Türkiye Jeoloji Bülteni **Cilt 52, Sayı 1, Nisan 2009**
Geological Bulletin of Turkey *Volume 52, Number 1, April 2009*

Ostracoda Assemblage and Environmental Interpretation of the Bartonian-Priabonian Seydiler Formation (Kastamonu-Northern Turkey)

Bartoniyen-Priaboniyen Yaşlı Seydiler Formasyonu'nun (Kastamonu-Kuzey Türkiye) Ostrakod Topluluğu ve Ortamsal Yorumu

Nazan YEŞİLYURT [1], Cemal TUNOĞLU *[2] and İbrahim K. ERTEKİN [2]

[1]General Directorate of State Hydraulic Works, 5. Regional Directorate, Groundwater and Geotechnical services, Balgat, Ankara, TURKEY
[2] Hacettepe University, Faculty of Engineering, Department of Geological Engineering, 06532 Beytepe, Ankara, TURKEY
**Corresponding Author: tunay@hacettepe.edu.tr*

ABSTRACT

The study area comprises about 40 km^2 and is located in the north of Seydiler town near Kastamonu city. The unit, that is widely exposed in the region, is named for the first time "Seydiler Formation". This formation conformably overlies the Lutetian Gürleyikdere Formation at the base while it is overlain by Recent and Quaternary alluvium deposits with an unconformity at the top. Seydiler Formation is represented by thin bedded sandstone-marl alternations at the base and by medium to thick-bedded, dark grey marls in the upper parts. The thickness of the formation varies from 30 to 215 meters. Paleontological examinations were carried out on 184 samples collected from 7 stratigraphic sections. Overall, 19 taxa belonging to 11 ostracod genera in 9 different families were determined. Among the families *Cytherellidae, Bairdiidae* and *Krithidae*, were the dominant genera. One species "*Echinocythereis anatolica* n.sp." is proposed as a new species. *Cytherella* and *Krithe* are very abundant and dominant within the ostracoda assemblage. Based on the ostracod assemblage examined, the age of this unit is assigned as Bartonian-Priabonian. This assignment is also supported by the dating of planktonic foraminifers, nannoplanktons and dinoflagellates. All paleontological data of the study area indicate neritic to bathyal marine depositional conditions with normal salinities.

Keywords: Ostracoda, Bartonian-Priabonian, Seydiler Formation, Kastamonu, Turkey.

ÖZ

Çalışma, yaklaşık 40 km^2 lik bir alanda ve Kastamonu İli, Seydiler İlçesi kuzeyinde gerçekleşmiştir. Geniş bir yayılıma sahip olan söz konusu birim, ilk kez "Seydiler Formasyonu" olarak isimlendirilmiştir. Seydiler Formasyonu Lütesiyen yaşlı Gürleyikdere Formasyonu üzerine uyumlu olarak gelir. Güncel ve Kuvaterner alüvyon çökellerle de uyumsuz olarak örtülür. Seydiler Formasyonu tabanda ince tabakalı kumtaşı-marn ardalanması ile başlar ve üst seviyelerde orta-kalın tabakalı koyu gri marnlarla temsil edilir. Formasyonun kalınlığı 30-215 metre arasında değişmektedir. Paleontolojik çalışmalar, 7 stratigrafik kesitten derlenen 184 örnek üzerinde yürütülmüştür. Bu çalışmalara bağlı olarak, başlıca Cytherellidae, Bairdiidae ve Krithidae familyaları olmak üzere 9 familyaya ve 11 ostrakod cinsine bağlı toplam 19 tür tanımlanmıştır. Bunlardan biri "Echinocythereis anatolica n.sp." ilk kez bu çalışmada yeni tür olarak önerilmiştir. Ostrakod faunası içinde Cytherella ve Krithe cinsleri ile bunlara ait türler bol ve baskındır. Tanımlanan ostrakod faunasına göre, bu formasyonun yaşı Bartoniyen-Priaboniyen'dir. Bu yaş bulgusu ayrıca planktonik foraminifer, nannoplankton ve dinoflagellatlar ile de desteklenmiştir. Tüm fauna ve flora topluluğu yaşam ortamının normal tuzluluk koşullarına sahip, neritikden batiyale kadar değişebilen bir derinlikteki depolanma ortamının varlığını işaret etmektedir.

Anahtar kelimeler: *Bartoniyen-Priaboniyen, Kastamonu, Seydiler Formasyonu, Ostrakoda, Türkiye.*

INTRODUCTION

Bartonian-Priabonian lithostratigraphic units are very restricted in Turkey: The Çatalca Peninsula in the Thrace Basin (Sönmez-Gökçen, 1973), the Bakırköy Basin-İstanbul (Şafak, 1997); the Sinop Basin (Tunoğlu, 2001) and the Devrekani Basin in northern Anatolia (Tunoğlu, 1991a, b), the Kasaba Basin-Antalya in southern Turkey (Bilen, 1996; Tunoğlu and Bilen, 2001) and the Darende Basin (Nazik, 1993) in Eastern Anatolia are a few of them (Figure 1).

Many geological investigations had been carried out in the Devrekani basin and its surroundings: (Blumethal, 1948; Dizer, 1953; Geiss, 1954; Göktunalı, 1955; Ketin, 1962, Tunoğlu, 1991a, b; 1992a, b; 1993, 1994, 2001; Bragin et al., 2001; Bardet & Tunoğlu, 2002; Yeşilyurt, 2004; Yeşilyurt et al., 2005; Yıldız et al., 2007). An important investigation dealing with the foraminiferal biostratigraphy of Bartonian, Priabonian and Oligocene shallow-water sediments of southern and eastern Turkey was carried out by Sirel (2003). Another one, dealing with the larger foraminiferal biostratigraphy and its correlation with planktonic foraminifer and nannoplankton zones of the Tethyan Paleocene and Eocene, was carried out by Serra-Kiel et al. (1998).

This article is concerned with the first record of a diverse and correlative Bartonian-Priabonian ostracod assemblage within the Seydiler Formation of the Devrekani basin in the central Pontid region of northern Turkey (Figure 1).

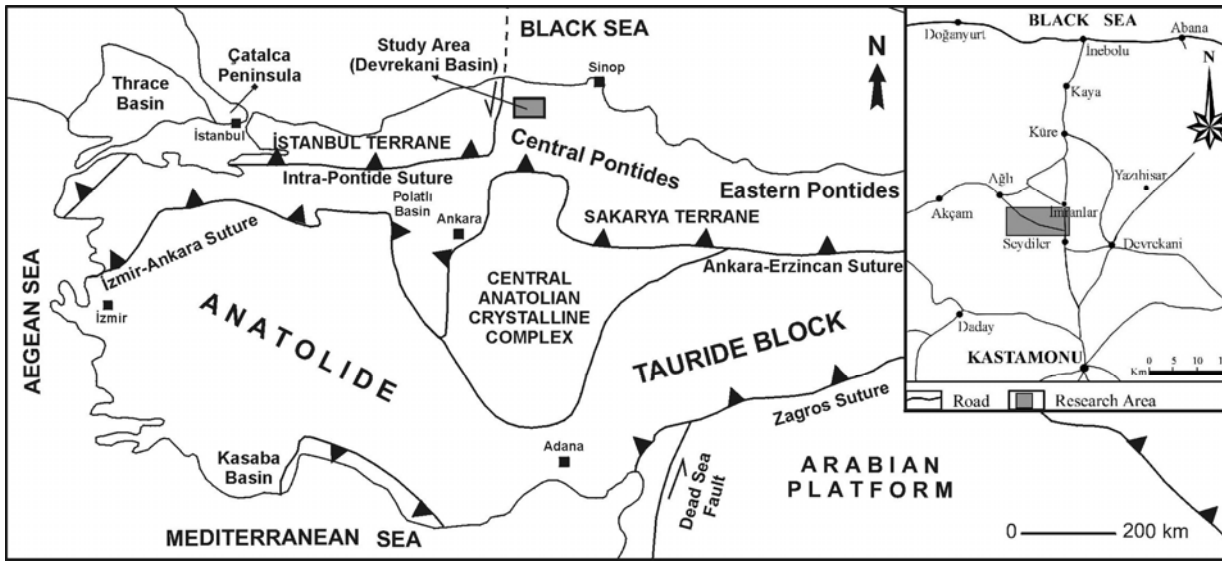

Figure 1. Geologic setting and location map of the study area (large map after Okay and Göncüoğlu, 2004 and small map after Yeşilyurt et al., 2005 and Yıldız et al., 2007).

