First record of the new Neoplanorbulinid species (Foraminifera) from the Early Oligocene in Turkey, Malatya Basin, Eastern Taurids

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ABSTRACT
The genus *Neoplanorbulinella* Matsumaru, 1976 was firstly identified in the Lower Miocene of Saipan and Mariana Islands in the Western Pacific. The present paper reports on its occurrence in the Lower Oligocene of Malatya Basin (Eastern Taurids, East Turkey). *Neoplanorbulinella* is characterized by a conical test, having several sized equatorial chambers irregularly arranged around the cone, and lateral chambers underdeveloped in umbilical cavity. The new planorbulinid species, namely *Neoplanorbulinella matsumarui* n. sp. and *Neoplanorbulinella malatyaensis* n. sp., are recorded in the Muratlı Formation (Malatya Basin, Turkey), which is dated to the Rupelian-early Chattian. The new species are associated to an assemblage of the SB 21-22 larger foraminiferal zone. The new species are described, and their affinities are discussed.

KEY WORDS
Foraminifera,
Systematics,
Oligocene,
Malatya Basin,
Turkey,
new species.

RÉSUMÉ
Signalement d'une nouvelle espèce de Neoplanorbulinid (Foraminifera) de l'Oligocène inférieur du bassin de Malatya (Taurides orientales, Est de la Turquie).
Le genre *Neoplanorbulinella* Matsumaru, 1976 a d'abord été identifié dans le Miocène inférieur des îles de Saipan et de Mariana dans le Pacifique occidental. Le présent article rend compte de sa présence dans l'Oligocène inférieur du bassin de Malatya (Taurides orientales, Est de la Turquie). *Neoplanorbulinella* est caractérisée par un test conique, présentant plusieurs chambres équatoriales de taille irrégulière disposées autour du cône, et des chambres latérales moins développées dans la cavité ombilical. Les nouvelles espèces de Planorbulinidae, à savoir *Neoplanorbulinella matsumarui* n. sp. et *Neoplanorbulinella malatyaensis* n. sp., ont été trouvées dans la formation de Muratli (bassin de Malatya, Turquie), qui est datée du Rupélien-Chattien inférieur. Les nouvelles espèces sont associées à un assemblage de la zone de grands foraminifères SB 21-22. Les nouvelles espèces sont décrites, et leurs affinités discutées.

MOTS CLÉS
Foraminifera,
Systématique,
Oligocène,
Bassin de Malatya,
Turquie,
espèces nouvelles.

INTRODUCTION

The Oligocene is one of the most significant time intervals for the geology of Turkey as Neo-Tethys came to end in this time through the collision of the African and Eurasian plates (Şengör & Yılmaz 1981; Rögl 1999). In addition to the initiating Taurus mountain range, which is a part of the Alp-Himalayan orogenic belt, the closure of the Neo-Tethys Ocean caused new basins to form and/or existing Anatolian basins to change their characteristics. One of changed basins was the Malatya Basin which is the object of this study (Fig. 1). The Malatya Basin is a major interior basin in East Anatolia, approximately 1000 km² wide, exposing Upper Cretaceous-Cenozoic volcano-sedimentary rocks up to 4500 m thick (Çağlar 2009).

Several geological studies with different aims have been done in the investigated area by the following authors: Ayan 1961; Akkuş 1971; Yoldaş 1972; Kurtman 1978; Örçen 1986; Karaman *et al.* 1993; Alkan 1997; Çağlar 2009; Gedik 2010, 2014, 2015 and Karadenizli *et al.* 2016. In this long stratigraphic succession, Karaman *et al.* (1993) reported that the Muratlı Formation is Oligocene in age based on the foraminiferal data. For some other students (Yoldaş 1972; Örçen 1986) the age of the Muratlı Formation is Aquitanian. The unit starts with a brecciated limestone at the base, followed upward by clastic limestones, marls and limestones with abundant benthic foraminiferal assemblages of Oligocene age.

Oligocene shallow marine sedimentary successions of the Neo-Tethys realm contain diagnostic hyaline larger foraminifera such as miogypsinids, lepidocyclinids and nummulitids that are used for biostratigraphic dating and regional correlations (Drooger 1993; BouDagher-Fadel 2008). Furthermore, in the Oligocene of the Near and Middle East, diverse associations of porcelaneous larger foraminifera are known to be common and widespread since the work of Henson (1948a, b; 1950). Especially, the representatives of the subfamily Archaiasinae are common and associated with *Peneroplis glynnjonesi* (Henson, 1950), *P. thomasi* Henson, 1950, *Praerhapydionina delicata* Henson, 1950 and various species of *Austrotrillina* Parr, 1942, *Borelis* de Montfort, 1808 and *Bullalveolina* Reichel, 1936. As Henson (1950) demonstrated, these associations are clearly linked to a particular, very shallow, often restricted marine carbonate facies (see also Bassi *et al.* 2007).

The section measured in this study represents an uninterrupted Oligocene sequence, chiefly composed of carbonate/clastic succession, and includes large benthic foraminifera. In addition to this, this section is important in containing porcelaneous large foraminifera associated with *Penarchaias glynnjonesi* (Henson, 1950), *Austrotrillina brunni* Marie, 1955, various species of *Borelis* de Montfort, 1808, two new Neoplanorbulinid species (see here below), indicative of very shallow-water carbonate facies, and the hyaline group with miogypsinids, lepidocyclinids and nummulitids, which characterizes shallow-water marine environments.

This study presents a systematic description of two new Neoplanorbulinid species, obtained from the Rupelian-lower Chattian limestones of the Karamağara section (Figs 2; 4). In a previous study, Sirel & Gedik (2011) reported on the occurrence of a new miogypsinid genus and species, *Postmiogypsinella intermedia* Sirel & Gedik, 2011, from the late Chattian shallow marine limestone of the Karamağara section, associated with foraminiferal species.

The interpretation of structural elements is given in Fig. 5 for the new Neoplanorbulinid species as well as for the already known Early Miocene species described by K. Matsumaru.

MATERIAL AND METHODS

This study is based on samples collected along the Karamağara section in the Muratlı Formation. The examined section is located to the northeast of Akçadağ, 35 km west of Malatya (Fig. 2). In this section, strata comprise limestones, sandy/clayey limestones and marls. The foraminifera were recovered mainly from the limestones. The foraminiferal fauna was studied in non-oriented thin sections because the indurated carbonate rocks do not allow specimens to be freed.

