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PRESENCE OF *NUMMULITES FABIANII* (PREVER) GROUP *(Nummulites* ex gr. *fabianii)* AND ASSOCIATED FORAMINIFERS IN THE ELAZIĞ REGION

Niyazi AVŞAR*

ABSTRACT— The presence of *Nummulites* ex gr. *fabianii* has been indicated in the Eocene sediments, and the stratigraphy of the region is briefly given. The rock units of Paleozoic, Mesozoic and Cenozoic ages crop out in the region. The Paleozoic sequence is composed of metamorphic rocks. This unit is tectonically underlain by the Mesozoic sequence formed of magmatic rocks. The Paleozoic and Mesozoic rocks arc unconformably overlain by the sandstone and algal limestones of the Upper Lutetian age. Algal limestone contain genera of the Foraminifcra such as *Nummulites perforatus* (Montfort). *Assilina spira* (de Roissy), *Alveolina fusiformis* Sowerby, *Alveolina elongata* d'Orbigny, *Fabiania cassis* (Oppenheim) and *Chapmanina gassinensis* (Silvestri). The Priabonian sequence conformably overlies the sandstone and algal limestones of the Upper Lutetian age. It is composed of the alternating sandstone and clay and limestones. The Priabonian sequence is characterized by the species of Foraminifera such as *Nummulites fabianii* (Prever), *Nummulites* ex gr. *fabianii, Nummulites striatus* (Bruguicrc), *Chapmanina gassinensis* (Silvestri), *Asterigerina rotula* (Kaufmarm), *Linderina brugesi* Schlumberger, *Eorupertia magna* (Le Calvez). *Halkyardia minima* (Liebus) and *Praernapydionina huberi* Henson. The Upper Miocene sequence unconformably overlies the limestone of the Phabonian age, and it is composed of volcanic rocks.

INTRODUCTION

The investigated area is located around the Üçtepe, Körpe, Çatalharman and Egopköy 15 km NW of Elazığ province (Eastern Anatolia) (Fig. 1).

The geology of this area was studied by numerous researchers (Ketin, 1946; Tolun, 1955; Kipman, 1976; Tuna, 1979; Naz, 1979; Bingöl, 1984; Turan, 1984; Özkul, 1982; Asutay, 1985). In the eastern part of studied area, in Palu region, the presence of the marine Oligocene has been determined by Sirel et al. (1975).

The purpose of this study is to reveal the presence *of Nummulites* ex *gr. fabianii* in the Elazığ region which is known all over the world up to now but which could not be included within any group between *Nummulites fabianii* (Prever) and *Nummulites intermediums* (d'Archiac) and to give briefly the stratigraphy and the associated foraminifers of the region.

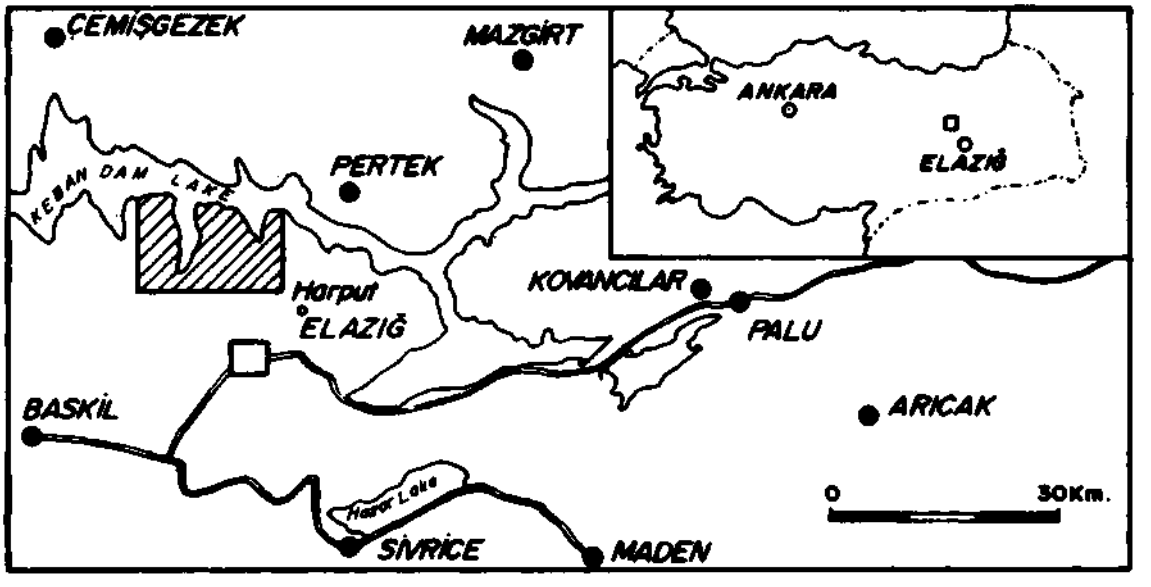

Fig. 1- Location map of the study area.

STRATIGRAPHY

Paleozoic

The Paleozoic sequence is composed of metamorphic rocks such as crystallized limestone, calcschist, marble, metaconglomerate and calcphyllite. These metamorphic sequences are tectonically thrusted over the Mesozoic units, and their primary relation is not known.