Şekil 1. *Çalışma alanı yer bulduru haritası ve jeolojik konumu (Büyük harita Okay ve Göncüoğlu, 2004'ten, küçük harita ise Yeşilyurt ve diğ., 2005 ve Yıldız ve diğ., 2007'den değiştirilerek alınmıştır).*

GEOLOGICAL SETTING

The investigation area comprises about 40 km^2 and is located in the north of Seydiler town near Kastamonu city in northern Anatolia (Kastamonu E31-d2; 51^{00}-64^{00} latitude and 08^{50}-16^{00} longitude). The study area is located geologically in the central part of the Pontid tectonic unit (Ketin, 1966), or the " Rhodope-Pontide fragment" according to Şengör (1984). The Pontid area is a main orogenic belt in northern Turkey, which spread along east to west and is characterized by the presence of several basins with transgressive to reggressive Jurassic, Cretaceous and Tertiary successions on ?Precambrian or Paleozoic methamorphic basement units (Figure 1). One of these basins is the Devrekani basin (Tunoğlu, 1991a), which represents a depression with a nearly east-west trending long axis. This basin was entirely related to the Tethyan bioprovince. Late Mesozoic and Cenozoic marine sedimentation took place in the basin on a metamorphic basement of supposed Precambrian age in the south, and on Jurassic clastics and carbonates in the north. The Late Mesozoic and Early-Middle Cenozoic are represented by the following lithostratigraphic units in the basin (Figure 2, 3): The Campanian-Mastrichtian and Paleocene Davutlar Formation is represented by marls, sandy marls, sandy limestones, sandstones and claystones with thicknesses of approximately 300-400 meters (Tunoğlu, 1991 a, b and 1992 a, b). Eocene (Lutetian) The Gürleyikdere Formation The overlies the Davutlar Formation conformably (Figure 3). Gürleyikdere formation is mainly

composed of limestones, sandy limestones, bryozoan limestones and a few marls bearing benthic foraminifers, brachiopods, bryozoa, algae and corals. The Seydiler Formation was deposited during Bartonian-Priabonian stages and it is dominantly composed of marls, claystones and mudstones (Figure 3). This unit overlies a hardground surface on the Gürleyikdere Formation (Figure 3, 4), and contains diverse ostracod, nannoplankton, benthic and planktonic foraminifer and dinoflagellate assemblages. In the study area the upper level of the Seydiler Formation is observed as erosional surfaces.

Geologic sections are measured along two main roads; the NW-SE Seydiler-İnebolu road (Figure 5a) and the E-W Seydiler-Ağlı road (Figure 5b). Paleontological research was carried out on 184 marl samples collected from 7 different measured sections.

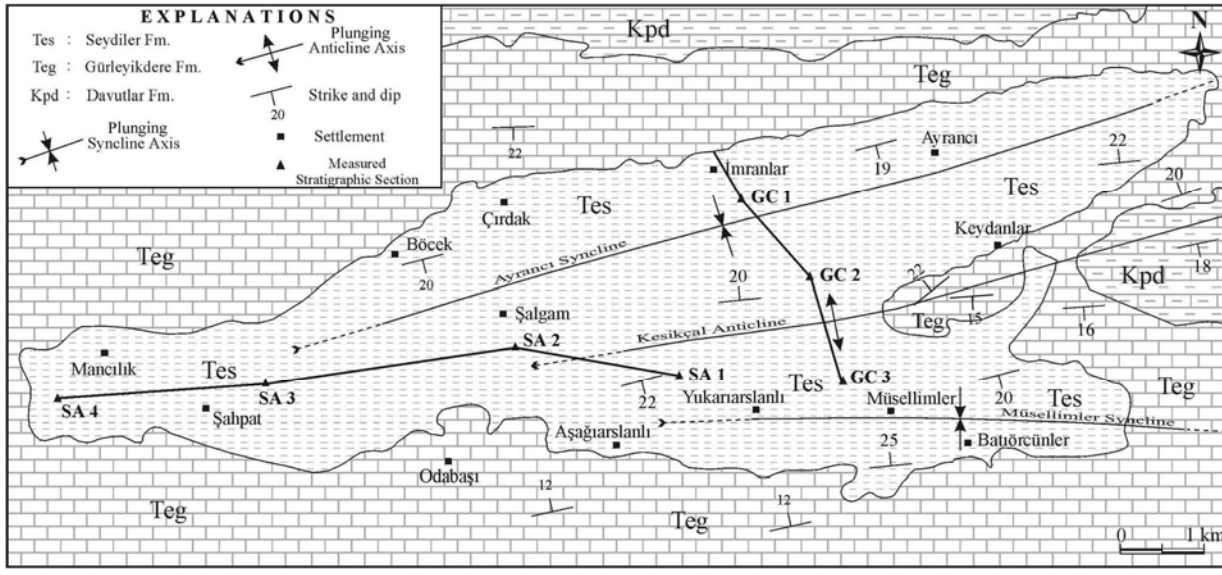

Figure 2. Geological map of the investigation area (changed after Yeşilyurt et al., 2005).

Şekil 2. *İncelenen bölgenin jeoloji haritası (Yeşilyurt ve diğ., 2005'den değiştirilmiştir).*

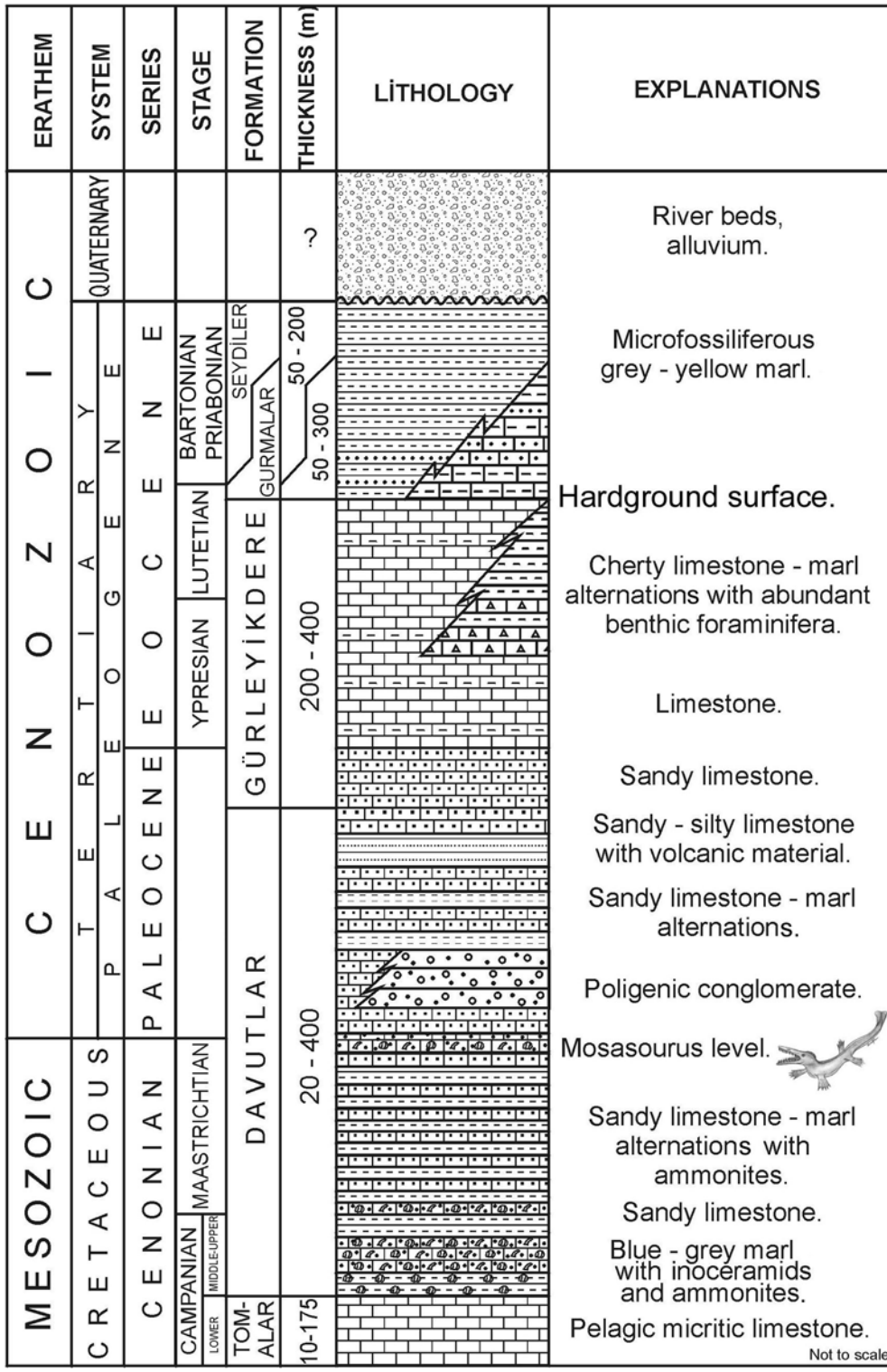

Figure 3. Generalized stratigraphic section of the investigation area (chanced after Yeşilyurt et al., 2005).

