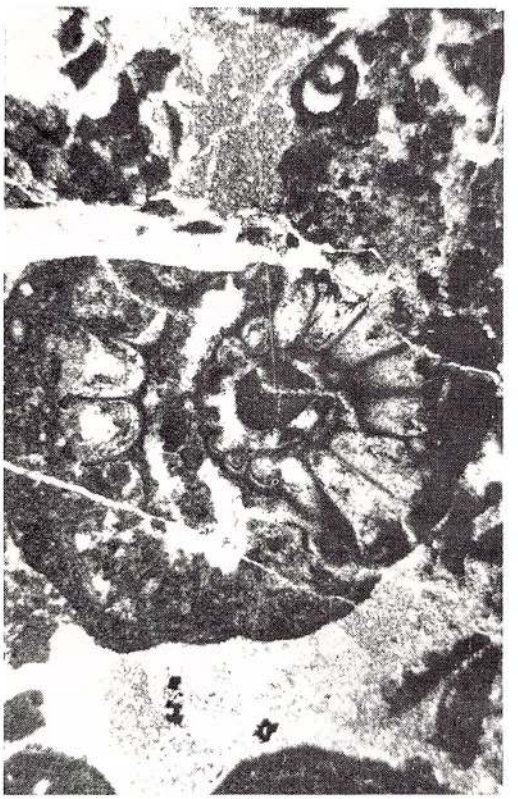

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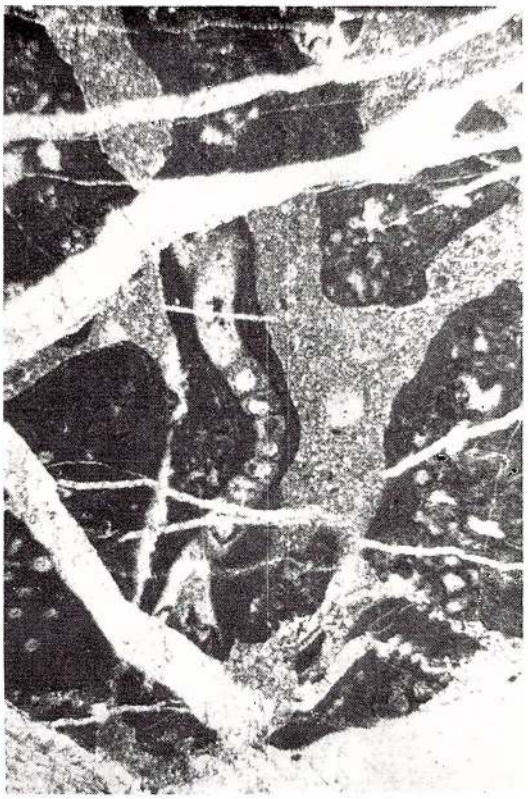

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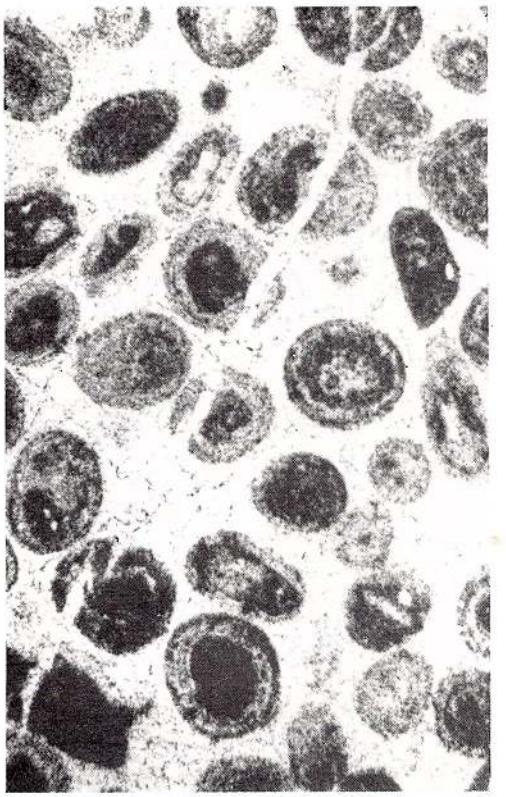

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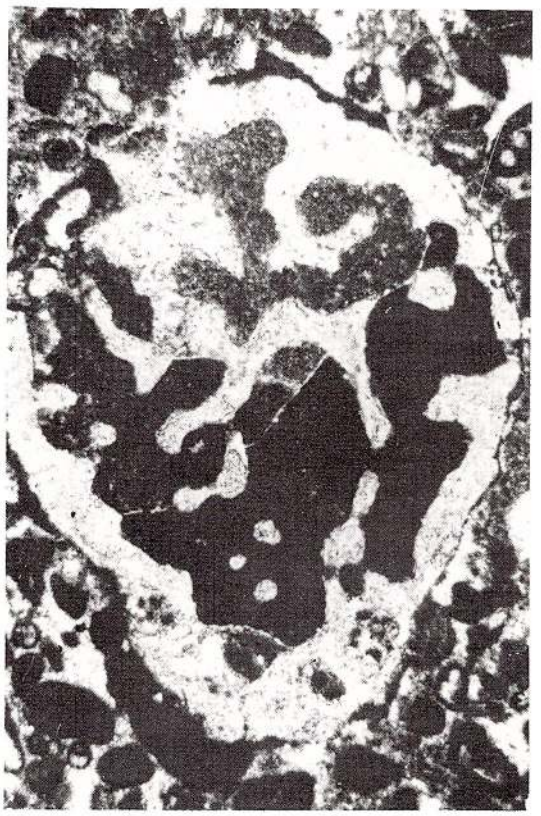
PLATE XXXVI

Fig. 1. — Biolitithe with *Cladocoropsis* sp., *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 3293, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Torinosuella peneropliformis* (Yabe & Hanzawa) and reworked pelmicrite, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9416, Ghilcoș Mts., × 15

Fig. 3. — Biopelsparite with *Rectocyclammina chouberti* Hottinger, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9874, Făgetul Ciucului Mts., × 30.

Fig. 4. — Biopelsparite with *Actinoporella podolica* (Alth), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9471, Făgetul Ciucului Mts., × 30.



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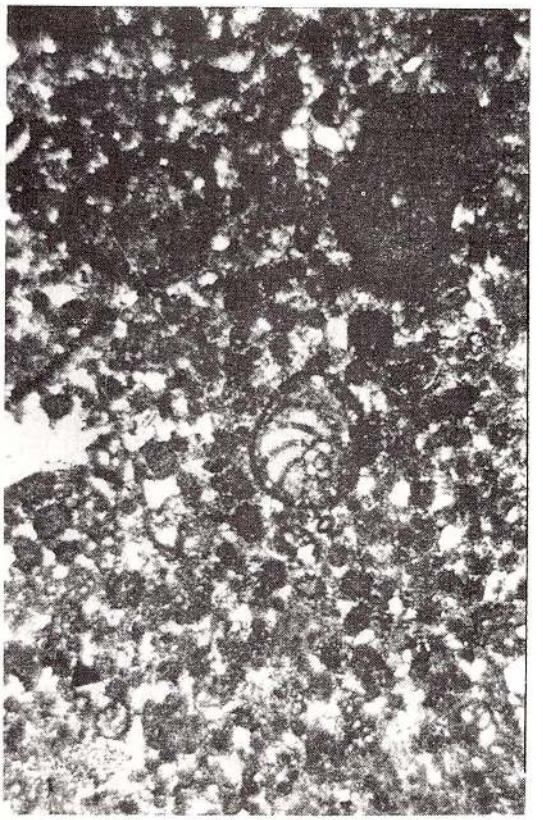

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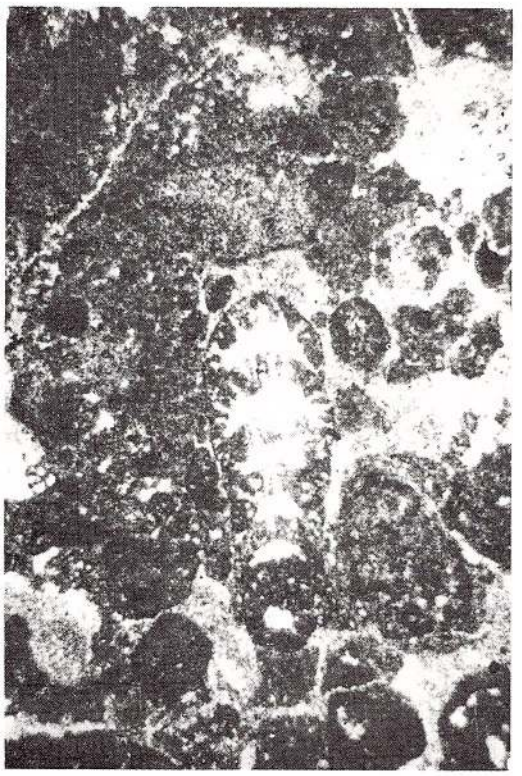

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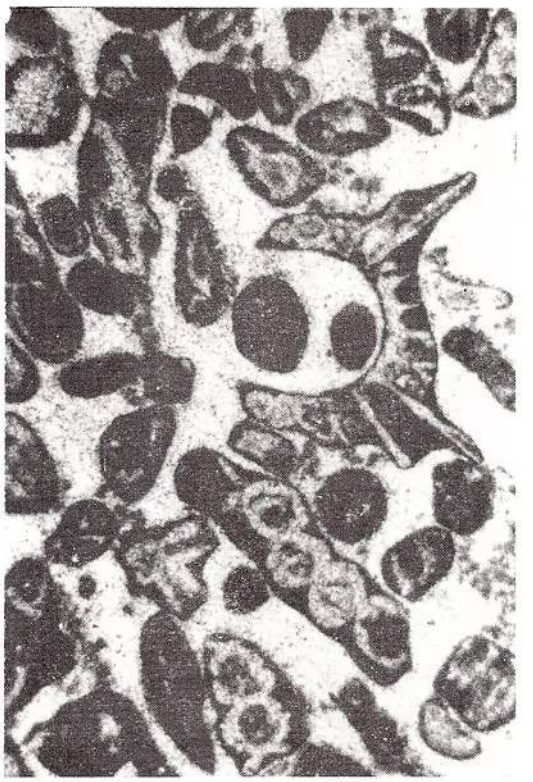

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PLATE XXXVII

Fig. 1, 4. — Biopelsparite with *Actinoporella podolica* (A l t h), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9471, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelsparite with *Cayeuxia moldavica* F r o l l o, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9484, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Pseudoepimastopora jurassica* E n d o, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9466, Ghilcoș Mts., × 30.

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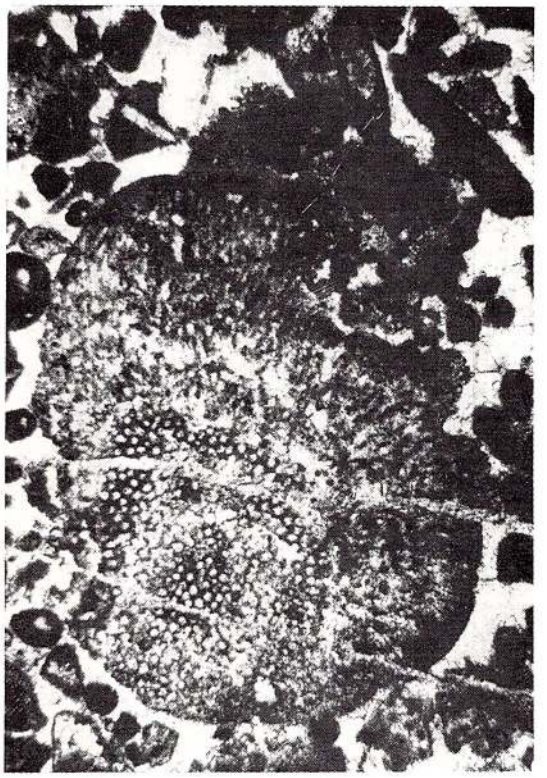

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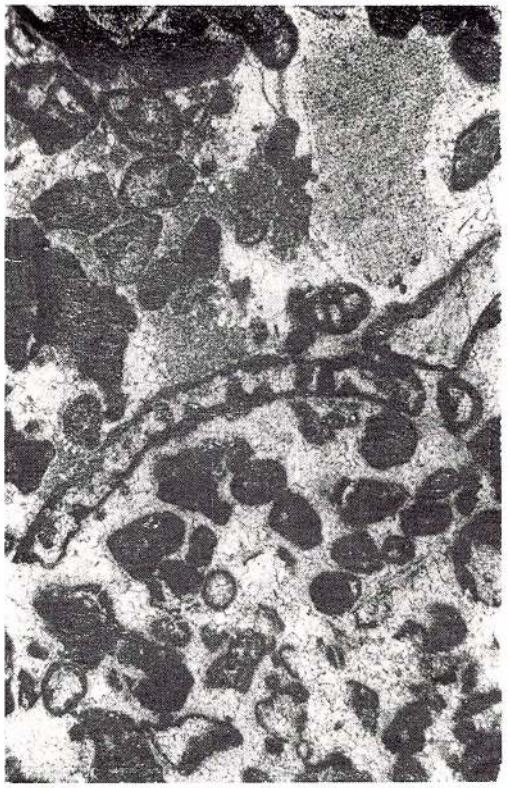

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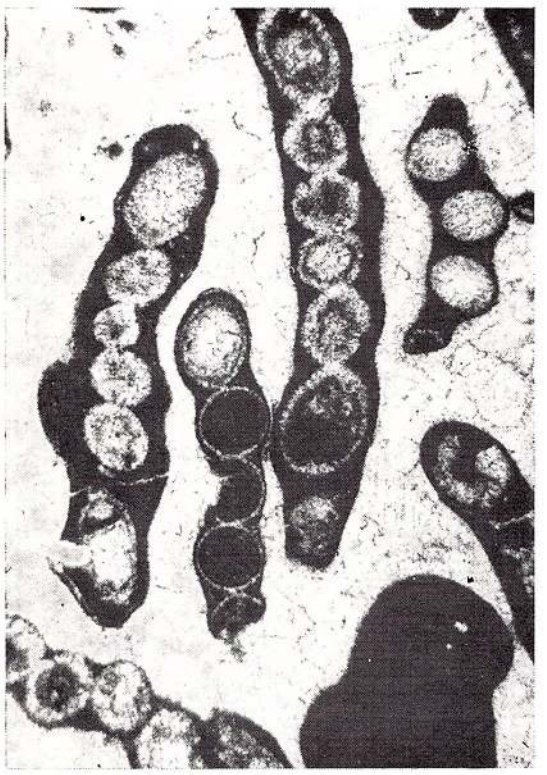

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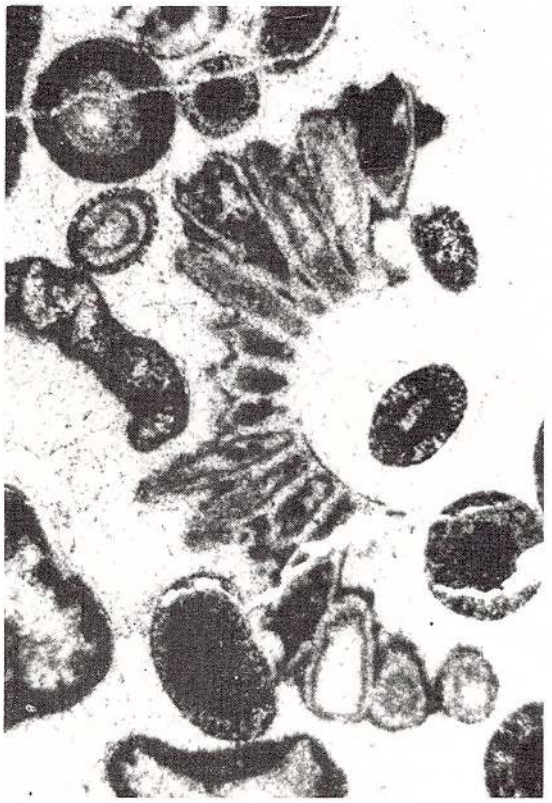
PLATE XXXVIII

Fig. 1. — Biopelsparite with *Actinoporella podolica* (Alth), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9471, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelsparite with *Cayeuxia* aff. *kurdistanensis* Elliott, *C. moldavica* Frollo and *Trocholina elongata* (Leupold), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9487, L.P.B. 9484, L.P.B. 9394, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Likanella* sp. (*L.* aff. *bartheli* Bernier), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 0013, Făgetul Ciucului Mts., × 30.

Fig. 4. — Bioopelsparite with reworked oopellets, *Clypeina jurassica* Zone, Upper Tithonian Ghilcoș Mts., × 30.



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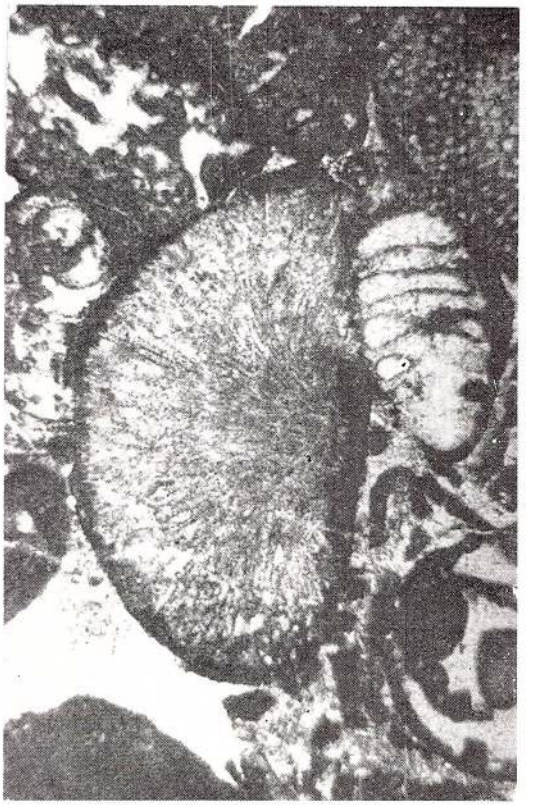

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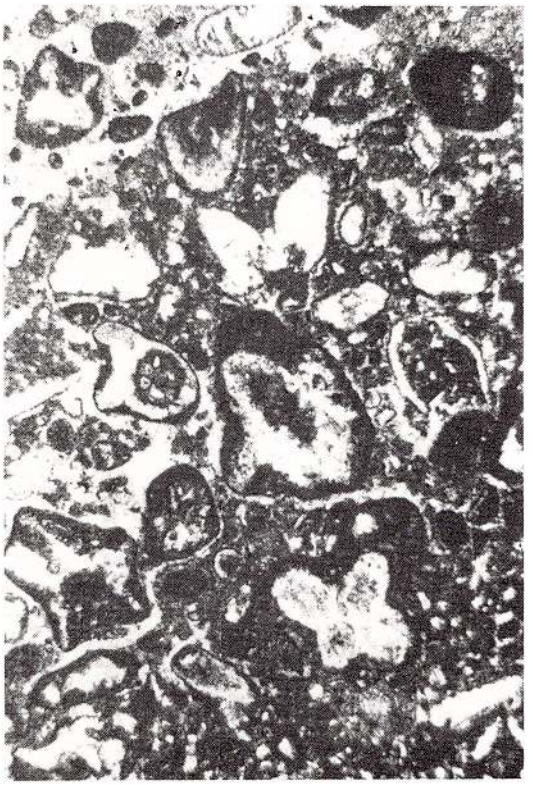

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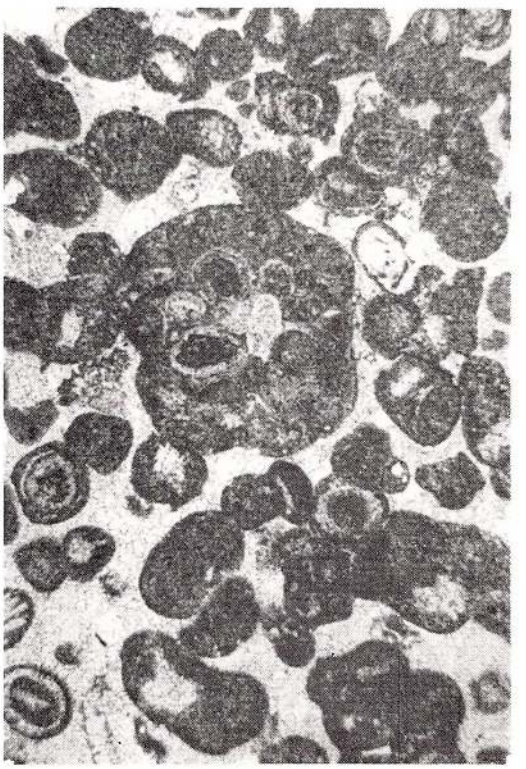

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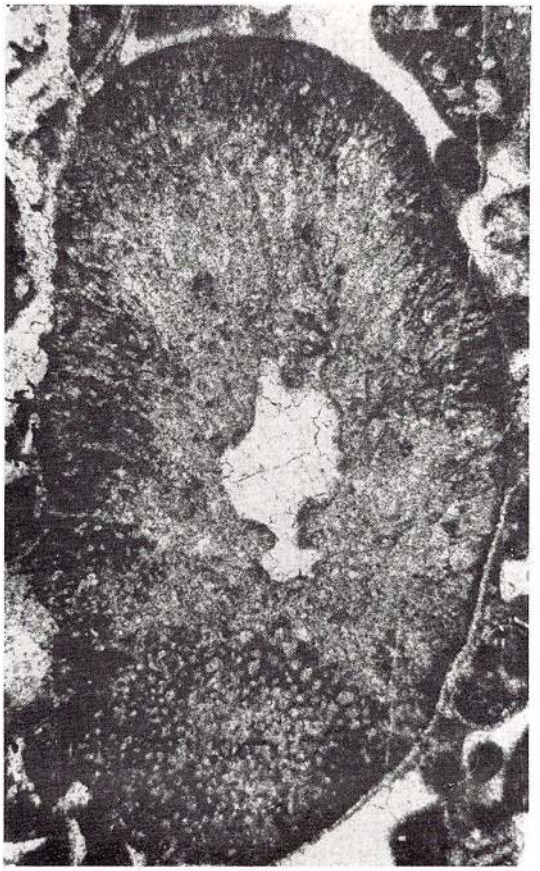
PLATE XXXIX

Fig. 1. — Algal-biolitithe with *Cayeuxia elliotti* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9340, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biostromite with *Cryptoplocus zitteli* (Gemmerallo), *Clypeina jurassica* Zone, Upper Tithonian, Făgetul Ciucului Mts., × 30.

Fig. 3. — Algal-biolitithe with *Griphoporella piae* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9321, Făgetul Ciucului Mts., × 30.

Fig. 4. — Pelitoid sandstone with *Nautiloculina oolithica* Mohler, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9428, Ghilcoș Mts., × 30.



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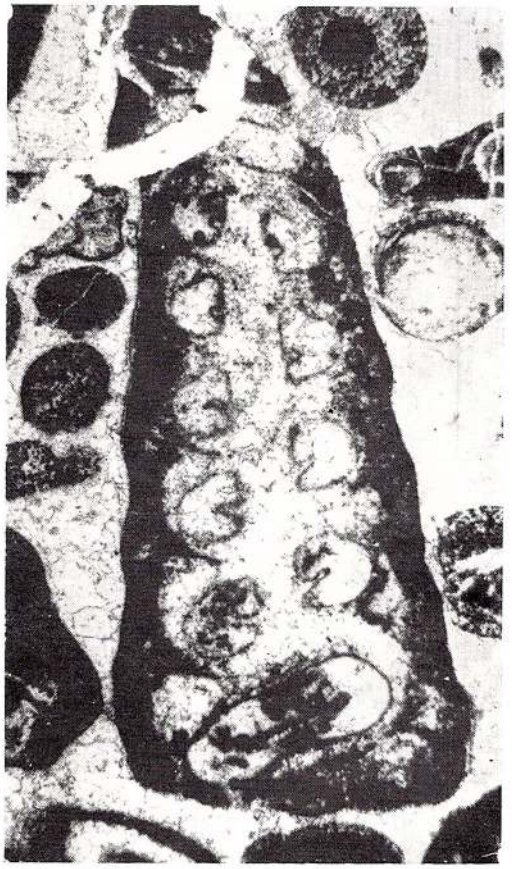

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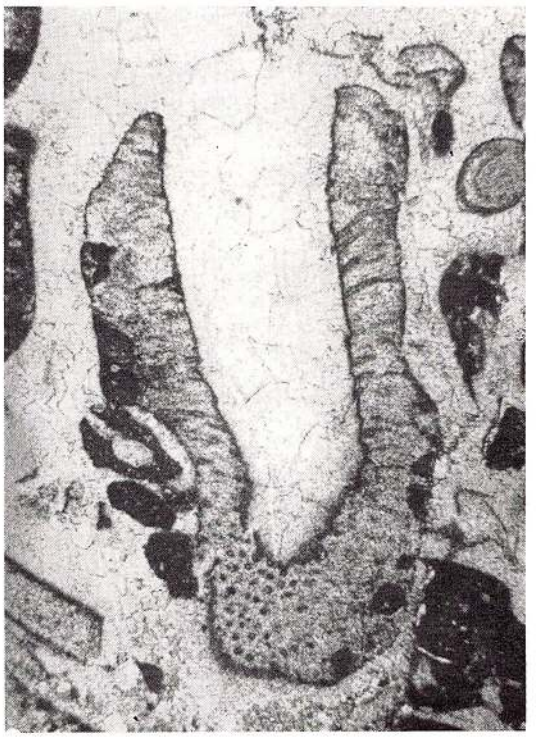

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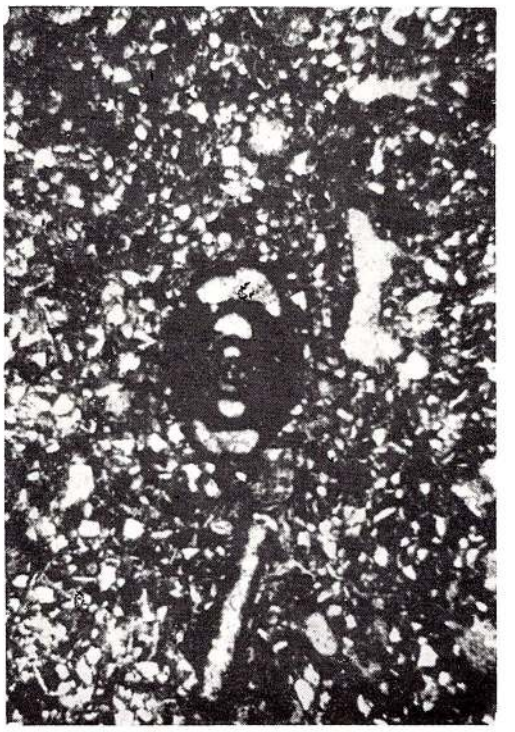

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PLATE XL

Fig. 1. — Biopelsparite with *Conicospirillina basiliensis* Mohler and *Lithophyllum*? *maslov* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9373 and L.P.B. 9347, Bicăjel I Mts., × 30.

Fig. 2. — Biopelmicrite with *Clypeina jurassica* (Favre), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9450, Bicăjel I Mts., × 30.

Fig. 3. — Biopelsparite with *Petrascula bursiformis* (Etallon) and *Trocholina alpina* (Leupold), *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9179 and L.P.B. 9392, Făgetul Ciucului Mts., × 30.

Fig. 4. — Biopelsparite with *Teutloporella obsoleta* Carozzi and *Nautiloculina oolithica* Mohler, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9462 and L.P.B. 9428 Făgetul Ciucului Mts., × 30.

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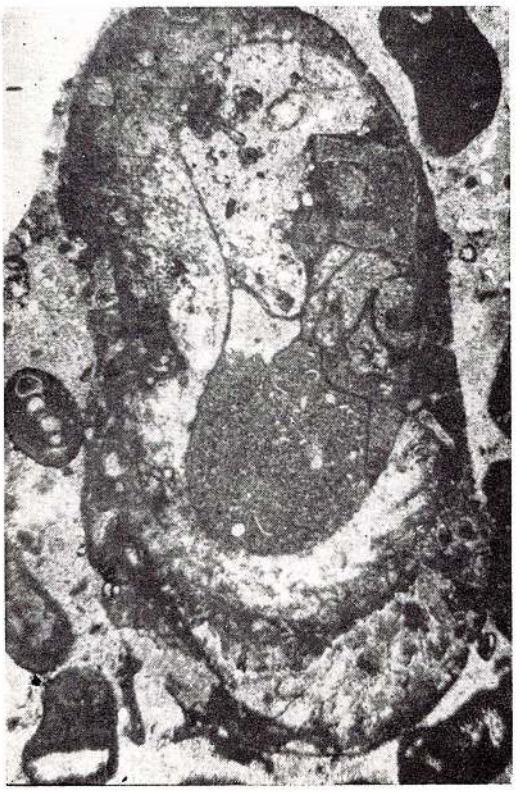

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PLATE XLI

Fig. 1. — Biopelsparite with *Arabicodium jurassicum* Dragastan, *Clypeina jurassica* Zone, Upper Tithonian, L.P.B. 9333, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelmicrite with *Likanella* sp. (*L.* aff. *bartheli* Bernier) and *Trocholina elongata* (Leupold), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 0013, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Likanella* sp. (*L.* aff. *bartheli* Bernier) and *Everticyclammina virguliana* (Koechlin), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 0013, Făgetul Ciucului Mts., × 30.

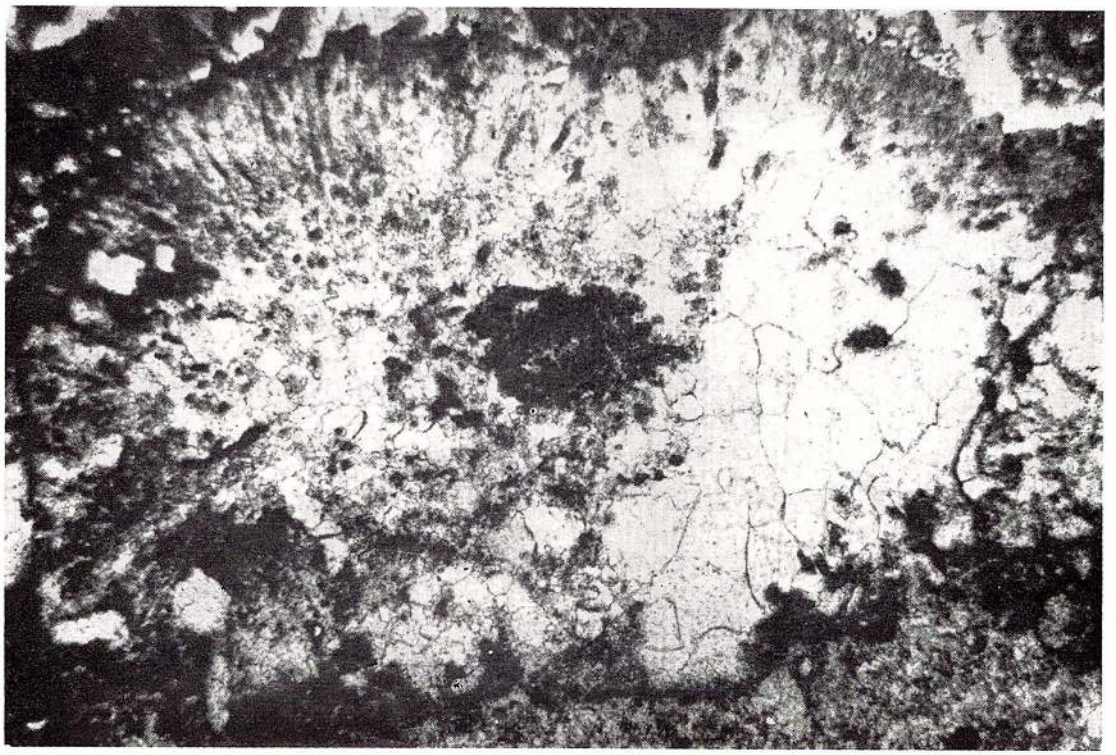

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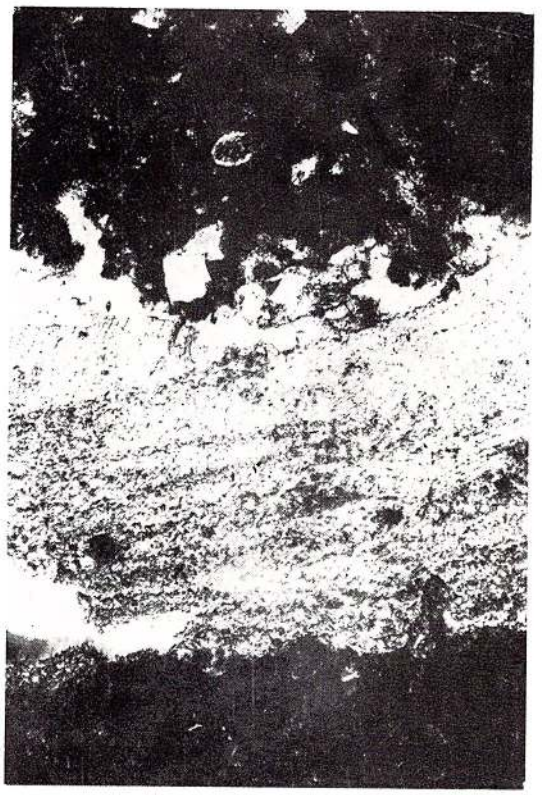
PLATE XLII

Fig. 1. — Biomicrite with *Calpionella alpina* Lorenz, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9507, Făgetul Ciucului Mts., × 100.

Fig. 2. — Biomicrite with *Calpionella alpina* Lorenz and *Tintinnopsella carpathica* (Murgeanu & Filipescu), *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9507 and L.P.B. 9509, Ghilcoș Mts., × 100.

Fig. 3. — Biopelmicrite with *Tintinnopsella remanei* Borza and *Crassicollaria parvula* Remane, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9872 and L.P.B. 9508, Bicăjel I Mts., × 100.

Fig. 4. — Biopelmicrite with *Crassicollaria parvula* Remane, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9508, Bicăjel I Mts., × 100.