Mesozoic

This sequence is represented by granite, granodiorite, gabbro, diabase, basalt, agglomerate, tuff, volcanic sandstone and limestone. This magmatic unit is unconformably overlain by the younger sedimentary and volcanic rocks.

Eocene

Upper Lutetian: The Paleozoic and the Mesozoic rocks are unconformably overlain by the Upper Lutetian sediments. It consists of conglomerates which are various colored, medium to thick bedded sandstone and algal limestones. Algal limestones contain genera of Foraminifera such as *Nummulites perforates* (Montfort), *Assilina spira* (de Roissy), *Alveolina fusiformis* Sowerby, *Alveolina elongata* d'Orbigny, *Fabiania cassis* (Oppenheim), *Chapmanina gassinensis* (Silvestri) and *Silvestriella tetraedra* (Gümbel).

Priabonian: The Priabonian sediments conformably overlie the sandstone and algal limestones of the Upper Lutetian age. It is composed of the alternating sandstone and clay and limestones which are white yellow and beige colored fossiliferous and regularly bedded. The Priabonian sequence is characterized by the species of Foraminifera such as *Nummulites fabianii* (Prever). *Nummulites* ex gr. *fabianii, Nummulites striatus* (Bruguiere), *Asterigerina rotula* (Kaufmann), *Eorupertia magna* (Le Calvez), *Halkyardia minima* (Liebus), *Linderina brugesi* Schlumberger and *Praerhapydionina huberi* Henson.

Miocene

Upper Miocene: This unit unconformably overlies the limestones of the Priabonian age and the older units. It generally consists of basalt, tuff, agglomerate, limestone and sandstone.

SYSTEMATIC DESCRIPTION

In this chapter, the description *of Nummulites* ex gr. *fabianii* which belongs to *Nummulites fabianii* (Prever) group, found in the Priabonian and associated foraminifers is given below.

(Plate I, figs. 1-10; Plate II, figs. 1-9)

Form A: Test small, slightly inflated lenticular, with a rounded margin. The surface is covered by a reticulum generally arranged in two different ways. Its mesh is rectangular shaped on the margin and near the margin, and it has a reticulum towards the center of test. Diameter is 4.2-5.1 mm. and its thickness is 2.3-3.2 mm.

In the equatorial section, the dimension of the first chamber is about 263 microns in sphacrical and protococh 288x361 microns, deutroconch 175x350 microns in oval. The spiral lamina is growing progressively until the end of the penultimate whorl.

Septa are rectilinear, slightly recurved and slightly inclined to the spiral lamina of the previous whorl. The chambers are subquadrate or slightly longer than higher in the early whorls, but later become decisively rectangular and towards the last whorls the chambers are 3-4 times longer than higher.

Form B: Test lenticular, with a sharp margin, and it has a slightly swollen in the center. Its diameter is 8-10.6 mm. and thickness is 1.4-3 mm. In the equatorial section, the first chamber is very small. Other characteristics are the same as the macrospheric form.

Distribution and associated foraminifers

The *Nummulites* ex gr. *fabianii* is found in the limestone of the Priabonian with *Nummulites fabianii* (Prever), *Nummulites striatus* (Bruguiere), *Sphaerogypsina globulus* (Reuss), *Linderina brugesi* Schlumberger, *Chapmanina gassinensis* (Silvestri), *Asterigerina rotula* (Kaufmann), *Eorupertia magna* (Le Calvez), *Halkyardia minima* (Liebus), *Praerhapydionina huberi* Henson, *Rotalia* sp., *Austrolrillina* sp., *Peneroplis* sp., and *Planorbulina* sp. in the Körpe, Egopköy and Çatalharman measured stratigraphic sections (Fig. 2), (Plate II, III).