Şekil 3. *İncelenen bölgenin genelleştirilmiş stratigrafik istifi (Yeşilyurt ve diğ., 2005'den değiştirilmiştir).*

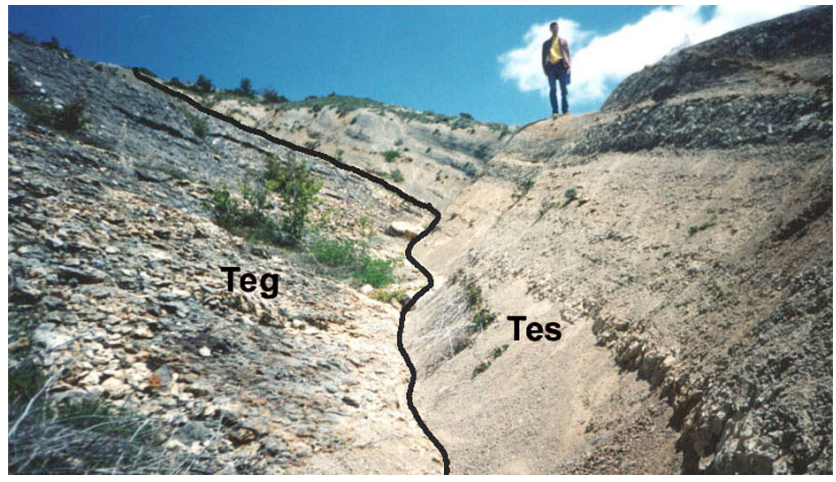

Figure 4. Hardground (paraconformity) surface between Gürleyikdere (Teg) and Seydiler (Tes) Formations from the type section locality (Yeşilyurt et al., 2005).

Şekil 4. *Tip kesit lokasyonunda Gürleyikdere (Teg) ve Seydiler (Tes) formasyonları arasında gözlenen hardground (parakonformite)* yüzeyi (Yeşilyurt ve diğ., 2005).

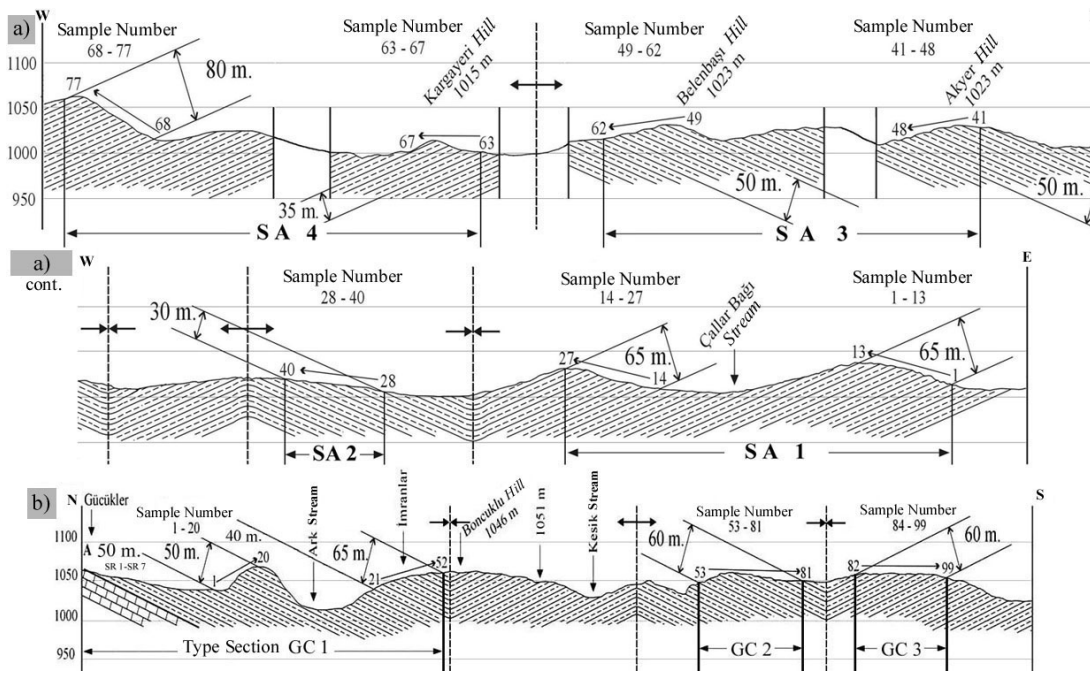

Figure 5 **a)** E-W directed (Seydiler-Ağlı road) geologic section of Seydiler Formation and locations of referance sections (chanced after Yeşilyurt et al., 2005).
b) E-W directed (Seydiler-Ağlı road) geologic section of Seydiler Formation and locations of referance sections (chanced after Yeşilyurt et al., 2005).

Şekil 5 ***a)*** *Seydiler Formasyonu'nun D-B uzanımlı (Seydiler-Ağlı yolu) jeolojik kesiti ve referans kesit yerleri (Yeşilyurt ve diğ., 2005'den değiştirilmiştir).*
b) *Seydiler Formasyonu'nun D-B uzanımlı (Seydiler-Ağlı yolu) jeolojik kesiti ve referans kesit yerleri (Yeşilyurt ve diğ., 2005'den değiştirilmiştir).*

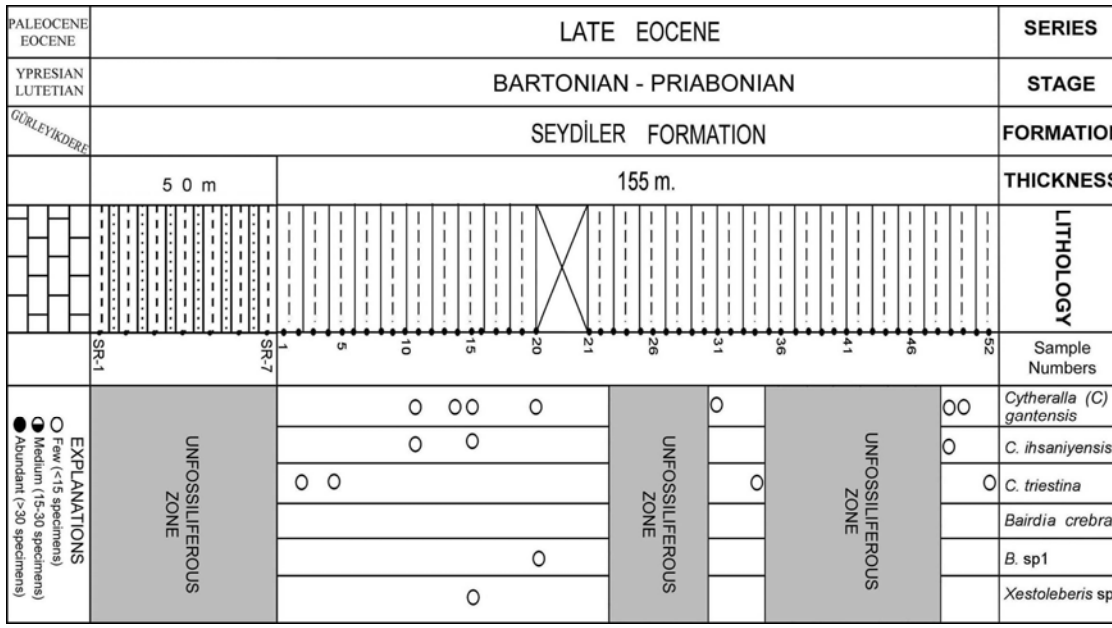

Figure 6. Ostracod association and distribution in the GC-1 Type section.
Şekil 6. *GC-1 Tip kesitindeki ostrakod birlikteliği ve dağılımı.*

METHODOLOGY

This investigation includes both field and laboratory studies of the samples taken from Seydiler Formation. Paleontological examinations were carried out on 184 samples collected from 7 different stratigraphic sections along the Seydiler-İnebolu and Seydiler-Ağlı Roads (Figure 2), and they were prepared for micropaleontologic study to determine the ostacod assemblage under a binocular microscope. Especially claystone, and marl samples from the study area were processed using dilute 10% H_2O_2. During the study an Olympus binocular stereo microscope was used while a Scannig Electron Microscope (SEM-Jeol-JSM-6400) was used for more precise determinations and photomicrography.