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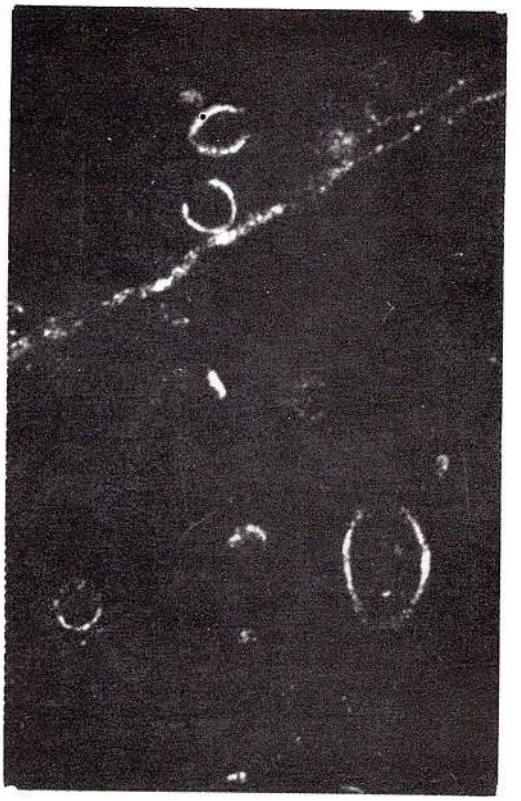

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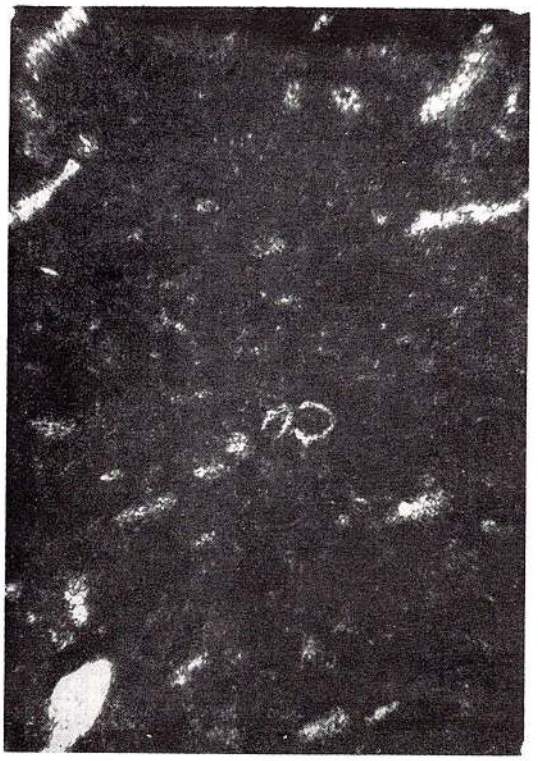

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PLATE XLIII

Fig. 1. — Biopelmicrite with *Calpionella alpina* Lorenz, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9507, Ghilcoş Mts., × 100.

Fig. 2. — Biopelmicrite with *Calpionella elliptica* Cadisch, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9871, Ghilcoş Mts., × 100.

Fig. 3. — Biopelsparite with *Tintinnopsella carpathica* (Murgeanu & Filipescu) specific to Tithonic terminal, L.P.B. 9509, Ghilcoş Mts., × 100.

Fig. 4. — Biopelmicrite with *Durandella helentappani* Dragastan and Calpionellids, *Crassocollaria* Zone, Upper Tithonian, Bedeleu range, Trascău Mts., × 30.

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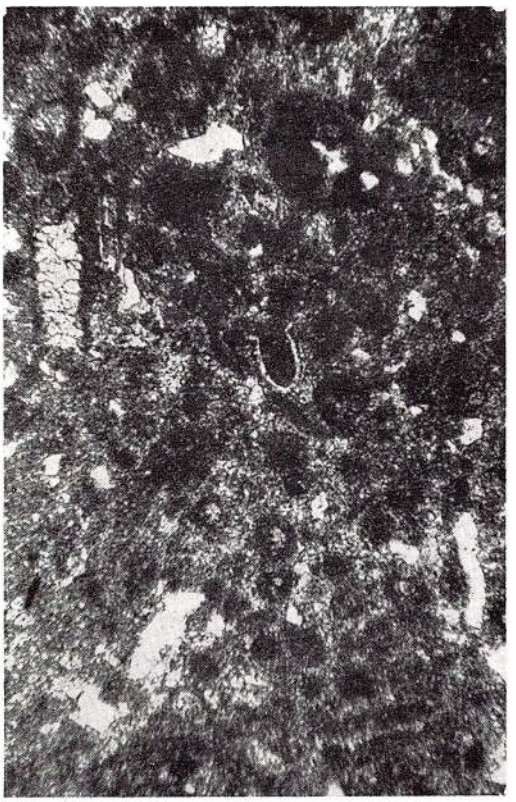

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PLATE XLIV

Fig. 1. — Biopelmicrite with *Nipponophycus* aff. *ramosus* Yabe & Toyama, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9497, Ghilcoș Mts.. × 30.

Fig. 2. — Biopelmicrosparite with *Pseudocyclammina lituus* (Yok.), *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9412, Ghilcoș Mts., × 30.

Fig. 3. — Biostromite with *Nerinea zeuschneri* Peters, *Macroporella praturloni* Zone, Upper Tithonian-Ghilcoș Mts., × 30.

Fig. 4. — Biostromite with *Plygmatis carpathica* Zeuschner, *Macroporella praturloni* Zone, Upper Tithonian, Ghilcoș Mts., × 1.

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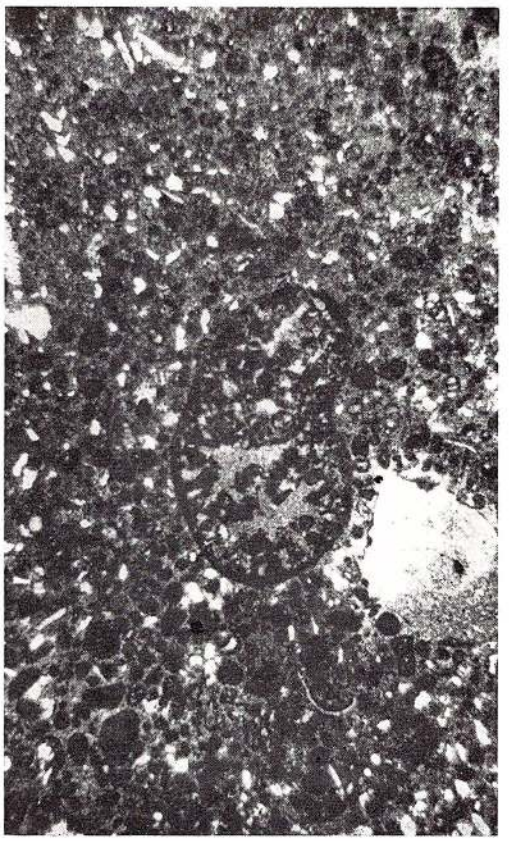

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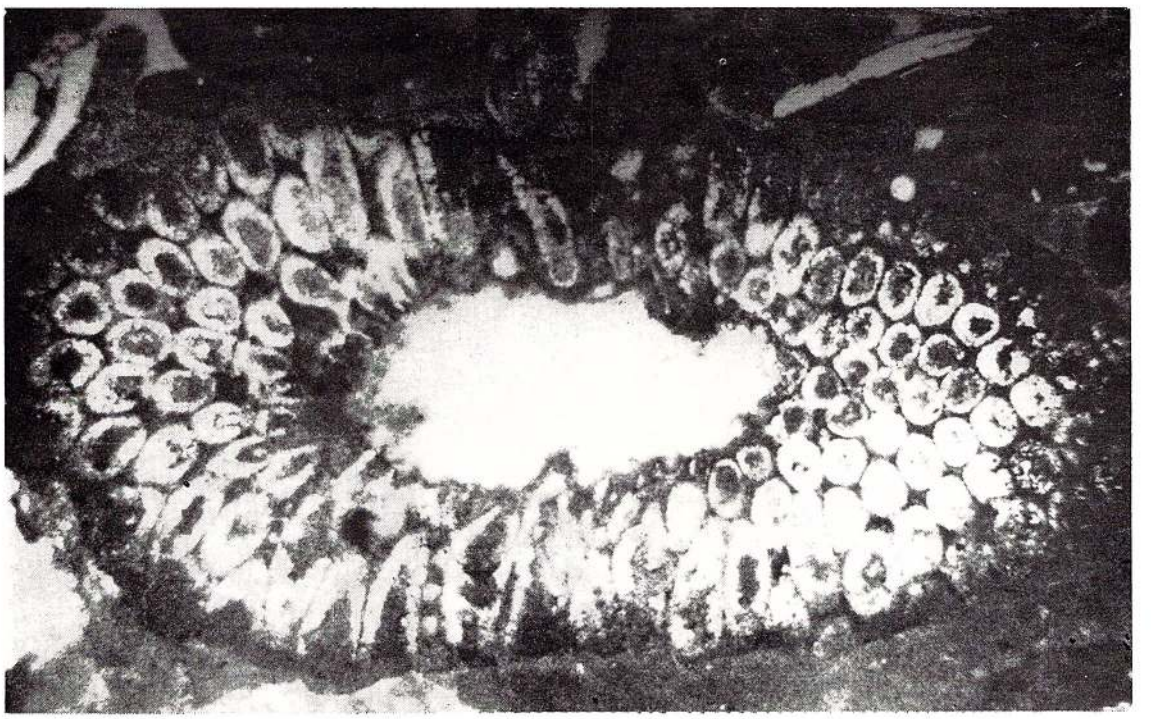
PLATE XLV

Fig. 1. — Biopelmicrite with *Macroporella praturloni* Dragastan, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9322, Ghilcoș Mts., × 30.

Fig. 2—3. — Algal-biolitithe with *Cymopolia jurassica* Dragastan and *Griphoporella piae* Dragastan, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9455 and L.P.B. 9321, Făgetul Ciucului Mts., × 15.



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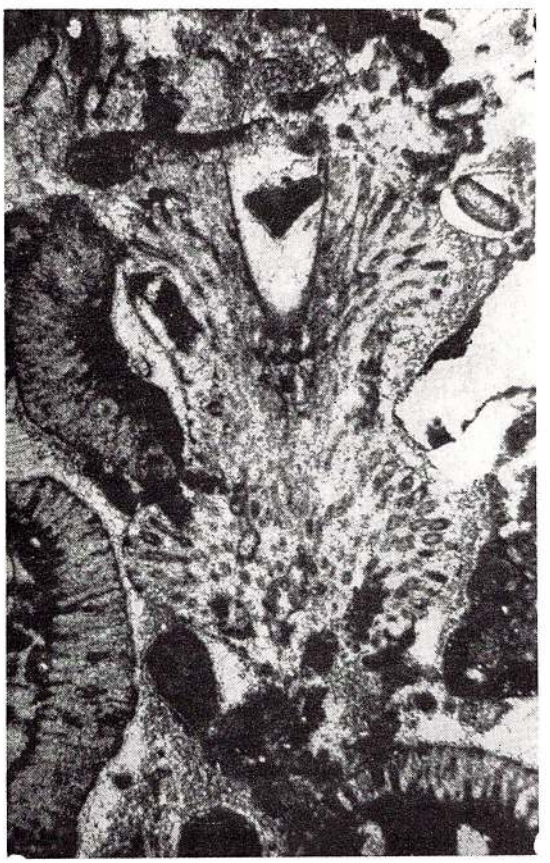

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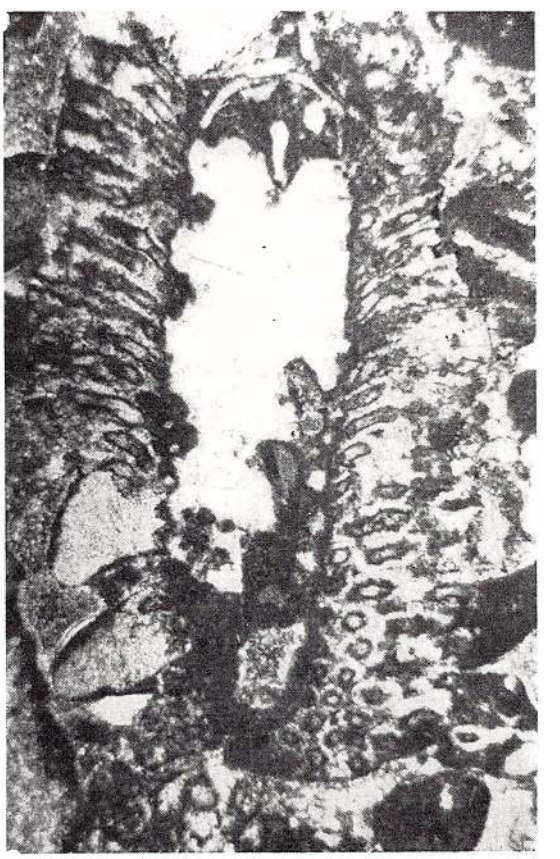

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PLATE XLVI

Fig. 1. — Biopelsparite with *Rectocyclammina chouberti* Hottinger and *Pseudocyclammina* sp., *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9874, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Conicospirillina basiliensis* Mohler, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9373, Făgetul Ciucului Mts., × 30.

Fig. 3. — Bioopelsparite with *Trocholina elongata* (Leupold) and gastropods, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9394, Făgetul Ciucului Mts., × 30.

Fig. 4. — Algal-biolitithe with *Cayeuxia moldavica* Frollo, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9484, Făgetul Ciucului Mts., × 30.

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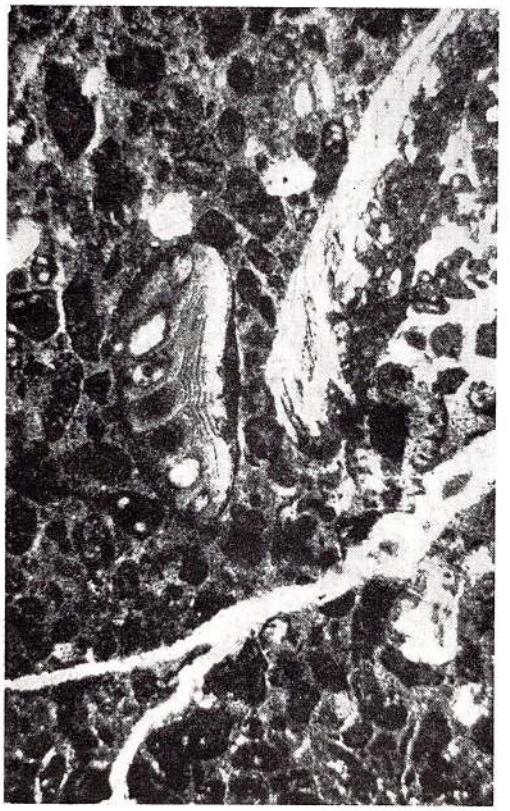

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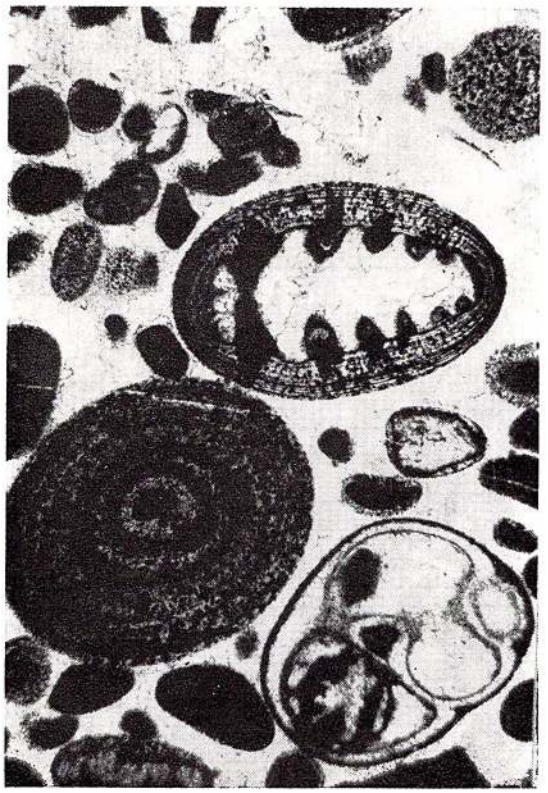

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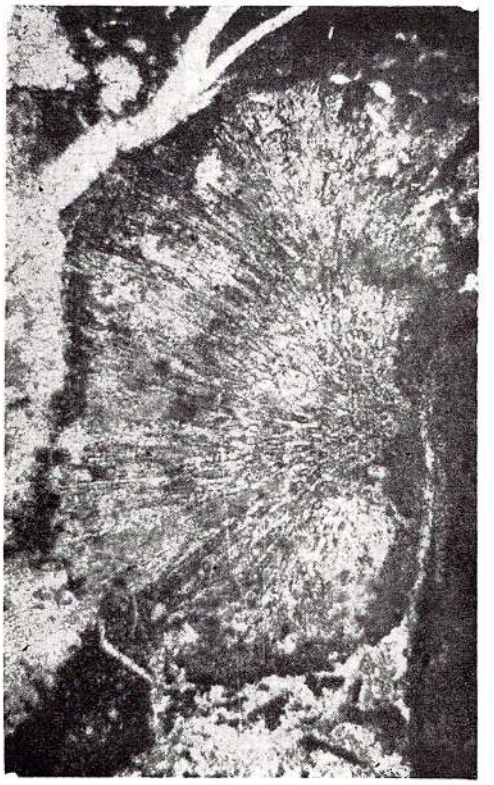

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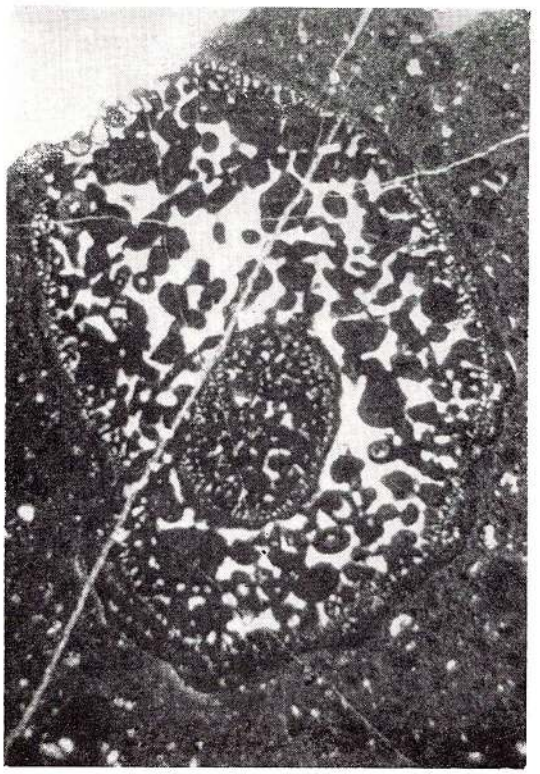
PLATE XLVII

Fig. 1—2. — Biopelmicrite with *Anchispirocyclina lusitanica* (E g g e r), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9417, Făgetul Ciucului Mts., × 30.

Fig. 3—4. — Biopelsparite with *Pseudocyclammina* aff. *lituus* (Y o k.) and fragments of *Likanella* sp., *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9412 a, Făgetul Ciucului Mts., × 30.



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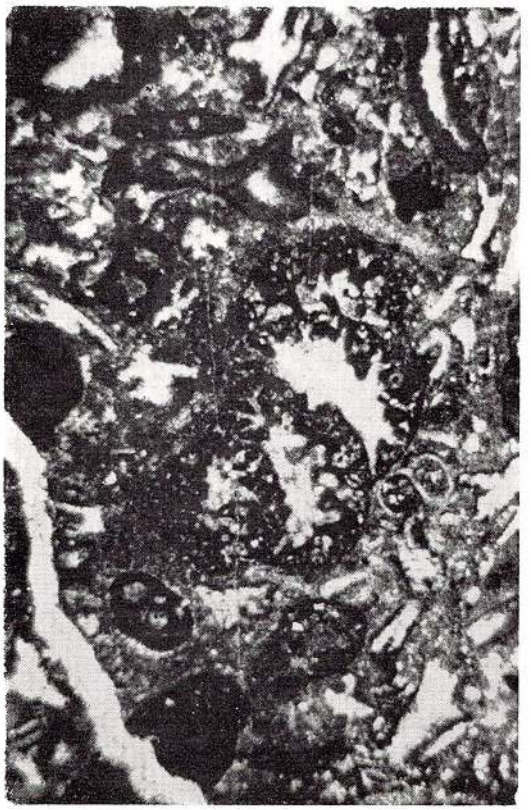

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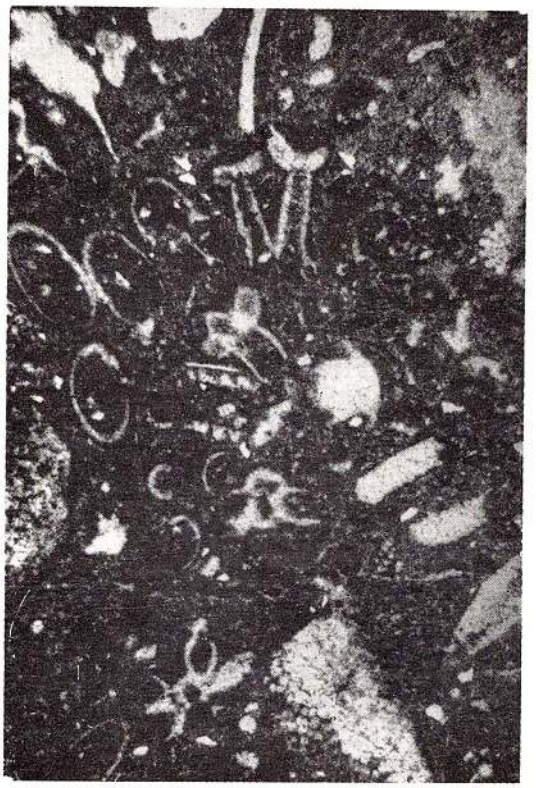
PLATE XLVIII

Fig. 1. — Biopelmicrite with *Radoiciciella subtilis* Dragastan, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9328, Ghilcoș Mts., × 15.

Fig. 2. — Biopelsparite with "*Dasycladacea*" and gastropods fragments, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, Ghilcoș Mts., × 30.

Fig. 3—4. — Biopelsparite with *Likanella* sp. (*L.* aff. *bartheli* Bernier) and *Trocholina elongata* (Leupold), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 0013 and L.P.B. 9394, Făgetul Ciucului Mts., × 15.



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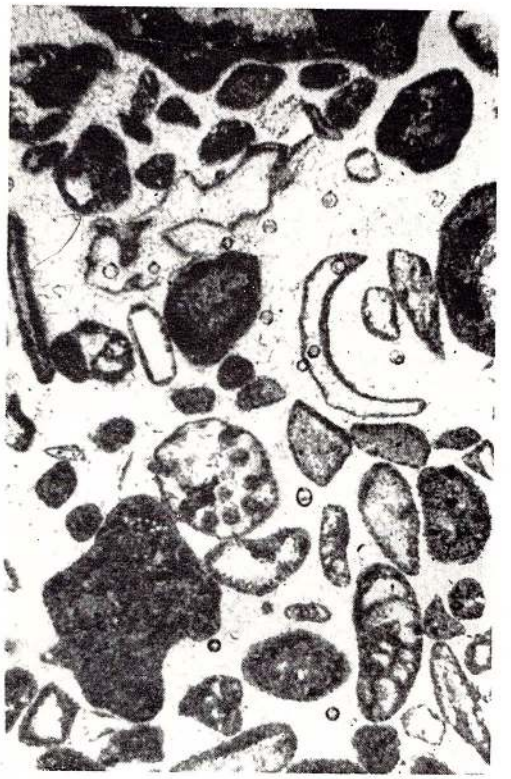

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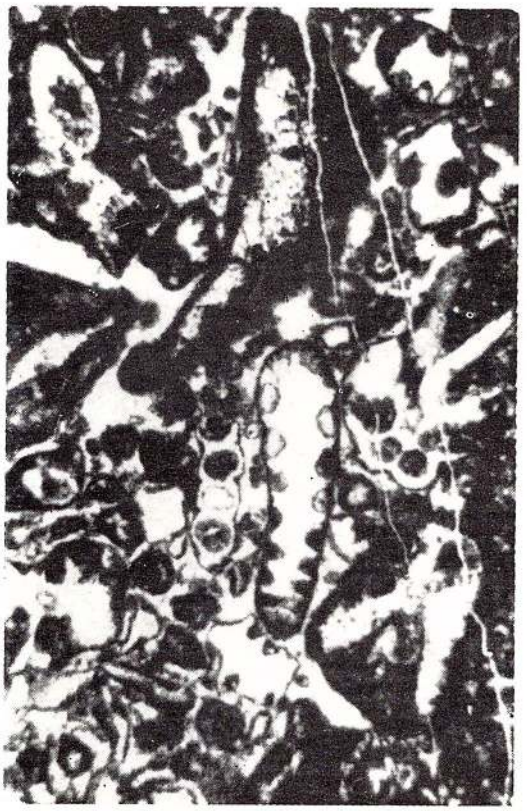

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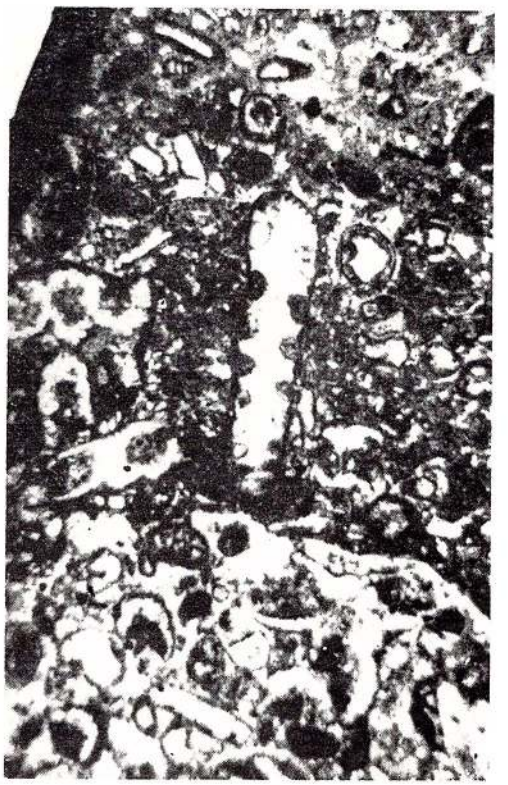

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PLATE XLIX

Fig. 1. — Biopelmicrite with *"Dasycladacea"*, *Likanella* sp. and fragments of *Radoiciciella subtilis* Dragastan, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 0014, Ghilcoș Mts., × 15.

Fig. 2. — Biopelsparit with *Everticyclammina irregularis* n.sp., paratype, L.P.B. 9879, *Clypeina* sp., and *Acicularia* sp., *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts., × 15.

Fig. 3—4. — Biopelmicrite with *Likanella* sp. and *Trocholina elongata* (Leupold), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 0013 and L.P.B. 9394, Făgetul Ciucului Mts., × 15.

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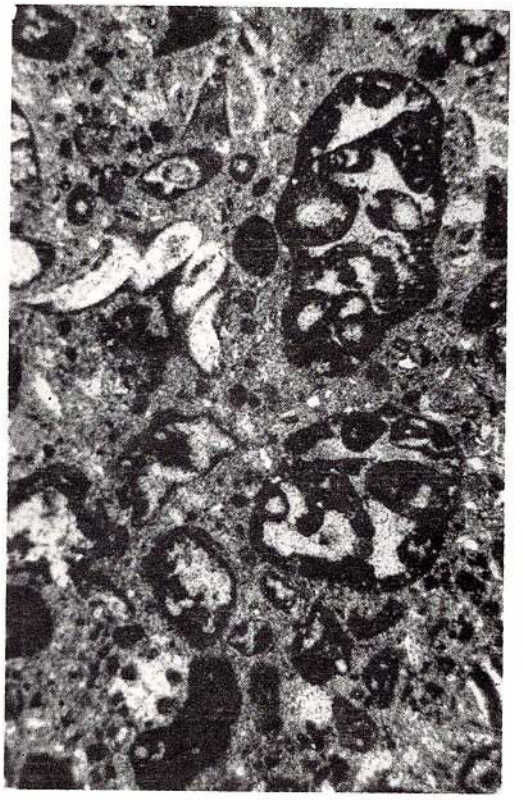

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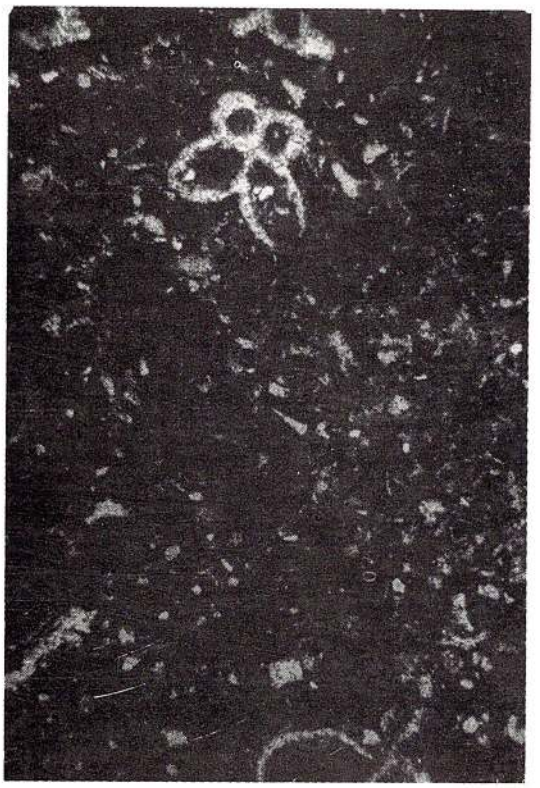

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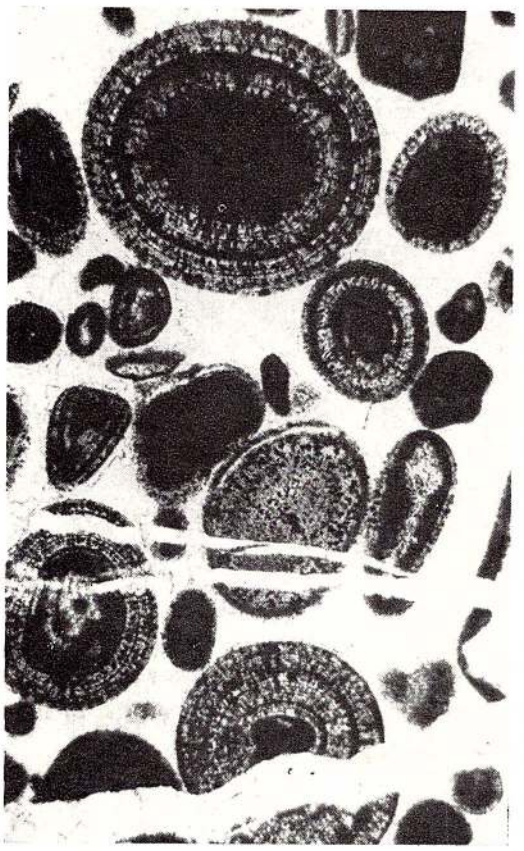
PLATE L

Fig. 1. — Bioopelsparite with different types of oolites, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts., × 15.

Fig. 2. — Bioopelsparite with broken and reworked oolites, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts., × 15.

Fig. 3—4. — Biopelmicrite with *Everticyclammina virguliana* (K o e c h l i n), *Calpionella* Zone, Berriasian, L.P.B. 9875, Bicăjel I Mts., × 30.



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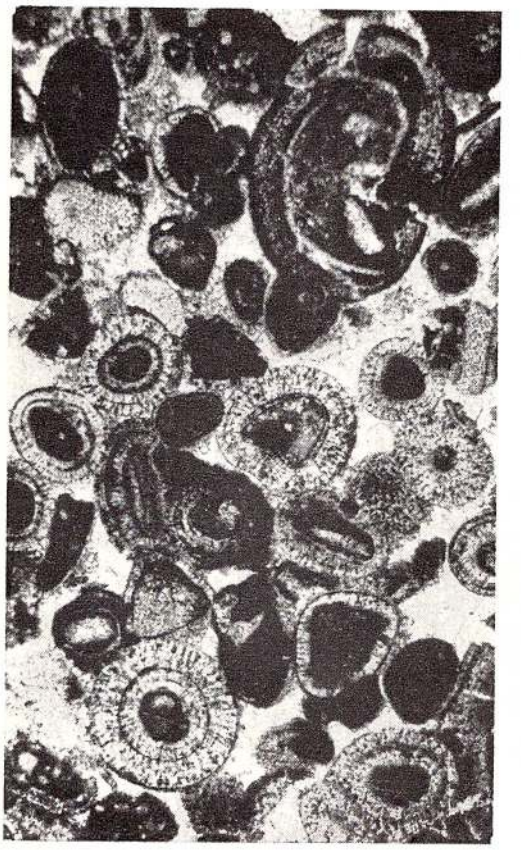

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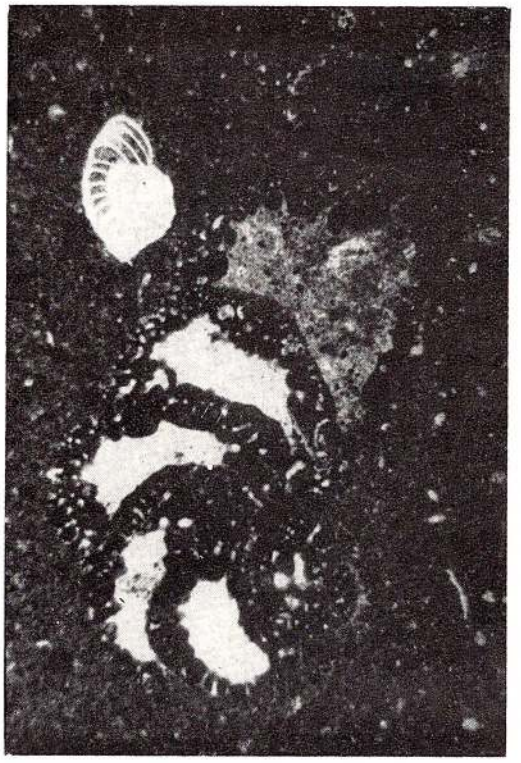

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PLATE LI

Fig. 1. — Biopelsparite with *Trocholina elongata* (L e u p o l d) and fragments of *Likanella* sp., *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9394 and L.P.B. 0013, Făgetul Ciucului Mts., × 15.

Fig. 2. — Algal-biolitithe, biopelsparite with *Macroporella praturloni* D r a g a s t a n, *Pseudoepimastopora cretacea* D r a g a s t a n and *Actinoporella podolica* (A l t h), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9322, L.P.B. 9467 and L.P.B. 9471, Făgetul Ciucului Mts., × 15.

Fig. 3. — Algal-biolitithe, biopelmicrite with *Cayeuxia piae* F r o l l o, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9485, Făgetul Ciucului Mts., × 15.

Fig. 4. — Biopelsparite with *Nautiloculina oolithica* M o h l e r and reworked pelmicrite with *Conicospirillina basiliensis* M o h l e r, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9428 and L.P.B. 9373, Făgetul Ciucului Mts., × 15.