Abbreviations

HYM	Karamağara section sample numbers;
SB	shallow marine benthic foraminiferal zones;
MSS	measured stratigraphical section.

STRATIGRAPHY AND LITHOLOGY OF THE KARAMAGARA SECTION

This studied Karamağara section (NE-SW) lies to the north of Karamağara village, situated on the 1/25 000 topografic sheet of Malatya L40-a1 (bottom coordinates X1: 16 599; Y1: 57 032 and the top X2: 12 705; Y2: 58 026) (Fig. 1). Sirel & Gedik (2011) and Gedik (2015) already provided a detailed lithological description of this section and some biostratigraphical data. Oligocene-Early Miocene deposits with abundant shallow-water foraminiferal species are well developed in the Karamağara section. The sample numbers and stratigraphic distribution of the foraminiferal species are shown in Figure 4. The following lithologic units are observed from bottom to top.

The lithologic succession of the Karamağara section begins with the breccia limestones without fossils. The first fossilliferous unit extends from the samples 35 to 40 and is composed of shallow-water sandy and clayey limestones, which include *Borelis pygmaea* (Hanzawa, 1930), *Borelis merici* Sirel & Gündüz, 1981, *Austrotrillina brunni* Marie, 1955, *Archaias hensoni* Smout & Eames, 1958, *Penarchaias glynnjonesi* (Henson, 1950), *Planorbulina bronnimanni* Bignot & Decrouez, 1982, *Amphistegina* sp. This assemblage indicates a Rupelian-early Chattian age (SB 21-22).

The second unit extends from the samples 40B to 42 and consists of alternations of marls and limestones. The

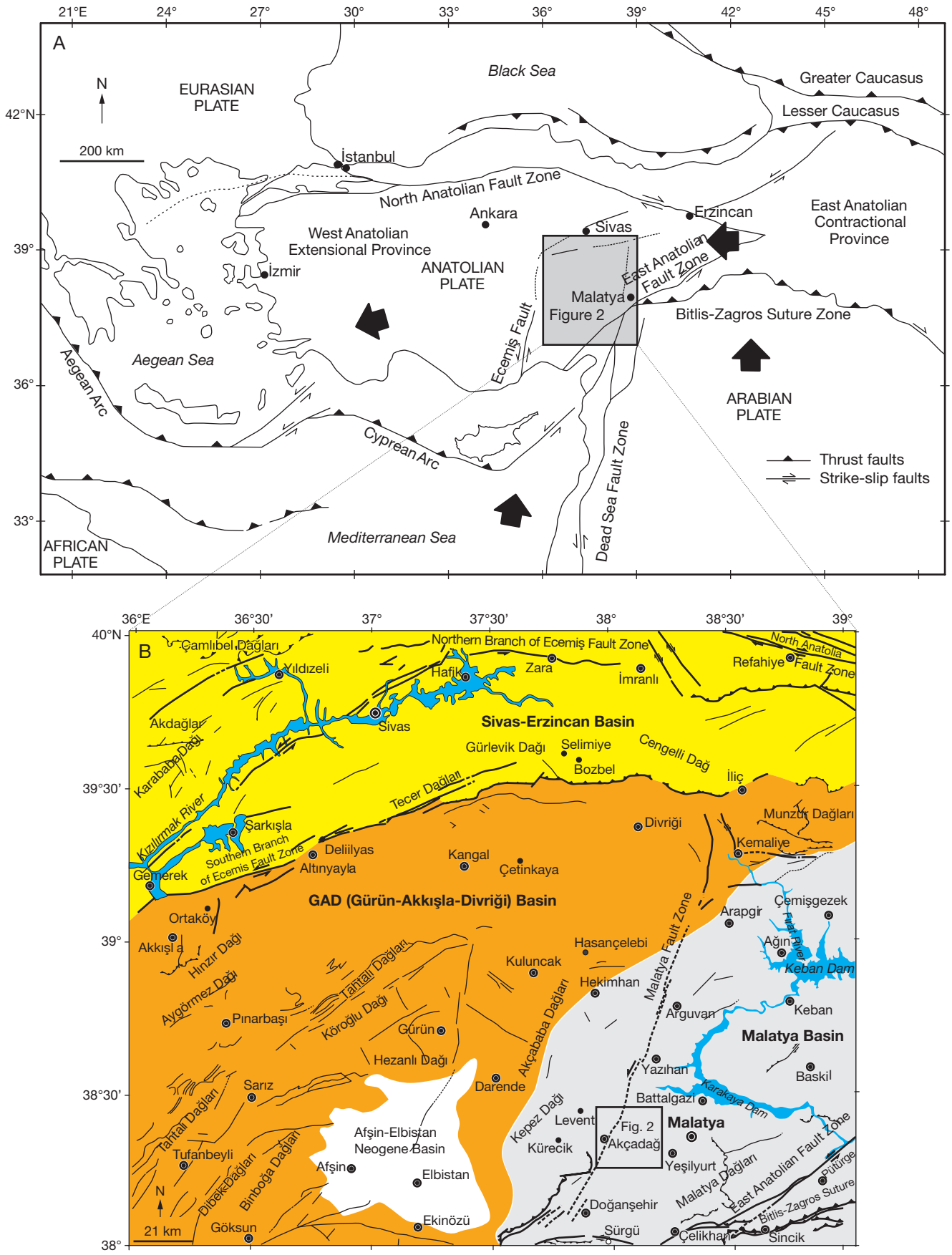


FIG. 1. — **A**, Tectonic map of Turkey showing the major tectonic structures (modified from Bozkurt 2001); **B**, limits of the Sivas-Erzincan, GAD (Gürün-Akkışla-Divriği) and Malatya basins.