DESCRIPTION OF THE SECTIONS

Measured Stratigraphic Sections were taken along two different routes (Figure 2), one of them is along the slope of the İnebolu-Seydiler Road, in a nearly NW-SE direction (GC-1, GC-2 and GC-3), and the other is along the slope of the Seydiler-Ağlı Road, in a nearly E-W direction (SA-1, SA-2, SA-3 and SA-4). Below are given some main aspects and features that indicate all of these sections.

The GC-1 stratigraphic section has a thicknees of 155 m (Figure 6). The whole section is represented by gray claystones and marls. Macro fossils can not be observed. 52 samples have been collected along this section. 6 ostracod taxa and three unfossilifereous zones have been identified in the GC-1 Section. The *Cytherella* species are dominant along the section.

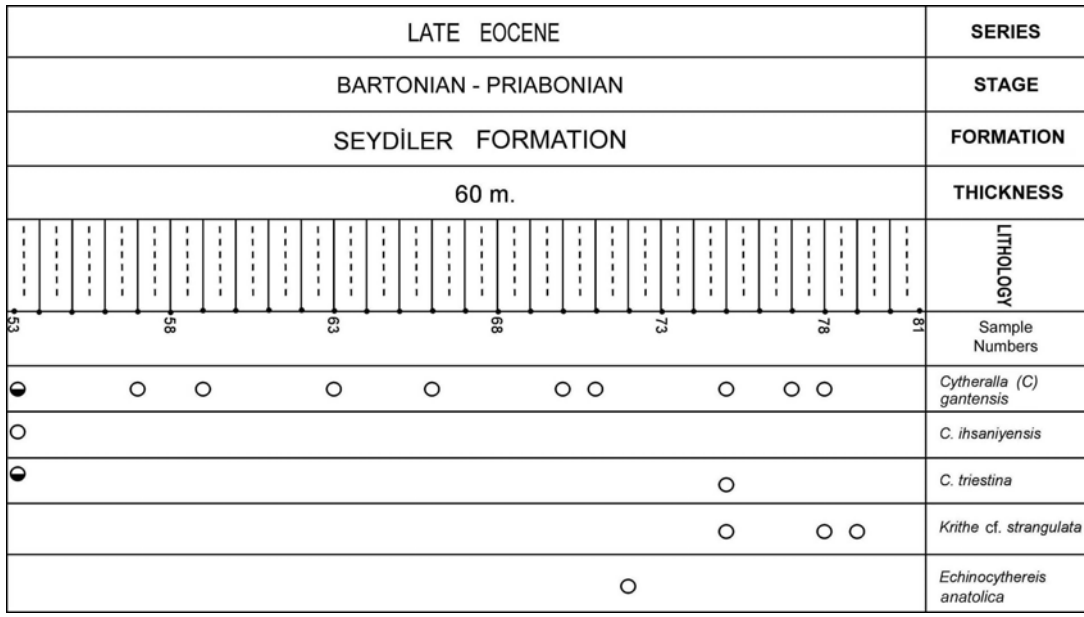

Figure 7. Ostracod association and distribution in the GC-2 reference section.

Şekil 7. *GC-2 Referans kesitindeki ostrakod birlikteliği ve dağılımı.*

The GC-2 stratigraphic section has a thickness of 60 m (Figure 7). The whole section is represented by claystones and marls. 29 samples have been collected from the section and 5 ostracod taxa have been determined. *Cytherella* is the dominant genus and *Cytherella (Cytherelloidea) gantensis* is the dominant species throughout this section.

The thickness of the section GC-3 is measured as 60 meters. Claystone and marl alternation is the dominant lithology in this section. 18 samples have been collected from the section but no ostracods can be observed. For this reason, this section has not been given as a figure in this paper.

The thickness of the section SA-1 is measured as 195 meters (Figure 8). The lithology is mainly claystone and marl alternations. 27 samples have been collected from this section and 14 ostracod taxa have been determined. The diversity and abundance of ostracod species are very high towards the upper levels of this section. *Cytherella* and *Krithe* are the dominant genera along the section.

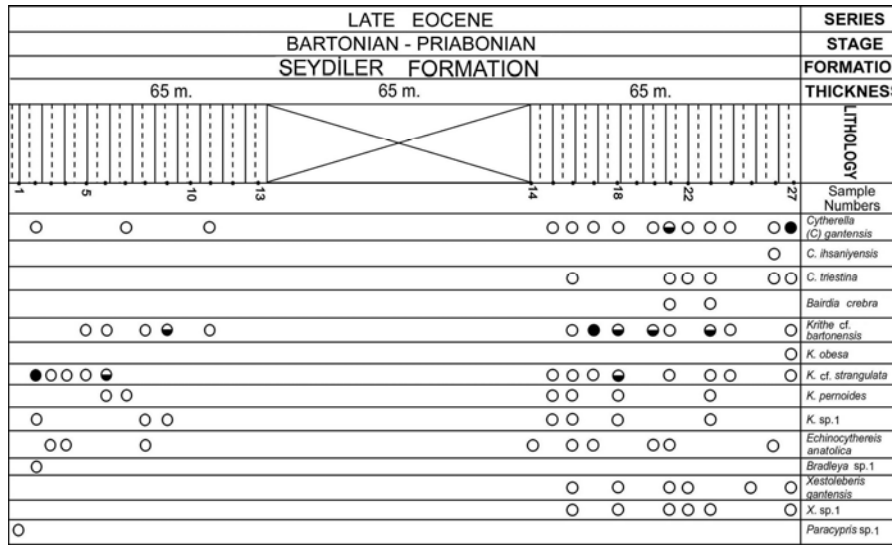

Figure 8. Ostracod association and distribution in the SA-1 reference section.
Şekil 8. *SA-1 Referans kesitindeki ostrakod birlikteliği ve dağılımı.*

Section SA-2 has a 30 m total thickness (Figure 9). This section is represented by yellow and gray claystone and marl alternations. 13 samples have been collected from the section. 11 of the samples contain ostracods and these samples belong to the lower and upper levels of the section. 11 ostracod taxa have been determined. *Cytherella* and *Krithe* are the dominant genera. The number of individuals decrease in this section.

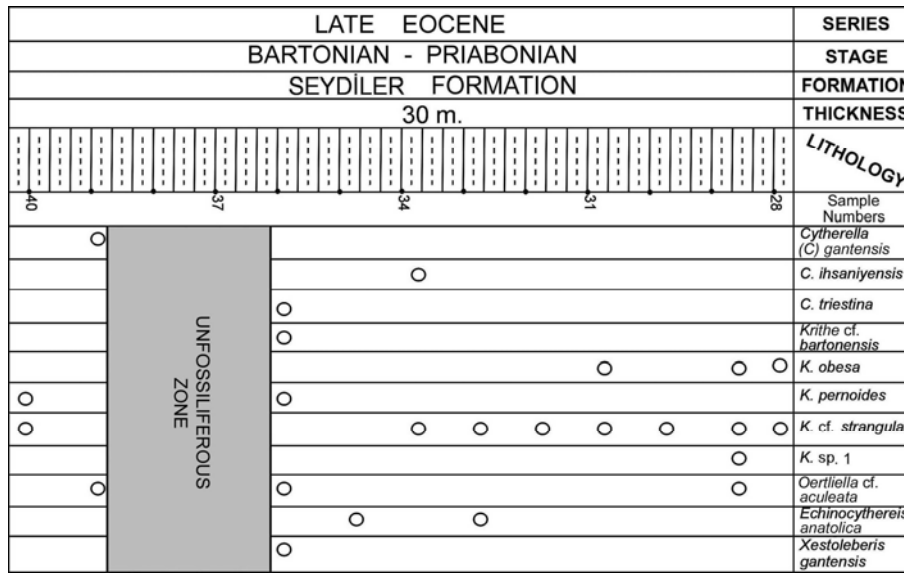

Figure 9. Ostracod association and distribution in the SA-2 reference section.