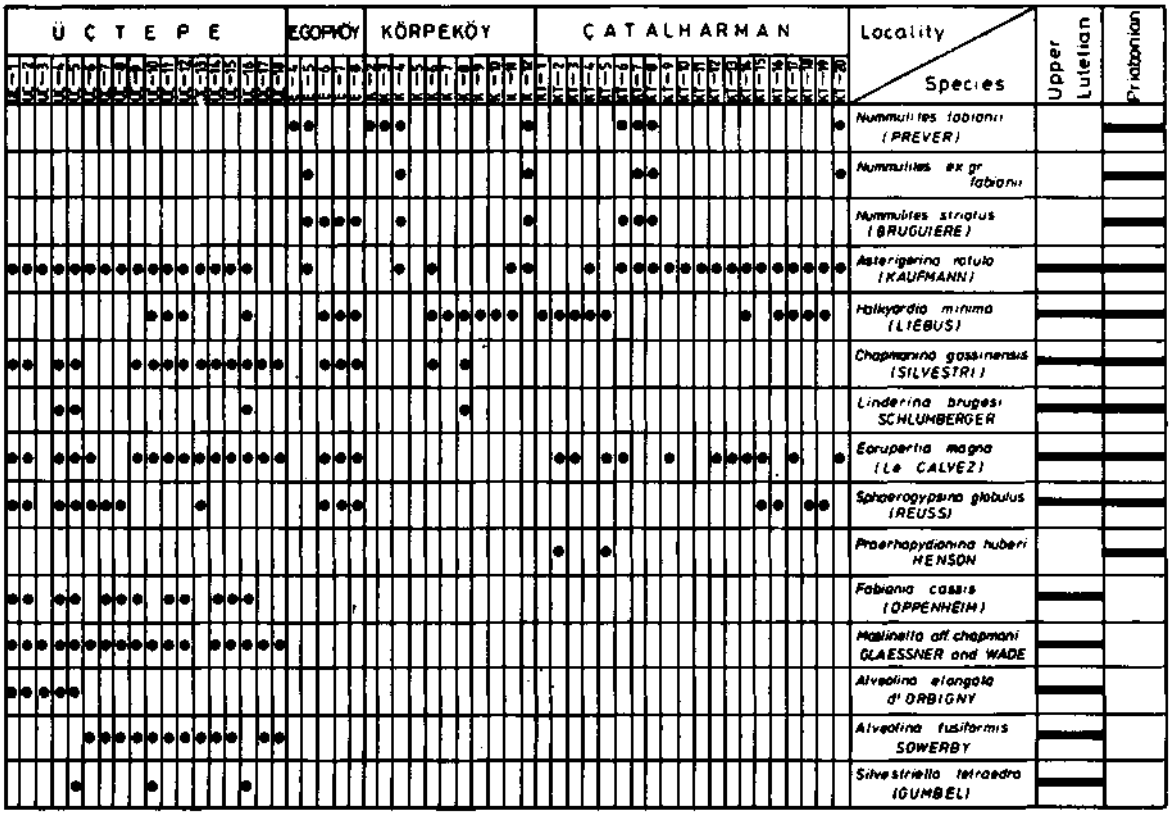

Fig.2- Biostratigraphic distribution of the foraminifers in limestone in Elazığ.

In addition, the same fossil is observed around the Baskil region (Turan, 1984; Asutay, 1985) together with the fossil assemblages: *Nummulites fabianii* (Prever), *Nummulites striatus* (Bruguiere), *Eorupertia magna* (Le Calve?.), *Chapmanina gassinensis* (Silvestri), *Fabiania cassis* (Oppenheim), *Halkyardia minima* (Liebus), *Sphaerogypsina globulus* (Reuss), *Amphistegina* sp., *Heterostegina* sp., and *Alveolina* sp

Stratigraphic level: Priabonian.

DISCUSSION AND CONCLUSIONS

The nummulites which belong to *Nummulites fabianii* (Prever) group are different from real *Nummulites fabianii* (Prever). Also, these species are diffrerent from *Nummulites fichteli* Michclotti which arc characteristic of Oligocene. Our species are found together with the characteristic foraminifers of Eocene; *Nummulites fabianii* (Prever), *Nummulites striatus* (Bruguiere), *Halkyardia minima* (Liebus), *Chapmanina gassinensis* (Silvestri), *Linderina brugesi* Schlumberger, *Asterigerina rotula* (Kaufmann), *Eorupertia magna* (Le Calvez) and *Sphaerogypsina globulus* (Reuss) and that is why there is no doubt about their age.