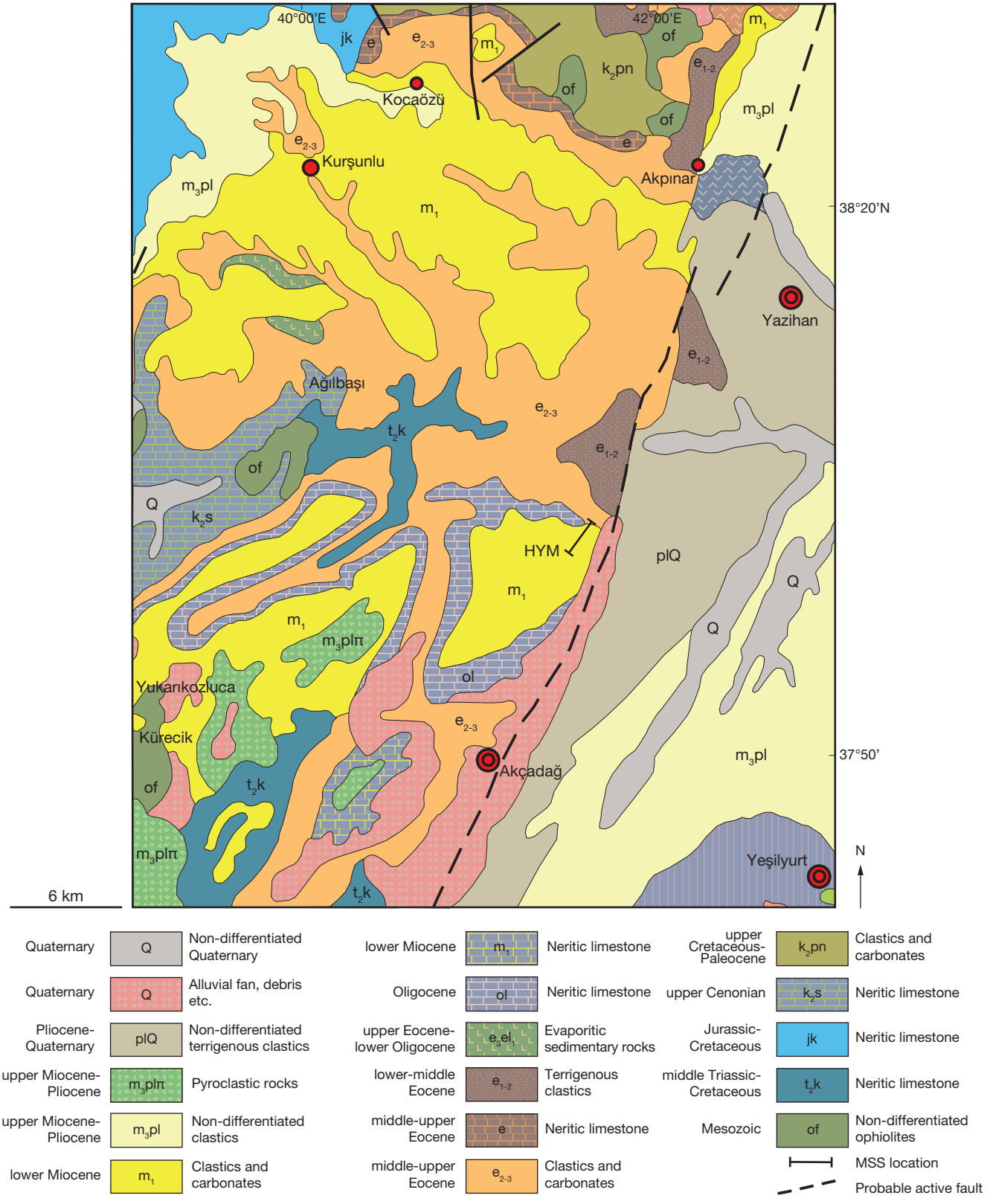


FIG. 2. — Geological map of the study area (simplified from Bilgiç 2002).

basal marl beds contain planktonic foraminiferal species, namely, *Globigerinoides primordius* Blow & Banner, 1962, *Tenuitellinata juvenilis* (Bolli, 1957), *Globigerinita incrusta* Akers, 1955, *Globigerina leroyi* Blow & Banner, 1962, *G. occlusa* Blow & Banner, 1962, *G. praebulloides* Blow, 1959, *G. gnaucki* Blow & Banner, 1962, *G. ouachitaensis*