Şekil 9. *SA-2 Referans kesitindeki ostrakod birlikteliği ve dağılımı.*

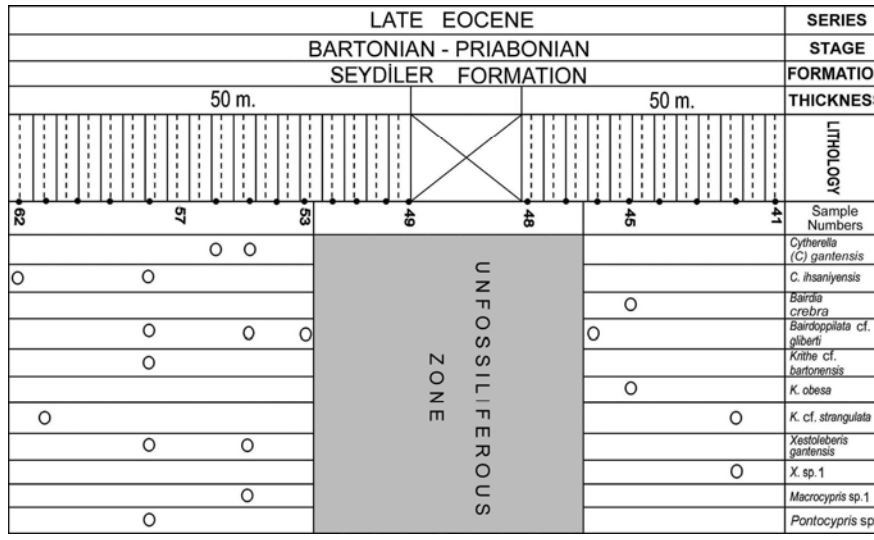

Figure 10. Ostracod association and distribution in the SA-3 reference section.

Şekil 10. *SA-3 Referans kesitindeki ostrakod birlikteliği ve dağılımı.*

SA-3 has a thickness of 100 m. (Figure 10). The Section is represented by yellow, gray claystone and marl alternations. 22 samples have been collected along the section and 9 samples belonging to the upper and lower levels are fossilifereous. 11 ostracod taxa have been identified. *Cytherella* and *Krithe* are the dominant genera in this section.

SA-4 has a thickness of 115 meters (Figure 11). The Section is represented by yellow and gray claystone and marl alternations. 15 samples have been collected along the section. 11 ostracod taxa have been identified. *Cytherella* and *Krithe* are the dominant genera in this section.

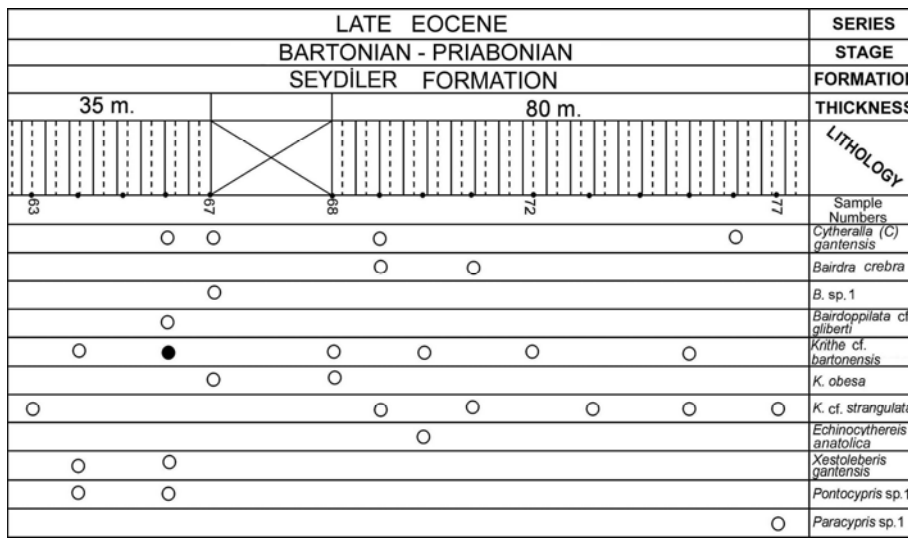

Figure 11. Ostracod association and distribution in the SA-4 reference section.

Şekil 11. *SA-4 Referans kesitindeki ostrakod birlikteliği ve dağılımı.*

SYSTEMATIC DESCRIPTION

Nineteen ostracod species belonging to eleven genera and nine families were identified from the Bartonian-Priabonian deposits. One species within this fauna is proposed as new, eleven species are known but seven species have been left in the open nomenclature. Ostracod assemblages and their SEM images are given in plates 1-3 (some of the figures of the first plate which are related to the Type Section of this study have been used and published in Yıldız et al., 2007). The classification of Ostracoda by Hartmann and Puri (1974) is used for the taxonomy of the species. Moore (1961), Morkhoven (1962, 1963) and the Catalogue of Ostracoda (Ellis and Messina, 1953-1985) have also been used for identification. The species are archived at the paleontological laboratory of Geological Engineering Department of Hacettepe University.

Sub Class: OSTRACODA Latreille, 1802

Order: PODOCOPIDA G.W. Müller, 1894

Sub Order: PLATYCOPA Sars, 1866

Family: CYTHERELLIDAE Sars, 1866

Sub Family: CYTHERELLINAE Pokorny, 1958

Genus: *Cytherella* Jones, 1849

Type-species: *Cytheralla ovata* Roemer, 1841

Stratigraphic range: From Jurassic to Recent.

Environment: Generally whole marine bathymetric levels, rare in the brackish water environments (Morkhoven, 1963).

Cytherella (Cytherelloidea) gantensis (Monostori, 1977)

Pl. 1, Figs.1-3

1977 *Cytherella (Cytherelloidea) gantensis* Monostori, p. 76, 77, pl. 1, fig. 1.

1985a *Cytherella (Cytherelloidea) gantensis* Monostori, Monostori, p. 27-31, pl. 1, figs. 1-17.

Material: 68 carapaces, 42 valves.

Dimensions: Length: 0.67 – 0.87 mm
Height: 0.41 – 0.48 mm
Width: 0.40 – 0.45 mm

Remarks: *Cytherella (Cytherelloidea) gantensis* has been identified in three different forms (being A, B, C forms of *Cytherella (Cytherelloidea) gantensis*) by Monostori (1985a). Our specimen is identical to the B form.

Geographic distribution and stratigraphic range: Hungary: Environs of Budapest and Gánt, Middle Eocene (Monostori, 1977, 1982, 1985a). **Turkey:** Seydiler/Kastamonu, Bartonian-Priabonian.

Cytherella ihsaniyensis Sönmez-Gökçen,1973

Pl. 1, Figs. 4, 5

1973 *Cytherella ihsaniyensis* Sönmez-Gökçen, p. 24, 25, pl. 11, figs. 5-9.

Material: 11 valves, 2 carapaces.

Dimensions: Length: 0.75-0.77 mm
Height: 0.45-0.48 mm
Width: 0.35-0.40 mm

Geographic distribution and stratigraphic range: Turkey: Thrace basin-İnceğiz, Bartonian (Sönmez-Gökçen, 1973); Seydiler/Kastamonu, Bartonian-Priabonian.

Cytherella triestina Kollmann, 1962

Pl. 1, Figs. 6-9

1962 *Cytherella triestina* Kollmann, p. 210, pl. 3, figs. 1-10.

1970 *Cytherella triestina* Kollmann, Gökçen, p. 93, pl. 1, figs. 5, 6.

1973 *Cytherella triestina* Kollmann, Sönmez-Gökçen, p. 27, pl. 2, figs. 16 -21.

1985 *Cytherella triestina* Kollmann, Duru ve Gökçen, p. 52-53, pl. 1, figs. 13-15.

1993 *Cytherella triestina* Kollmann, Nazik, p. 21, pl. 1, fig.1.

Material: 61 valves, 11 carapaces.

Dimensions: Length: 0.78-0.84 mm
Height: 0.44-0.49 mm
Width: 0.35-0.38 mm

Geographic distribution and stratigraphic range: Yugoslavia/Serbia: Lutetian (Kollmann, 1962). **England:** London basin, Ipresian (Gökçen, 1970). **Turkey:** Thrace basin-İnceğiz, Bartonian (Sönmez-Gökçen, 1973); Polatlı basin, Ilerdian-Kuvizian (Duru and Gökçen, 1985); Darende Basin, Lutetian (Nazik, 1993); Seydiler/Kastamonu, Bartonian-Priabonian.

Sub Order: PODOCOPA Sars, 1866

Super Family: BAIRDIACEA Sars, 1866

Family: BAIRDIIDAE Sars, 1866

Genus: ***Bairdia*** M'coy, 1844

Type-species: ***Bairdia curtus*** M' coy, 1844

Stratigraphic range: From Silurian to Recent.

Environment: Marine, Occurs in very shallow waters as well as in very deep waters (Morkhoven, 1963).