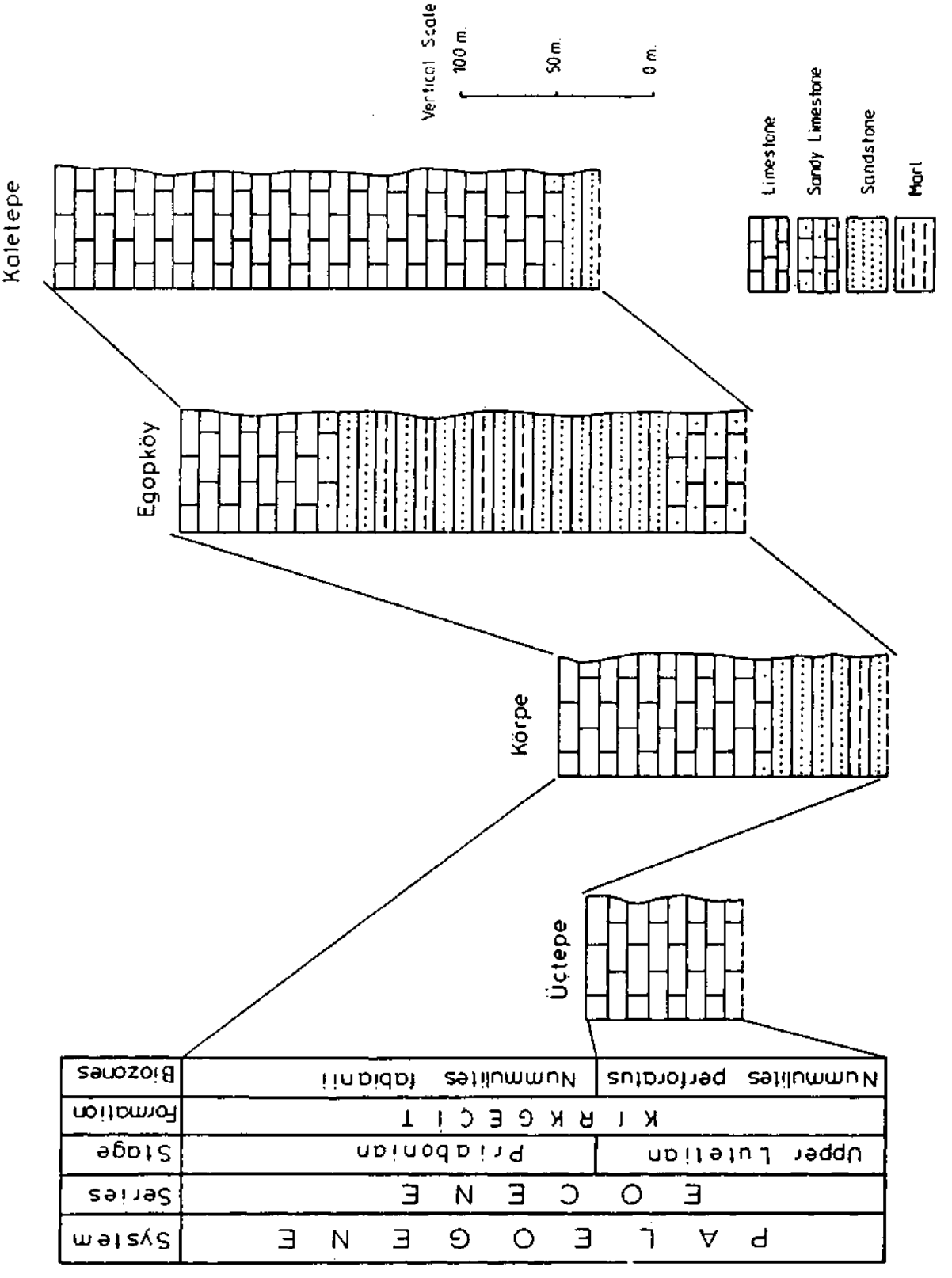

Fig.3- The correlation of the measured stratigraphic section in the study area.

However, paleontologists studied on the nummulites all over the world have indicated their problems about naming this kind of nummulites.

Boussac (1911) stated that there were transitional nummulites between *Nummulites fabianii* (Prever) and *Nummulites intermedius* (d'Archiac) in Biarritz, and showed evidence revealing that the latter originated from the former. In addition, the same author pointed out that typical *Nummulites fabianii* (Prever) posses a sparse net and more granules, and *Nummulites* ex gr. *fabianii* are not found in the lower part of the Priabonian (Bartonian) and they indicate a variation approaching typical *Nummulites intermedius* (d'Archiac).

Flandrin (1938) pointed out that the transitional forms were in the upper part of the Eocene beds, and the lower part of the Oligocene layers having studied the materials collected from Algeria. The nummulites in the Flandrin's thesis resemble those of the Hoia-Cluj samples.

Grigorian (1961) accepts *Nummulites reliatus* Roveda as a subspecies. In addition, the same researcher pointed out that *Nummulites fabianii reliatus* Roveda indicated a transitional morphology between *Nummulites fabianii* (Prever) and *Nummulites intermedius* (d'Archiac) and was found at the Upper Eocene-Lower Oligocene boundary.

Roveda (1970) indicated that the nummulites are faced with a dangerous inflation as being parallel to the other foraminifcral group as result of the author's comprehensive study. For this reason, Roveda (1970) produced forty-one species, subspecies and varieties *of Nummulites fabianii* (Prever) and accepted only five of them.

Bombita (1975) revealed that four laxons of the group followed each other in Transilvania, first of which has a little primitive character and was found in Lcgia-Cluj Limestones, second of which formed an epibole species in the marls with *Nummulites fabianii* (Prever), third of which diminished in the marls bearing Bryozoa, and fourth of which formed a transitional form to *Nummulites intermedius* (d'Archiac) in Hoia Limestones and described the forms as follows;

1- Having studied the initial form (Plate I, figs. 1-17) from subspecies of Transilvania (Bombita, 1975), it was determined that the diameters of microspheric forms vary between 7.5-11.5 mm. The superficial net of the test shows transitional aspects of great nets to irregularly trajectory and broken and elongated meshes disposed, sinuous and granules arranged parallel to that of central form *of Nummulites fabianii* (Prever). In the equatorial section, the spiral lamina is growing progressively until the end of the penultimate whorl, and towards the last whorls of the chambers are longer than higher. The surface of the macrospheric form is covered by a reticulum. The diameter of the macrospheric form (3.5-4.5) is bigger than the previous form. The diameter of the macrosphere is approximately 0.35 mm.

2- *Nummulites* ex *gr. fabianii* (Plate II, figs. 1-15; Plate VII, figs. 1-6) are found in the marls with *Nummulites fabianii* (Prever) in the epibole zone of the Baci (Cluj) region. The margin of the test at these forms is undulated, and the superficial net is sinuous, meandriform and of parallel bunched forms containing thin meshes. The diameter of the test is between 12-13.5 mm. The diameter of the macrospheric forms (3-4 mm.) are less than those of the species of Legia Limestones, but diameter of the macrosphere is slightly larger.