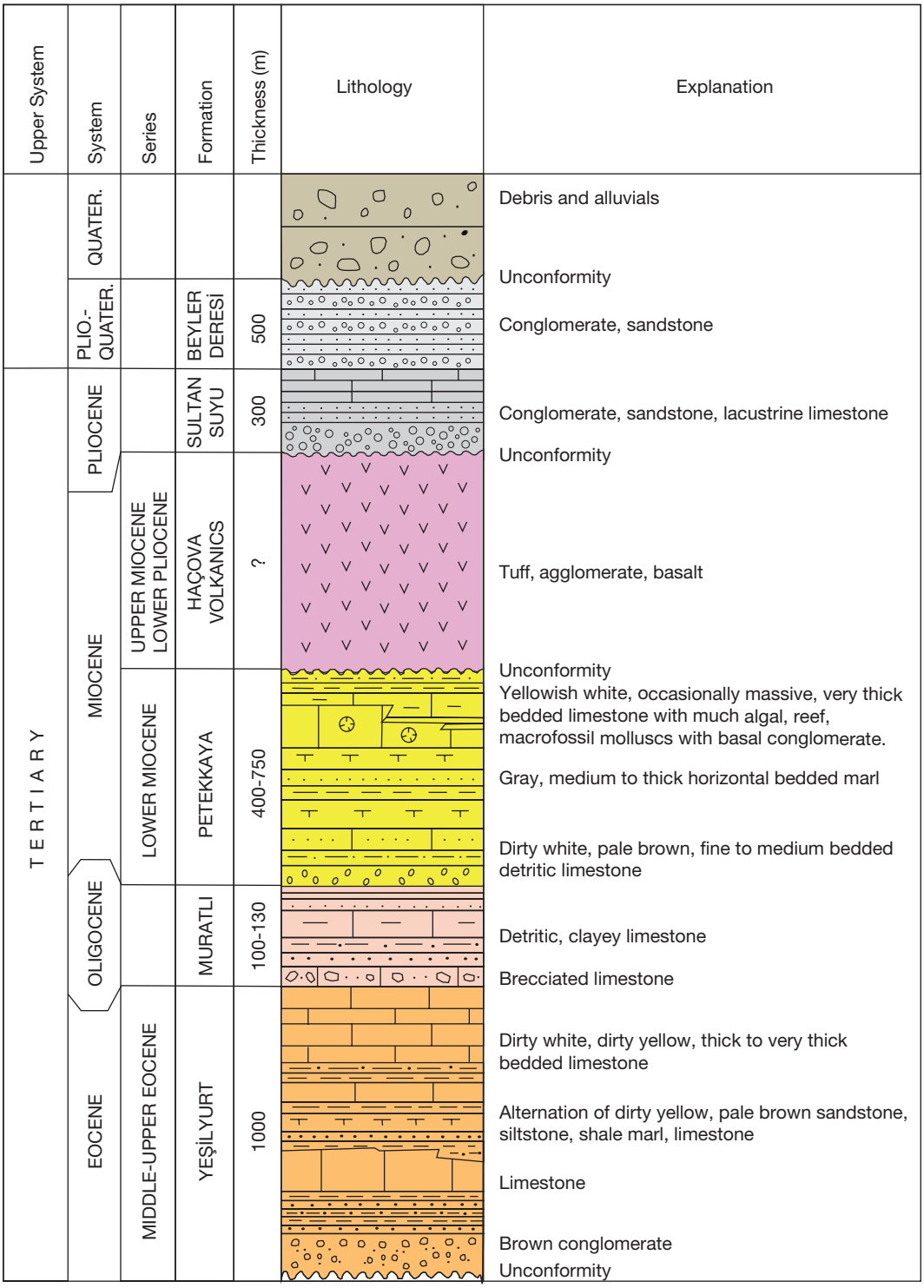


FIG. 3. — Generalized stratigraphy of Cenozoic deposits in the Malatya Basin (modified from Karaman *et al.* 1993).

Howe & Wallace, 1932, *G.* cf. *angulisuturalis* Bolli, 1957, *Globorotaloides* cf. *suteri* Bolli, 1957, *Paragloborotalia* spp., *Globoguadrina* sp., indicating the Chattian-Aquitanian interval. The limestone beds located at the top of the unit include the shallow-water benthic foraminiferal species *Postmiogypsinella intermedia* Sirel & Gedik, 2011, *Miogypsinella akcadagensis* (Gedik & Sirel, 2009), *M. borodinensis* Tan, 1936, *Miogypsinodella* sp. Considering the stratigraphic range of *M. borodinensis* Tan, 1936 and *M. akcadagensis* (Gedik & Sirel, 2009), this unit was dated as late Chattian (SB 23).

The third unit extends from the samples 42A to 44D. The marly horizon located at the bottom contains planktonic foraminiferal species, such as *Globoturborotalia euapertura*

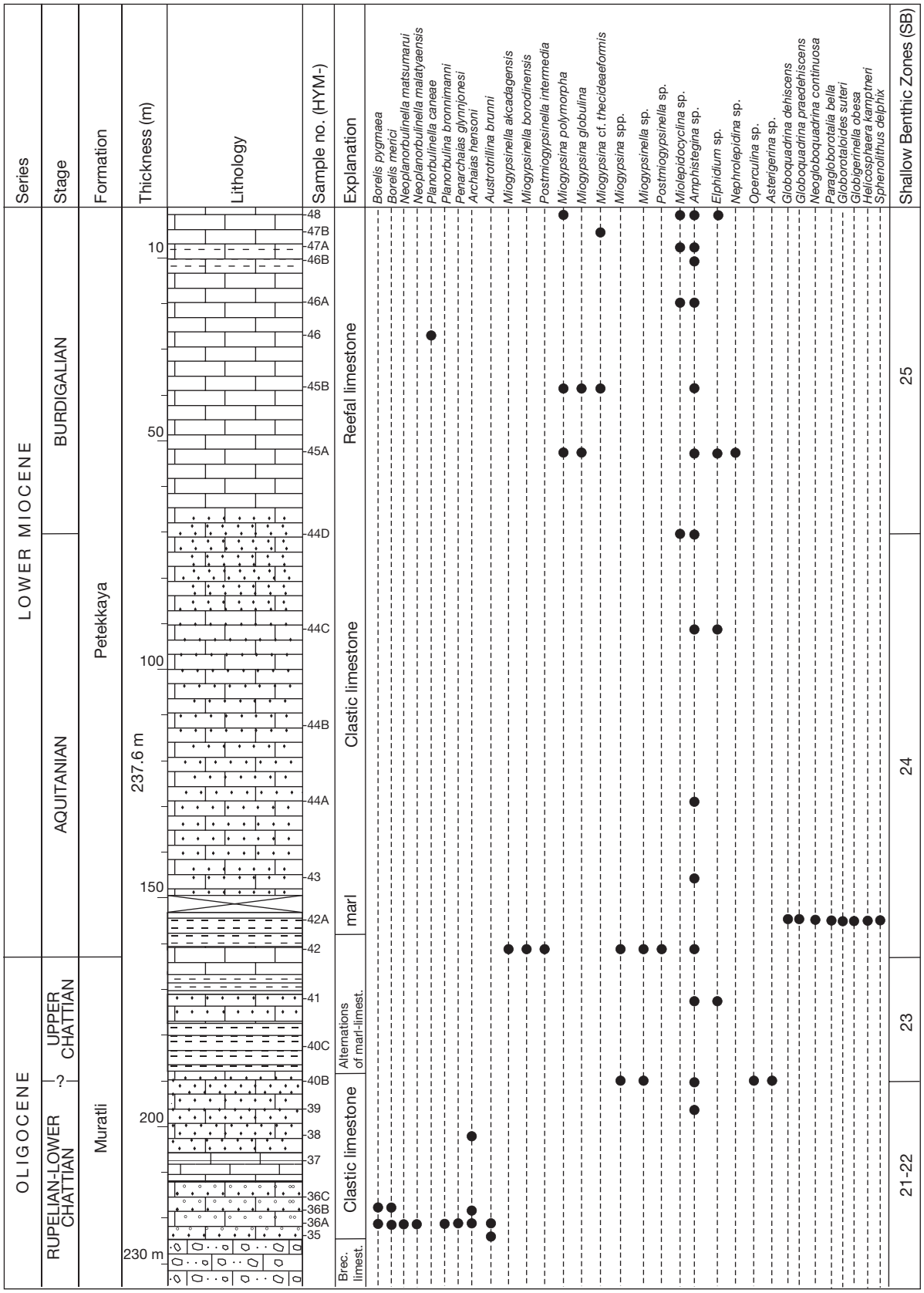


FIG. 4. — Stratigraphic distribution of larger benthic and planktonic foraminifera and nannoplankton species in the Karamağara section, NE Akçadağ, W of Malatya, Eastern Turkey.