Bairdia crebra (Deltel, 1962-63)

Pl. 1, Figs. 10, 11

1962-63 *Bairdia crebra* Deltel, p. 138, 139, pl. 1, figs. 15-17.

1973 *Baridia crebra* Deltel, Sönmez-Gökçen, p. 35, pl. III, figs. 22-25.

1985 *Bairdia crebra* Deltel, Duru and Gökçen, p. 57, pl. 2, figs. 1-4.

2001 *Baridia crebra* Deltel, Tunoğlu, p. 151, pl. 1, fig. 1.

Material: 2 carapaces, 5 valves.

Dimensions: Length: 0.86-1.00 mm
Height: 0.67-0.92 mm
Width: 0.52-0.65 mm

Geographic distribution and stratigraphic range: France: Coupe de Gibret, Lutetian (Deltel, 1962-63). **Turkey:** Thrace basin-İnceğiz, Bartonian (Sönmez-Gökçen, 1973); Polatlı basin, Tanetian-Kuvizian (Duru and Gökçen, 1985); Sinop Basin, Lutetian-Bartonian (Tunoğlu, 2001); Seydiler/Kastamonu, Bartonian-Priabonian.

***Bairdia* sp.1**

Pl. 1, Figs. 12, 13

Description: Valve shape is typically "bairdioid", antero-dorsal and postero-dorsal margins are angular, antero-dorsal margin is elevated towards dorsal margin, postero-ventral margin is tapering backward. The posterior margin is truncated towards the ventral margin. The left valve is larger than the right. The posterior end tapers more than the anterior at dorsal view. Maximum length, height and width are near the center of the carapace. The valve surface is smooth.

Material: 3 carapaces, 2 valves.

Dimensions: Length: 0.42-0.55 mm
Height: 0.27-0.30 mm
Width: 0.28-0.32 mm

Remarks: This species is very similar to *Bairdia* sp. determined by Donze et al. (1982-Tunusia/El Kef Section) in having a similar valve shape and outline of the dorsal margin; but our species has a very different antero-ventral area and a more rounded anterior margin than Donze et al.'s taxon.

Locality and stratigraphic level in this study: GC-1 measured stratigraphic section (MSS), sample number(s) (SN): 15, 20, 21, 49; SA 4 MSS, SN: 67, Bartonian-Priabonian.

Genus: ***Bairdoppilata*** Coryell, Sample & Jennings, 1935.

Type-Species: ***Bairdoppilata martyini*** Coryell, Sample & Jennings, 1935.

Stratigraphic range: From Cretaceous to Recent.

Environment: From very shallow to very deep marine waters (Morkhoven, 1963).

Bairdoppilata* cf. *gliberti Keij, 1957

Pl. 1, Fig. 14

1957 *Bairdoppilata gliberti* Keij, p. 53, pl. 1, figs. 18-21.

1958 *Bairdoppilata gliberti* Keij, Marlieére, p. 18, pl. 2, figs. 5-6.

1959 *Bairdoppilata gliberti* Keij, Ducasse, p. 13, pl. 1, fig. 4; pl. 10, fig. 2.

1968 *Bairdoppilata gliberti* Keij, Haskins, p. 1, pl. 2, figs. 29, 30.

1969 *Bairdia gliberti* Keij, Pietrzeniuk, p.15, pl. II, figs.9, 10.

1973 *Bairdoppilata gliberti* Keij, Sönmez-Gökçen, p. 38, 39, pl. 4, figs.12-14.

1985 *Bairdoppilata gliberti* Keij, Duru and Gökçen, p. 59, 60, pl. 3, figs. 1-4.

1997 *Bairdoppilata gliberti* Keij, Şafak, pl. 1, fig. 1.

2001 *Bairdia (Bairdoppilata) gliberti* Keij, Tunoğlu, p. 152, pl. 1, figs. 2-5.

2008 *Bairdia (Bairdoppilata)* cf. *gliberti* Keij, Shahin, El Halaby, El Baz, p. 129, pl. 1, fig. 12.

Material: 2 carapaces, 2 valves.

Dimensions: Length: 0.85-1.50 mm
Height: 0.50-0.80 mm
Width: 0.45-0.70 mm

Remarks: This specimen is higher but less elongated than the Keij (1957)'s holotype and

paratypes. For this reason, this taxon is proposed as "cf".

Geographic distribution and stratigraphic range: Belgium: Lutetian-Bartonian (Keij, 1957; Marliére, 1958). **France:** Paris basin; Tanetian-Lutetian (Apostolescu, 1955, 1956); Aquitaine basin, Lutetian-Bartonian (Ducasse, 1959). **England:** Bartonian (Haskins, 1968). **Spain:** Campo, Early Eocene/Ilerdian-Cuisian (Ducasse, 1959). **Germany:** Northern Germany, Eocene (Pietrzniuk, 1969). **Turkey:** Thrace basin-İnceğiz, Bartonian (Sönmez-Gökçen, 1973); Polatlı basin, Tanetian-Kuvizian (Duru and Gökçen, 1985); Darende Basin, Lutetian-Priabonian (Nazik, 1993); Bakırköy Havzası, İstanbul, Late Eocene (Şafak, 1997); Sinop Basin, Lutetian-Bartonian (Tunoğlu, 2001); Egypt, Middle Eocene (Shahin, El Halaby, El Baz, 2008), Seydiler/Kastamonu, Bartonian-Priabonian.

Family: KRITHIDAE Mandelstam, 1960

Sub Family: KRITHINAE Mandelstam, 1974

Genus: ***Krithe*** Brady, Crosskey and Robertson, 1874

Type-Species: ***Ilyobates praetexta*** Sars, 1866 but according to some authors ***Cythere (Cytherideis) bartonensis*** Jones, 1857

Stratigraphic range: From Cenomanian to Recent (Mokhoven, 1963).

Environment: Marine, especially infraneritic and bathyal environments (Morkhoven, 1962, 1963).

Krithe* cf. *bartonensis (Jones, 1857)

Pl. 2, Figs. 1-3

1857 *Krithe bartonensis* (Jones), Keij, p. 85, pl. VIII., figs. 11-17.

1959 *Krithe bartonensis* (Jones), Ducasse, p. 49-50, pl. III, fig. 1; pl. XX, figs. 3a-b.

1969 *Krithe bartonensis* (Jones), Pietrzeniuk, p. 21, figs. 5-6; pl. V, fig. 12.

1969 *Krithe bartonensis* (Jones), Scheremeta, p. 88, 89, pl. VIII, figs. 1, 2.

1970 *Krithe bartonensis* (Jones), Haskins, p. 13-16, pl. 1, figs. 5-14.

1973 *Krithe bartonensis* (Jones), Sönmez-Gökçen, p. 54, pl. VII, figs. 3 -7.

1985a *Krithe bartonensis* (Jones), Monostori, p. VII, figs.9-21.

1987 *Krithe bartonensis* (Jones), Monostori, p. 145, pl. 3, figs.12, 13.

1996 *Krithe bartonensis* (Jones), Monostori, p. 39-41, pl. 11, figs. 4-8; pl. 12, figs. 1-8.

2008 *Krithe bartonensis* (Jones), Shahin, El Halaby, El Baz, p. 131, pl. 2, figs. 1, 2.

Material: 101 carapaces, 20 valves.

Dimensions: Length: 0.57-0.62 mm
Height: 0.28-0.32 mm
Width: 0.25-0.30 mm

Geographic distribution and stratigraphic range: England: Early-Middle Eocene (Haskins,1970). **Belgium:** Early-Middle Eocene (Keij, 1957). **France:** ?Paleocene-?Oligocene (Ducasse, 1959). **Germany:** Middle Eocene (Pietrzeniuk, 1969). **Ukraine:** Early-Late Eocene

(Scheremeta, 1969). **Hungary:** Middle Eocene (Bartonian-Early Priabonian) (Monostori, 1985a, 1987,1996). **Turkey:** Thrace basin-İnceğiz, Middle Eocene-?Early Oligocene (Sönmez-Gökçen, 1973); Egypt, Middle Eocene (Shahin, El Halaby, El Baz, 2008), Seydiler/Kastamonu, Bartonian-Priabonian.

Krithe obesa Sönmez-Gökçen,1973

Pl. 2, Fig. 4, 5

1973 *Krithe obesa* Sönmez-Gökçen, p. 54, 55, pl. VII, figs. 8-10.

Material: 4 carapaces, 2 valves.