3- *Nummulites* ex gr. *fabianii* collected from the Hoia Limestones, cropped out the western part of the Cluj, formed the transitional form between *Nummulites fabianii* (Prever) and *Nummulites intermedius* (d'Archiac) (Plate IV, figs. 1-19). The diameters of the microspheric forms of the Hoia arp 5.9-9.3 mm. and generally vary between 7-7.5 mm. The margin of the test is often undulated and the central part is poorly prominent. In general, the secondary ramification of the superficial nets is not to be gathered in the nets but turminates in the meshes with or without granules. Unification as being net shaped can be seen at the polar, zone of the test in a narrow band. However, this unification docs not attain to the fineness revealed by the *Nummulites intermedius* (d'Archiac). The meshes of the net are more elongated in radial direction which form a similar type *of Nummulites fabianii* (Prever). Despite the fact that the diameter of the macrospheric form is found in the same variability limits in the marl with *Nummulites fabianii* (Prever), the diameter of the macrosphere indicated a slightly lessening magnitude (0.3-0.35 mm.). Most of the macrospheric forms, as seen in *Nummulites fabianii* (Prever), contain the rectangular mesh between septa and spiral lamina. In adult forms the lenghts of the final whorls arc more than their heights.

After having throughly studied all the general characteristics of *Nummulites* ex *gr.fabianii* collected from the Elazığ region (Eastern Anatolia), they are found to be within the same limits and to resemble the characteristics of *Nummulites* ex *gr.fabianii* determined from Baci, Legia and Hoia Limestones in Transilvania.

As pointed out before, a chaotic naming still continues. These nummulites are included in the *Nummulites fabianii* (Prever) group in this work because of the rarity of the nummulites.

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PLATES

PLATE -I

Nummulites ex gr. *fabianii*

Fig. 1- Equatorial section, microspheric form (E5-2f), X7.

Fig. 2-Equatorial section, microspheric form (E5/1), X7

Fig. 3- Equatorial section, microspheric form (E5-2i), X7.

Fig. 4- Equatorial section, microspheric form (E5-2h), X7.

Fig. 5- Axial section, microspheric form (E5-2b), X7.

Fig. 6- Equatorial section, microspheric form (E5-lk), X6.

Fig. 7- Equatorial section, microspheric form (E5-2k), X6.

Fig, 8- Axial section, microspheric form (K4-ld), X6.

Fig. 9-Equatorial section, microspheric form (E5-1n), X5.

Fig. 10- Equatorial section, microspheric form (E5-2g), X6.


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PLATE - II

Nummulites ex gr. *fabianii*

Fig. 1-Equatorial section, macrospheric form (E5-2), X11.

Fig. 2-Equatorial section, macrospheric form (E5/3), X12.

Fig. 3-Axial section, macrospheric form (E5-lb), X9.

Fig. 4- Axial section, macrospheric form (E5-lc), X9.

Fig. 5- Equatorial section, macrospheric form (E5/4), XI2.

Fig. 6- Equatorial section, macrospheric form (KT-7/4), XI1.

Fig. 7- Equatorial section, macrospheric form (E5/5), X12.

Fig. 8- Surface view, macrospheric form (E5/6), X9.

Fig. 9- Surface view, macrospheric form (E5/8), X8.

Nummulites fabianii (Prever)

Fig. 10- Equatorial section, macrospheric form (E4/1), X5.

Fig. 11- Equatorial section, macrospheric form (E4/2), X4.

Fig. 12- Surface view, macrospheric form (K-3), X6.

Nunvnulites striatus (Bruguiere)

Fig. 13- Surface view, macrospheric form (K4-2/1), X7.

Fig. 14- Axial section, macrospheric form,(K4-2), X7.

Fig. 15-Axial section, macrospheric form (K4-2d), X10.

Fig. 16- Equatorial section, macrospheric form (K4-2/3), X8.