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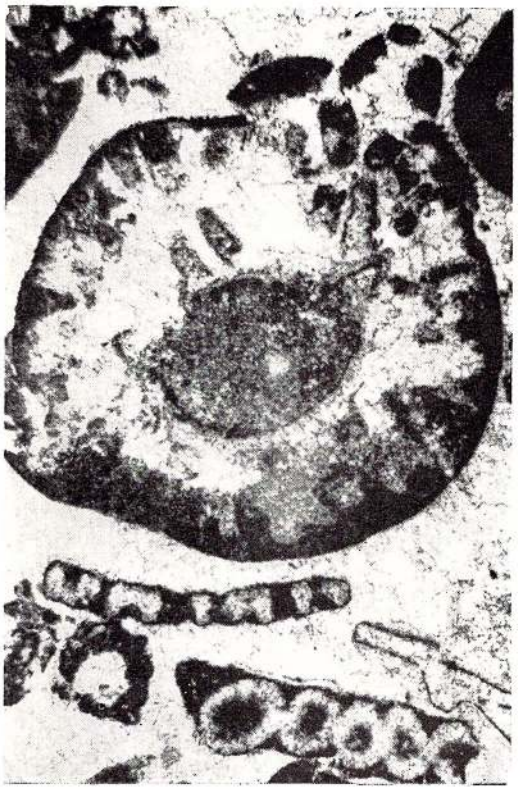

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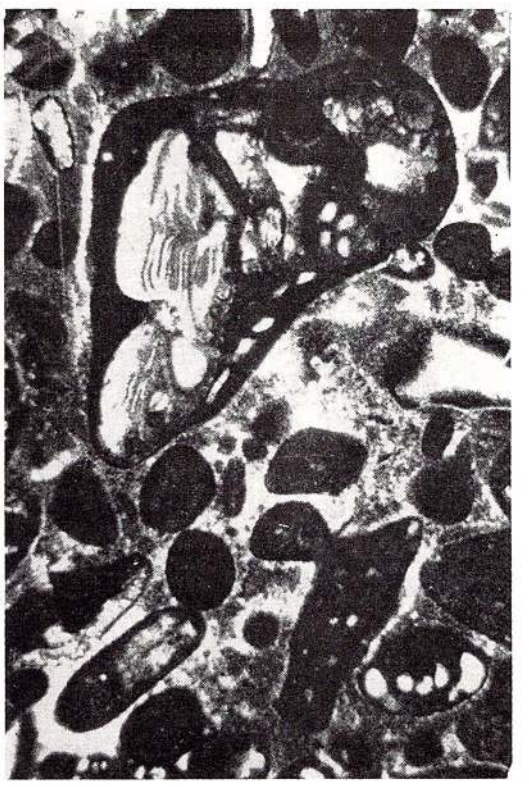

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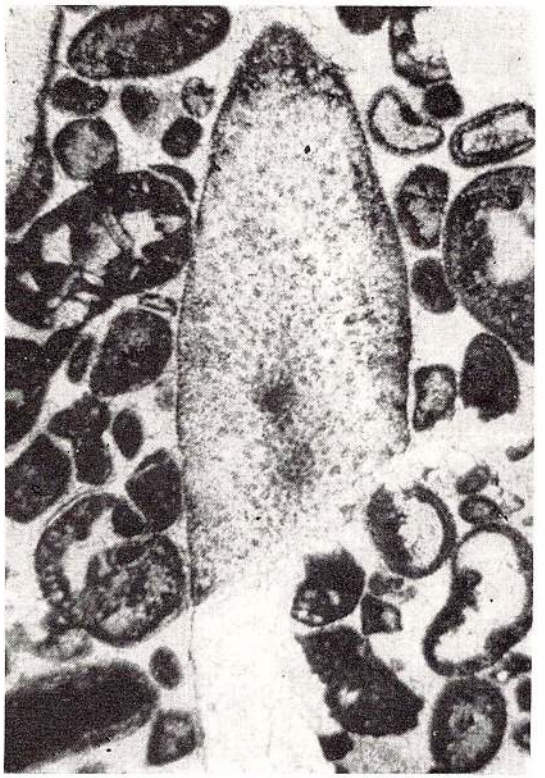
PLATE LII

Fig. 1. — Biopelsparite with *Permocalculus* sp., *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 0016, Făgetul Ciucului Mts., × 30.

Fig. 2, 4. — Algal-biolitithe with *Actinoporella podolica* (A l t h), *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9471, Făgetul Ciucului Mts., × 15.

Fig. 3. — Biopelsparite with *Everticyclammina* aff. *elegans* R e d m o n d, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9877, Făgetul Ciucului Mts., × 30.



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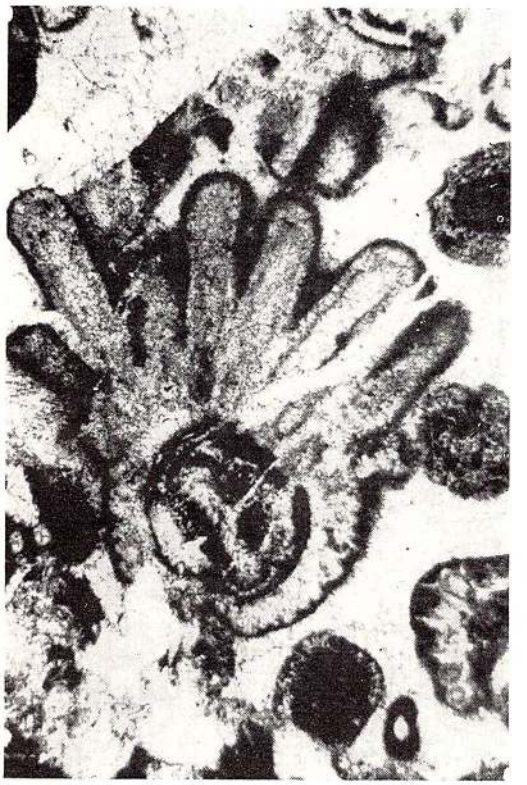

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PLATE LIII

Fig. 1—4. — Biopelsparite with *Everticyclammina irregularis* n.sp., 1—3 holotype; 4 paratype, L.P.B. 9878 and 9879, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, Făgetul Ciucului Mts., × 15.

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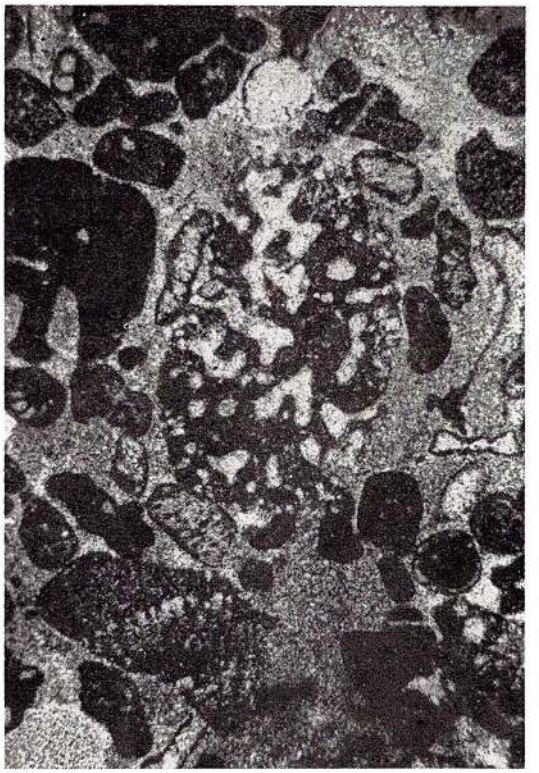

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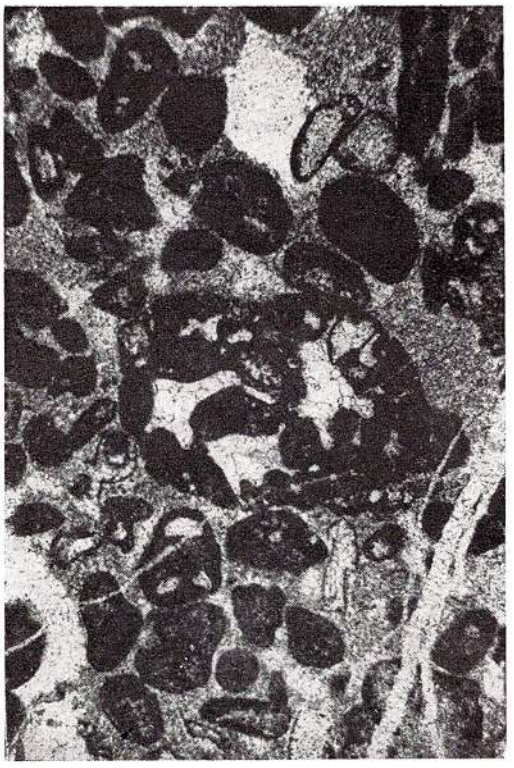

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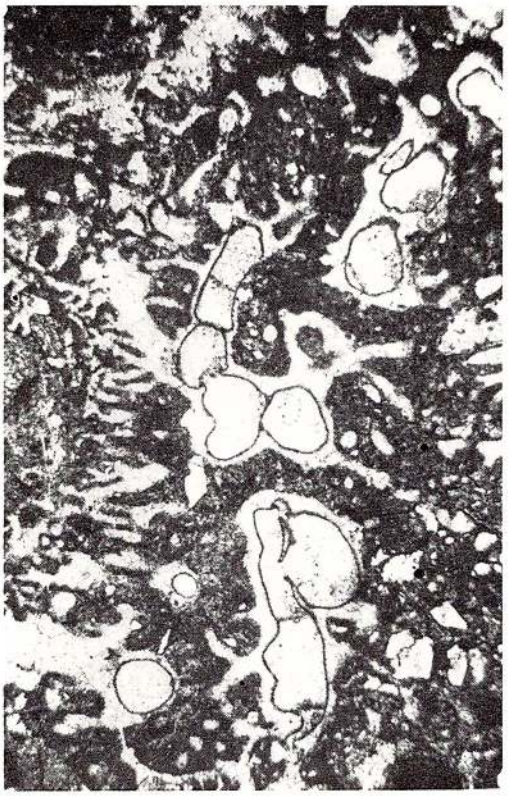
PLATE LIV

Fig. 1. — Algal-biolitithe with *Lithocodium morikawai* E n d o, *Anchispirocyclina* Zone, Upper Tithonian, L.P.B. 9490, Făgetul Ciucului Mts., × 15.

Fig. 2. — Bioopelsparite with *Cayeuxia atanasiui* D r a g a s t a n, *Anchispirocyclina* Zone, Upper Tithonian, L.P.B. 9341, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Cayeuxia anae* D r a g a s t a n, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9339, Bicăjel II Mts., × 15.

Fig. 4. — Biopelmicrite with *Cayeuxia atanasiui* D r a g a s t a n, *Macroporella praturloni* Zone, Upper Tithonian-Berriasian, L.P.B. 9341, Ghilcoş Mts., × 30.



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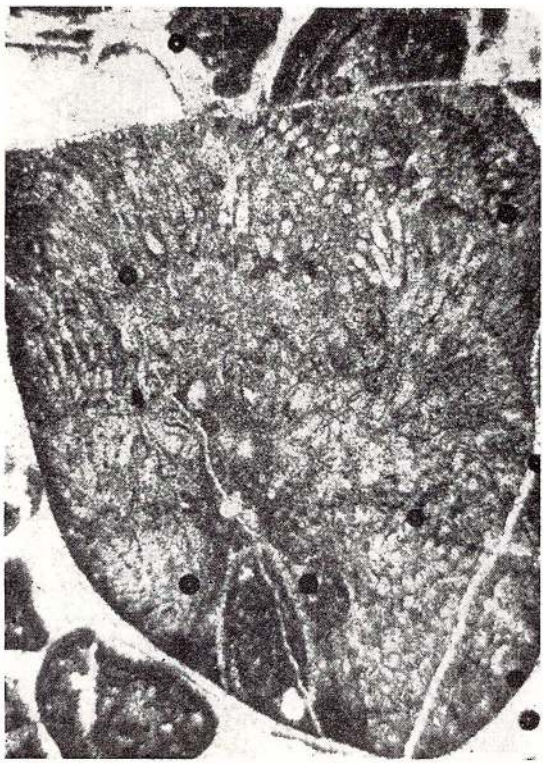

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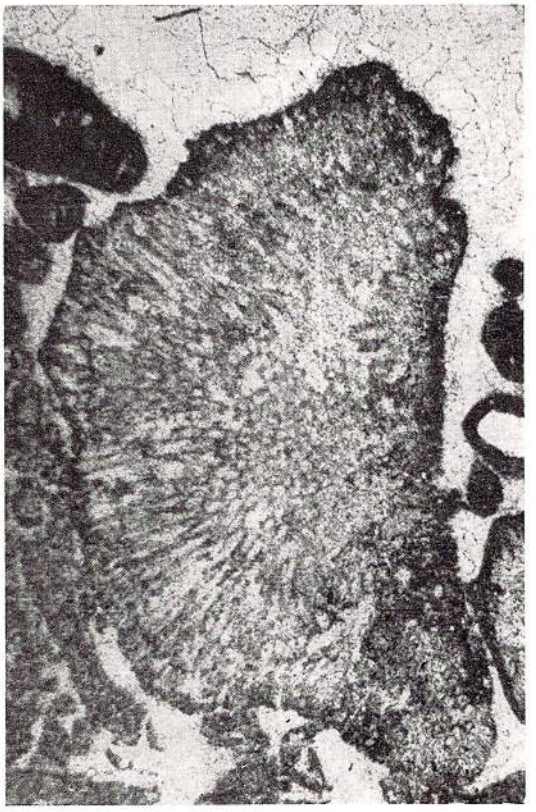
PLATE LV

Fig. 1. — Algal-biolitithe, biopelsparite with *Cayeuxia moldavica* F r o l l o, *Calpionella* Zone, Upper Tithonian-Berriasian, L.P.B. 9484, Bicăjel I Mts., × 30.

Fig. 2. — Biopelsparite with *Teutloporella socialis* P r a t u r l o n, *Anchispirocyclina* Zone, Upper Tithonian, L.P.B. 9463, Cupaș Mts., × 30.

Fig. 3. — Biopelsparite with *Petrascula bursiformis* (E t a l l o n), *Anchispirocyclina* Zone, Upper Tithonian, L.P.B. 9479, Făgetul Ciucului Mts., × 30.

Fig. 4. — Biopelmicrite with *Torinosuella peneropliformis* (Y a b e & H a n z a w a), fragments of *Radoiciciella sublilis* D r a g a s t a n, *Likanella* sp., *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9416 and L.P.B. 9328, Ghilcoș Mts., × 30



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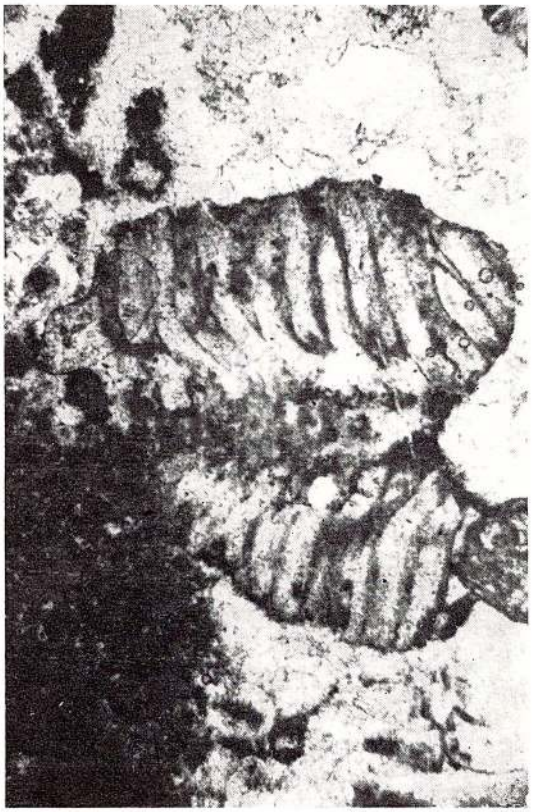

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PLATE LVI

Fig. 1. — Biopelmicrite with *Tintinnopsella carpathica* (Murgeanu & Filipescu), type caracteristic for Jurassic-Cretaceous boundary, *Calpionella* Zone, L.P.B. 9509, Ghilcoș Mts. (western slope), × 150.

Fig. 2—3. — Biopelmicrite with *Calpionella elliptica* Cadisch, *Calpionella* Zone, Berriasian, L.P.B. 9871, Ghilcoș and Bicăjel II Mts., × 110.

Fig. 4. — Biopelsparite with *Pseudocyclammina* aff. *lituus* (Yok.), *Calpionella* Zone, Berriasian, L.P.B. 9412, a, Ghilcoș Mts., (eastern slope), × 15.

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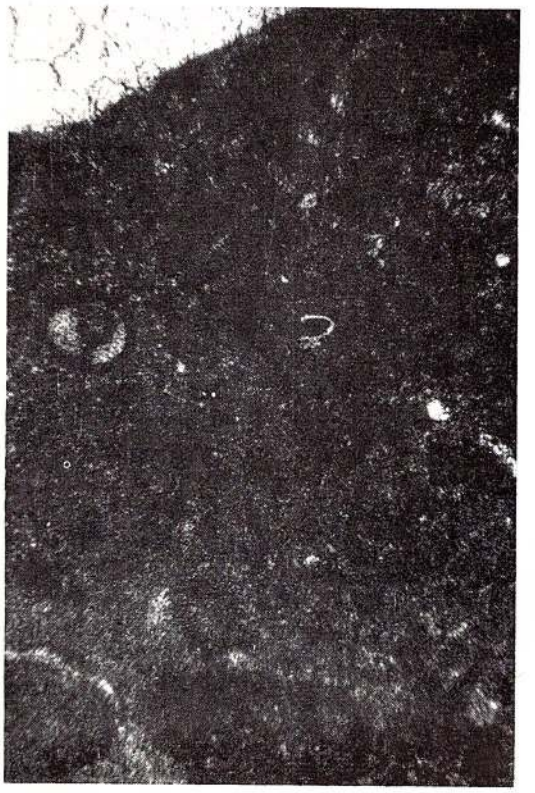

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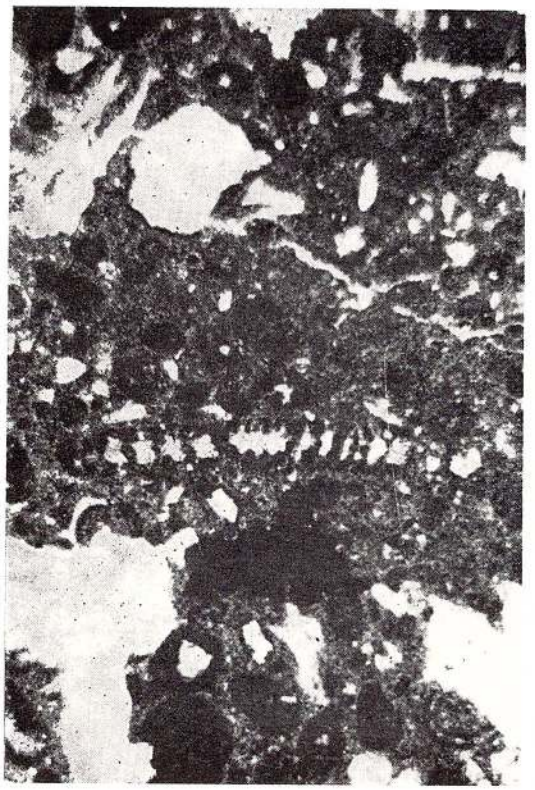
PLATE LVII

Fig. 1. — Biopelsparite with *Torinosuella peneropliformis* (Yabe & Hanzawa), *Feurtillia frequens* Zone, Berriasian-Lower Valanginian, L.P.B. 9416, Ghilcoș, × 30.

Fig. 2. — Biopelsparite with *Feurtillia* sp., *Cayeuxia anae* Dragastan, fragments of *Radoiciciella subtilis* Dragastan, *Feurtillia frequens* Zone, Berriasian-Lower Valanginian, L.P.B. 9339 and L.P.B. 9328, Ghilcoș Mts. × 30.

Fig. 3. — Biopelsparite with *Rectocyclammina chouberti* Hottinger, *Feurtillia frequens* Zone, Berriasian-Lower Valanginian, L.P.B. 9874, Ghilcoș Mts., × 30.

Fig. 4. — Biopelmicrite with *Anchispirocyclina lusitanica* (Egger) and *Clypeina* ? *solkani* Conrad & Radoicic, *Anchispirocyclina* Zone, Upper Tithonian-Berriasian, L.P.B. 9417 and L.P.B. 0010, Făgetul Ciucului Mts., × 15.



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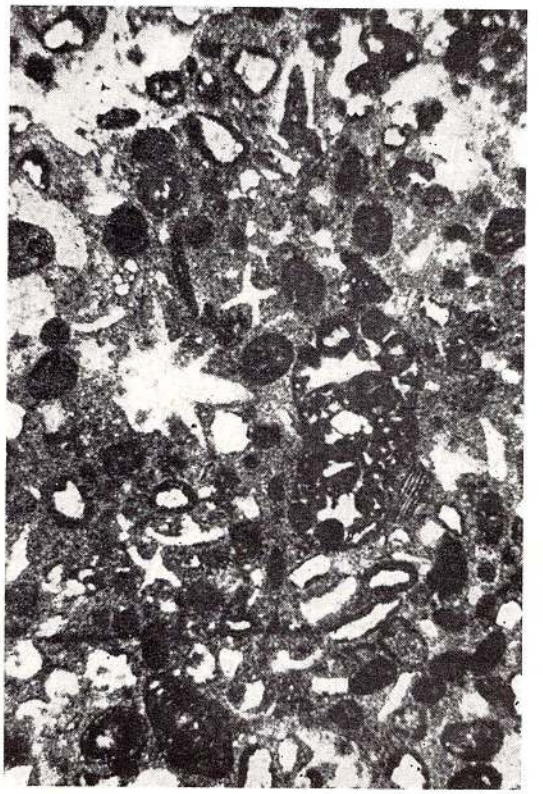

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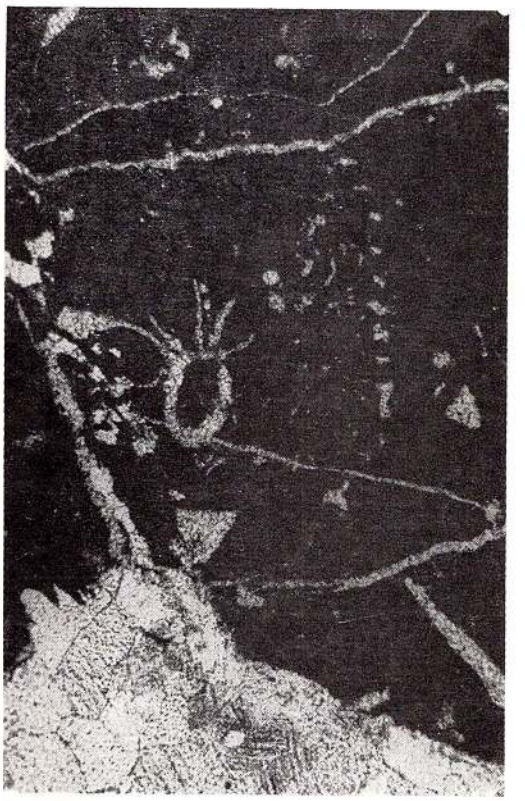

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PLATE LVIII

Fig. 1. — Biopelmicrite with *Tintinnopsella carpathica* (Murgeanu & Filipescu), *Calpionella* Zone, Berriasian, L.P.B. 9509, Ghilcoș Mts., × 150.

Fig. 2—3. — Biopelmicrite with *Calpionellopsis oblonga* (Cadisch), *Calpionellopsis* Zone, Berriasian-Lower Valanginian, L.P.B. 9016, Ghilcoș Mts., × 150.

Fig. 4. — Biopelmicrite with *Calpionellopsis simplex* (Colom), *Calpionellopsis* Zone, Berriasian-Lower Valanginian, L.P.B. 9016 a., Ghilcoș Mts., × 150.

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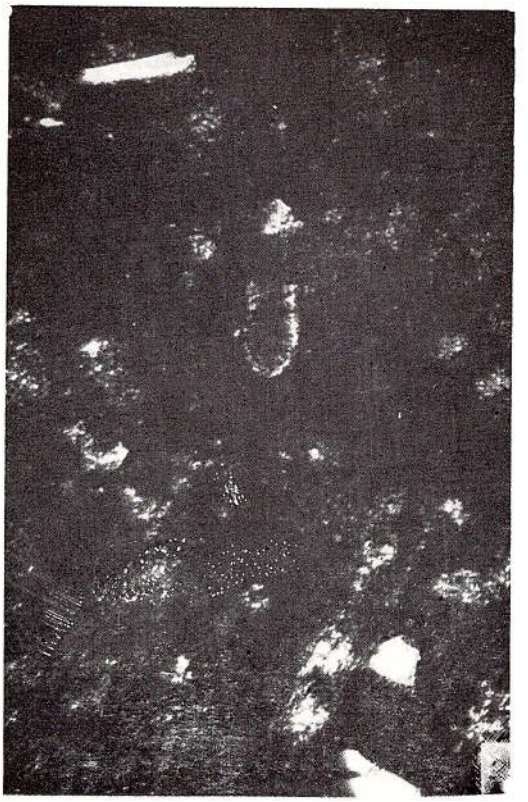

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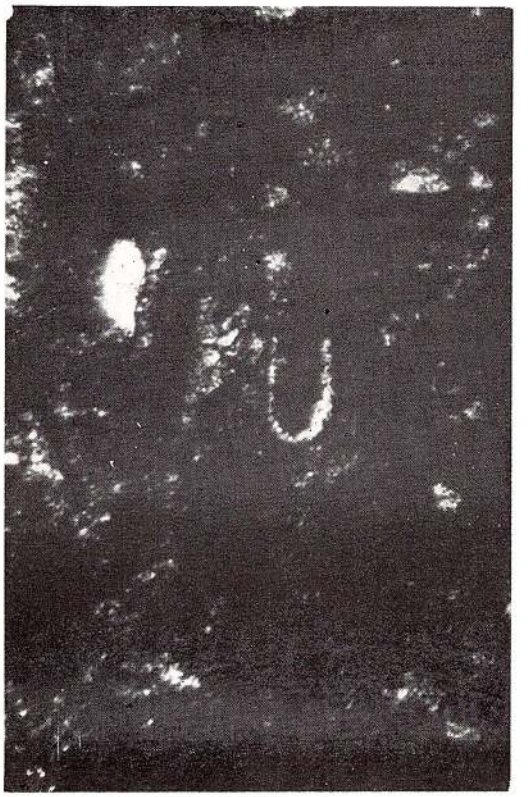

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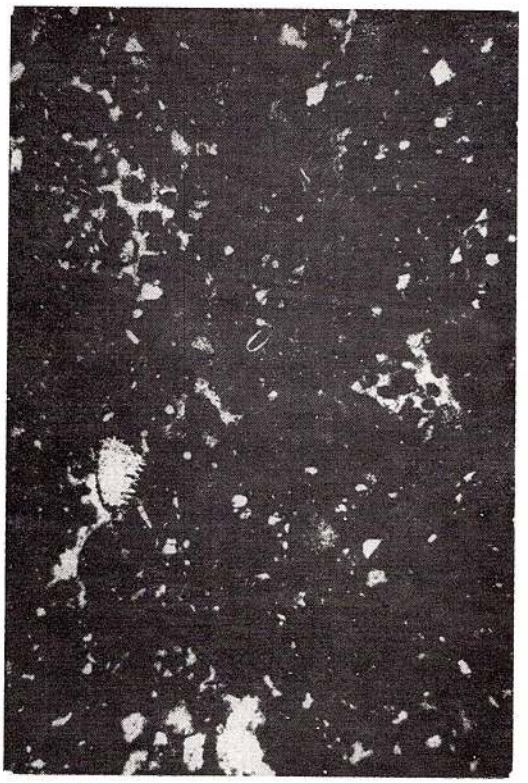
PLATE LIX

Fig. 1. — Biopelmicrite with *Calpionellopsis oblonga* (C a d i s c h), *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9016, Făgetul Ciucului Mts., × 80.

Fig. 2. — Biopelmicrite with *Calpionellopsis simplex* (C o l o m) and Ostracods, *Calpionellopsis* Zone, Berriasian-Lower Valanginian, L.P.B. 9016 a, Ghilcoș (eastern slope), × 80.

Fig. 3. — Biopelmicrite with *Tintinnopsella carpathica* (M u r g e a n u & F i l i p e s c u), *Calpionellopsis* Zone, Berriasian-Lower Valanginian, L.P.B. 9509, Ghilcoș Mts. (eastern slope), × 150.

Fig. 4. — Biopelsparite with *Trocholina* aff. *alpina* (L e u p o l d), *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9393 a, Ghilcoș Mts., × 30.



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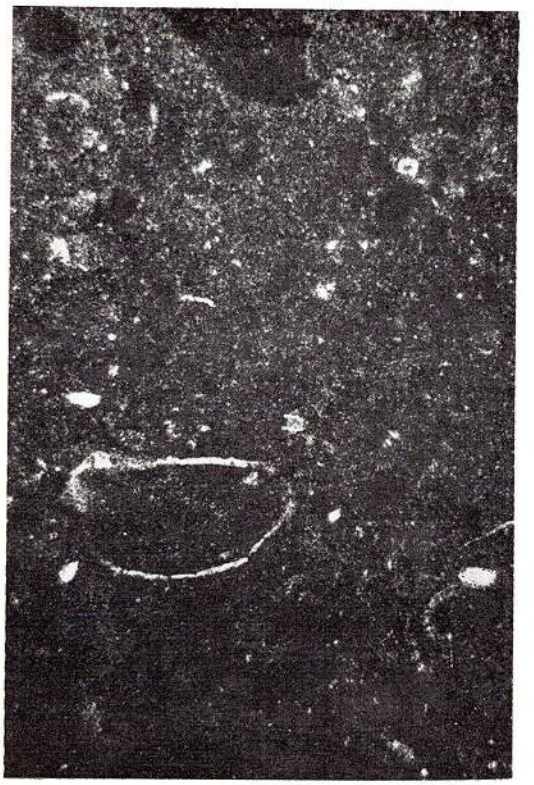

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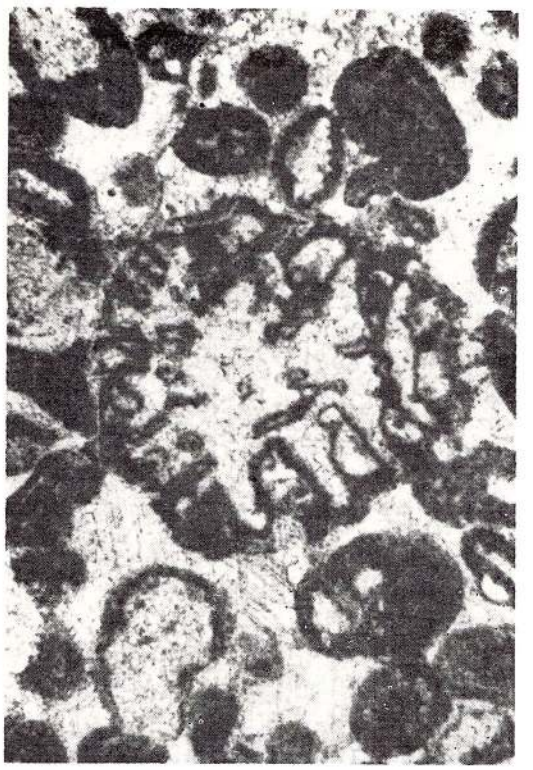

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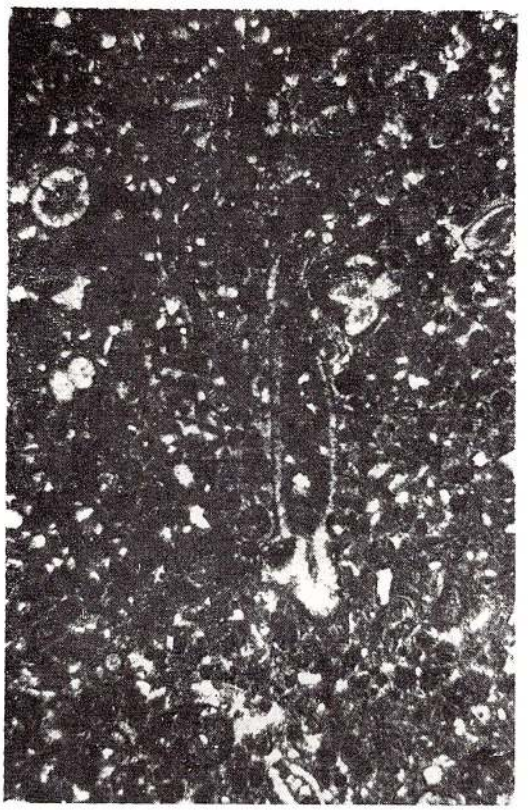
PLATE LX

Fig. 1. — Biopelmicrite with *Radoiciciella subtilis* Dragastan, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9328, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Likanella* sp. (*L.* aff. *bartheli* Bernier), *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 0013, Ghilcoș Mts., × 30.

Fig. 3. — Bioopelsparite with *Conicospirillina* cf. *basiliensis* Mohler, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9373 a, Ghilcoș Mts., × 30.

Fig. 4. — Algal-biolitithe, bioopelsparite with *Lithocodium aggregatum* Elliott, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9491, Ghilcoș Mts., × 30.