Dimensions: Length: 0.62-0.70 mm
Height: 0.35-0.40 mm
Width: 0.30-0.35 mm

Geographic distribution and stratigraphic range: Turkey: Thrace basin-İnceğiz, Bartonian (Sönmez-Gökçen, 1973); Seydiler/Kastamonu, Bartonian-Priabonian.

Krithe pernoides (Bornemann, 1855)

Pl. 2, Figs. 6-8

1957 *Krithe pernoides* (Bornemann), Keij, p. 86, pl. 6, figs. 11a-b.

1962 *Krithe pernoides* (Bornemann), Bassiouni, p. 22, pl. 9, figs.1- 3.

1985a Krithe n.sp. aff. *Krithe pernoides* (Bornemann), Monostori, p. 66, 67, pl. VII, figs. 22-27.

1985b *Krithe pernoides* (Bornemann), Monostori, p.189-190, pl. 4, fig. 9.

1996 *Krithe pernoides* (Bornemann), Monostori, p. 42, 43, pl. 14, figs. 5-8; pl. 15 figs. 1-3.

Material: 20 carapaces, 4 valves.

Dimensions: Length: 0.60-0.84 mm
Height: 0.25-0.35 mm
Width: 0.20-0.32 mm

Geographic distribution and stratigraphic range: Germany: Early Eocene-Late Oligocene (Bassiouni, 1962). **Belgium:** Rupelian (Keij, 1957). **Hungary:** Middle Eocene-Late Oligocene (Monostori, 1985a,b; 1996). **Turkey:** Seydiler/Kastamonu, Bartonian-Priabonian.

Krithe* cf. *strangulata Deltel, 1962-63

Pl. 2, Figs. 9-11

1962-63 *Krithe strangulata* Deltel, p. 173-174, pl. IV, figs. 90-92.

Material: 87 carapaces, 21 valves.

Dimensions: Length: 0.62-0.67 mm
Height: 0.35-0.40 mm
Width: 0.29-0.33 mm

Geographic distribution and stratigraphic range: France: Aquitaine basin Stampian (Deltel, 1962-63). **Turkey:** Seydiler/Kastamonu, Bartonian-Priabonian.

***Krithe* sp. 1**

Pl. 2, Fig. 12

Description: The valves are elongated, ovate in lateral outline, the dorsal margin is straight, the ventral margin nearly stratight in the left valve. The left valve is larger than the right. The anterior margin is broadly rounded, the dorsal

and ventral margins are nearly parallel, the antero-dorsal and postero-dorsal corners are not marked, the posterior end is obliquely truncated and the posteroventral end is beak shaped. The valve surface is smooth. The maximum height is between the anterior and center of the valve. Maximum length and width are measured at the center.

Material: 2 carapaces, 6 valves.

Dimensions: Length: 0.70-0.65 mm
Height: 0.25-0.35 mm
Width: 0.25-0.30 mm

Remarks: This species is very similar to *Krithe truncatus* Sönmez-Gökçen, but *Krithe* sp. 1 is slightly straighter at the ventral side, and the postero-ventral margin of *Krithe* sp.1 is stronger than that of *K. truncatus.*

Locality and stratigraphic level in this study:

SA-1 MSS, SN: 2, 8, 9, 11, 15,16,18, 23; Bartonian-Priabonian.

Family: TRACHYLEBERIDIDAE Sylvester-Bradley, 1946

Sub Family: TRACHYLEBERIDINAE Sylvester-Bradley, 1948

Genus: *Oertliella*, Pokorny, 1964

Type-species: *Cythere reticulata* Kafka, 1886

Stratigraphic range: Late Cretaceous-Paleogene.

Environment: Generally neritic marine environment (Pokorny, 1964).

Oertliella aculeata (Bosquet, 1852)

Pl. 2, Figs. 13, 14

1852 *Cythere aculeata* Bosquet, p. 107, pl. 5, fig. 10.

1955 *Trachyleberis aculeata* (Bosquet), Apostolescu, p. 271, pl. 8, figs. 123-124.

1957 *Trachyleberis* (*Trachyleberis*) *aculeata* (Bosquet), Keij, p. 90, pl. 13, figs. 16-17; pl. 16, figs. 14-15.

1959 *Trachyleberis* (*Trachyleberis*) *aculeata* (Bosquet), Ducasse, p. 68, pl. 5, fig. 4; pl. 26, fig. 1.

1961 *Trachyleberis aculeata* (Bosquet), Deltel, p. 183, pl. 18, figs. 301, 302.

1965 *Trachyleberis* (*Trachyleberis*) *aculeata* (Bosquet), Eager, p. 24, pl. 3, figs. 5, 6.

1972 *Oertliella aculeata* (Bosquet), Tambareau, p. 312-320, pl. 10, figs1-21.

1973 *Trachyleberis aculeata* (Bosquet), Sönmez-Gökçen, p. 79,80, pl. 9, figs. 39-40.

1977 *Oertliella aculeata* (Bosquet), Szczechura, p. 68-69, pl. 22, figs.1-6.

1984 *Oertliella aculeata* (Bosquet), Duru, p. 74, 75, pl. 5, figs. 1-4.

Material: 4 carapaces.

Dimensions: Length: 0.70-0.75 mm
Height: 0.40-0.50 mm
Width: 0.35-0.40 mm

Geographic distribution and stratigraphic range: England: Ledian (Middle Eocene) (Keij, 1957); Bartonian (Eager, 1965). **Belgium:** Danian-Bartonian (Keij, 1957). **France:** Paris basin, Montian-Ledian/Middle Eocene (Keij,

1957; Apostelescu, 1955); Aquitaine basin, Lutetian (Ducasse, 1959; Deltel, 1961). **Poland:** Paleocene-Eocene (Szczechura, 1977). **Spain:** Campo, Ilerdian (Tambareau 1972). **Turkey:** Thrace basin, Bartonian (Sönmez-Gökçen,1973); Polatlı basin, Tanetian-Kuvizian (Duru, 1984); Seydiler/Kastamonu, Bartonian-Priabonian.

Genus: *Echinocythereis* Puri, 1954

Type-species: *Cythereis goretti* Howe & Mc Cuirt, 1935

Stratigraphic range: From Paleocene to Recent.

Environment: Marine, deep regions (infraneritic, bathyal) (Morkhoven, 1963).

***Echinocythereis anatolica* n.sp.**

Pl. 2, Figs. 15-18

Derivation of name: Anatolia, the Asian part of Turkey.

Holotype: Carapace, right valve (plate 3, figure 2)

Paratype: 30 carapaces, 7 valves.

Type-ocality: Seydiler, SA-1 MSS, SN:16.

Type-level: Bartonian-Priabonian.

Diagnosis: The carapace is subovate in lateral view, the dorsal and ventral margins are nearly parallel. The anterior margin is broadly rounded. The posterior margin is "V" shaped. The left valve is larger than the right. The surface of the valve is covered with numerous small spines, tubercules and shallow pits.

Description: The carapace is subovate in lateral view. The dorsal margin is almost straight, the ventral margin is concave at the center. The anterior margin is broadly and well rounded. The posteroventral end is well rouded but the posterodorsal end is diagonally acute. The posterior margin is broadly "V" shaped and approximately centrally subacute, the anterior peripheral and posterior area are compressed. The carapace is swollen at the dorsal view. The anterior end is more tapering than the posterior end at the dorsal view. The maximum height is at the anterior, the maximum length and width are at the center of the carapace. The surface of the valve is covered with numerous small spines, tubercules and shallow pits bearing normal pore canals at their centers. They are aranged in peripheral concentric lines but not at the central area of the carapace. Two well developed peripheral ridges lie nearly parallel to the ventral margin, and there are weak ridges nearly parallel to the anterior and posterior margins. Eye spots are well developed and large at the anterodorsal corner. Males are slightly longer, alongate and narrower than females. The hinge, muscle scars and marginal pore canals are not observed.

Dimensions: Length: 0.70-0.87 mm
Heigth: 0.45-0.50 mm
Width: 0.30-0.42 mm

Remarks: Echinocythereis anatolica n.sp. is very different from known Echinocythereis taxa. *Echinocythereis karoma*, McKenzie, differs by possesing anterior marginal spines. Also the anterior peripheral and posterior area of our taxon is compressed and straight. *Echinocythereis multicostata* Deltel, has very dense parallel costa from anterior to posterior on the valve surface. *Echinocythereis lutfullahi* Sönmez-Gökçen has very dense and large tubercules on the valve surface. *E. dadayana* (Méhes) is very closely similar to *E. anatolica* in terms of general valve shape but *E. dadayana* differs by possesing large reticulates and ridges on the valve surface (Monostori, 1985a,1996).