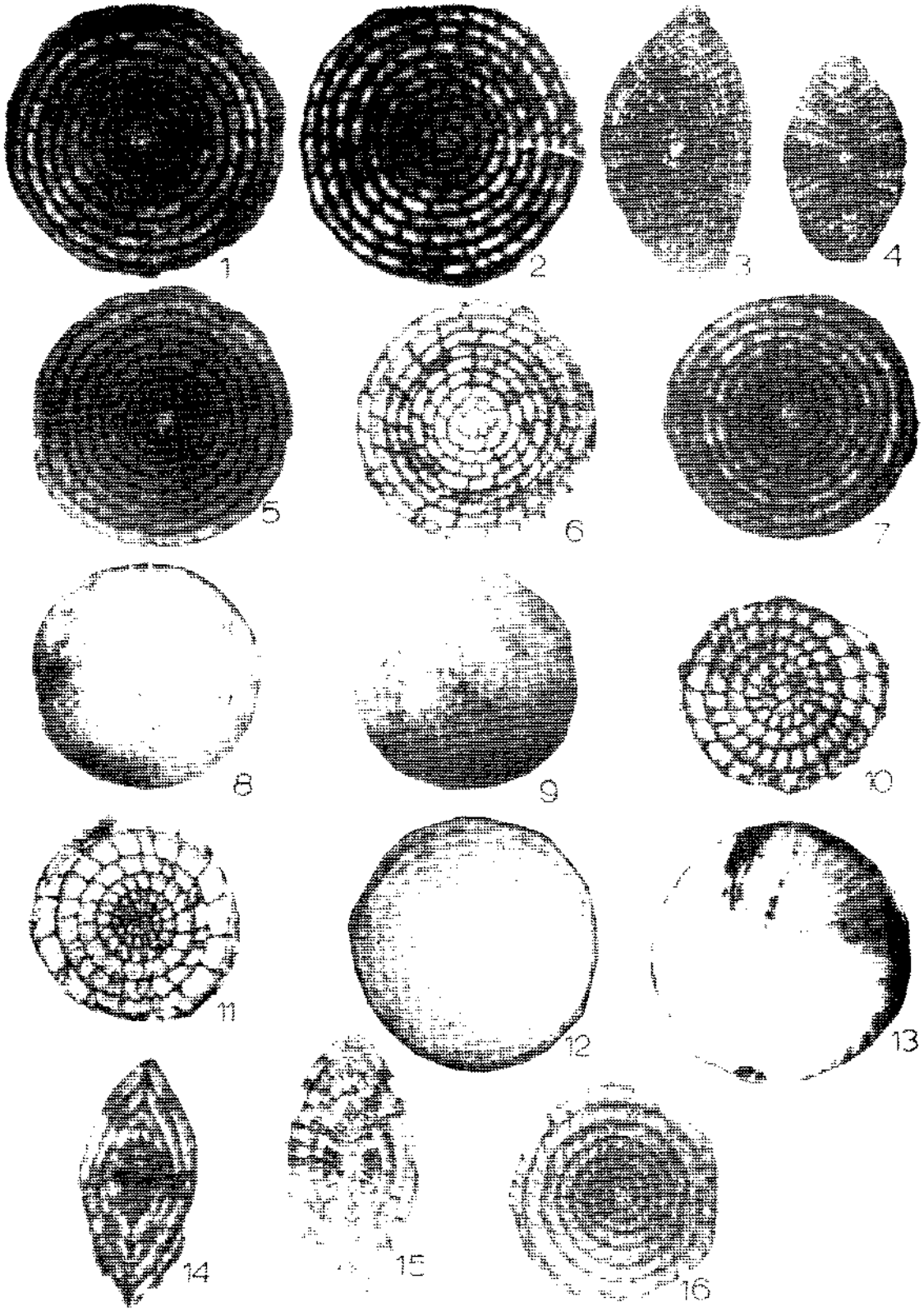
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PLATE - III

Eorupertia magna (Le Calvez)

Fig. 1-Equatorial section (Üç-18/1), X28.

Fig. 2-Axial section (Üç-17), X25.

Fig. 3- Axial section (Al-7), X16.

Halkyardia minima (Liebus)

Fig. 4-Axial section (A1-1), X92.

Fig. 5- Axial section (KT-14/1), X51.

Praerhapydionina huberi Henson

Fig. 6- Vertical section (A1-21/6), X34.

Fig. 7-Vertical section (Al-21/12), X32.

Chapmanina gassinensis (Silvestri)

Fig. 8- Vertical section (N-8), X34.

Fig. 9- Basal section (N-9), X32.

Sphaerogypsina globulus (Reuss)

Fig. 10- Axial section (KT-15/1), X36.

Asterigerina rotula (Kaufmann)

Fig. 11- Axial section (KT-14/1), X45.

Fig. 12- Axial section (KT-14/2), X47.

Rotalia sp.

Fig. 13-Axial section (KT-15/2), X33.

Austrolrillina sp.

Fig. 14- Equatorial section (Al-21/12), X35.

Peneroplis sp.

Fig. 15- Axial section (Al-21/4), X20.