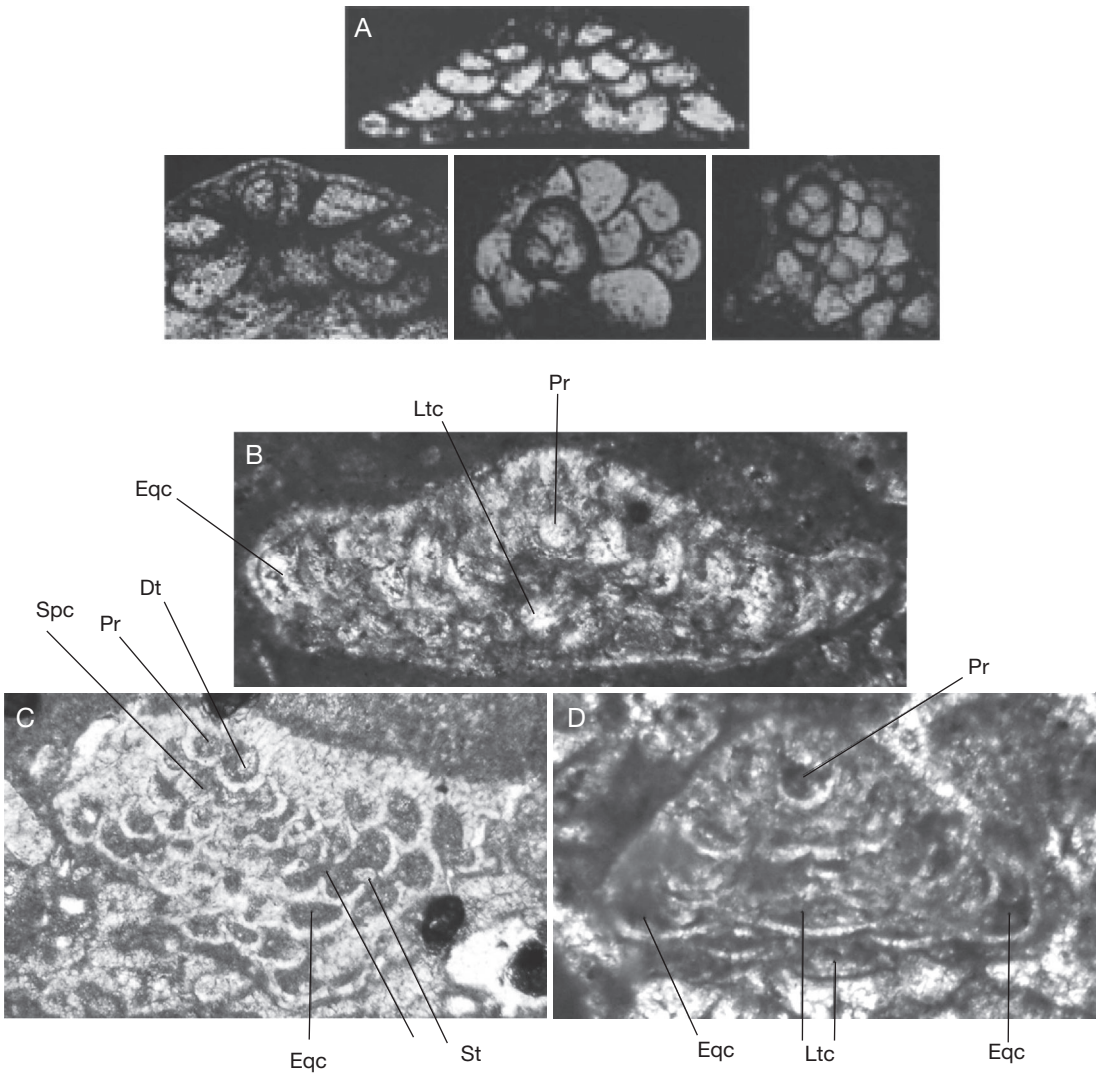


FIG. 5. — Diagnostic structural elements of the *Neoplanorbulinella*: **A**, *Neoplanorbulinella saipanensis* Matsumaru, 1976 (1976: 201, pl. 6, figs 1, 3-5); **B**, *Neoplanorbulinella malatyaensis* n. sp. (axial section); **C**, *Neoplanorbulinella malatyaensis* n. sp. (holotype, equatorial section); **D**, *Neoplanorbulinella matsumarui* n. sp. (axial section). Abbreviations: **Pr**, protoconch; **Dt**, deutoroconch; **Eqc**, equatorial chamber; **Ltc**, lateral chamber; **Spc**, spiral chamber; **St**, stolon.

(Jenkins, 1960), *Globigerina ouachitaensis* Howe & Wallace, 1932, *G. gnaucki* Blow & Banner, 1962, *G. occlusa* Blow & Banner, 1962, *G. leroyi* Blow & Banner, 1962, *G. praebulloides* Blow, 1959, *G.* cf. *angulisuturalis* Bolli, 1957, *G. ciperoensis* Bolli, 1954, *Globoquadrina dehiscens* (Chapman, Parr & Collins, 1934), *G. venezuelana* (Hedberg, 1937), *G. praedehiscens* Blow & Banner, 1962, *G. selli* Borsetti, 1959, *Globigerinoides primordius* Blow & Banner, 1962, and the calcareous nannoplankton species *Discoaster deflandrei* Bramlette & Riedel, 1954, *Coccolithus eopelagicus* (Bramlette & Riedel, 1954), *Cyclicargolithus abisectus* (Müller, 1970), *C. floridanus* (Roth & Hay, 1967), *Reticulofenestra hampdenensis* Edwards, 19732, *R. umbilica* (Levin, 1965), *R. reticulata* (Gartner & Smith, 1967), *R. hillae* Burky & Percival, 1971, *Zygrhablithus bijugatus* (Deflandre, 1959), *Lanternithus minutus* Stradner, 1962, *Ericsonia formosa* (Kamptner, 1963), *E. subdisticha* (Roth & Hay, 1967), *Cruciplacolithus tenuis* (Stradner, 1961), *Braarudosphaera bigelowi* (Gran & Braarud, 1935), *Helicosphaera perchnielseniae* Haq, 1971, *H. euphratis* Haq, 1966, *H. obligua* Bramlette & Wilcoxon, 1967, *H. kamptneri* Hay & Mohler, 1967, *H. recta* Haq, 1966, *Coronocyclus nitescens* (Kamptner, 1963), *Dictyococcites bisectus* (Hay, Mohler & Wade, 1966), *Pontosphaera multipora* (Kamptner, 1948), *P. plana* (Bramlette & Sullivan, 1961), *Micrantholithus crenulatus* Bramlette & Sullivan, 1961, *Sphenolithus moriformis* (Brönnimann & Stradner, 1960), *S. predistentus* Bramlette & Wilcoxon, 1967, *S. distentus* (Martini, 1965), *S. delphix* Burky, 1973, *Sphenolithus* sp. all dated to the Early Miocene. The limestone beds located at the top of the unit do not contain any characteristic foraminiferal species.