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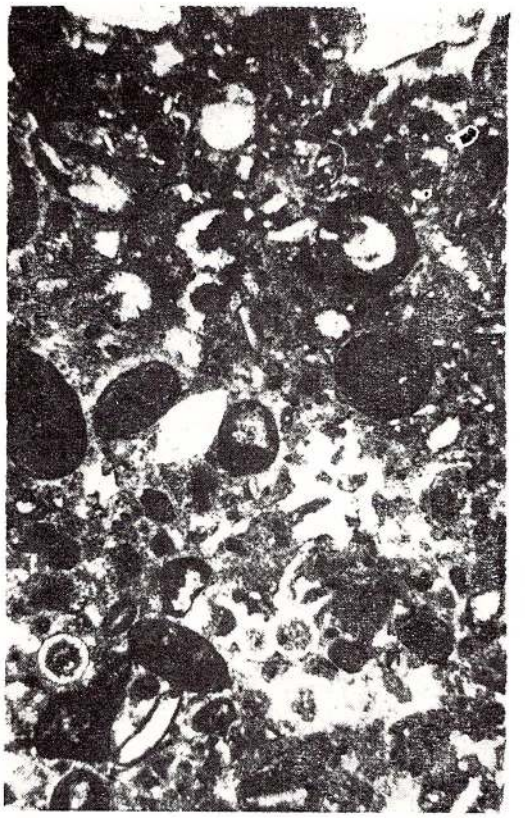

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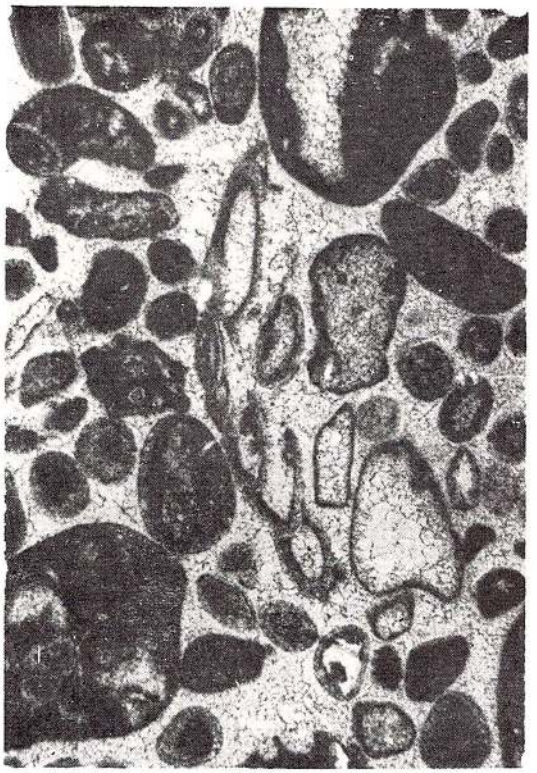

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PLATE LXI

Fig. 1. — Biopelmicrite with *Macroporella embergeri* Bouroullec & Deloffre, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9468, Ghilcoș Mts., × 30.

Fig. 2. — Biopelmicrite with *Clypeina* ? *solkani* Conrad & Radoicic, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 0010, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelmicrite with *Favreina cuvillieri* Brönimmann, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9505, Ghilcoș Mts., × 30.

Fig. 4. — Biopelmicrite with *Likanella campanensis* Azéma & Jaffrezo and *Pseudocyclammina* sp., *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 0012, Ghilcoș Mts., × 30.

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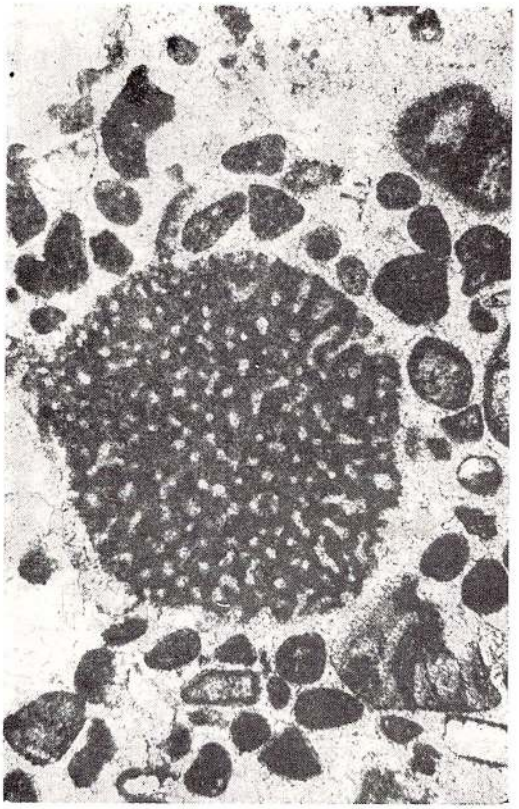

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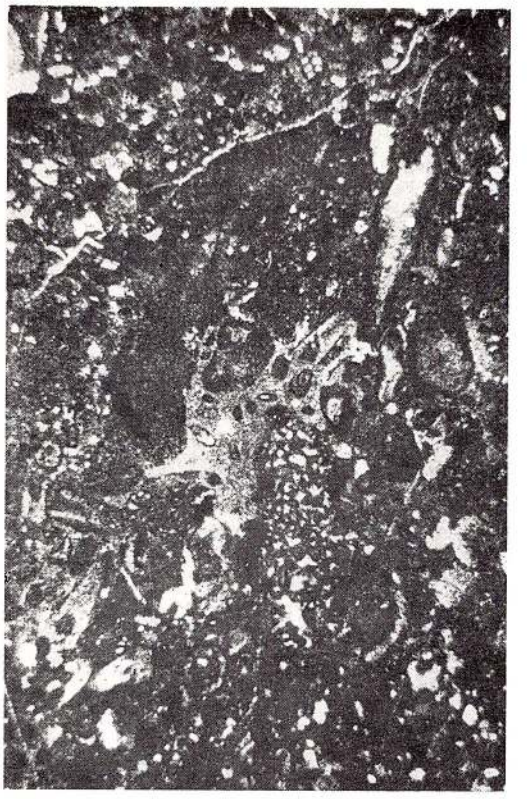

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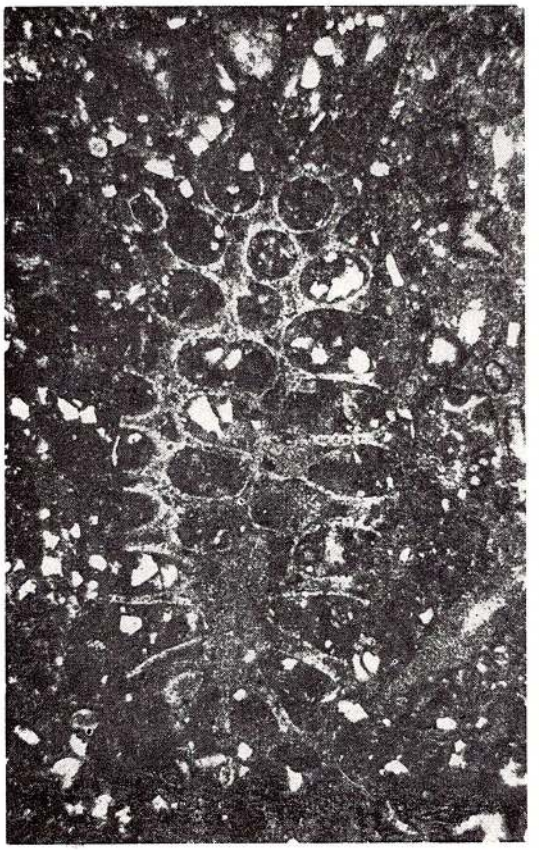
PLATE LXII

Fig. 1. — Biopelmicrite with *Macroporella embergeri* Bouroullec & Deloffre, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9468, Ghilcoș Mts., × 30.

Fig. 2. — Algal-biolitithe with *Lithocodium aggregatum* Elliott, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9491, Ghilcoș Mts., × 15.

Fig. 3. — Biomicrite with fragments of *Likanella* sp. and *Radoiciciella* sp., *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with *"Dasycladacea"*, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, Ghilcoș Mts., × 30.



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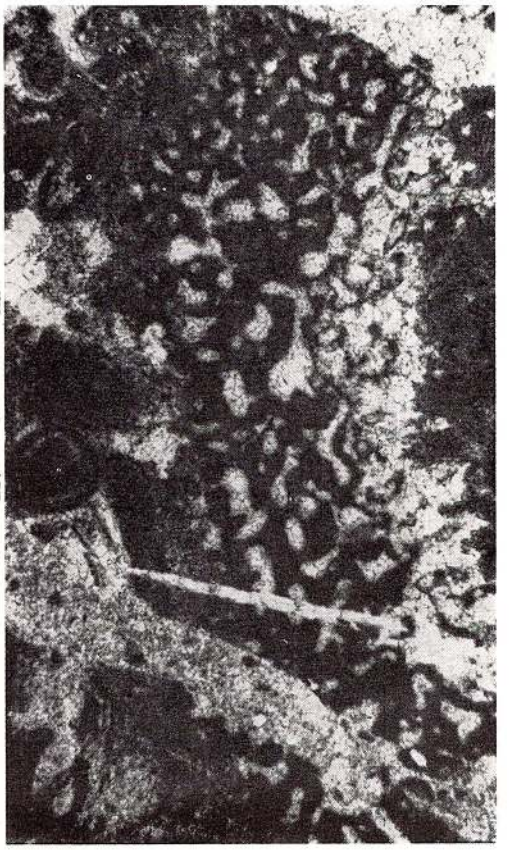

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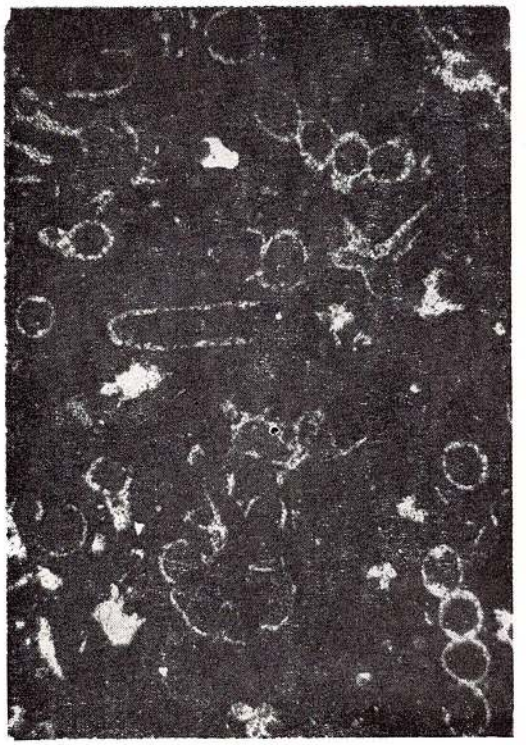

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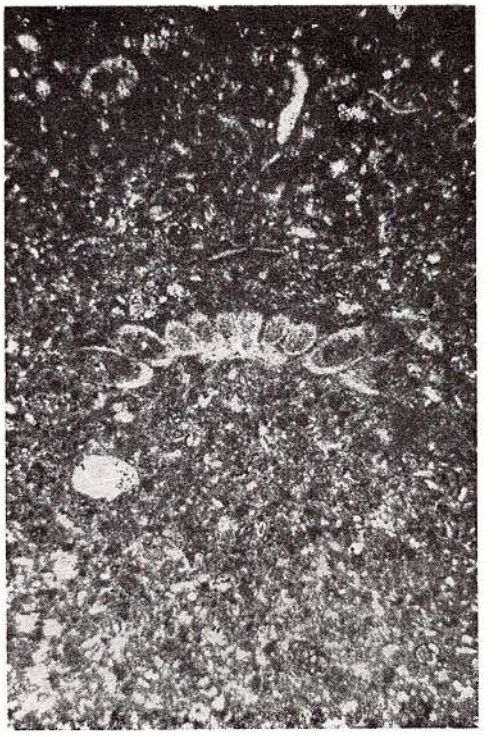

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PLATE LXIII

Fig. 1,3—4. — Biomicrite with *"Dasycladacea"*, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, Ghilcoș Mts., × 30.

Fig. 2. — Biopelmicrite with *Radoiciciella subtilis* Dragastan, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9328, Ghilcoș Mts., × 30.

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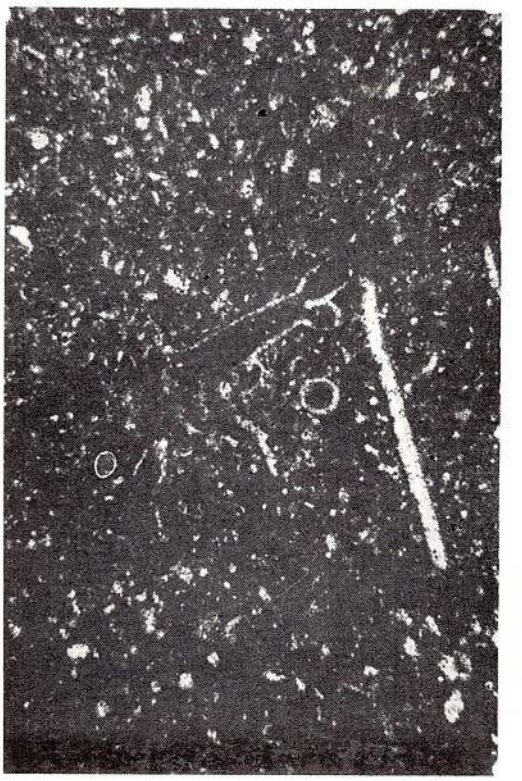

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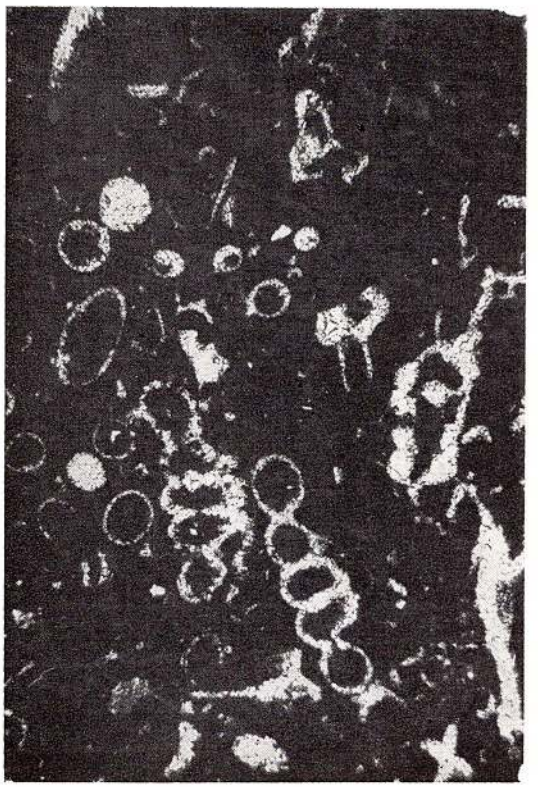

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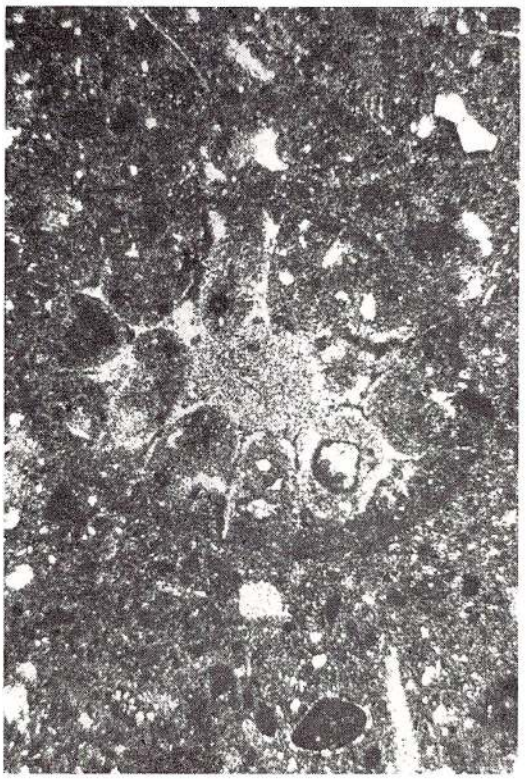
PLATE LXIV

Fig. 1. — Biopelsparite with *Macroporella embergeri* Bouroullec & Deloffre, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9468, Ghilcoș Mts., × 30.

Fig. 2. — Biopelmicrite with *"Dasycladacea"*, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Aeolissacus inconstans* Radoicic, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9518, Ghilcoș Mts., × 30.

Fig. 4. — Biomicrite with *Pseudosyslammina* sp. and *"Dasycladacea"*, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, Ghilcoș Mts., × 30.



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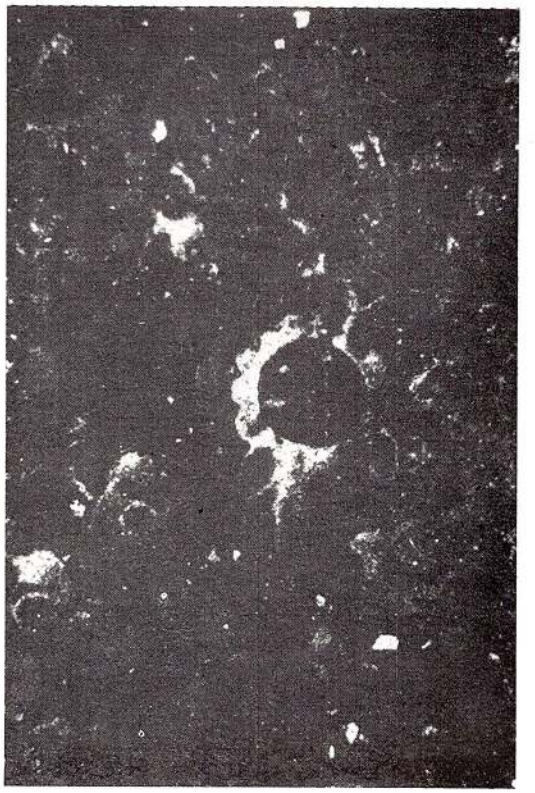

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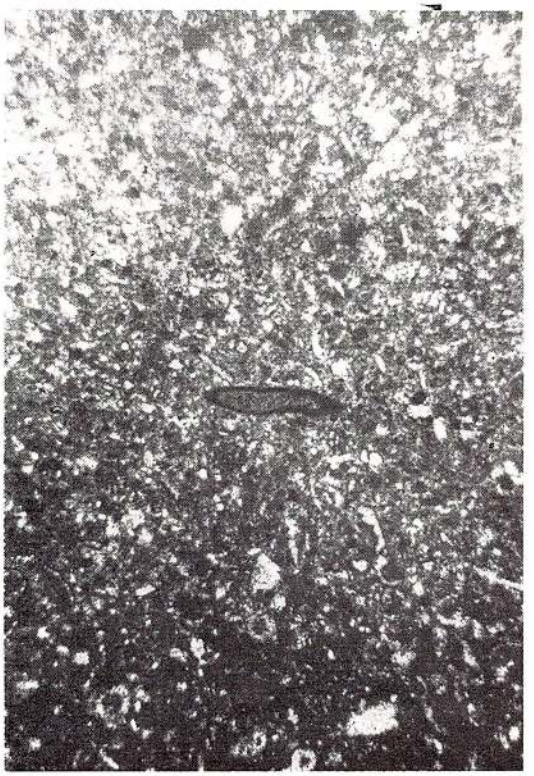

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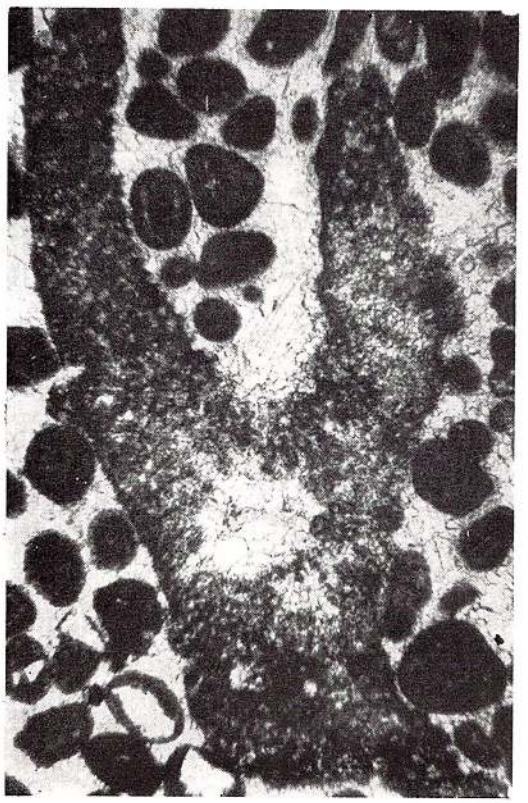
PLATE LXV

Fig. 1. — Biopelsparite with *Arabicodium* sp., *Macroporella embergeri* Zone, Berriasian-Lower-Valanginian, L.P.B. 0015, Ghilcoș Mts., × 30.

Fig. 2. — Biopelmicrite with *Rectocyclammina chouberti* Hottinger, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9874, Ghilcoș Mts., × 30.

Fig. 3. — Bioopelsparite with reworked and broken oolites, *Feurtillia frequens* Zone, Berriasian-Valanginian, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with *Likanella* sp., *Macroporella embergeri* Zone, Berriasian-Lower-Valanginian, L.P.B. 0013, Ghilcoș Mts., × 30.



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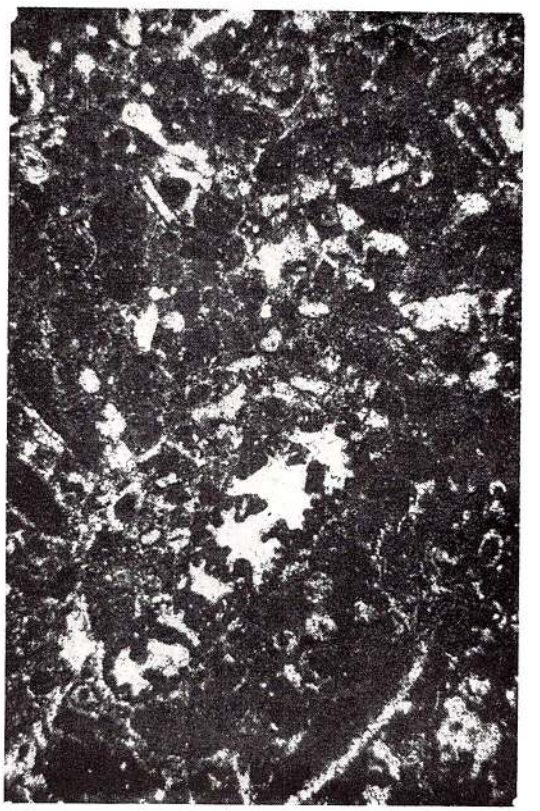

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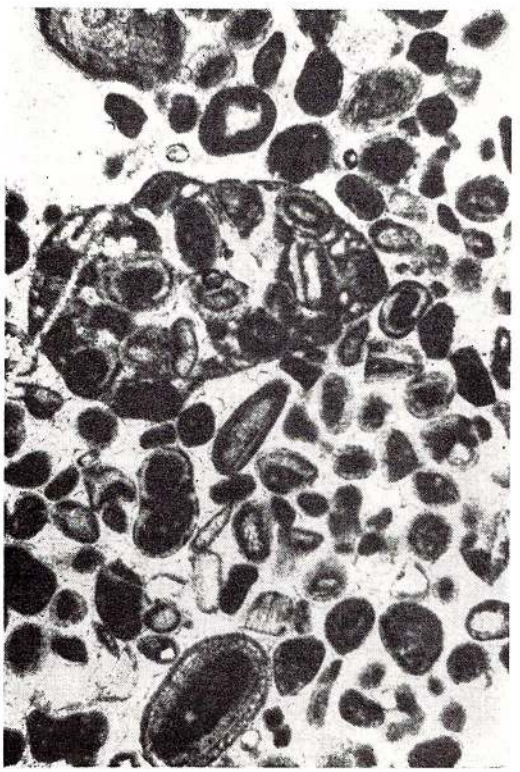

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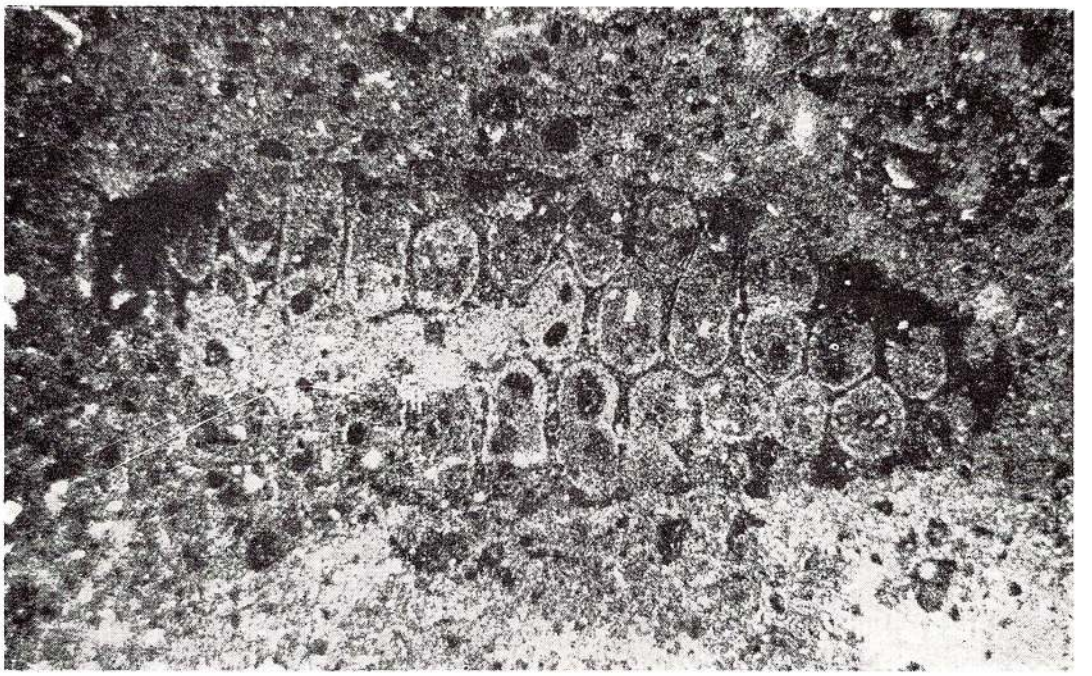
PLATE LXVI

Fig. 1. — Biopelsparite with *Macroporella embergeri* Bouroullec & Deloffre, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9468, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Heteroporella lemoinei* Dragastan and gastropod fragments, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9187, Ghilcoș Mts., × 30.



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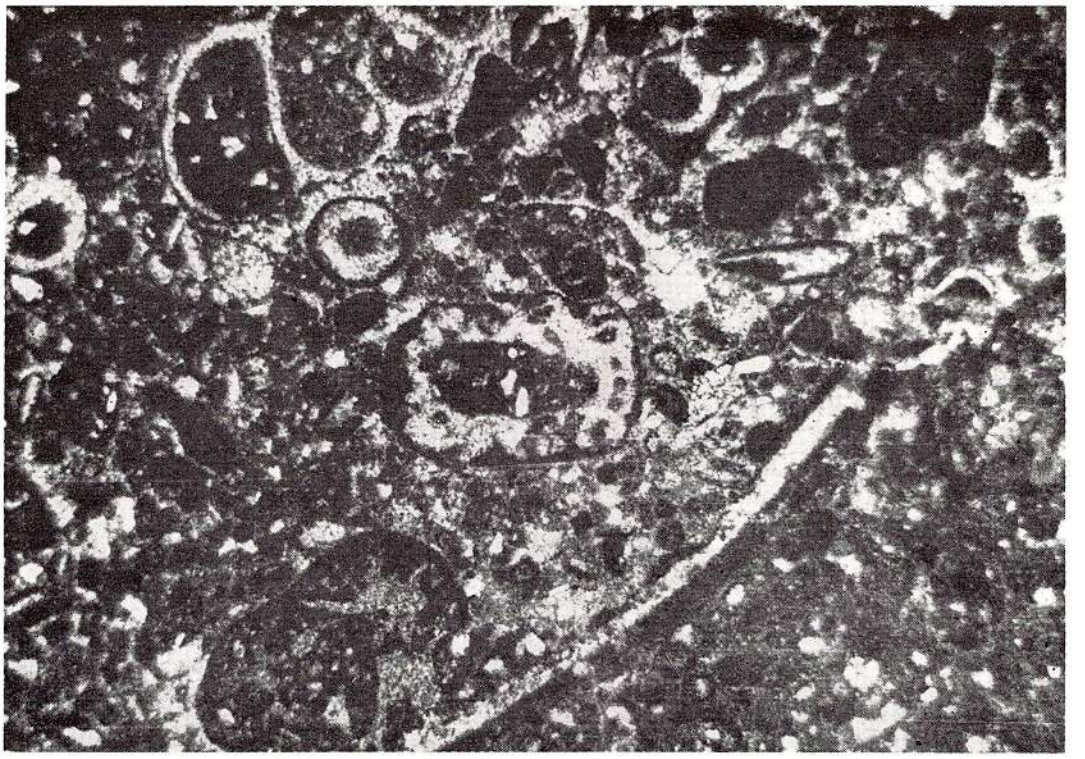

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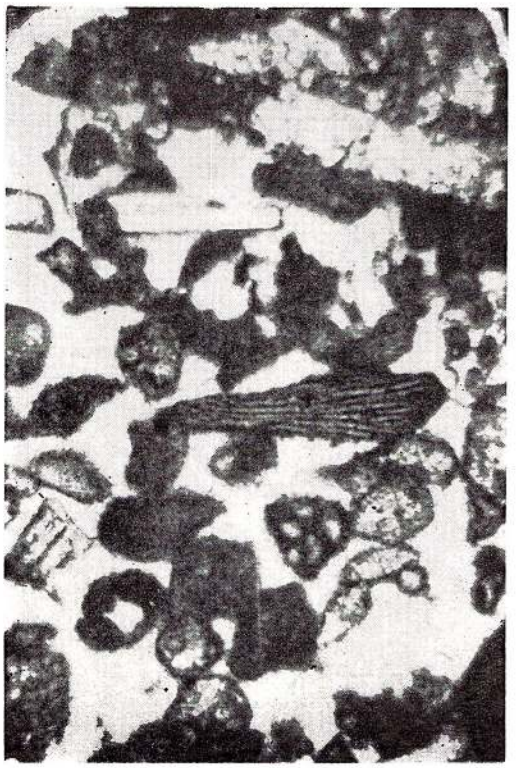
PLATE LXVII

Fig. 1. — Biopelsparite with *Cayeuxia anae* Dragastan, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9339, Ghilcoș Mts., × 30.

Fig. 2. — Biopelmicrite with *Radoiciciella subtilis* Dragastan, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9328, Ghilcoș Mts., × 30.

Fig. 3. — Biopelsparite with *Diplopora johnsoni* Praturlon, *Macroporella embergeri* Zone, Berriasian-Lower Valanginian, L.P.B. 9480, Ghilcoș Mts., × 30.

Fig. 4. — Biopelmicrite with *Feurtillia* sp., and Ostracods., *Feurtillia frequens* Zone, Berriasian-Valanginian, Ghilcoș Mts., × 30.



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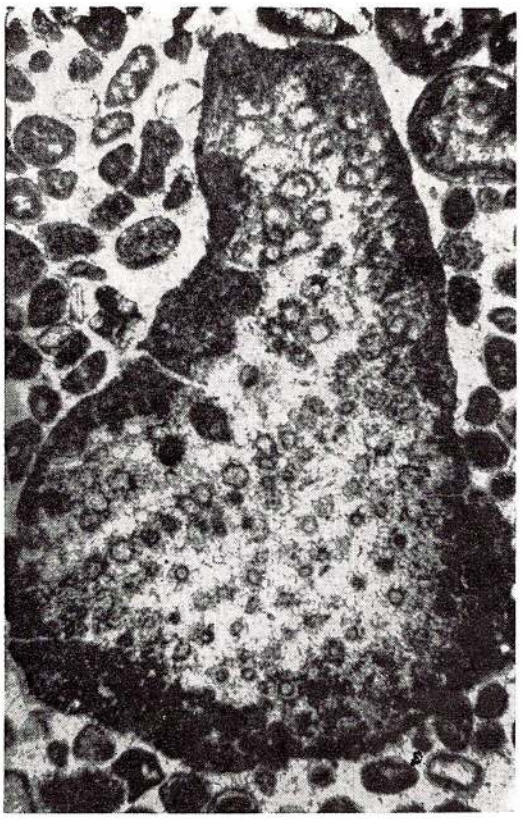

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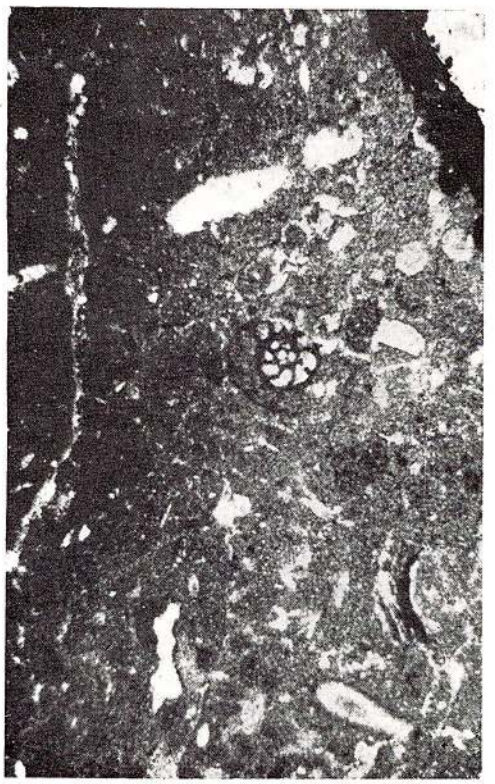
PLATE LXVIII

Fig. 1, 4. — Biopelmicrite with *Feurtillia frequens* M a y n c, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9411, Ghilcoș Mts., × 30.

Fig. 2—3. — Biopelsparite with *Feurtillia frequens* M a y n c, and *Macroporella embergeri* B o u r o u l l e c & D e l o f f r e and reworked pelmicrite, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9411 and L.P.B. 9468, Ghilcoș Mts. (eastern slope), × 30.



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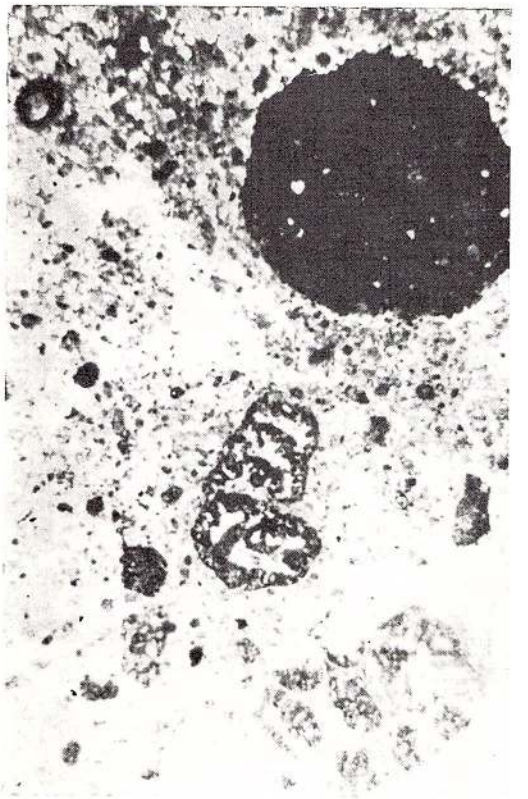

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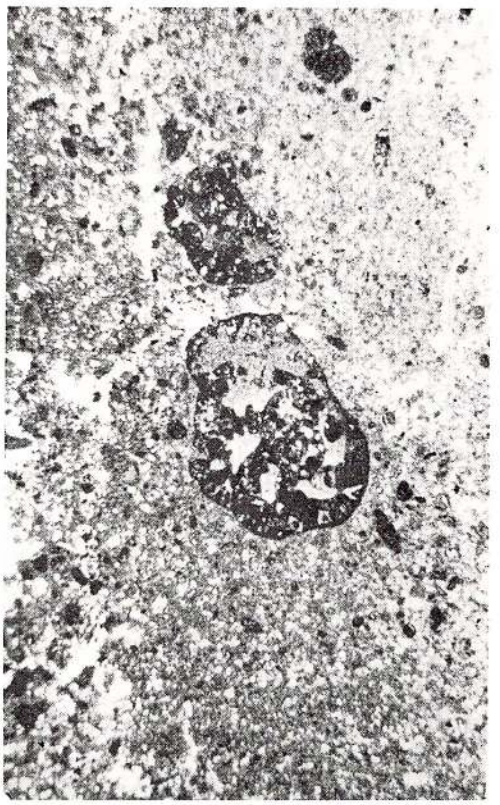

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PLATE LXIX

Fig. 1, 3. — Biopelmicrite with *Lorenziella dacica* (F i l i p e s c u & D r a g a s t a n), *Lorenziella* Zone, Valanginian, fig. 1. — Ghilcoș Mts., fig. 3. — Valanginian, Crivina marls with *Neocomites neocomiensis* (d' O r b.), L.P.B. 9185, × 150.