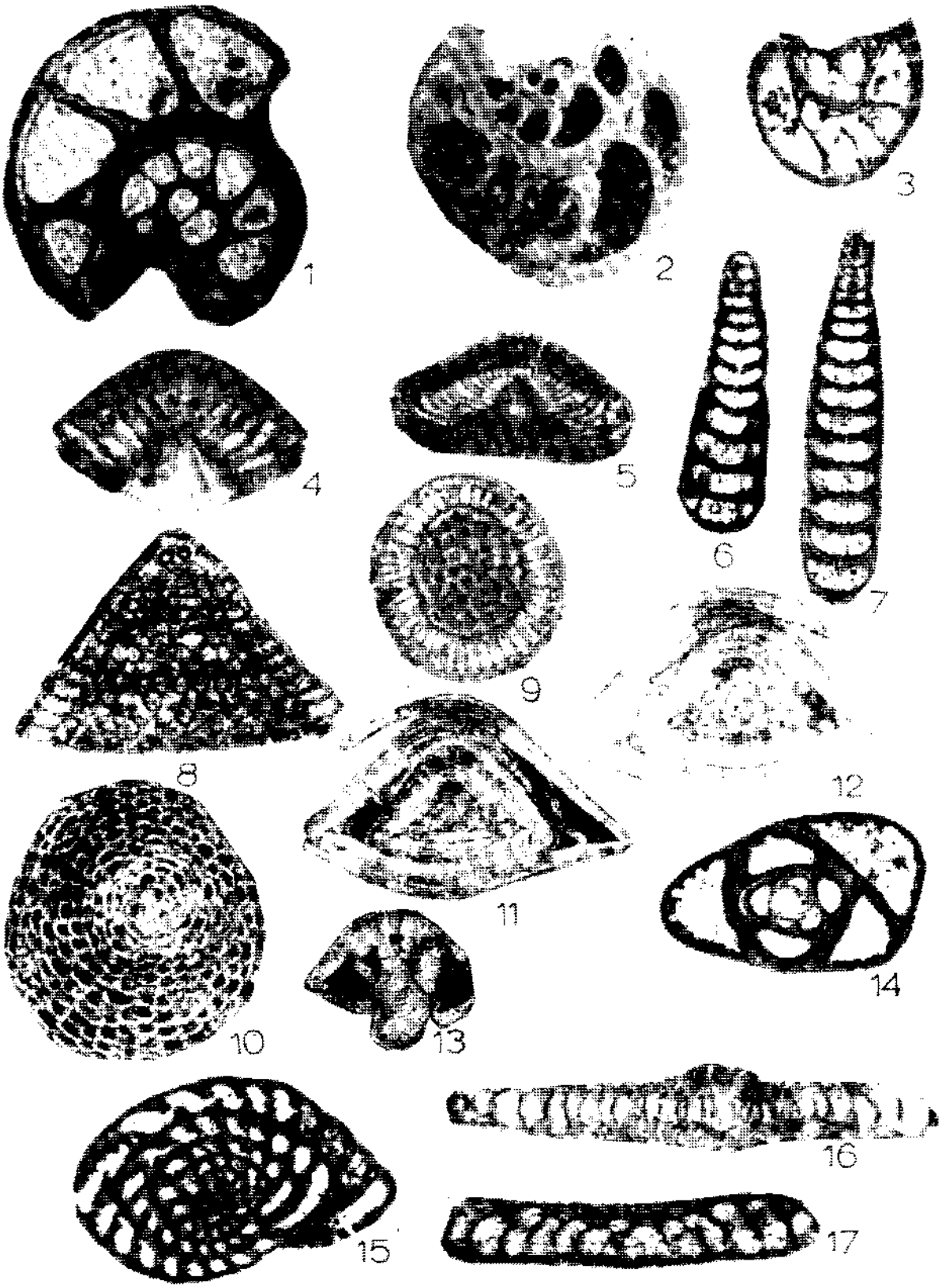
Linderina brugesi Schlumberger

Fig. 16- Vertical section (Al-4), X35.

Planorbulina sp.

Fig. 17- Axial section (KT-18), X75.

NiyaziAVŞARPLATE-III



ABSTRACTS OF THE PAPERS PUBLISHED ONLY IN THE TURKISH EDITION OF THIS BULLETIN

TECTONIC FEATURES AND STRUCTURAL EVOLUTION OF THE YALVAÇ - YARIKKAYA NEOGENE BASIN

Fuzuli YAĞMURLU*

ABSTRACT— Yalvaç-Yarıkkaya Neogene basin, which has a triangular shape, with its margins bordered largely by normal faults, is located in the central pan of a regional-scale structure, the so-called Isparta flexure. Ordovician mete-sedimentiles comprising the Sultan Mountains, and Triassic-Cretaceous aged carbonate rocks border the basin in the east and north, respectively. The Anamas Mountains, bordering the basin in the south, comprise largely a carbonate rock sequence of Triassic to Cretaceous, whose thickness reaches 5000 m. An ophiolilic complex, described as the "inner Tauride ophiolitic complex nappe" by the former investigators, and whose emplacement in the region has been ascribed to Upper Lutetian, forms the boundary of the basin in south and west. The Neogene sequence, reaching a total thickness of 800 m. in the region, dominantly comprise alluvial fan, fluvial and lacustrine sediments. Alluvial and lacustrine sediments exhibit intervened stratigraphic relations laterally at the margins of the basin. Neogene sediments, which are distributed extensively in the region, have been deposited under the control of growthfaults. These faults, bordering the basin, have a general trend in the N, NE and NW directions, and exhibit parallel en echelon structural features. Structural elements in the study area and in near vicinity have developed under the influence of compressional and tensional tectonic regimes, that prevailed in different epochs. In Langian, due to the compressional tectonic regime that progressed in the N-S direction, many intersecting shear-faults developed in the NE and NW direction, which shaped the Isparta flexure, in addition to many folded and thrusled structures. In the period following the Langian compressional regime, Yalvaç Neogene basin opened by the transformation of previously formed strike-faults into normal-faults, due to tensional tectonics.