The fourth unit, from the samples 44D to 48, is composed of reefal limestones, which contain *Miogypsina globulina* (Michelotti, 1841), *M. polymorpha* (Rutten, 1912), *M.* cf. *thecideaeformis* (Rutten, 1912), *Miolepidocyclina* sp. and other foraminiferal taxa of Burdigalian (SB 25).

SYSTEMATICS

This study follows the systematic classification of Loeblich & Tappan (1987). All holotypes and paratypes are stored in the collection of the Natural History Museum of MTA (General Directorate of Mineral Research and Exploration of Turkey, Ankara), under no. MTA 2006/FG16.

Order FORAMINIFERIDA Eichwald, 1830
Suborder ROTALIINA Delage & Herouard, 1896
Family PLANORBULINIDAE Schwager, 1877

Genus *Neoplanorbulinella* Matsumaru, 1976

TYPE SPECIES. — *Neoplanorbulinella saipanensis* Matsumaru, 1976 by original designation.

Neoplanorbulinella matsumarui n. sp.
(Fig. 6A-D)

HOLOTYPE. — Axial section, Fig. 6A (sample no. HYM-36A/5/2).

TYPE LOCALITY. — Karamağara village, NE Akçadağ, W Malatya, Eastern Turkey, HYM-first unit.

AGE. — Rupelian-Early Chattian (SB 21-22).

DIAGNOSIS. — *Neoplanorbulinella* with small, high conical test with almost right apical angle, having equatorial chambers around the cone, and lateral chambers underdeveloped in umbilical cavity, and calcareous wall.

ASSEMBLAGE. — *Borelis pygmaea*, *B. merici*, *Penarchaias glynnjonesi*, *Archaias hensoni*, *Neoplanorbulinella malatyaensis* n. sp., *Neoplanorbulinella* sp., *Malatyna* sp., *Borelis* sp., *Miogypsinella* sp. and *Asterigerina* sp.

ETYMOLOGY. — This species is dedicated to Professor Kuniteru Matsumaru to acknowledge his contribution to micropaleontological research.

DESCRIPTION
Only megalospheric form is observed. This form has a high conical test with small size. The basal diameter of the cone reaches 0.5 mm, and the maximum cone height is 0.3 mm. The apical angle is about 90°. The large, spherical megalosphere (its diameter 30-92 µm) is situated at the top of the cone, followed by arcuate equatorial chambers. The size of the equatorial chambers increases regularly from apex to the base.

COMPARISON
Neoplanorbulinella matsumarui n. sp. differs from *N. saipanensis* Matsumaru, 1976 in having high conical test and about 90° apex angle. *N. saipanensis* has low conical test and about 112° apex angle (Matsumaru 1976). In addition, the equatorial and lateral chambers of *N. saipanensis* are arranged irregularly. The equatorial chambers of the new species are arranged regularly, and the connection of chambers is provided with stolons.

Neoplanorbulinella malatyaensis n. sp.
(Fig. 6E-H)

HOLOTYPE. — Equatorial section, Fig. 6F (sample no. HYM-36A/5/1).

TYPE LOCALITY. — Karamağara village, NE Akçadağ, W Malatya, Eastern Turkey, HYM-first unit.

AGE. — Rupelian-Early Chattian (SB 21-22).

DIAGNOSIS. — *Neoplanorbulinella* with large, low conical to lenticular test, having equatorial chambers around the cone, lateral chambers underdeveloped in umbilical cavity, and calcareous wall.

ASSEMBLAGE. — The same assemblage as for *Neoplanorbulinella matsumarui* n. sp.

ETYMOLOGY. — From Malatya, a city of eastern Turkey.