Fig. 2. — Biopelmicrite with *"Calpionellites" dadayi* K n a u e r, *Lorenziella* Zone, Valanginian, L.P.B. 9873, Ghilcoș Mts., × 50.

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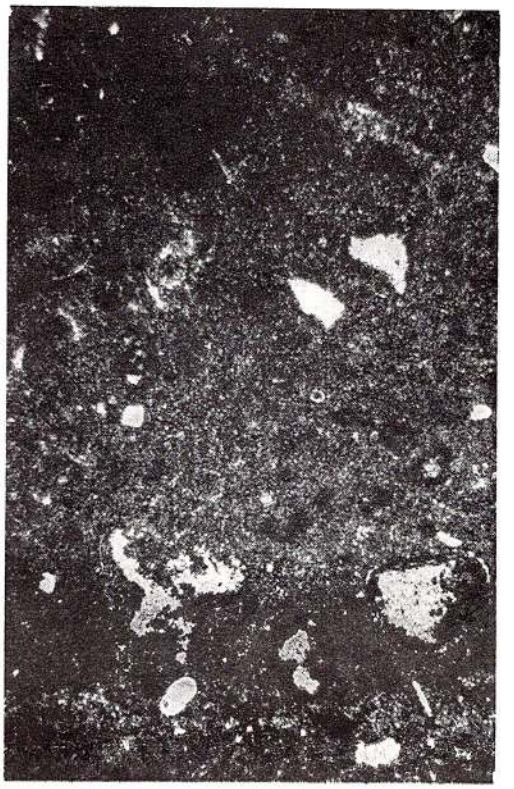

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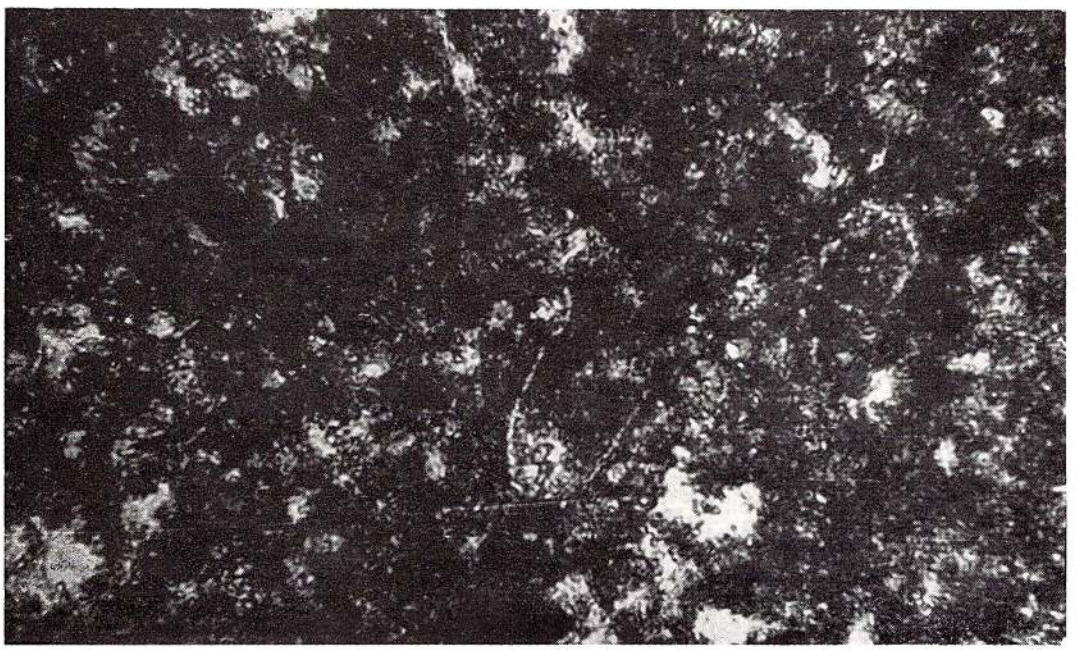

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PLATE LXX

Fig. 1. — Biopelmicrite with *Feurtillia frequens* Maync and *"Dasycladacea"*, *Feurtillia frequens* Zone, Berriasian-Valanginian, L.P.B. 9411, Ghilcoș Mts., × 30.

Fig. 2–3. — Biomicrite with *Salpingoporella annulata* Carozzi and *Actinoporella podolica* (Alth), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459 and L.P.B. 9471, Ghilcoș Mts., × 30.

Fig. 4. — Biopelmicrite with *Radoiciciella subtilis* Dragastan, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9328, Ghilcoș Mts., × 30.

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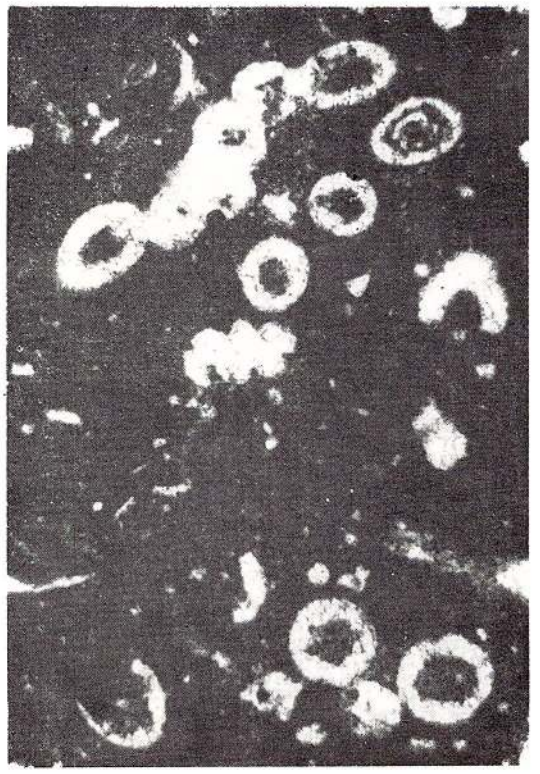

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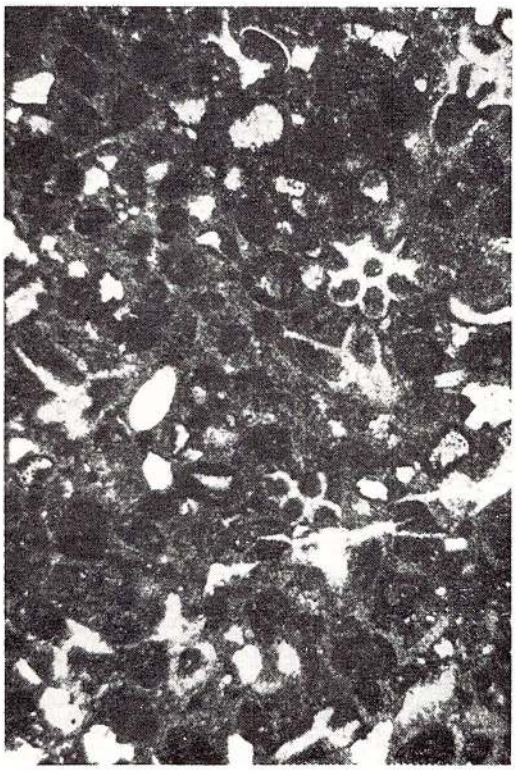

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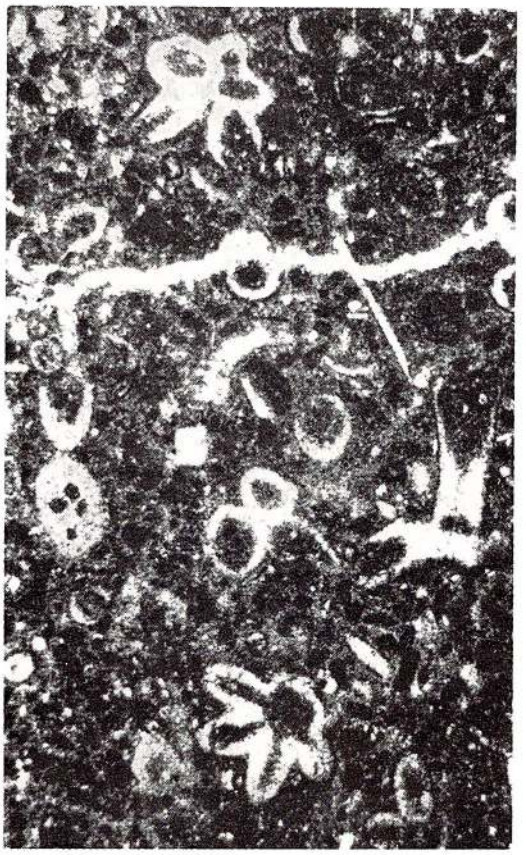
PLATE LXXI

Fig. 1. — Biopelmicrite with *Likanella* sp., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 0013, Ghilcoş Mts., × 30.

Fig. 2. — Algal-biolitithe with *Actinoporella podolica* (Alth), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9471, Ghilcoş Mts., × 30.

Fig. 3. — Algal-biolitithe with *Cayeuxia elliotti* Dragastan, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9340, Ghilcoş Mts., × 30.

Fig. 4. — Biomicrite with *Salpingoporella annulata* Carozzi, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459, Ghilcoş Mts., × 30.



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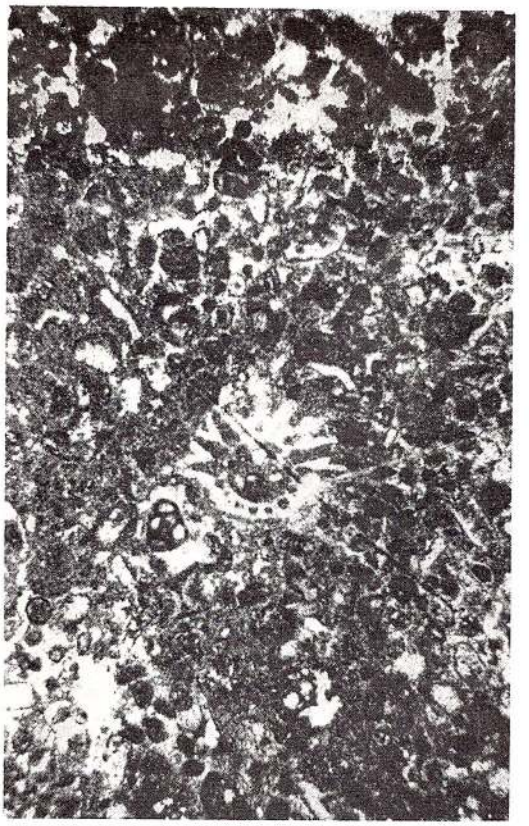

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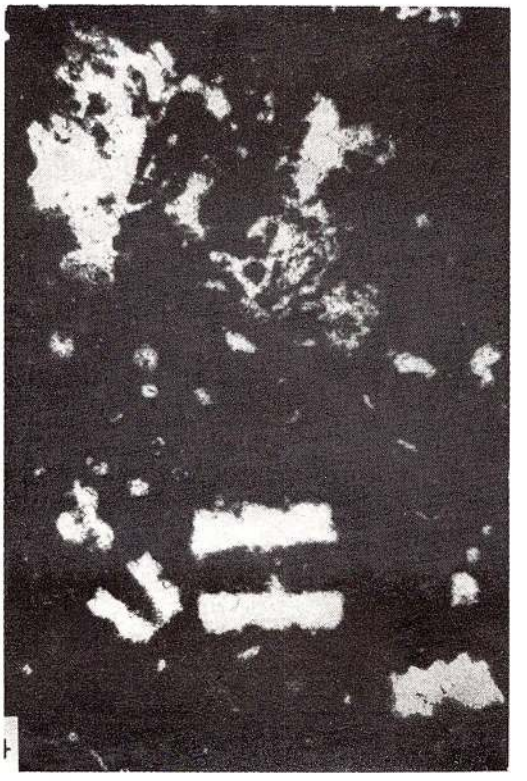

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PLATE LXXII

Fig. 1, 3. — Bioopelsparite with *Salpingoporella radoicicae* (P r a t u r l o n), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9474, Ghilcoș Mts., × 30.

Fig. 2. — Biomicrite with *Clypeina* aff. *pejovicae* R a d o i c i c, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9452, Ghilcoș Mts., × 30.

Fig. 4. — Algal-biolitithe with *Lithophyllum* ? *maslovi* D r a g a s t a n, and *Epimastopora* sp., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9347, Ghilcoș Mts., × 30.

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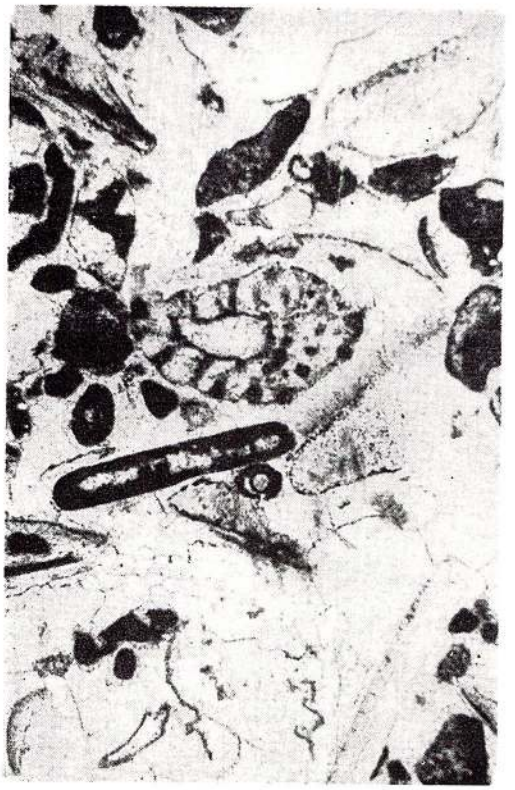

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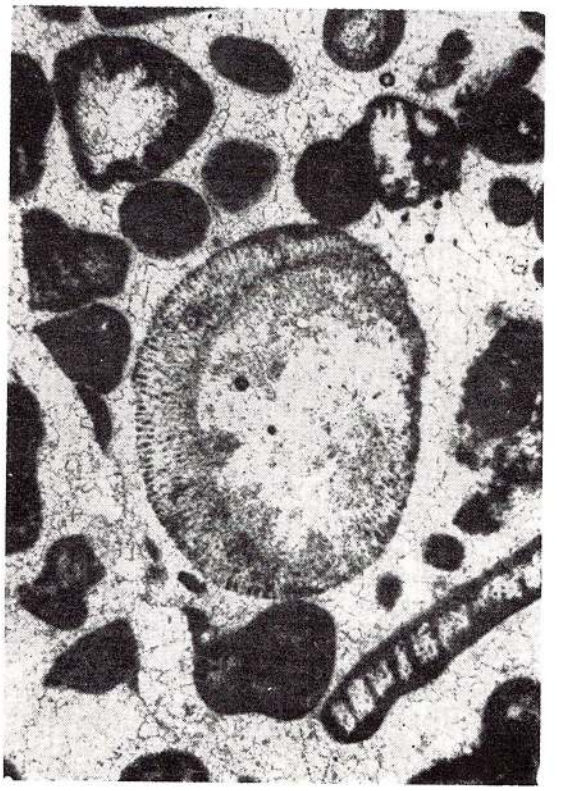

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PLATE LXXIII

Fig. 1. — Biopelsparite with *Trocholina elongata* (L e u p o l d), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9394, Ghilcoș Mts., × 30.

Fig. 2—4. — Biopelmicrite with *Clypeina ? solkani* C o n r a d & R a d o i c i c, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 0010, Ghilcoș Mts., × 30.

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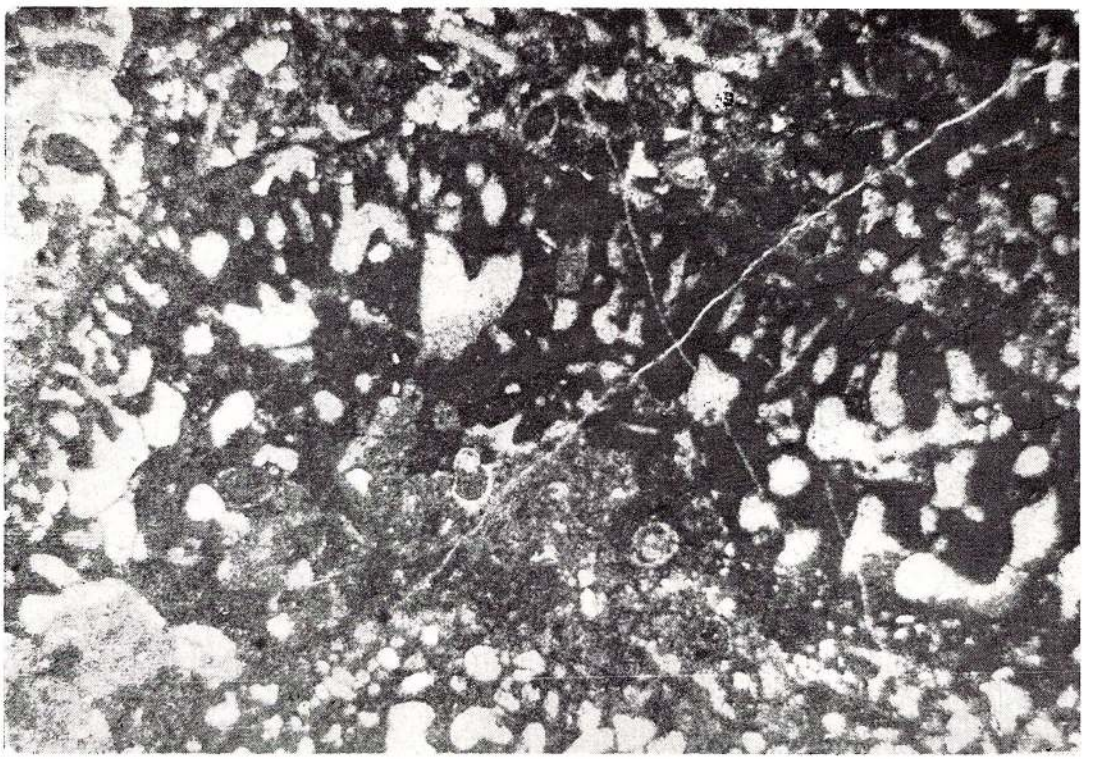
PLATE LXXIV

Fig. 1. — Algal-biolitithe with *Lithocodium aggregatum* Elliott, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9491, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Cayeuxia anae* Dragastan, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9339, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelsparite with *Salpingoporella annulata* Carozzi, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459, Făgetul Ciucului Mts., × 30.



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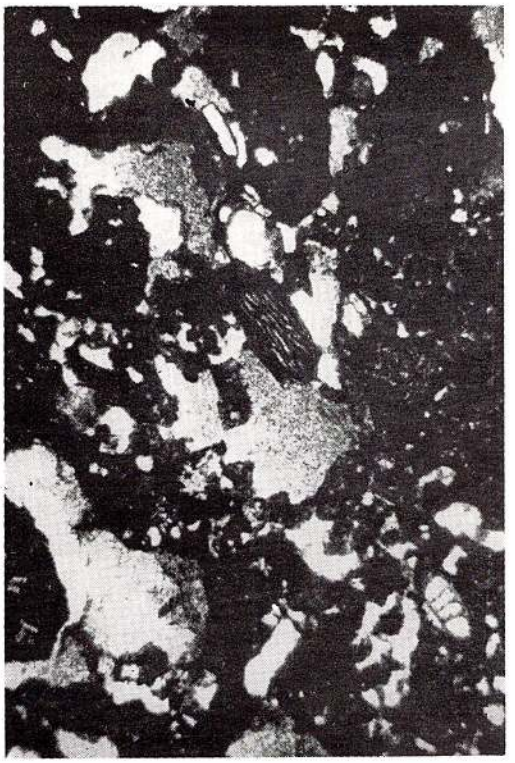

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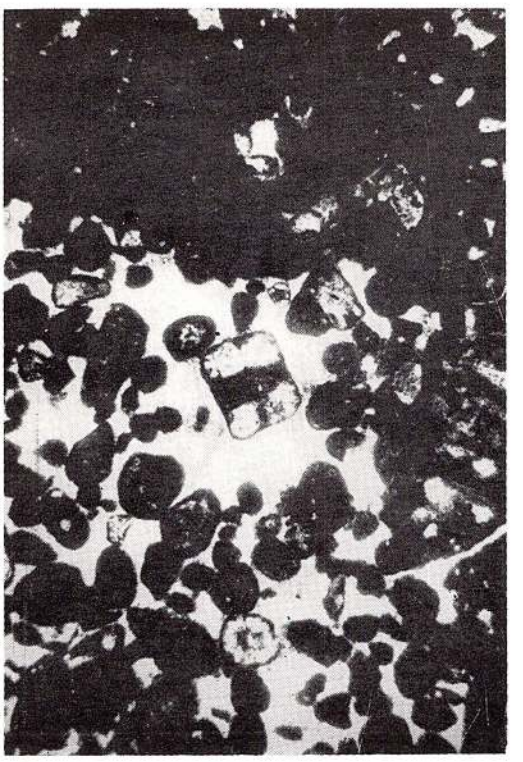

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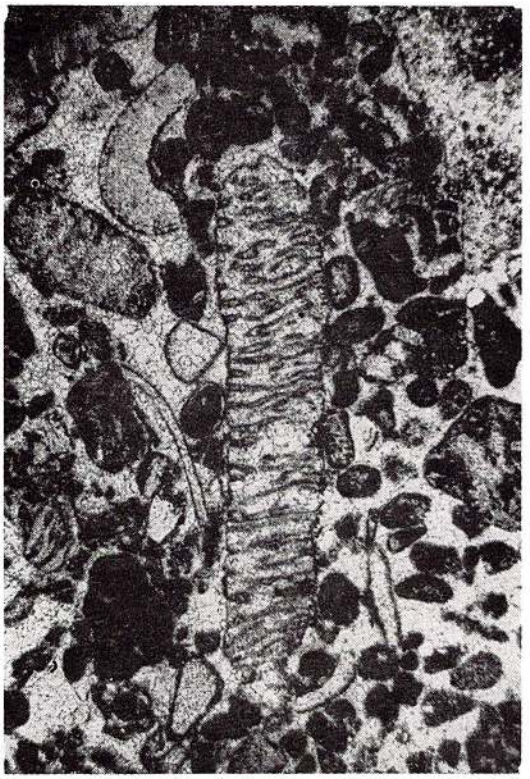
PLATE LXXV

Fig. 1. — Biopelsparite with *"Dasycladacea"*, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *Teutloporella* n.sp., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9465, Ghilcoș Mts., × 30.

Fig. 3. — Biomicrite with *Harlanjohnsonella* sp., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9482, Bicăjel II Mts., × 30.

Fig. 4. — Algal-biolitithe with *Cayeuxia fruticulosa* Johnson & Kaska, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9486, Ghilcoș Mts., × 30.



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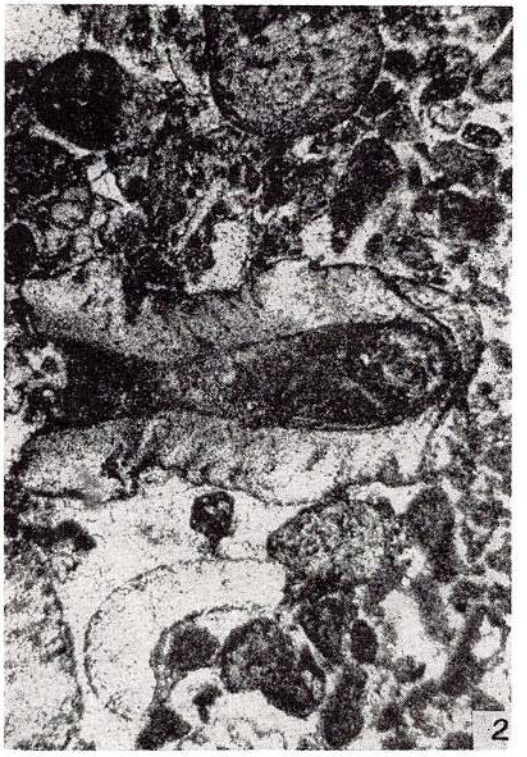

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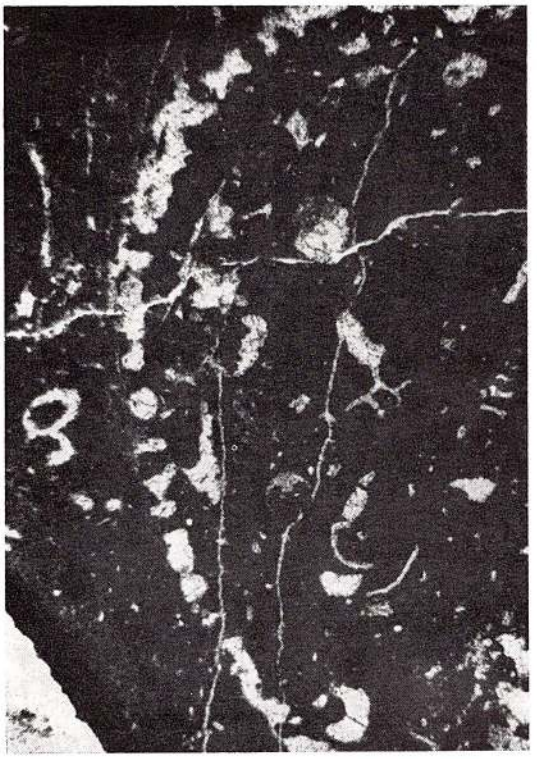

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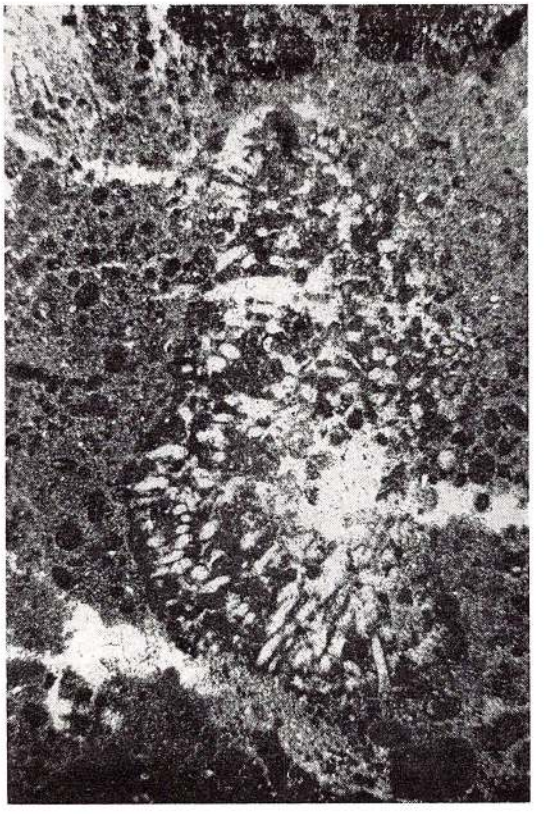

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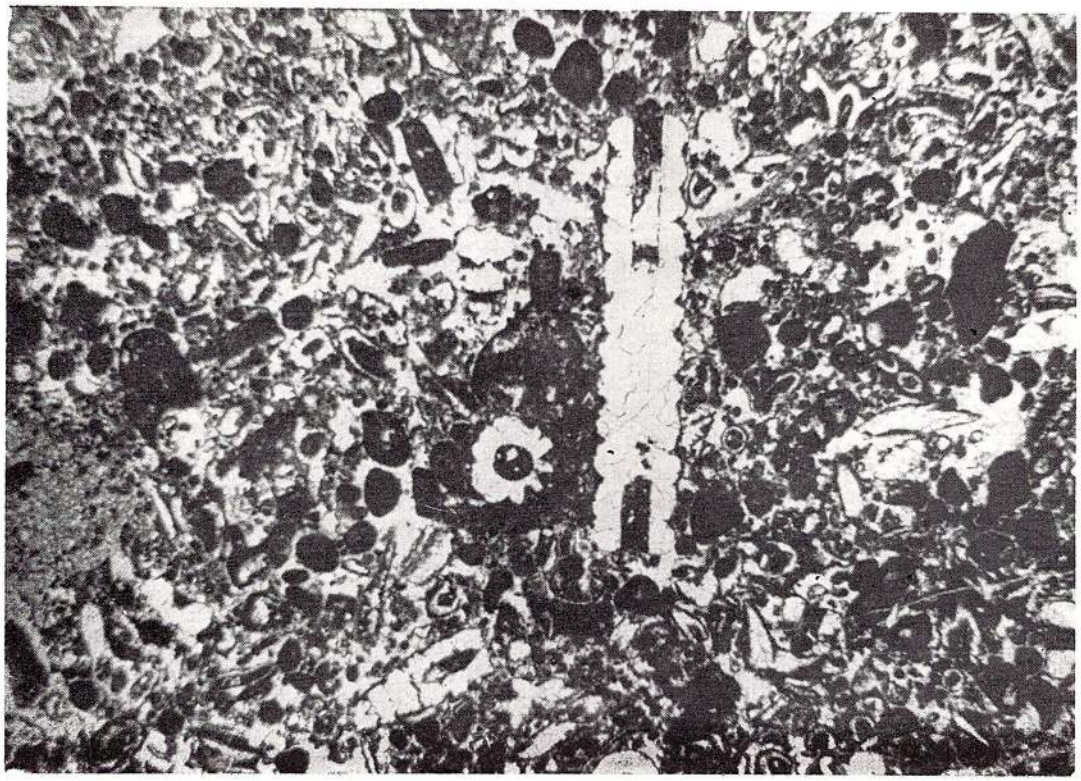
PLATE LXXVI

Fig. 1. — Algal-biolitithe with *Salpingoporella annulata* Carozzi, fragments of *Radoiciciella subtilis* Dragastan and *Likanella* sp., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459 and L.P.B. 0013, Bicăjel II Mts., × 30.

Fig. 2. — Algal-biolitithe with *Salpingoporella annulata* Carozzi, *Likanella* sp. and *Trocholina elongata* (Leupold)., *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459 and L.P.B. 9394, Bicăjel II Mts., × 30.

Fig. 3. — Biopelsparite with *Salpingoporella annulata* Carozzi, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9459, Făgetul Ciucului Mts., × 30.



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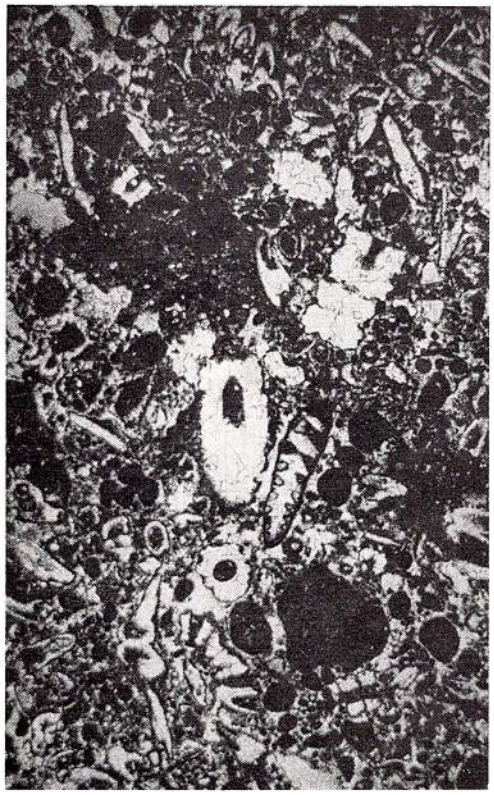

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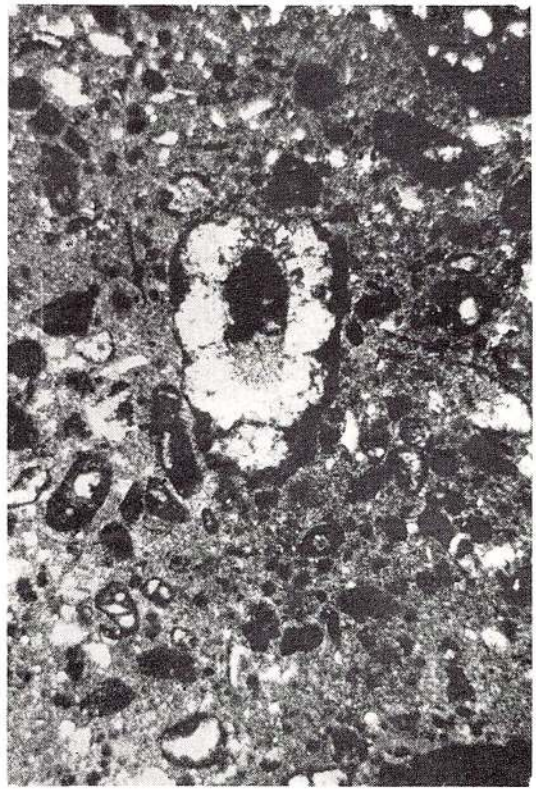

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PLATE LXXVII

Fig. 1. — Biolitithe with Serpulid tubes, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Bicăjel II Mts., × 20.

Fig. 2. — Algal-biolitithe with *Thaumatoporella parvovesiculifera* (R a i n e r i), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9498, Făgetul Ciucului Mts., × 20.

Fig. 3. — Biopelsparite with *Cayeuxia anae* D r a g a s t a n, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9339, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with *Chinianella* sp., and algal debris facies, *Salpingoporella annulata* Zone, L.P.B. 9458, Făgetul Ciucului Mts., × 30.