FACIES AND DEPOSITIONAL ENVIRONMENTS OF THE MIOCENE SEDIMENTARY SEQUENCE IN NORTH OF TORBALI, IZMIR

Ugur İNCİ**

ABSTRACT— A Late Miocene sedimentary sequence, over 900 m., crops out in the north-northeast trending graben type depression developed at the western margin (north of Torbalı) of the Bozdağ high. This sequence is represented with the several complete and incomplete sedimentary cycles which are mainly composed of, in ascending order, conglomerate, sandstone and algal limestone segments. According to the lithofacies analyses, the clastic rocks of this normal fault-boundered depression deposited in the alluvial fan and plain environmental conditions by rapid deposition of the sedimentary load of the gravel-sand dominated hyperconcentrated flood flows originated from the Nif Dağı and Bozdağ high. In consequence of these floods, the small, variable boundered, occasionally wavered and fringing with swamps, ephemeral freshwater lake environments formed characterizing with algal limestones.

PETROGRAPHICAL STUDY OF THE ZINC-LEAD DEPOSITS IN THE BOLKARDAĞ (ULUKIŞLA-NİĞDE) DISTRICT

Sedat TEMUR***

ABSTRACT— In the studied area, the ore are presented both by primary mineralizations which are composed of sulphide minerals and by secondary mineralizations which are composed of oxide and carbonate minerals. In the primary mineralizations the main minerals are pyrite, sphalerite and galena. Also there are pirrotite, arscnopyrite, chalcopyrite, argantite, pyrargirite, magnetite, fahlore, geocronite, freislebenite. boumonite, marcasite, boulangerile, meneginite, skutlerudite, molybdenite, electrum, native Au and native Ag in minor ratios. In primary ore, the common gangue minerals are quartz, calcite and dolomite. In minor ratios, there are barite, siderite, seriate, biotite, muscovite and chlorite. The secondary minerals are smitsonite, anglesite, seruscite, hematite, lepidocrocite, amorph iron hydroxide, gothite, malachite, azurite, hemimorphide and hydrozincite. The main mineralization which occurs within some representative minerals has been realized in four period. These periods can be distinguished by the definite textural and structural features such as exsolution, inclusion, idiomorphism, slit, metasomatose or by the appearance and absence of some minerals.

PETROLOGY OF THE PLIOCENE VOLCANTCS AROUND MUŞ SE, ANATOLIA

Ahmet TÜRKECAN*

ABSTRACT— This study has been carried out in the Muş region in southeast Anatolia. It covers particularly the petrography and geochemistry of the Pliocene aged volcanics in the region. In general volcanics are observed as plateau lavas having all properties of alkaline volcanism. Sometimes peralkaline and tholeiitic volcanism can also be observes together with these alkaline volcanics. The major and trace elements of the volcanics show that they are indicative of an intracontinent. The radiometric datings showed that the volcanism which gave the first products of neomagmatism started in the Early Pliocene.

PETROLOGY OF AKÇATAŞ GRANITE (NEVŞEHİR) IN THE MIDDLE ANATOLIAN MASSIVE

Ş.Nihal AYDIN**

ABSTRACT— Akçataş granite is located in the northwest of Nevşehir. Granites, orthodase granites, orthoclase granite with oligoclase, granodiorites, quartzdiorites, diorite (albitized), syenites, monzonites, quartzmonzonite, monzodiorite and altered plutonic rocks (granites and/or orthoclase granites) are identified in pluton. The enclaves are sparsely observed in granites and granodiorites. Abyssal rocks are determined as granite aplite, granite porphyre, diorite porphyrite (albitized). Field and microscobik studies show that magma has become differentiated twice, has generally assimilated the pieces of adjacent sedimentary rocks, intruded not deeper than the top level of the mesozone, genesis of enclaves are identical with plutonic rocks and hydrothermal stage was effective.

REMOVAL OF ELECTROMAGNETIC COUPLING EFFECT FROM IP PHASE DATA

İlyas ÇAĞLAR***

ABSTRACT— Since the electromagnetic (EM) coupling effect causes spurious anomalies on induced polarization (IP) pseudo-section phase data collected over metallic sulphide mineralization area, it is difficult to evaluate and to interpret as truely of these data. Coupling removal process by dividing (DAKG) IP pseudo-section data has been developed for to remove this effect on raw phase data. In this process theoretical earth model considered as has continuously varying conductivity. Apparent resistivity and EM coupling computations have been made by using mathematical expressions based on this earth model. DAKG process is applied to the real IP phase field data given by recent works in which used the "Quadratic Extrapolation" (QE) and "Complex Resistivity Interactive" (CRI) techniques. The extension of mineralization zone, is described as agrees with the results of QE and CRI techniques by interpreting of pseudo-section decoupled phase data obtained from DAKG process. Hence, it is seen that the DAKG was an useful process like QE and CRI on removing of EM coupling.

MACRO AND MICRO FOSSIL FLORA OF SOMA COAL AREA

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ABSTRACT— The macro and micro fossil flora of Soma coal area (West Anatolia) embodying important lignite deposits of Turkey; has been investigated in this study in all 72 family, genus or species level have been determined from the area. The most distributed species are *Glyptostrobus europaeus* (Brong.) Unger, *Pinus* (cf. *P. taedaformis* Heer) and *Quercus. These* specimens point out that this flora belongs to Middle Miocenes age. It also depicts the presence of a subtropical hot and wet climatic conditions. The most probable vegetation could have been a marshy forest cover of *G. europaeus* alongside the lake with a mixed forest of *Pinus-Quercus* at its margin.

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