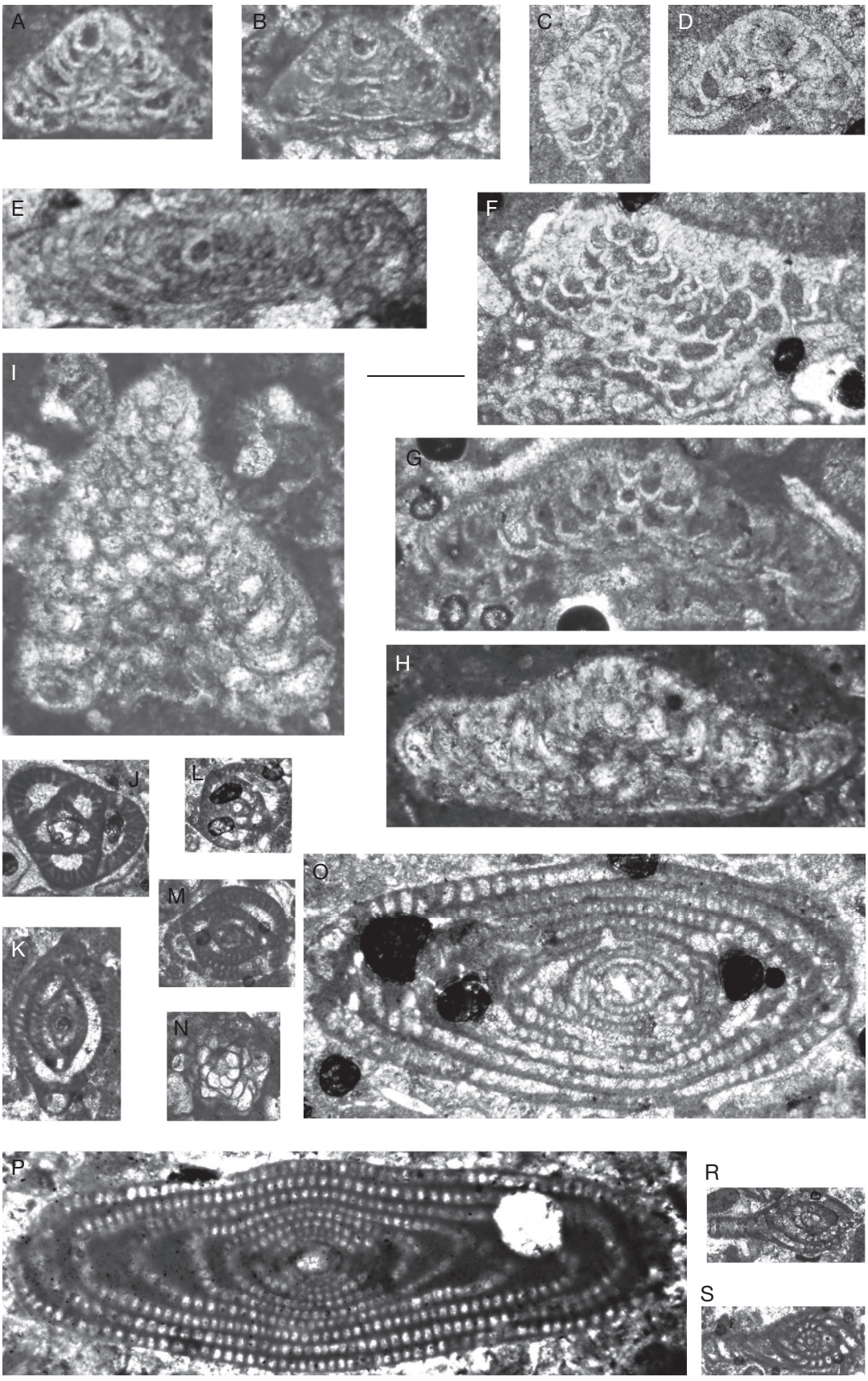
DESCRIPTION
Only megalospheric form is observed. This form has a low conical to lenticular test of large size. The basal diameter of the cone reaches 1.18 mm and the cone maximum height is 0.42 mm. The apical angle is about 140°. The large, spherical megalosphere (its diameter 65 µm) is situated at the top of the cone, and it is followed by the second chamber (its diameter 78 µm; Fig. 6F) and arcuate equatorial chambers. The umbilical cavity is very wide and its diameter is 0.85 mm. Lengthened umbilical cavity is filled by underdeveloped lateral chambers (Fig. 6H).

COMPARISON
Neoplanorbulinella malatyaensis n. sp. differs from *N. matsumarui* n. sp. in possessing larger and low conical to lenticular test, greater apex angle, almost flat base of cone, larger proloculus and greater number and larger equatorial chambers, which are observed in axial sections.

Neoplanorbulinella sp.
(Fig. 6I)

DESCRIPTION
Only one specimen is observed. This form has a very high conical test with large size. The basal diameter of the cone reaches 0.8 mm and the cone height is 0.8 mm. The apical angle is 90°. The spherical megalosphere (diameter 65 µm) is situated at the top of the cone, followed by arcuate equatorial chambers. The size of the equatorial chambers increases gradu-

FIG. 6. — Selected benthic foraminiferal species from the studied section in the Malatya Basin, Turkey: **A-D**, *Neoplanorbulinella matsumarui* n. sp.; **A**, holotype, axial section, megalospheric form, showing spherical megalosphere followed by equatorial chambers, umbilical cavity is filled 5 row lateral chambers (HYM-36A/5/2); **B**, axial section, megalospheric form (HYM-36A/11/1); **C**, **D**, axial sections (HYM-36A); **E-H**, *Neoplanorbulinella malatyaensis* n. sp.; **E**, axial section, megalospheric form, (HYM-36A/8/1); **F**, holotype, equatorial section, megalospheric form (HYM-36A/5/1); **G**, **H**, axial sections, megalospheric forms, showing small spherical megalosphere followed by equatorial chambers (HYM-36A/8 and HYM-36A/3/2); **I**, *Neoplanorbulinella* sp., axial section, showing its very high conical test with equatorial chambers and coarser structure of lateral chambers in the umbilical cavity (HYM-36A/10/4); **J-M**, *Austrotrillina brunni* Marie, 1955, **J**, axial section (HYM-35/1/1); **K**, subaxial section (HYM-36A/3/1); **L**, axial section, megalospheric form (HYM-36A/1); **M**, subaxial section, (HYM-36A/10/1); **N**, *Planorbulina bronnimanni* Bignot & Decrouez, 1982,



axial section, showing protoconch followed by planispiral chambers (HYM-36A/6/1); **O**, *Borelis merici* Sirel & Gündüz, 1981, non-centered axial section (HYM-36A/5/4); **P**, *Borelis pygmaea* (Hanzawa, 1930), axial section, megalospheric form (HYM-36A/1/1); **Q**-**R**, *Penarchaias glynnjonesi* (Henson, 1950), axial section, megalospheric forms showing protoconch followed by planispiral chambers and chambers with uncoiled stage (HYM-36A/3 and HYM-36A). Scale bar: A-I, O-S, 0.25 mm; J-N, 0,5 mm.

ally from the apex to the base. The diameter of umbilical cavity is 0.42 mm, which is filled by numerous lateral chambers.

Comparison
Neoplanorbulinella sp. resembles *N. malatyaensis* n. sp. and *N. matsumarui* n. sp. in general appearance, but is distinguished by having very high conical test and larger size. In addition, it differs from *N. malatyaensis* n. sp. and *N. matsumarui* n. sp. in possessing numerous equatorial chambers and coarser structure of lateral chambers in the umbilical cavity. *Neoplanorbulinella* sp. is found in the Karamağara section together with *N. matsumarui* n. sp. and *N. malatyaensis* n. sp.

Genus *Planorbulina* d'Orbigny, 1826

Type species. — *Planorbulina mediterranensis* d'Orbigny, 1826 by original designation.