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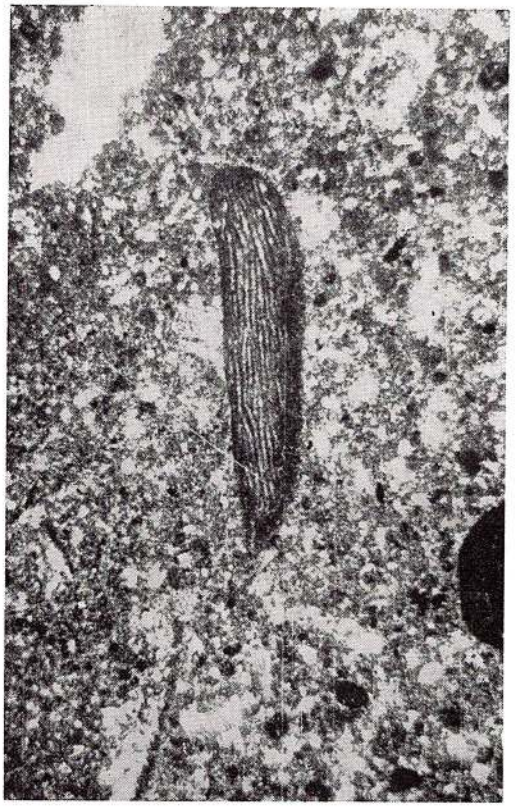

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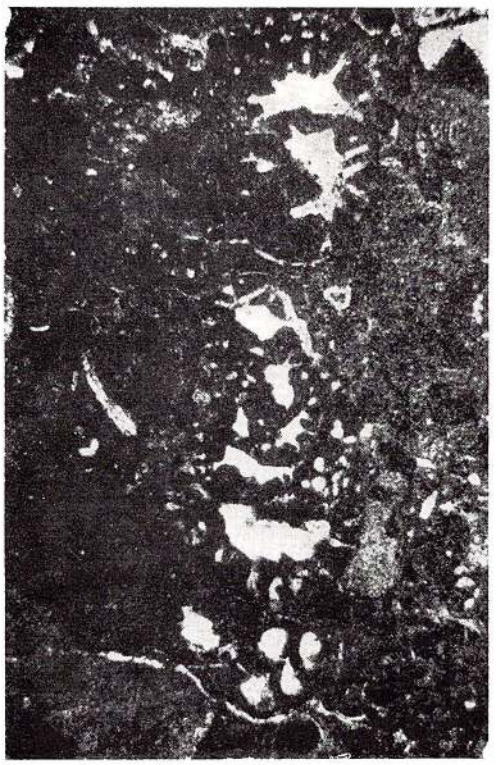
PLATE LXXVIII

Fig. 1, 4. — Biopelmicrite with reworked *Everticyclammina virguliana* (K o e c h l i n), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelmicrite with reworked *Acicularia elongata* C a r o z z i, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Făgetul Ciucului Mts., × 30.

Fig. 3. — Calcareous breccia with reworked *Nautiloculina oolithica* M o h l e r, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Făgetul Ciucului Mts., × 30.



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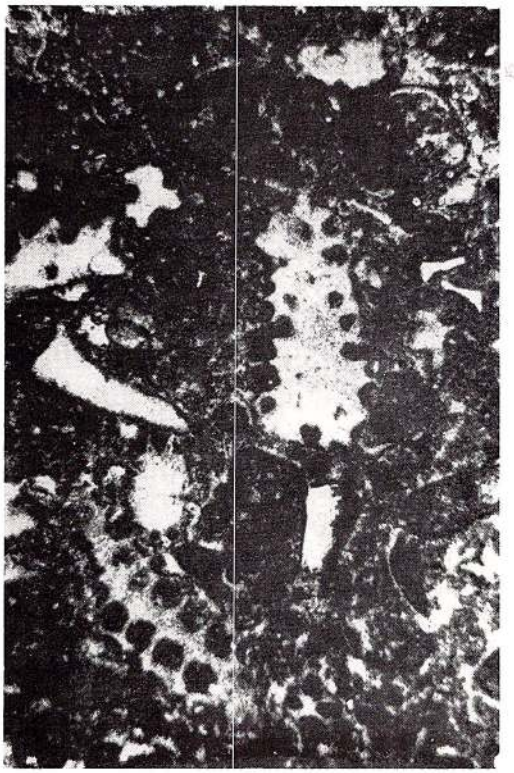

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PLATE LXXIX

Fig. 1. — Biopelsparite with reworked *Pseudocyclammina* aff. *lituus* (Y o k.), *Salpingoporella annulata* Zone, Valanginian-Hauterivian, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biopelsparite with *Cylindroporella sugdeni* E l l i o t t, *Salpingoporella annulata* Zone, Valanginian-Hauterivian, L.P.B. 9457, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biopelmicrite with Ostracods, *Ostracods* Zone, Hauterivian, Ghilcoș Mts., × 15.

Fig. 4. — Biomicrite with *Cladocoropsis cretacica* T u r n s e k, *Ostracods* Zone, Hauterivian, L.P.B. 3291, Ghilcoș Mts., × 15.

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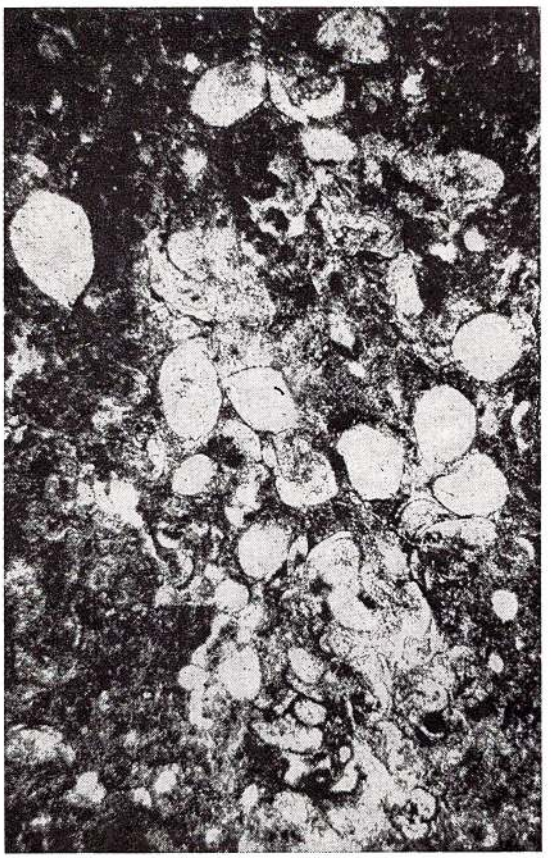

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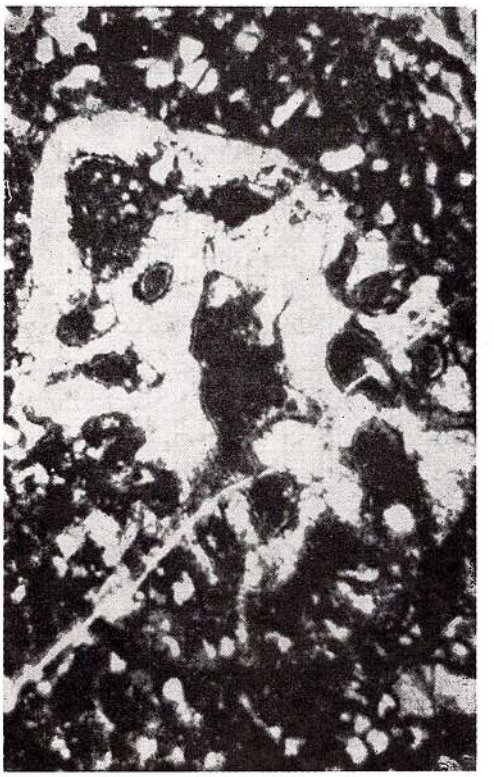

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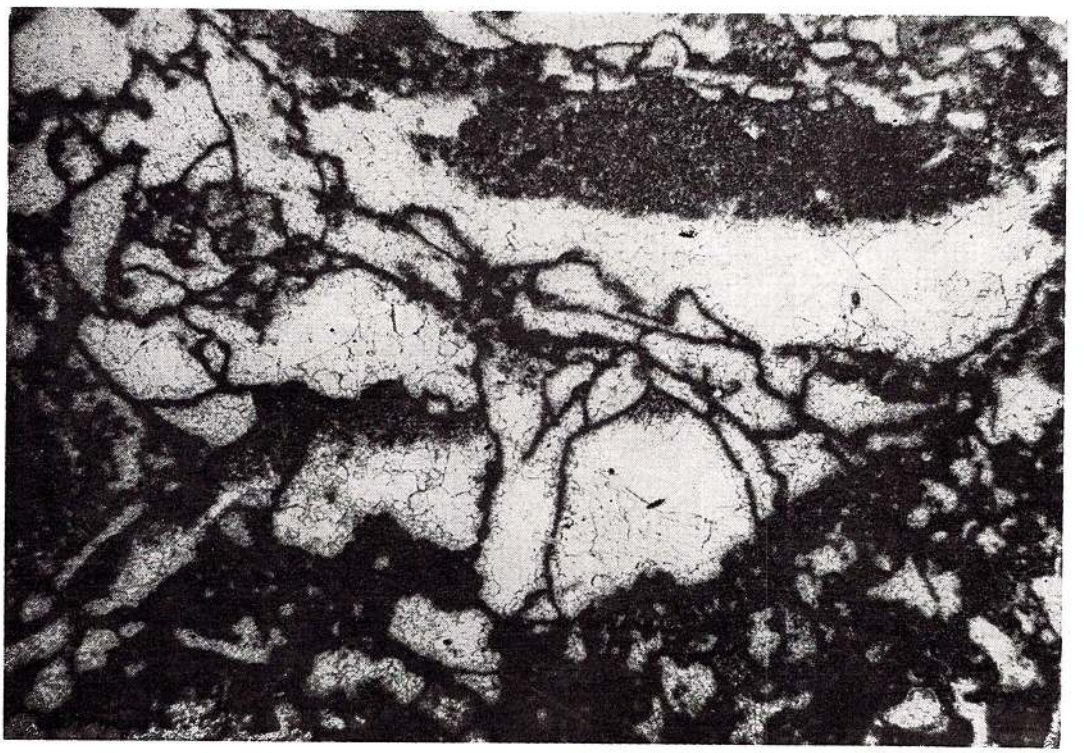
PLATE LXXX

Fig. 1. — Algal-biolitithe with *Bacinella irregularis* Radoicic, *Ostracods* Zone, Hauterivian, L.P.B. 9502, Ghilcoș Mts., × 15.

Fig. 2. — Algal-biolitithe with *Lithocodium aggregatum* Elliott, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 9491, Suhardu Mic Mts., × 15.

Fig. 3. — Biopelmicrite with *Glomospira* sp. and Miliolidae, *Pseudocyclammina hedbergi* Zone, Barremian, Ghilcoș Mts., × 30.



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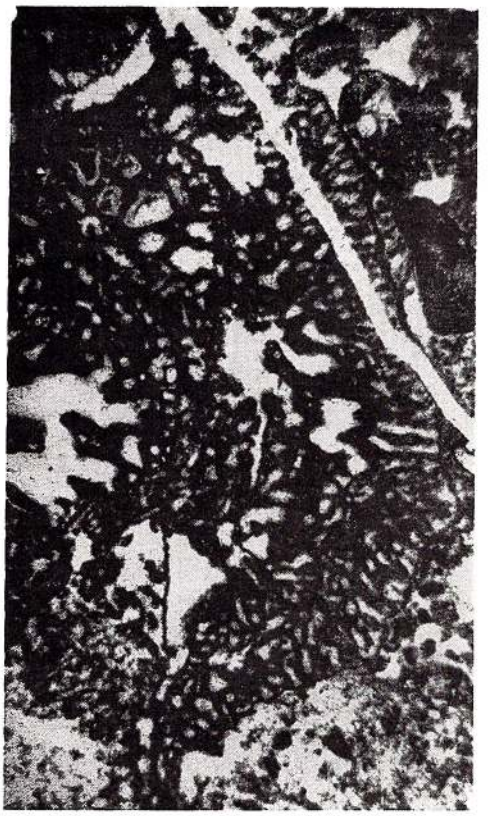

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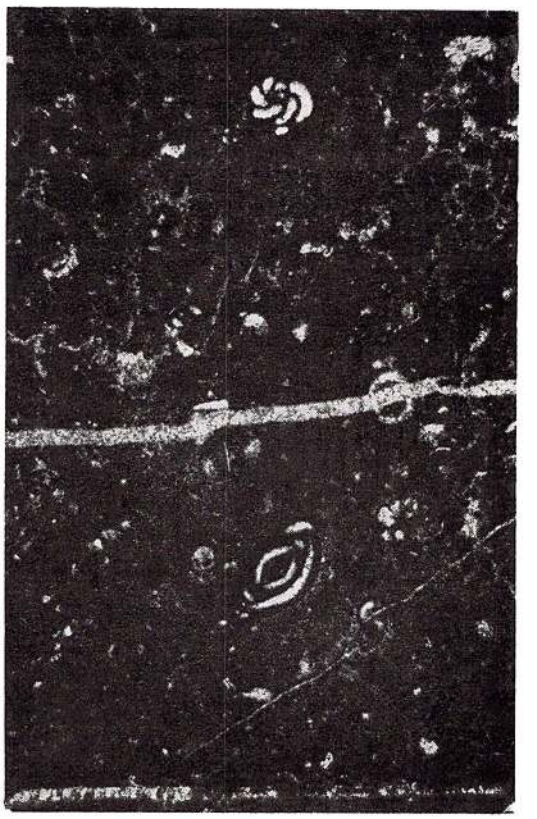

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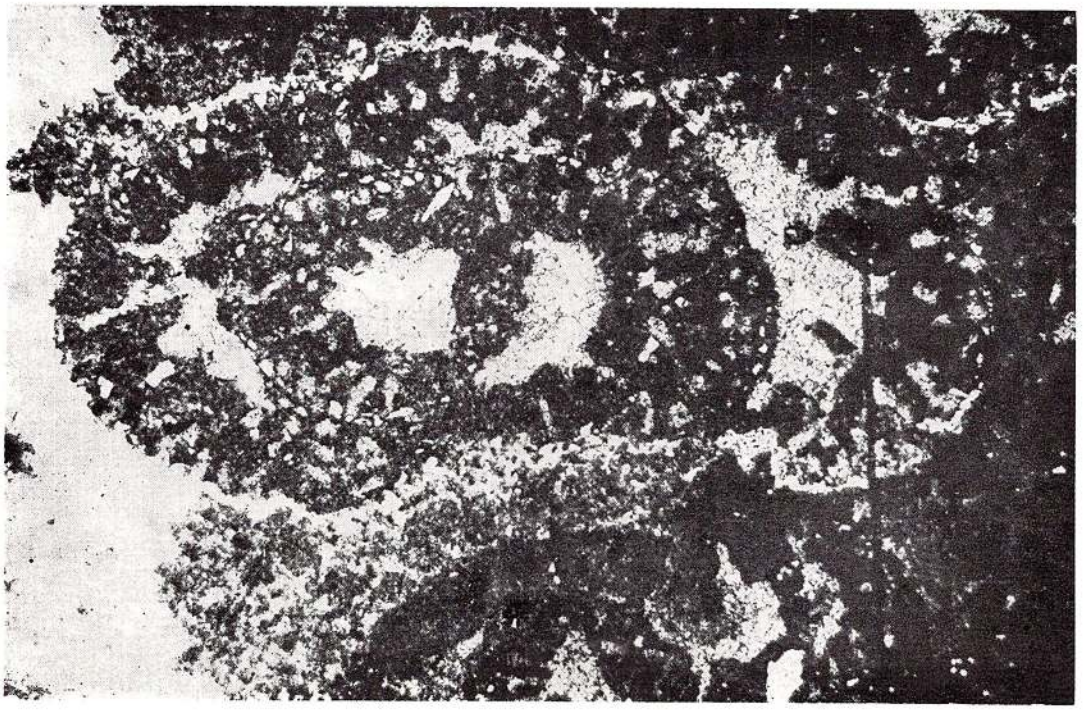
PLATE LXXXI

Fig. 1. — Biopelmicrite with *Pseudocyclammina hedbergi* Maync. *Pseudocyclammina hedbergi* Zone, Barremian, L.P.B. 9413, Ghilcoș Mts., × 15.

Fig. 2. — Algal-biolitithe, biomicrite with *Cladocoropsis cretacica* Turnsek and *Salpingoporella dinarica* Radoicic, *Salpingoporella dinarica* Zone, Barremian, L.P.B. 3291 and L.P.B. 9460, Ghilcoș Mts., × 15.

Fig. 3. — Biomicrite with *Salpingoporella carpathica* Dragastan and *"Dasycladacea"*, *Salpingoporella dinarica* Zone, Barremian, L.P.B. 9461, Ghilcoș Mts., × 30.



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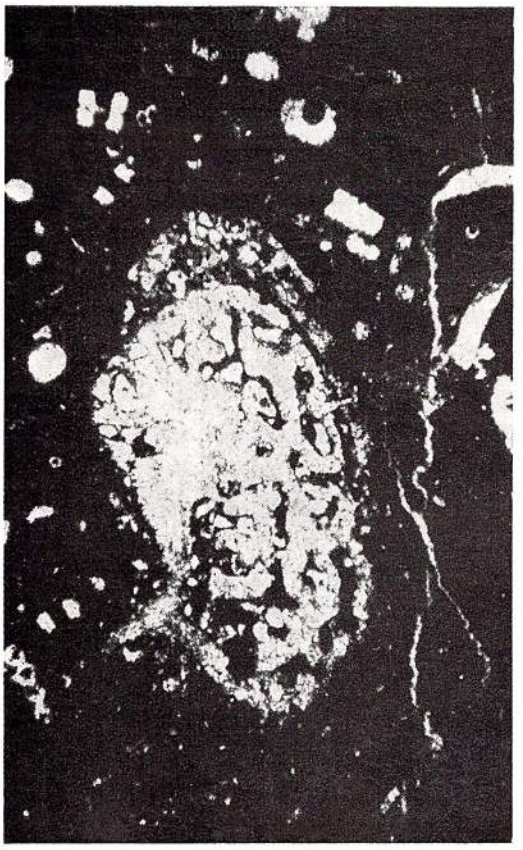

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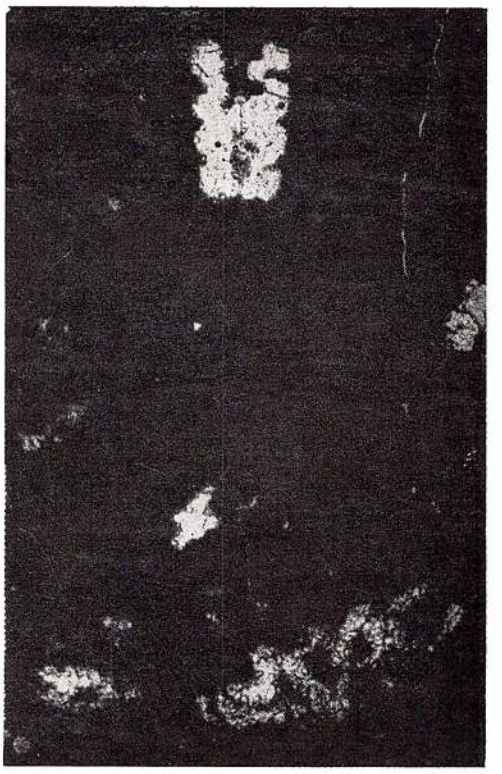

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PLATE LXXXII

Fig. 1, 3. — Biopelmicrite with *Salpingoporella carpathica* Dragastan, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 9461, Făgetul Ciucului Mts., × 30.

Fig. 2. — Biomicrite with *Aeolissacus inconstans* Radoicic, *Pseudocyclammina hedbergi* Zone, Barremian, L.P.B. 9518, Ghilcoș Mts., × 30.

Fig. 4. — Algal-biolitithe with *Cayeuxia piae* Frollo, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 9485, Făgetul Ciucului Mts., × 30.

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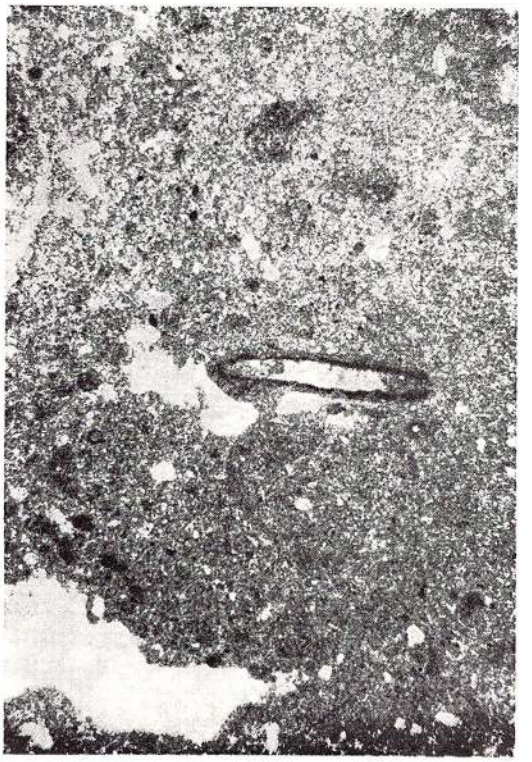

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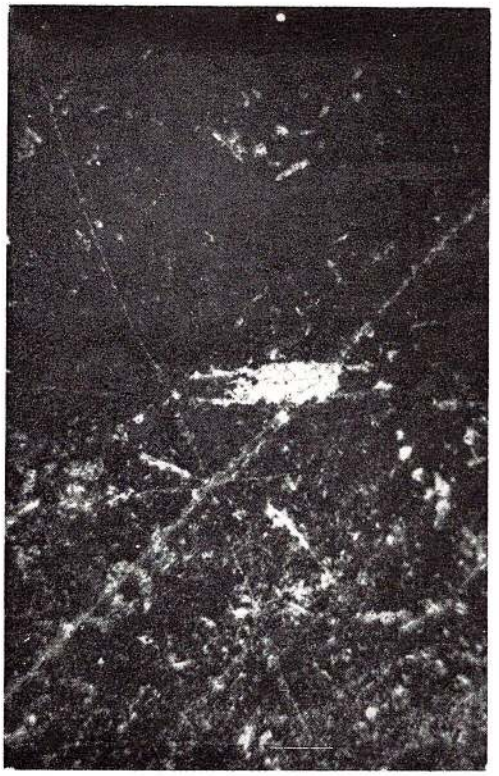

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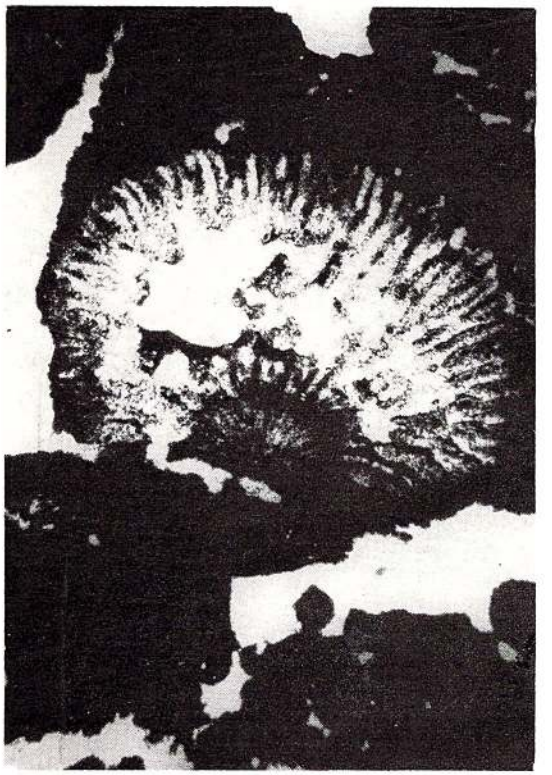

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PLATE LXXXIII

Fig. 1. — Biopelsparite with *Choffatella decipiens* Schlumberger, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 9410, Suhardu Mic Mts., × 30.

Fig. 2. — Biopelsparite with *Pseudocyclammina hedbergi* Mayne, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 9413, Făgetul Ciucului Mts., × 30.

Fig. 3. — Biomicrite with *Salpingoporella dinarica* Radoicic, and Miliolidae, *Salpingoporella dinarica* Zone, Barremian, L.P.B. 9460, Ghilcoș Mts., × 30.

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PLATE LXXXIV

Fig. 1—2. — Biolitithe with *Chaetetopsis rumanus* (S i m i o n e s c u), fig. 1 — longitudinal section; fig. 2 — cross section, *Salpingoporella carpathica* Zone, Barremian, L.P.B. 3297, Bicăjel II Mts., × 30.

Fig. 3. — Biomicrite with *Likanella* ? *danilovae* R a d o i c i c, *Likanella* ? *danilovae* Zone, Barremian, L.P.B. 9478, Ghilcoș Mts., × 30.

Fig. 4. — Biopelmicrite with *Lacrymorphus barremianus* D r a g a s t a n, *Likanella* ? *danilovae* Zone, Barremian, L.P.B. 9350, Ghilcoș Mts., × 30.

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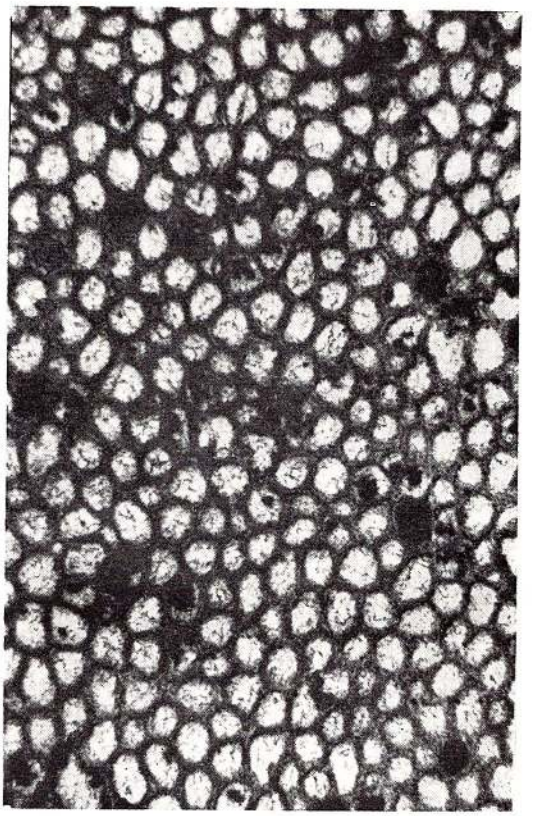

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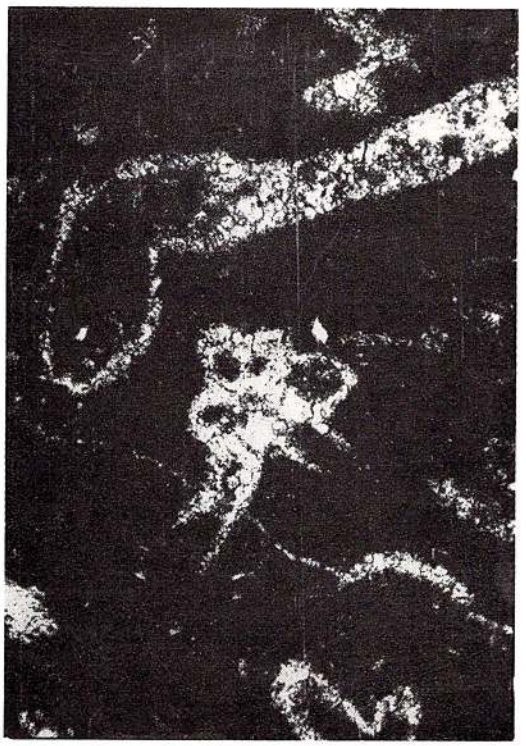

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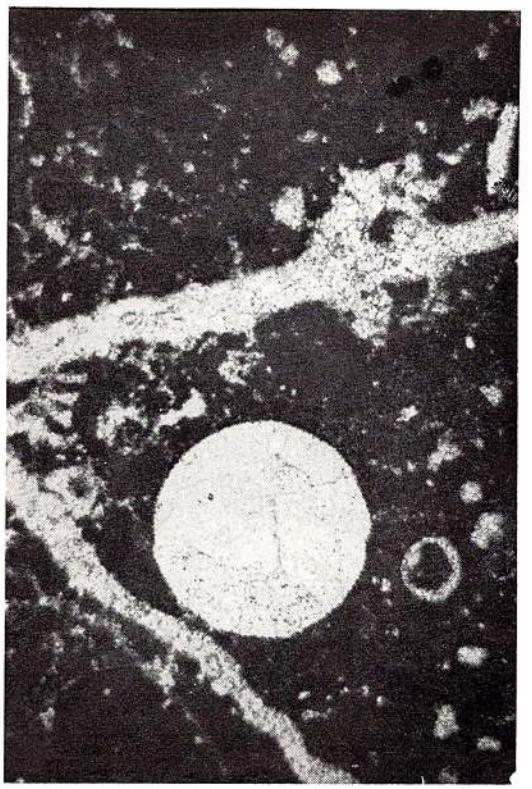

4

LXXXV

Fig. 1—4. — Biopelsparite with *Trocholina friburgensis* (Guillaume & Reichel), *Salpingoporella melitae* Zone, Barremian, L.P.B. 9398, Făgetul Ciucului and Bicăjel I Mts., × 30.

1

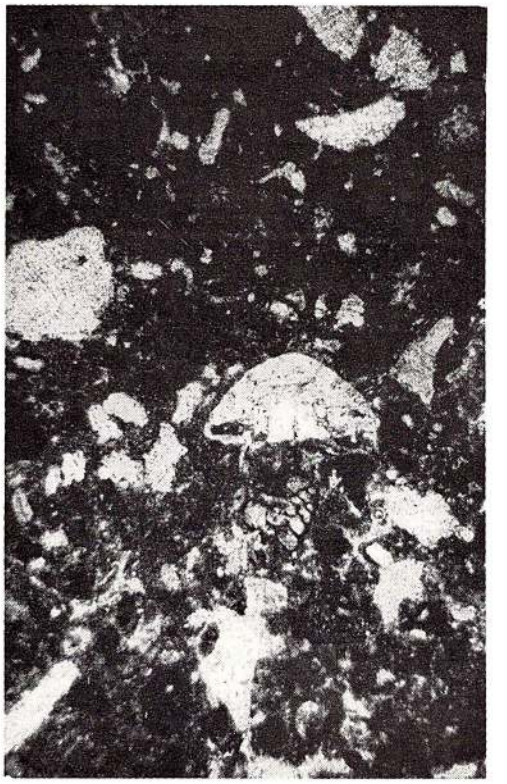

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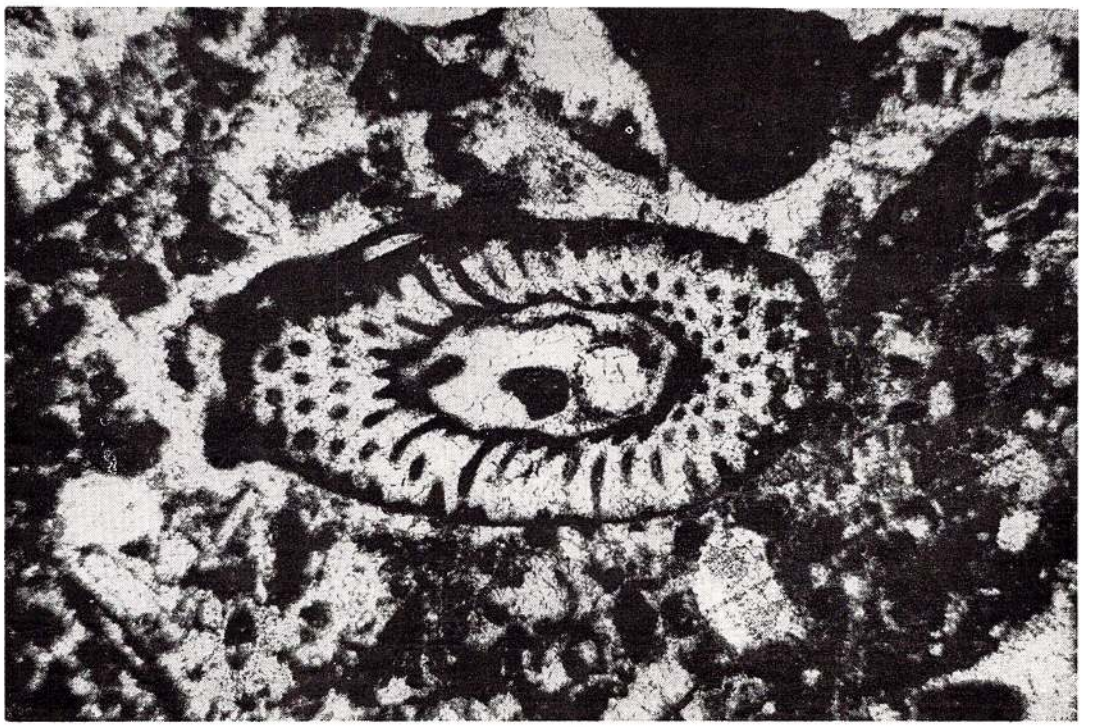
PLATE LXXXVI

Fig. 1. — Algal-biolitithe with *Salpingoporella melitae* (R a d o i c i c), *Pianella melitae* Zone, Barremian, L.P.B. 9448, Bicăjel I Mts., × 30.

Fig. 2. — Biopelsparite with *Pseudotextulariella scarcellai* (d e C a s t r o), *Likanella? danilovae* Zone, Barremian, L.P.B. 9434, Ghilcoş Mts., × 20.

Fig. 3. — Algal-biolitithe with *Thaumatoporella parvovesiculifera* (R a i n e r i), *Pianella melitae* Zone, Barremian, L.P.B. 9498, Bicăjel I Mts., × 20.



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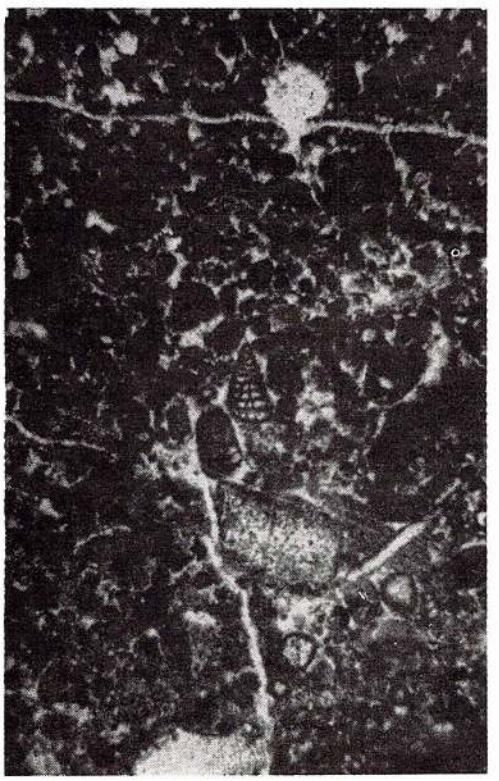

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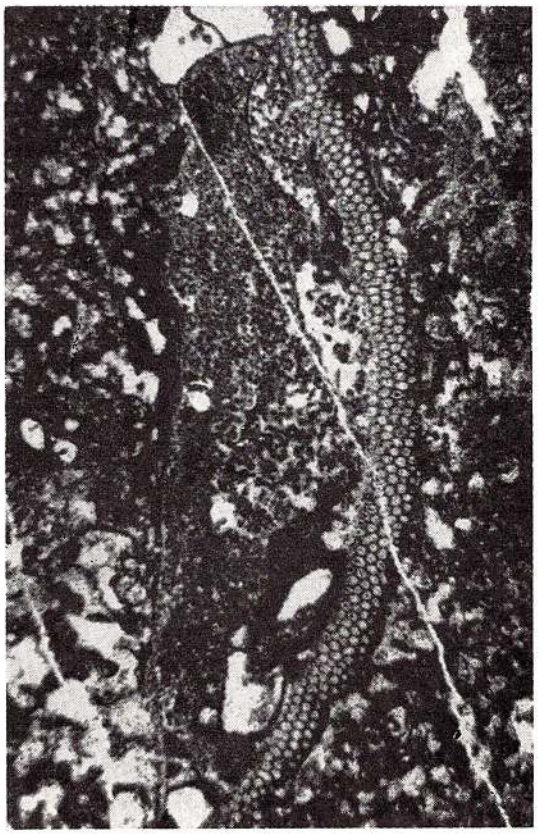
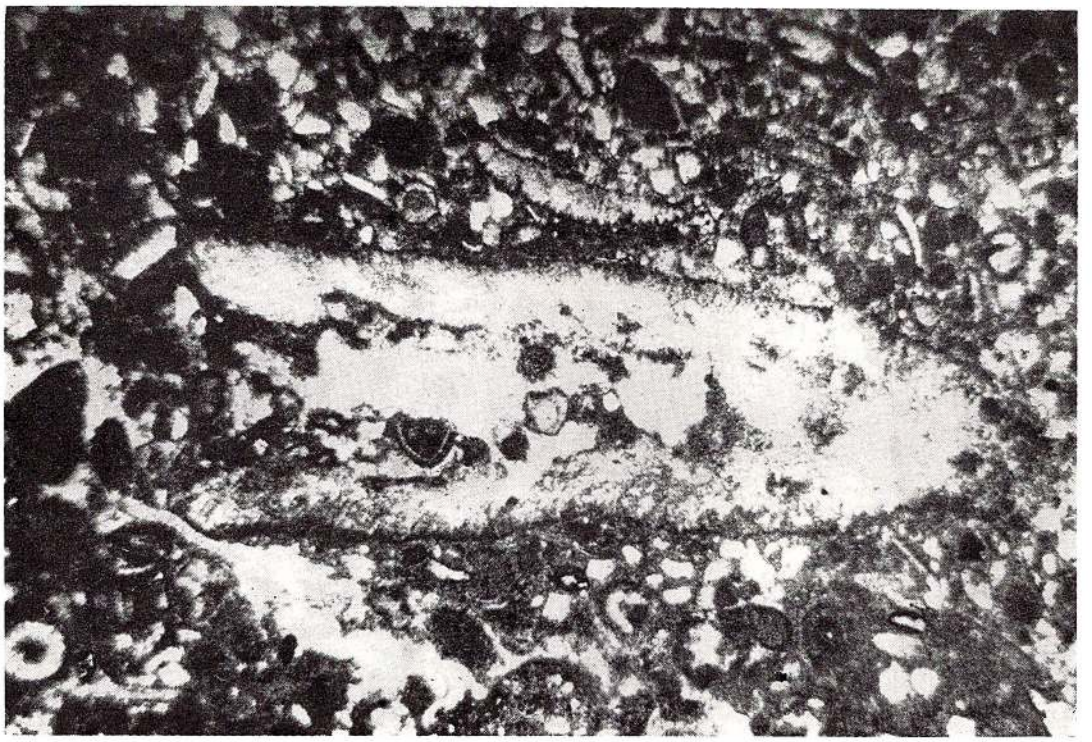


3

PLATE LXXXVII

Fig. 1–2. – Biopelsparite with *Arabicodium elongatum* Dragastan, *Likanella? danilovae* Zone, Barremian, L.P.B. 9335, Ghilcoș Mts., × 30.

Fig. 3. – Biomicrite with *Choffatella decipiens* Schlumberger, *Salpingoporella melitae* Zone, Barremian, L.P.B. 9410, Bicăjel II Mts., × 15.



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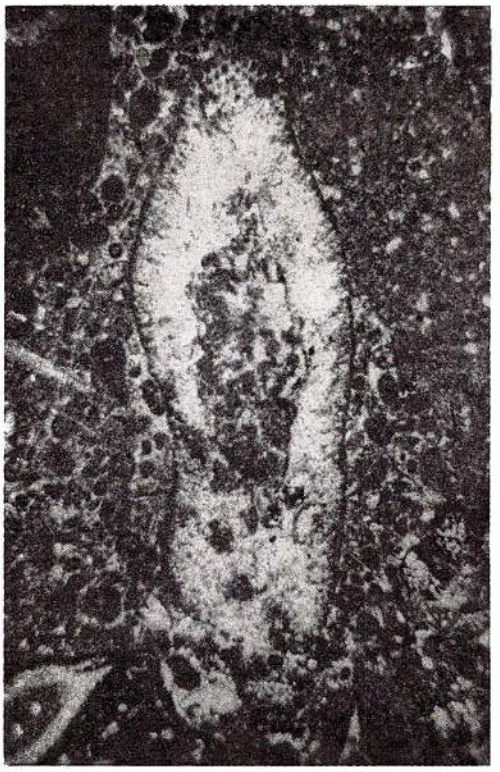

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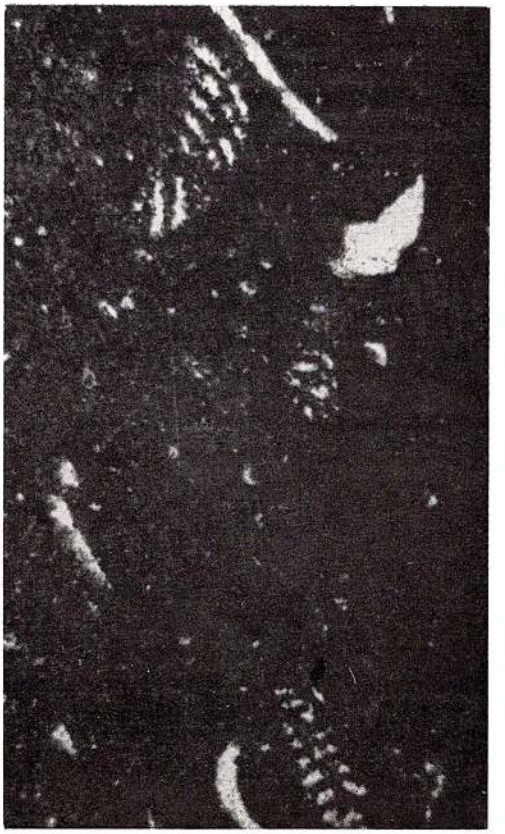

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PLATE LXXXVIII

Fig. 1. — Biopelsparite with *Lacrymorphus barremianus* Dragastan, *Salpingoporella melitae* Zone, Barremian, L.P.B. 9350, Bicăjel I Mts., × 30.

Fig. 2. — Biopelsparite with *Lacrymorphus barremianus* Dragastan and *Acicularia intermedia* Dragastan, *Salpingoporella melitae* Zone, Barremian, L.P.B. 9350 and L.P.B. 9444, Bicăjel I Mts., × 15.

Fig. 3–4. — Biomicrite with "*Dasycladacea*" *dalmatica* Radoicic, *Likanella*? *danilovae* Zone, Barremian, L.P.B. 9477, Ghilcoș Mts., × 30.

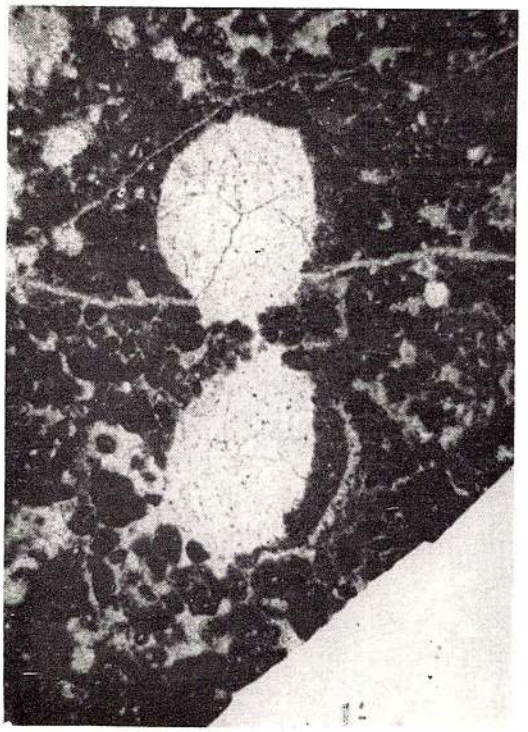

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PLATE LXXXIX

Fig. 1—2. — Biopelsparite with *Carpathoporella fontis* (P a t r u l i u s) and *Bacinella irregularis* R a d o i c i c, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9332 and L.P.B. 9502, Bicăjel I Mts, × 30.

Fig. 3. — Biopelsparite with *Trocholina* sp., *Palaeodictyoconus arabicus* Zone, Lower Aptian, Bicăjel I Mts., × 30.

Fig. 4. — Biomicrite with *Macroporella* sp., *Palaeodictyoconus arabicus* Zone, Lower Aptian, Bicăjel I Mts., × 30.

1

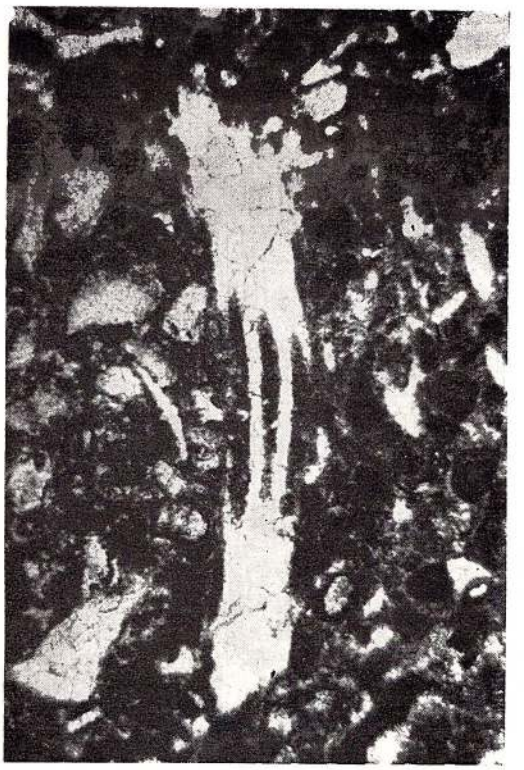

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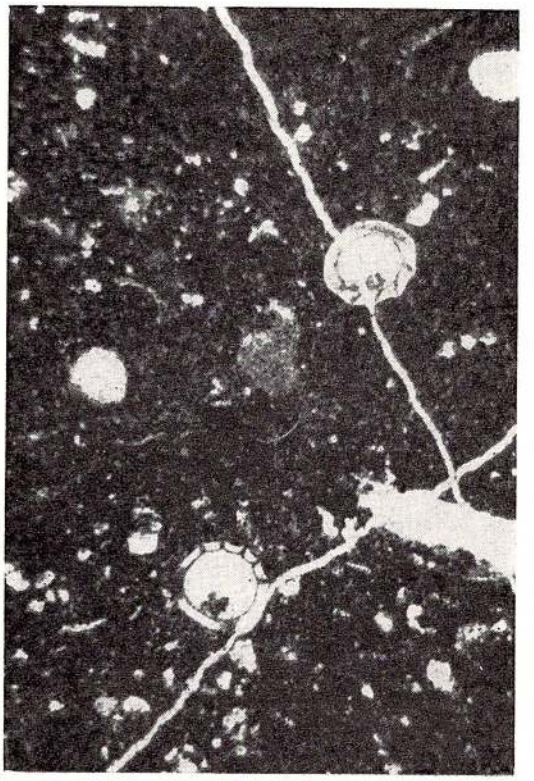
PLATE XC

Fig. 1—2. — Biomicrite with gyrogonites of *Atopochara* sp. *Atopochara* Zone, Lower Aptian, L.P.B. 0018 Ghilcoș Mts., × 30.

Fig. 3. — Calcareous sandstone with tangential and cross sections in the central stem of *Charophytes*, *Atopochara* Zone, Lower Aptian, Ghilcoș Mts., × 30.

Fig. 4. — Biopelsparite with *Acicularia antiqua* P i a, *Atopochara* Zone, Lower Aptian, L.P.B. 9445, Ghilcoș Mts., × 30.

1



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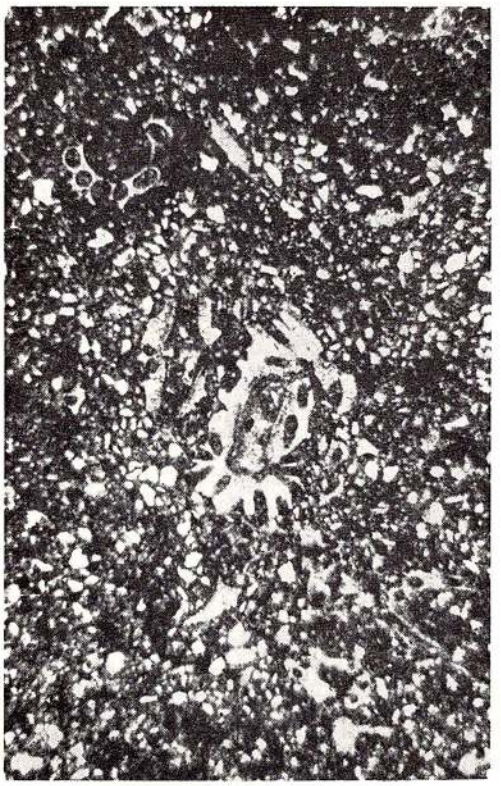

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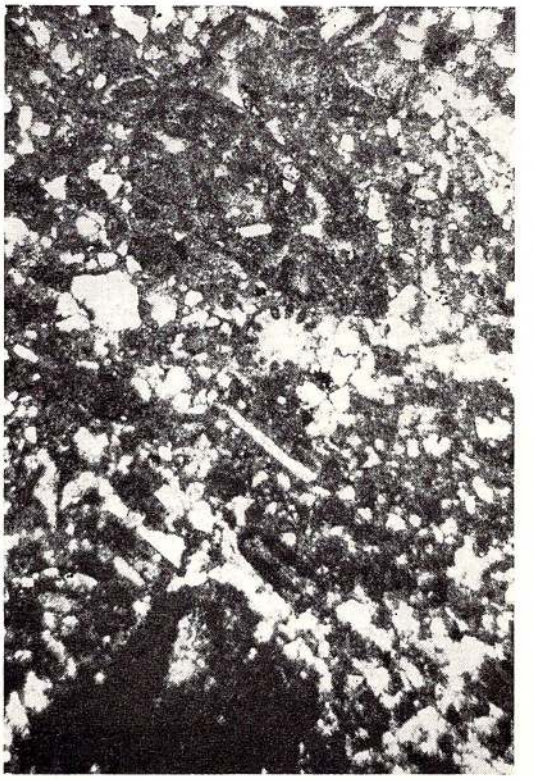

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PLATE XCI

Fig. 1. — Biopelmicrite with *Cayeuxia atanasiui* Dragastan, *Atopochara* Zone, Lower Aptian, L.P.B. 9341, Ghilcoș Mts., × 30.

Fig. 2. — Biopelsparite with *"Pianella" exilis* Dragastan and *Acicularia intermedia* Dragastan, *"Pianella" exilis* Zone, Lower Aptian, L.P.B. 9327 and L.P.B. 9444, Bicăjel I Mts., × 30.

Fig. 3. — Biomicrite with *"Dasycladacea"*, *"Pianella" exilis* Zone, Lower Aptian, Bicăjel I Mts., × 30.

Fig. 4. — Algal-biolitithe with *Cymopolia* aff. *longistila* Sokac & Nikler and *Acicularia intermedia* Dragastan, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 0011 and L.P.B. 9444, Bicăjel Mts., × 30.

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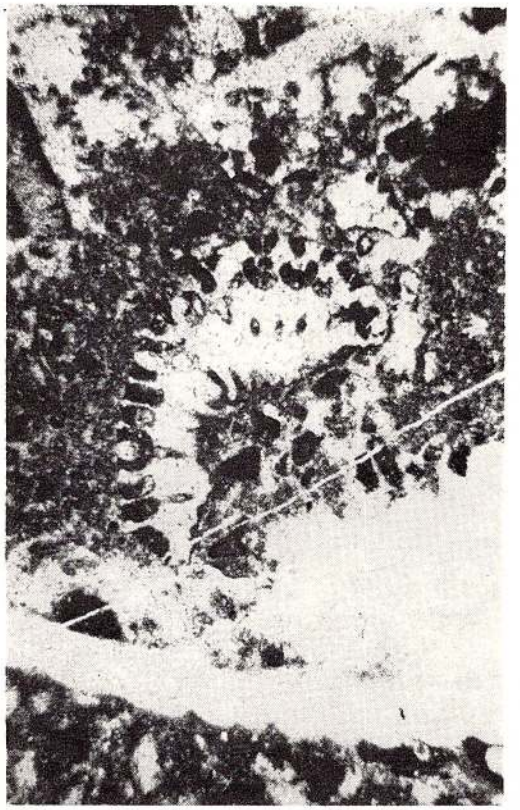

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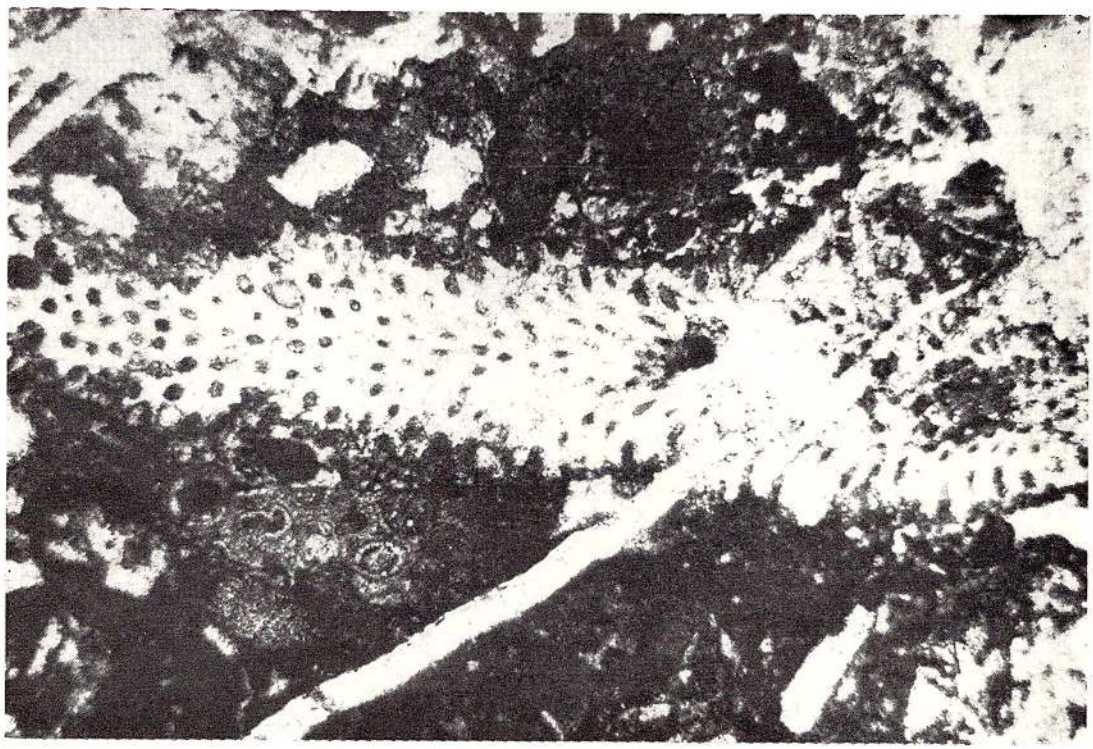
PLATE XCII

Fig. 1. — Biopelsparite with *"Pianella" exilis* Dragastan, *"Pianella" exilis* Zone, Lower Aptian, L.P.B. 9327, Bicăjel I Mts., × 30.

Fig. 2. — Algal-biolitithe with *Lithocodium aggregatum* Elliott, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9491, Bicăjel I Mts., × 15.

Fig. 3. — Biopelsparite with *Palaeodictyoconus arabicus* (Henson) and *"Dasycladacea"*, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9437, Bicăjel I Mts., × 30.



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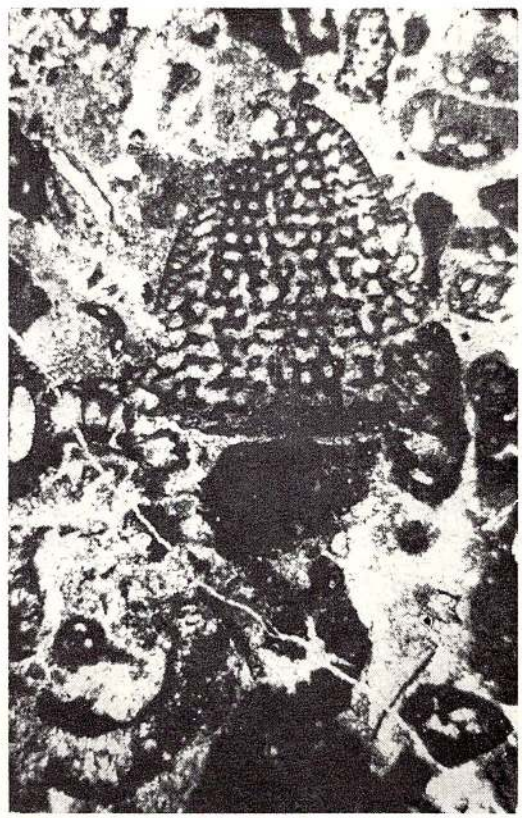


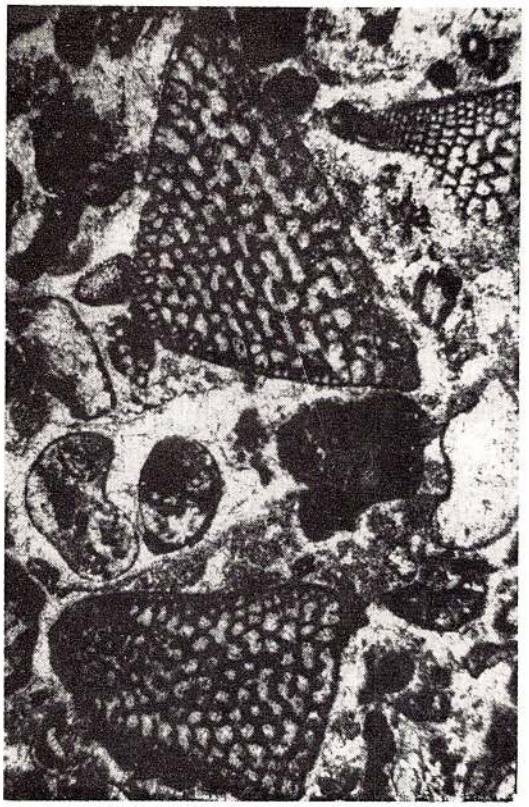
3

PLATE XCIII

Fig. 1—2. — Biopelsparite with *Palaeodictyoconus arabicus* (H e n s o n). *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9437, Bicăjel I Mts., × 30.

Fig. 3. — Biopelsparite with *Orbitolinopsis simplex* (H e n s o n). *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9438, Bicăjel I Mts., × 30.

Fig. 4. — Biopelsparite with *Orbitolinopsis simplex* (H e n s o n) and *"Dasycladacea"*, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9438, Bicăjel I Mts., × 30.



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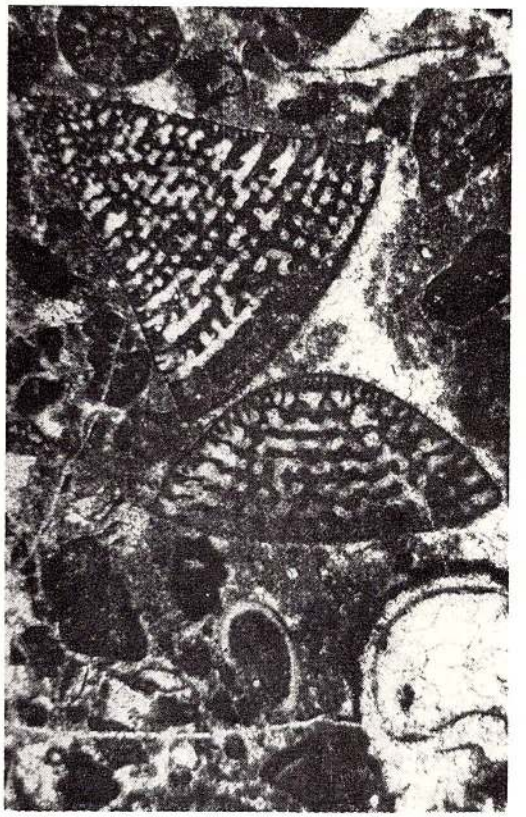

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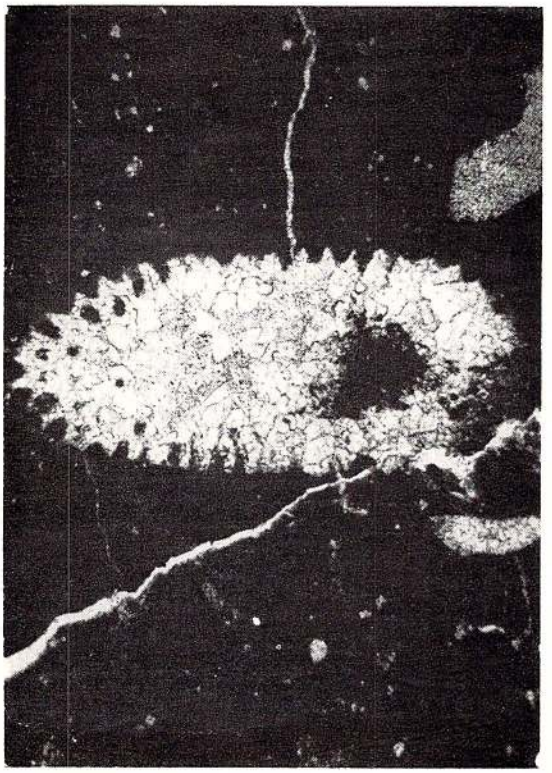
PLATE XCIV

Fig. 1. — Biomicrite with *Salpingoporella turgida* (R a d o i c i c), *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9449, Bicăjel I Mts., × 30.

Fig. 2. — Coral-biolitithe with *Ethelia alba* (P f e n d e r) and *Mesomorpha ornata* M o r y c h o w a, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9500, Bicăjel I Mts., × 30.

Fig. 3. — Biopelmicrite with *"Pianella" exilis* D r a g a s t a n and pelecypods fragments, *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9327, Bicăjel I Mts., × 30.

Fig 4. — Biopelsparite with *Trocholina apticnsis* Y o v t c h e v a and *Pseudocyclammina* sp., *Palaeodictyoconus arabicus* Zone, Lower Aptian, L.P.B. 9399, Bicăjel I Mts., × 30.



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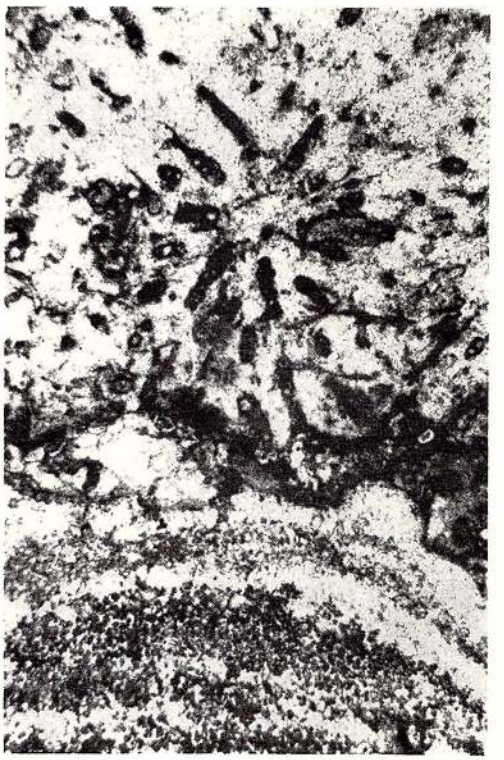

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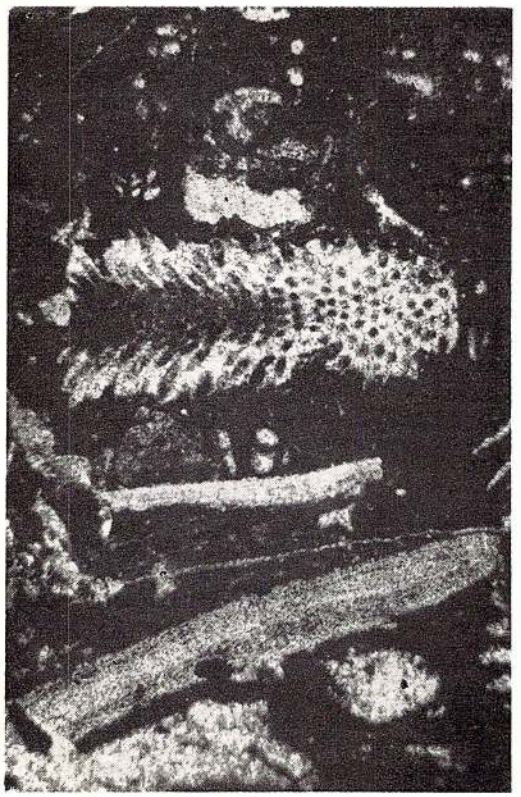

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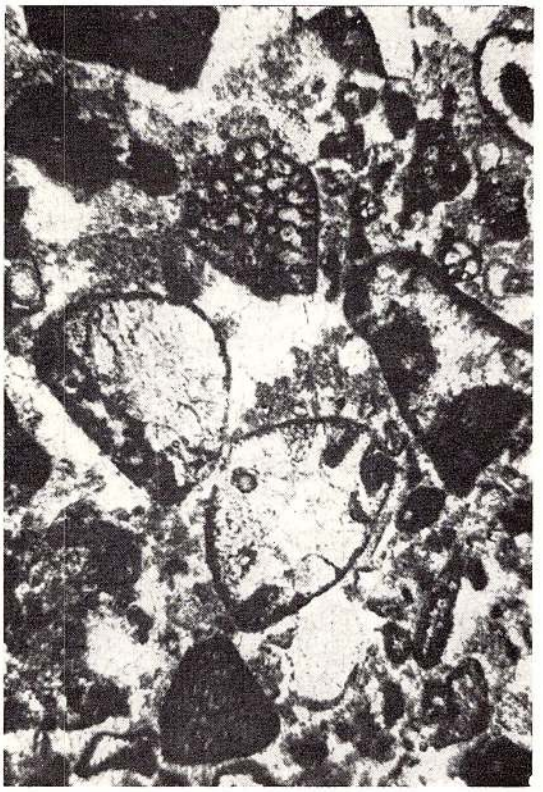
PLATE XCV

Fig. 1. — Biopelsparite with *Trocholina* sp. and Orbitolinids fragments, *Palaeodictyoconus arabicus* Zone, Lower Aptian, Bicăjel I Mts., × 30.

Fig. 2, 4. — Biopelsparite with *Amphiroa carpiana* (D r a g a s t a n), Vraconian-Cenomanian, L.P.B. 9349, Făgetul Ciucului Mts., × 30.

Fig. 3. — Calcareous conglomerate with diabasic elements, Vraconian-Cenomanian, Făgetul Ciucului Mts , × 30.