Planorbulina bronnimanni Bignot & Decrouez, 1982
(Fig. 6N)

Planorbulina bronnimanni Bignot & Decrouez, 1982: 144, pl. 1, figs 1-9; pl. 2, figs 1-5; pl. 3, figs 1-3; plate 4, figs 1-6, pl. 5, figs 1-9; plate 6, figs 1-8. — Sirel & Acar 1993: 181, 183, pl. 2, fig. 21.

Description
The test is discoidal with calcareous wall and its diameter varies between 0.55-1.89 mm. It is dimorphic and there are chambers in megalospheric forms with trochospiral whorls after the proloculus. The following chambers are irregularly arranged in different sizes. As it is clearly seen in well-oriented sections, the connection between chambers is provided by the basal stolons.

Suborder MILIOLINA Delage & Herouard, 1896
Family Soritidae Ehrenberg, 1839
Subfamily Archaiasinae Cushman, 1927

Genus *Penarchaias* Hottinger, 2007

Type species. — *Peneroplis glynnjonesi* Henson, 1950 by original designation.

Penarchaias glynnjonesi (Henson, 1950)
(Fig. 6Q, R)

Peneroplis glynnjonesi Henson, 1950: 35, pl. 9, figs 8, 9.

Peneroplis aff. *glynnjonesi* – Sirel 2004: 36, pl. 35, figs 2, 3, 5, 10.

Penarchaias glynnjonesi – Hottinger 2007: 11, 12, pl. 1, fig. 3; pl. 6, figs 2, 10; pl. 7, figs 7, 8; pl. 8, figs 6, 10; pl. 9, figs 6; pl. 12, figs 2; pl. 13, figs 3; pl. 14, figs 13; pl. 15, figs 1-5, 9.

Description
Only megalospheric form is observed. The test is lenticular, its diameter 0.9 mm in early stage, while in adult forms the diameter and the thickness of the test ranges from 1.31 to 1.36 mm and 0.47 to 0.52 mm, respectively. Spheric megalosphere is followed by planispiral early chambers, and later chambers become uniserial. Interior skeletal apertures are observed on the septum (Hottinger 2007: pl. 7, figs 7, 9). These apertures, which are one of the most important characteristics of the genus, are well observed in Figure 6R, S.

Family Austrotrillinidae Loeblich & Tappan, 1986

Genus *Austrotrillina* Parr, 1942

Type species. — *Trillina howchini* Schlumberger, 1893 by original designation.

Austrotrillina brunni Marie, 1955
(Fig. 6J-M)

Austrotrillina brunni Marie, 1955: 203, pl. 9, figs 4-8. — Adams 1968: 85, pl. 6, figs 6, 8. — Sirel 2003: 294, pl. 10, figs 10-16.

Description
Megalospheric form
The test is small and the peripheral margin is rounded in transverse sections (Fig. 6L). The length of the test ranges from 0.62 to 0.75 mm and the width from 0.39 to 0.49 mm. The spheric megalosphere (0.11 to 0.19 mm in diameter) is followed by small undivided chambers arranged in triloculine mode. Later adult chambers with fine subepidermal partitions are also lined up in triloculine pattern. Two types of subepidermal partitions form small alveolar compartments.

Microspheric form
The small test is triangular with rounded margin in transverse sections. The length of this species is unknown, the width of the test is 0.8 mm. Very small, spherical microsphere is followed by the early chambers arranged in quinqueloculine mode, later chambers arranged in triloculine pattern.

Family Alveolinidae Ehrenberg, 1839

Genus *Borelis* de Montfort, 1808

Type species. — *Nautilus melo* Fichtel & Moll, 1798 by original designation.

Borelis pygmaea (Hanzawa, 1930)
(Fig. 6P)

Borelis (*Fasciolites*) *pygmaea* Hanzawa, 1930: 94, pl. 26, figs 14, 15.

Neoalveolina pygmaea – Bakx 1932: 237, pl. 3, figs 18, 19. — Bursch 1947: 28, pl. 1, figs 11, 15, 19. — Adams 1965: 25.

Borelis pygmaea – Sirel 2003: 298, pl. 11, figs 1-7.

DESCRIPTION

The specimens of the megalospheric form are medium sized and fusiform. Their axial diameter is 2.10 mm and equatorial diameter 0.68 mm at the 6th whorls. Index of elongation is 3.08. The small spherical megalosphere (its diameter is 0.65 mm; Fig. 6P) is followed by tightly coiled four or five and loosely arranged adult whorls. The whorls are coiled tightly at the equatorial region, but they are arranged loosely at axial region, so that the axial thickening becomes higher at the poles of the test. The subspheric to oval chamberlets are arranged tightly and their size becomes large at the axial regions.

Borelis merici Sirel & Gündüz, 1981
(Fig. 6O)

Borelis merici Sirel & Gündüz, 1981: 73, 74, pl. 1, figs 9-13. — Sirel 2003: 299, pl. 11, figs 8, 9.

DESCRIPTION

The test is slightly elongated oval with an axial diameter of 1.01-1.41 mm and equatorial diameter of 0.45-0.78 mm. Index of elongation is between 1.79-2.71. The first 4-5 whorls which follow the proloculus are devoid of an axial thickening, so that the shape of the test seems spheric in this stage. Axial thickening increases at the last 4 whorls, therefore the shape of the test becomes elongated oval in the adult stage. Dimorphism is faint.

CONCLUSION

The genus *Neoplanorbulinella* Matsumaru, 1976 was firstly identified in the Lower Miocene of Saipan and Mariana Islands in the Western Pacific. It is discovered for the first time in the Lower Oligocene deposits of Malatya Basin in eastern Anatolia (Turkey), and is not known there from older or younger strata. The present study provides the description of two new species from the Karamağara stratigraphic section, *Neoplanorbulinella matsumarui* n. sp. and *Neoplanorbulinella malatyaensis* n. sp. *N. matsumarui* n. sp. differs from the type species *N. saipanensis* Matsumaru, 1976 in being characteristically small, and in having high conical test with almost right apical angle. The other species *N. malatyaensis* n. sp. has a larger, low conical to lenticular test. In addition, the associated foraminiferal taxa are listed and the key species are described and illustrated (Fig. 6J-S).

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