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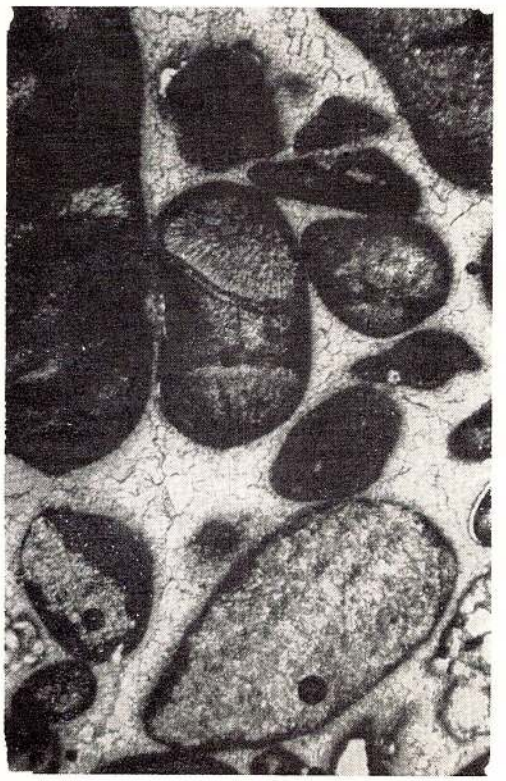

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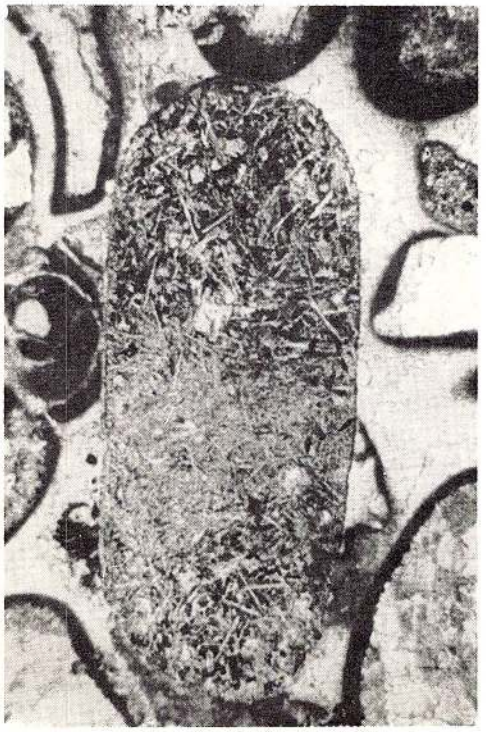

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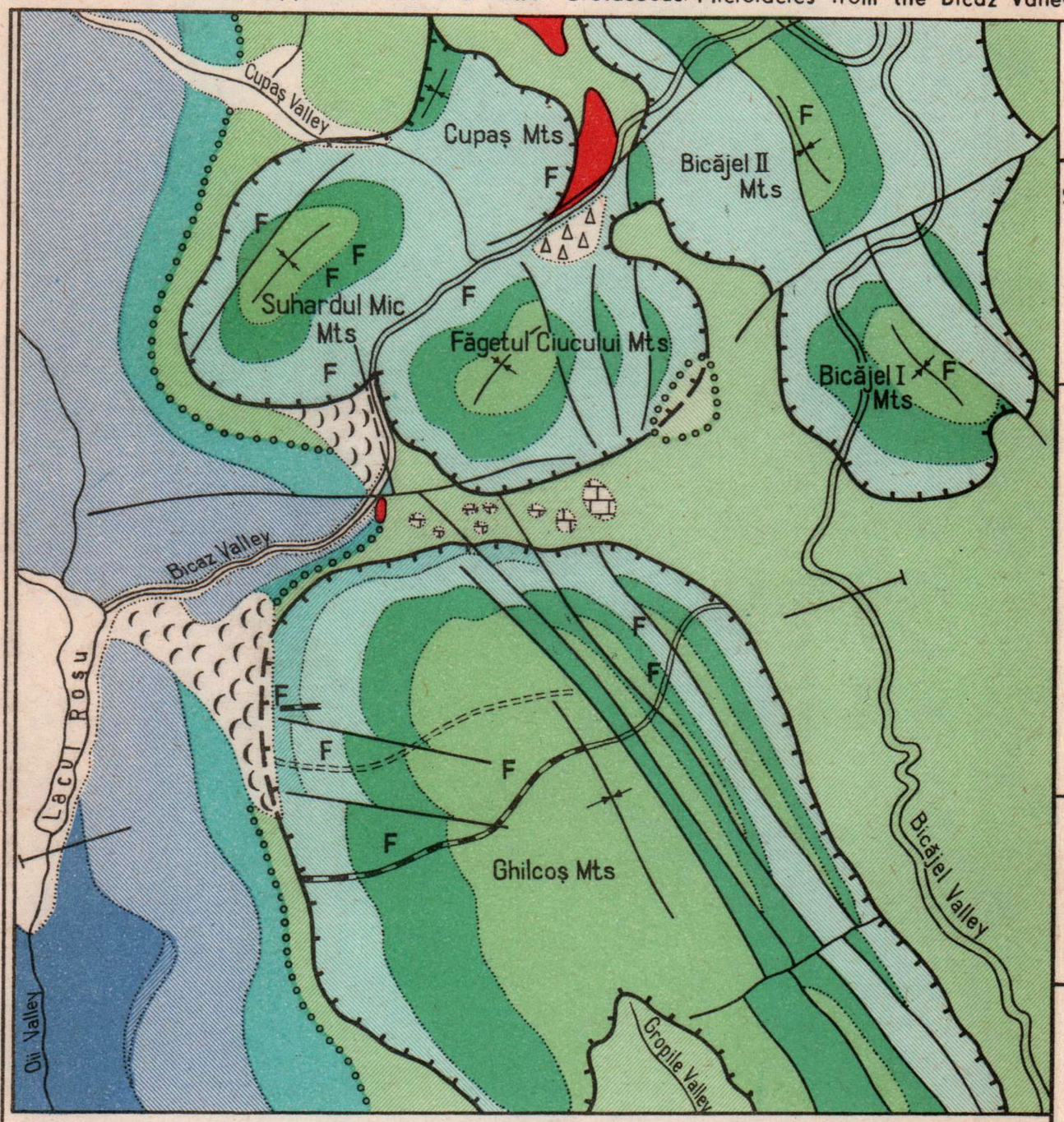
4

OVIDIU DRAGASTAN

GEOLOGICAL MAP OF CHEILE BICAZULUI REGION (EAST CARPATHIANS)

OVIDIU DRAGASTAN: Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)

PLATE XCVI

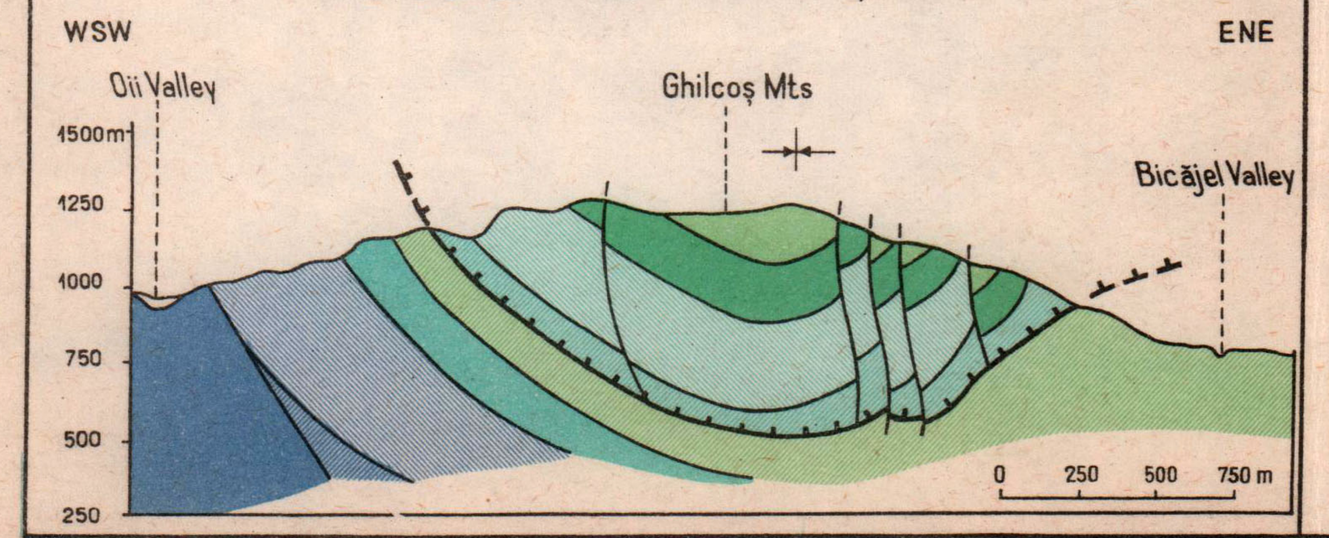


STRATIGRAPHICAL COLUMNS

Scale 1:10.000

SYSTEM	EPOCH	HAGHIMAS NAPPE	BUCOVINIAN NAPPE
CRETACEOUS	upper	CENOMANIAN	CENOMANIAN
		VRACONIAN	VRACONIAN
	lower	lower APTIAN	ALBIAN
			APTIAN
		BERREMIAN	BARREMIAN
JURASSIC	upper	HAUTERIVIAN VALANGINIAN BERRIASIAN	OXFORDIAN CALLOVIAN
		TITHONIAN	DOGGER
		KIMMERIDGIAN	lower LIASSIC
TRIASSIC	middle-upper		TRIASSIC

GEOLOGICAL SECTION BETWEEN OII VALLEY AND BICĂJEL VALLEY TO GHILCOȘ Mts.



LEGEND

- QUATERNARY — a. alluvium; b. landslides; c. boulders
- VRACONIAN CENOMANIAN — sandstone conglomerate
- WILDFLYSCH (BAR.-ALB.) — marls sandstone conglomerate
- BARREMIAN LOW. APTIAN — calcilutite
- NEOCOMIAN (BE.-VA.-HAUT.) — calcilutite
- TITHONIAN — calcilutite fine calcarenite coarse calcarenite
- KIMMERIDGIAN — pelitoidal sandstone coarse calcarenite
- CALLOVIAN-OXFORDIAN — radiolarite
- DOGGER — calcareous sandstone
- LIASSIC — limonitic and oolitic limestone
- MID. and UP TRIASSIC — limestone dolostone

TYPICAL ELEMENTS OF THE WILDFLYSCH FORMATION

a. basic eruptive rocks
b. sedimentary klippes (tithonian-neocomian urgonian-limestones)

F fossils

conformable boundry

discomformity

synclinal axis

fault

nappe

section

SECTION

A

B

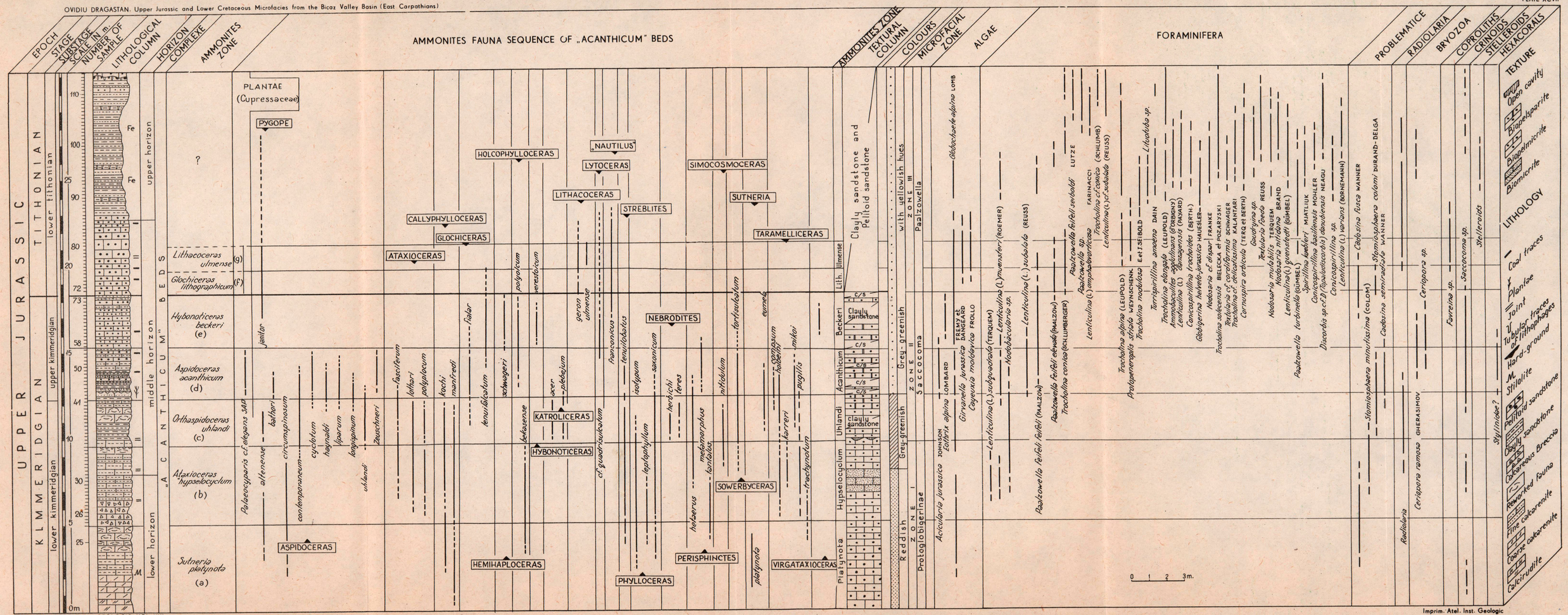
C

MEMORIILE INSTITUTULUI GEOLOGIC, VOL. XXI

Imprim. Atel. Inst. Geologic

FAUNA AND MICROFAUNA OF „ACANTHICUM" BEDS FROM WESTERN SLOPE OF GHILCOŞ MTS. (EAST CARPATHIANS)

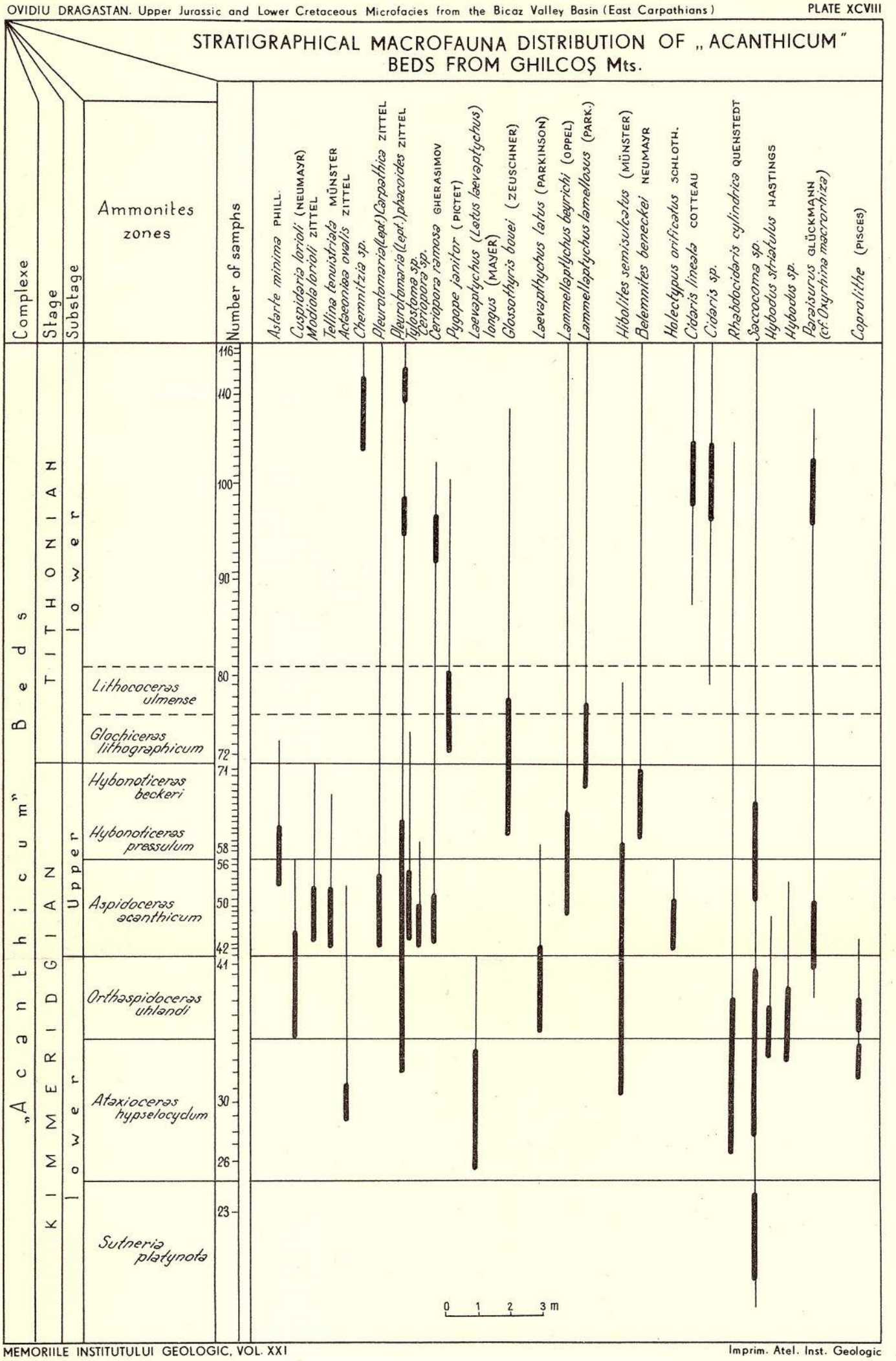
OVIDIU DRAGASTAN. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)



MEMORIILE INSTITUTULUI GEOLOGIC, VOL. XXI

Imprim. Atel. Inst. Geologic

STRATIGRAPHICAL MACROFAUNA DISTRIBUTION OF „ACANTHICUM" BEDS FROM GHILCOȘ Mts.



Imprim. Atel. Inst. Geologic

SEQUENCE OF TITHONIAN MICROFACIAL ZONES FROM GHILCOŞ MTS. (EAST CARPATHIANS)

PERIOD: MESOZOIC — JURASSIC — UPPER JURASSIC — TITHONIAN — Upper Tithonian / Lower Tithonian

EPOCH / STAGE: Berriassian; A; Tithonian

Columns: MACROFAUNA; Nr. of sample; LITHOLOGICAL COLUMN; COLOURS; TEXTURAL COLUMN; ZONE; ALGAE; FORAMINIFERS; COPROLITHS; HYDROZOA HEXACORALS SERPULIDS BRYOZOA; PROBLEMATIC.; CALPIONELLID.; RADIOLARIA

GHILCOŞ Mts. (WESTERN SLOPE) A - B

GHILCOŞ Mts. (EASTERN SLOPE) C

LITOPHASE

- Calcilutite
- Fine calcarenite
- Coarse calcarenite
- Calcirudite
- Pelitoid sandstone

Graded-bedding; Stilolite; Reworked fauna; Calcareous breccia

TEXTURE

- Open cavity
- Biopelsparite
- Biopelsparite
- Biopelmicrite
- Biomicrite
- Si Silica

BIOPHAZE

- Hexacorals
- Bryozoa
- Hydrozoa
- Mercierella
- Acervulina
- Halimeda
- Dasycladaceae
- Oncolithe
- Codiaceae
- Lithocodium
- Bacinella
- Gastropods

Redish with yellow hues; Grey whithish; Grey greenish; Grey; Reddish Grey reddish

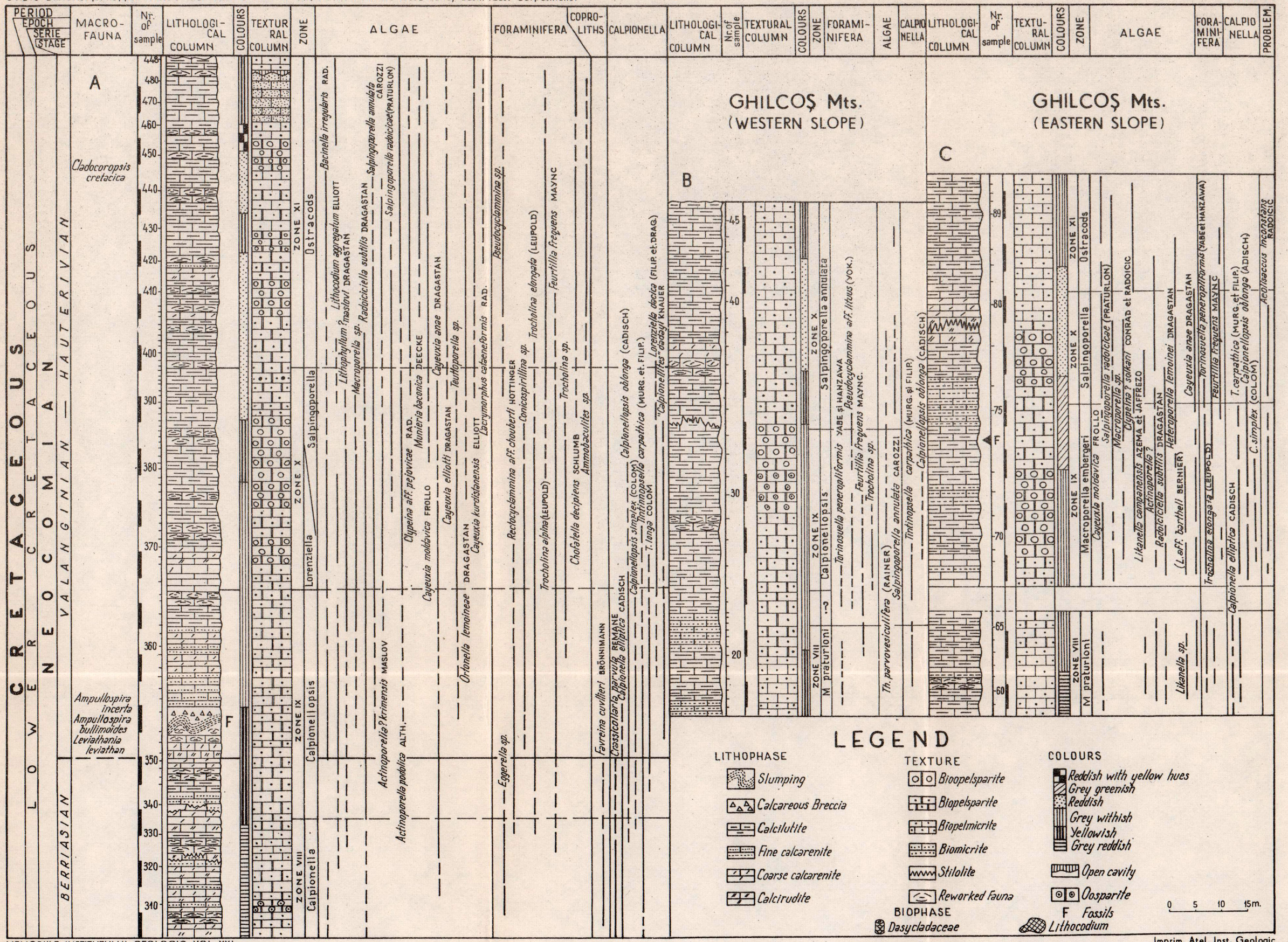
0 5 10 15

Imprim. Atel. Inst. Geologic

SEQUENCE OF NEOCOMIAN MICROFACIAL ZONES FROM GHILCOŞ MTS. (EAST CARPATHIANS)

OVIDIU DRAGASTAN. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)

PLATE C

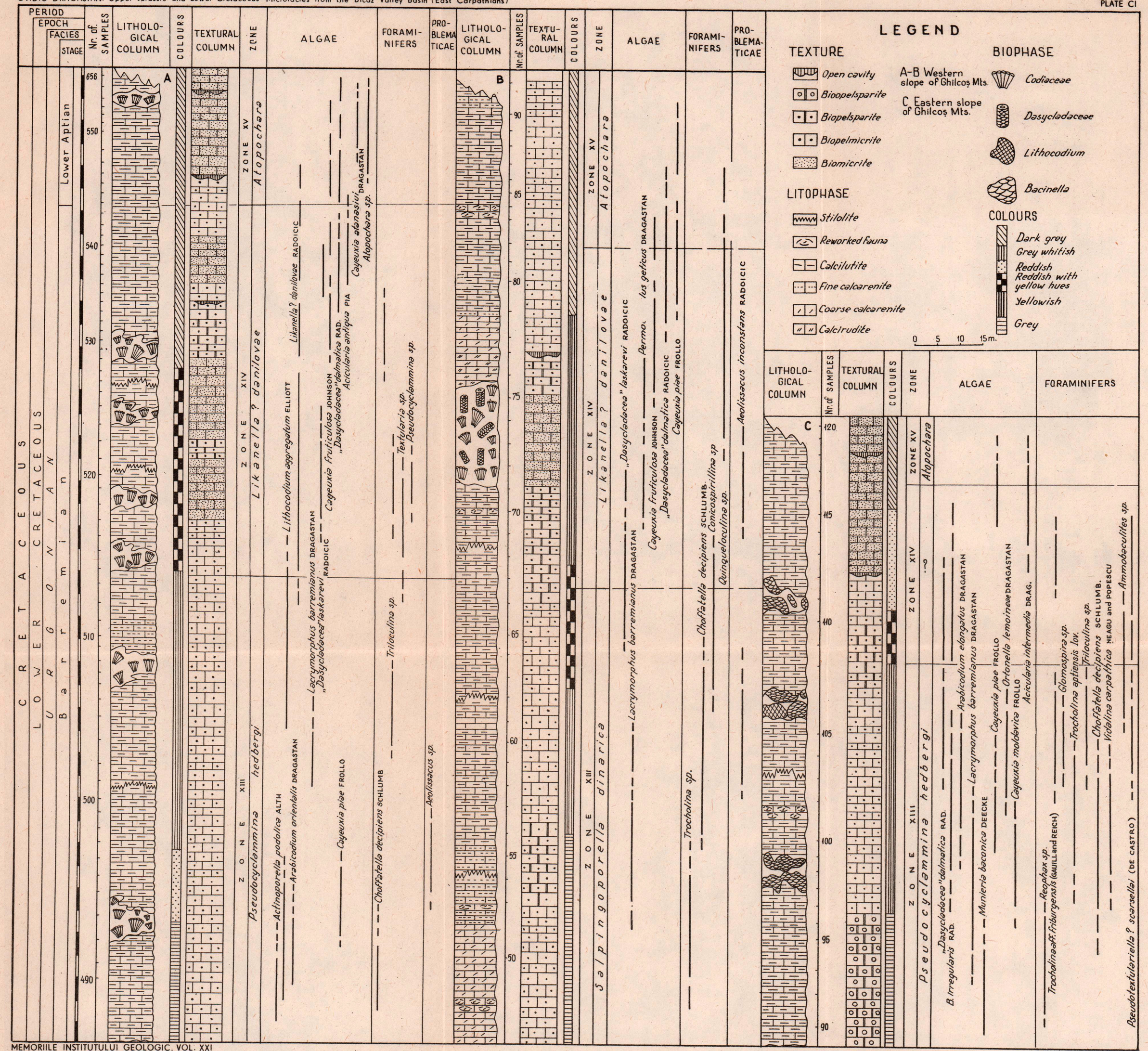


Imprim. Atel. Inst. Geologic

SEQUENCE OF BARREMIAN AND LOWER APTIAN MICROFACIAL ZONES OF GHILCOȘ MTS. (EAST CARPATHIANS)

OVIDIU DRAGASTAN. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)

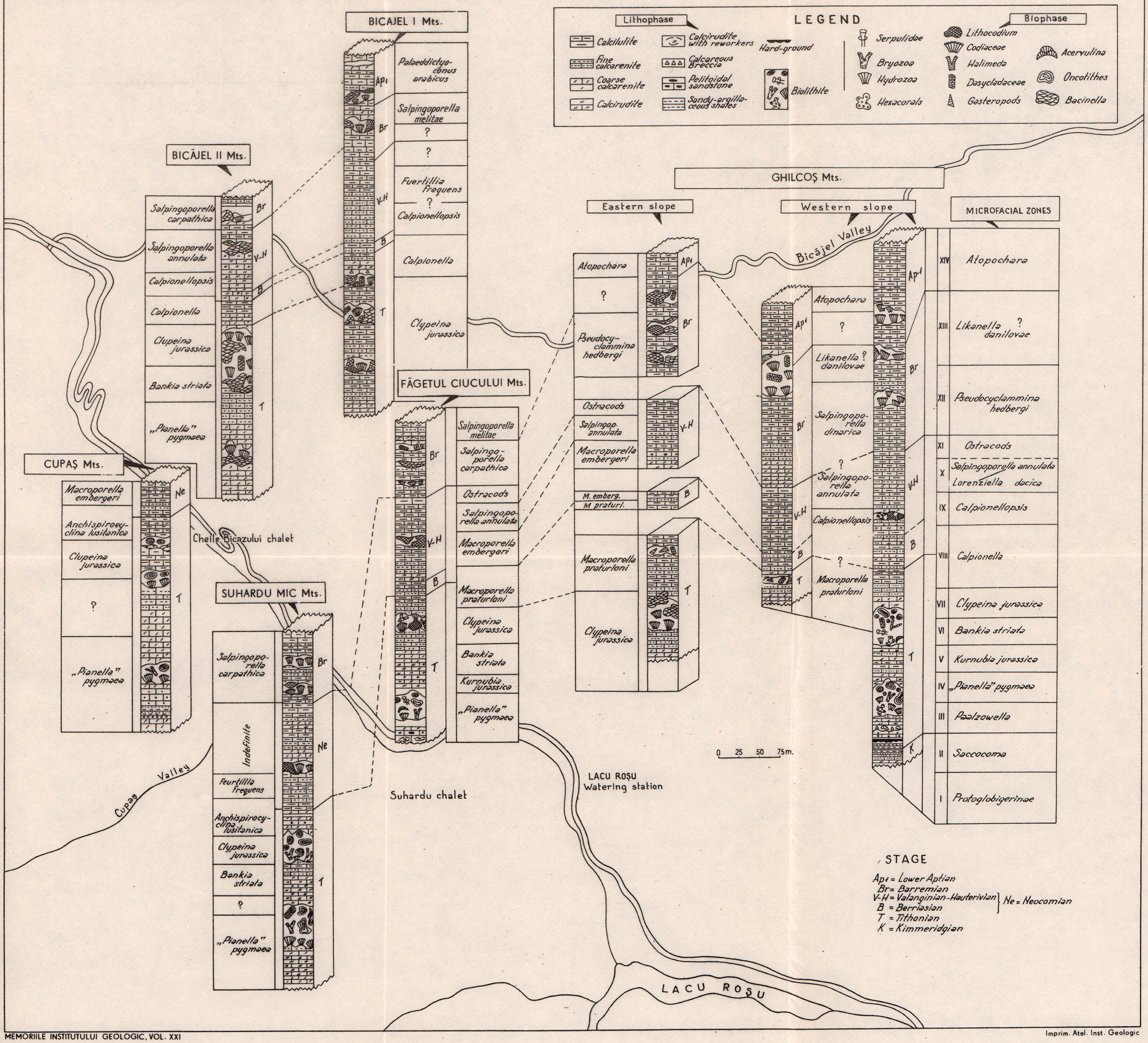
PLATE CI



Imprim. Atel. Inst. Geologic

CORRELATIONS BETWEEN MICROFACIAL ZONES OF THE KIMMERIDGIAN - LOWER APTIAN INTERVAL, IN THE BICAZ BICAZ VALLEY REGION [redacted] (EAST CARPATHIANS)

OVIDIU DRAGASTAN. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)



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ESSAY OF THE CORRELATIONS BY MICROFACIES BETWEEN THE CARPATHIANS, THE APENNINES, THE DINARIC ALPS, CEVENNES MTS. AQUITAIN BASIN, SPAIN AND PORTUGAL

OVIDIU DRAGASTAN. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians)

PLATE CIII

PERIOD	SERIES	STAGE	CHARACTERISTIC ZONES FROM BICAZ VALLEY REGION (EAST CARPATHIANS) Dragastan	CHARACTERISTIC ZONES FROM KLIPPEN BELT WEST CARPATHIANS Borza 1969	CHARACTERISTIC ZONES FROM HIGH TATRA Mts. Lefeld 1968	CHARACTERISTIC ZONES FROM CENTRAL APENINES AND OUTER DINARIC ALPS Farinacci and Radoicic 1964	CHARACTERISTIC ZONES FROM CEVENNES Mts. Bernier 1968	CHARACTERISTIC MICROFACIES ASSOCIATIONS FROM SW-AQUITAINE BASIN (FRANCE) Bouroullec and Delnffre 1969 - 1970	CHARACT. ASSOCIAT FROM CASTELLON PROVINCE (SPAIN) Bouroullec, Canérot and Déres 1970	CHARACTERISTIC ASSOCIATIONS FROM LISBOA (PORTUGAL) Ramalho 1971
CRETACEOUS	„URGONIAN"	BARREMIAN–L. APTIAN	XIV *ATOPOCHARA* / *PALAEODICTYOCONUS ARABICUS* / *"PIANELLA" EXILIS*	*HEDBERGELLA*	*ORBITOLINA LENTICULARIS*	*ORBITOLINA AND SALPINGOPORELLA DINARICA*		*PALAEDICTYOCONUS SP.*	*PERMOCALCULUS SP.*	
			XIII *LIKANELLA ? DANILOVAE* / *SALPINGOPORELLA MELITAE*					*CHOFFATELLA DECIPIENS*	*BOUEINA SP.*	
			XII *PSEUDOCYCLAMMINA HEDBERGI* / *SALPINGOPORELLA DINARICA*		*SALPINGOPORELLA MUEHLBERGII ?*			*CUNEOLINA HENSONI*		
	NEOCOMIAN	BE.VALANG.HAUT.	XI *OSTRACODS* / *LORENZIELLA* / *SALPING. ANNULATA*	*NANNOCONUS*		*SALPINGOPORELLA ANNULATA*		*CHOFFATELLA DECIPIENS* / *OSTRACODS* / *PIANELLA ANNULATA* / *FEURTILLIA FREQUENS* / *MACROPORELLA EMBERGERI*	*CHOFFATELLA DECIPIENS* / *OSTRACODS* / *CLYPEINA MARTELI* / *FEURTILLIA FREQUENS* / *ANCHISPIROCYCLINA LUSITANICA*	*FEURTILLIA FREQUENS* / *TORINOSUELLA PENEROPLIFORMIS* / *ANCHISPIROCYCLINA LUSITANICA* / *EVERTICYCLAMMINA VIRGULIANA* / *CLYPEINA JURASSICA* / *"YAGINELLA" STRIATA* / *KURNUBIA PALASTINIENSIS* / *LABYRINTHINA MIRABILIS* / *ALVEOSEPTA JACCARDI*
			X *CALPIONELLOPSIS*	*CALPIONELLOPSIS*	*CALPIONELLOPSIS* / *SACCOCOMA SP.*					
			IX *CALPIONELLA*	*TINTINNOPSELLA* / *CALPIONELLA*	*TINTINNOPSELLA* / *CALPIONELLA*	*ABERRANT TINTINNIDS*				
			VIII *CLYPEINA JURASSICA*	*CRASSICOLLARIA*	*CRASSICOLLARIA*	*CLYPEINA JURASSICA AND* / *ABERRANT TINTINNIDS*	*ANCHISPIROCYCLINA LUSITANICA limestone*	*ANCHISPIROCYCLINA LUSITANICA*		
JURASSIC	MALM	TITHONIAN	VII *BANKIA STRIATA*				*KURNUBIA JURASSICA limestone*	*HAPLOPHRAGMIUM JURASSICUM*		
			VI *KURNUBIA JURASSICA*	*CHITINOIDELLA*			*VAGINELLA STRIATA limestone*	*PSEUDOCYCLAMMINA VIRGULIANA*	*EVERTICYCLAMMINA VIRGULIANA*	
			V *"PIANELLA" PYGMAEA*			*CLYPEINA JURASSICA*	*MACROPORELLA PYGMAEA limestone*	*PSEUDOCYCLAMMINA JACCARDI*		
			IV *PAALZOWELLA*	*"LOMBARDIA"*		*CLADOCOROPSIS MIRABILIS*		*"PROTOGLOBIGERINAE"*		
		KIMM.	III *SACCOCOMA*	*CADOSINA*						
			II *PROTOGLOBIGERINAE*	*"PROTOGLOBIGERINAE"*						
		OXF.	I							

NANNOCONIDAE

SALPINGOPORELLA ANNULATA

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OVIDIU DRAGASTAN

MICROFACIESURILE JURASICULUI SUPERIOR ŞI CRETACICULUI INFERIOR DIN BAZINUL VAII BICAZULUI (CARPAŢII ORIENTALI)

BUCUREŞTI 1975