Locality and stratigraphic level in this study: GC-2 MSS, SN:72, SA-1 MSS, SN:2, 8, 9, 15,

16, 18, 23; SA 2 MSS, SN:33, 35; SA-4 MSS, SN:70. Bartonian-Priabonian.

Family: HEMICYTHERIDAE Puri, 1954

Sub Family: THAEROCYTHERINAE Hazel,1965

Genus: ***Bradleya*** Hornibrook, 1952

Type-species: ***Cythere arata*** Brady, 1880

Stratigraphic range: Late Cretaceous-Recent.

Environment: Marine (Morkhoven, 1963).

***Bradleya* sp.**

Pl. 3, Fig. 1

Description: The valves are rectangular in lateral view. The anterior margin is broadly and well rounded, bearing short spines, the postero-dorsal magin is angular, the dorsal margin slightly convex, the ventral margin slightly concave, the posterior margin slighty convex and the posterodorsal area has five or six distinct spines. Dorsal and ventral margins are nearly parallel. There is a straight rib near the ventral margin continuing along the anterior margin. The valve surface is reticulated with a meandric pattern. Maximum length and width are at the center of the valves, maximum height is anterior.

Material: 2 carapaces.

Dimensions: Length: 0.62-0.70 mm
Heihgt: 0.32-0.35 mm
Width: 0.30-0.34 mm

Remarks: This species is similar to *B. bosquetina* (Jones and Sherbon) according to general valve shape, but *B. bosquetina* has longer and stronger ridges on the valve surface.

Locality and stratigraphic level in this study: SA-1 MSS, SN: 2, Bartonian-Priabonian.

Family: XESTOLEBERIDIDAE Sars, 1927

Genus: ***Xestoleberis*** Sars, 1866

Type-species: ***Cythere aurrantia*** Bbaird, 1838

Stratigraphic range: From Cenomanian to Recent.

Environment: They can live from oligohaline to mesohaline water conditions, from 2° C to 20° C and from littoral to bathyal (Morkhoven, 1962).

Xestoleberis gantensis Monostori, 1977

Pl. 3, Fig. 2

1977 *Xestoleberis gantensis* Monostori, p. 113-115, pl. IV, figs. 14-17.

1985a *Xestoleberis gantensis* Monostori, Monostori, p. 121-124, pl. XVI, fig. 13.

1987 *Xestoleberis gantensis* Monostori, Monostori, p. 158-159, pl. 7, figs. 4, 8-11.

2000 *Xestoleberis gantensis* Monostori, Monostori, pl. 9, figs. 2-7; pl. 10, figs. 1-7; pl. 11, figs. 1-4.

Material: 8 carapaces, 2 valves.

Dimensions: Length: 0.45-0.60 mm
Height: 0.32-0.48 mm
Width: 0.25-0.34 mm

Geographic distribution and stratigraphic range: Hungary: Middle-Late Eocene (Late Lutetian, Bartonian, Priabonian), (Monostori

1977, 1985a, 1987, 2000). **Turkey:** Seydiler/Kastamonu, Bartonian-Priabonian.

***Xestoleberis* sp. 1**

Pl. 3, Fig. 3

Description: The valves are ovate or egg shaped in lateral view. The dorsal margin is strongly convex, the ventral margin slightly concave, the posterior margin broadly and well rounded, and the anterior margin is depressed towards the ventral margin and well rounded. Maximum length, height and width are measured at the center of the valve. The valve surface is smooth.

Material: 2 carapaces, 9 valves.

Dimensions: Length: 0.65-0.67 mm
Height: 0.35-0.40 mm
Width: 0.30-0.37 mm

Remarks: This species is very similar to *Xestoleberis ? kenawyi* Cronin and Khalifa, but the ventral margin of *Xestoleberis ? kenawyi* is more concave.

Locality and stratigraphic level in this study:

GC-1 MSS, SN: 15; SA-1 MSS, SN: 16, 18, 21, 22, 23, 27; SA-3 MSS, SN: 42, 58, 60; Bartonian-Priabonian.

Family: MACROCYPRIDIDAE G.W. Müller, 1912

Genus: ***Macrocypris*** Brady, 1868

Type-species: ***Cythere minna*** Baird, 1850

Stratigraphic range: Early Cretaceous-Recent.

Environment: Marine, generally from infraneritic to bathial conditions (Morkhoven, 1962, 1963).

Macrocypris sp.

Pl. 3, Fig. 4

Description: The valves are large and elongated in lateral view. The dorsal margin is straight, the postero-dorsal and antero-dorsal corners are angular, the ventral margin is slightly concave. The anterior margin is blunt, broadly rounded and depressed towards the ventral end. The Posteroventral end is strongly tapering and acute, the posterior is more tapering than the anterior in dorsal view. Maximum length, height and width are at the center of the carapace. The valve surface is smooth.

Material: 2 carapaces.

Dimensions: Length: 0.80-1.00 mm
Height: 0.38-0.43 mm
Width: 0.25-0.30 mm

Remarks: This taxon is very similar to *Macrocypris* sp. of Guernet (1985), but *Macrocypris* sp. differs by having a more concave ventral margin.

Locality and stratigraphic level in this study: SA-3 MSS, SN: 55; Bartonian-Priabonian.

Family: PONTOCYPRIDIDAE G. W. Müller,1894

Genus: ***Pontocypris*** Sars, 1866

Type-species: ***Cythere (Bairdia) mytiloides*** Norman, 1862

Stratigraphic range: From Paleocene to Recent.

Environment: They are active swimmers in the neritic environment (Morkhoven, 1963).

***Pontocypris* sp. 1**

Pl. 3, Figs. 5-7

Description: Valves are nearly triangular or subrtiangular in lateral view. The dorsal margin is strongly convex and well rounded, the ventral margin is slightly concave. The anterior margin is depressed from the dorsal to the ventral margin and well rounded, the posterior margin is truncated and tapering at the posteroventral area. The left valve is larger than the right. Anterior and posterior parts are equally tapering in dorsal view. Maximum length, height and width are at the center of carapace. The valve surface is smooth.

Material: 8 carapaces.

Dimensions: Length: 0.95-1.00 mm
Height: 0.40-0.57 mm
Width: 0.32-0.37 mm

Remarks: This specimen is similar to *Pontocypris* sp. of Oertli (1956), but *Pontocypris* sp. has a more concave ventral margin and tapers more in the postero-ventral area.

Locality and stratigraphic level in this study: SA-4 MSS, SN: 64, 66; Bartonian-Priabonian.

Family: CANDONIDAE Kaufmann, 1900

Sub Family: PARACYPRIDINAE Sars, 1923

Genus: ***Paracypris*** Sars, 1866

Type-species: ***Paracypris polita*** Sars, 1866

Stratigraphic range: From Silurian to Recent.

Environment: Marine. They generally prefer deep (from infraneritic to bathyal) and oxygen rich waters (Morkhoven, 1963).

***Paracypris* sp. 1**

Pl. 3, Figs. 8-10

Description: Valves are elongated and subtriangular in lateral view. The left valve is larger than the right. The dorsal margin is nearly straight and angular at the antero-dorsal and postero-dorsal areas. The anterior margin is broadly and well rounded. There is tapering towards the posterior. The posteroventral end is acutely pointed and the posterior margin is truncated behind the hinge margin. The ventral margin is concave at the center. Maximum length is near the ventral margin, maximum width is at the center, maximum height is measured between the anterior and the center of the carapace. The valve surface is smooth.

Material: 6 carapaces.

Dimensions: Length: 0.83-1.10 mm
Height: 0.30-0.56 mm
Width: 0.30-0.35 mm

Remarks: This species is closely similar to *P. polita* Sars and *P. aerodynamica* Oertli, but our specimen has a very tapering postero-ventral part.

Locality and stratigraphic level in this study: SA-1 MSS, SN: 1; SA-3 MSS, SN: 58; SA-4 MSS, SN: 77; Bartonian-Priabonian.

OTHER PALEONTOLOGICAL DATA

Seydiler Formation (Yeşilyurt, 2004) has very the abundant and diverse nannoplankton, dinoflagellate and benthic and planktonic foraminifer associations. The main nannoplankton species in this formation (determined by Prof. Dr. Ayşegül Yıldız-Niğde University) consists of *Coccolithus pelagicus* (Wallich), *Coccolithus formosus, Braarudosphaera bigelowi* (Gran and Braarud), *Braarudosphaera discula, Ericsonia robusta, Ericsonia formosa* (Kamptner), *Biantholithus sparsus* Bramlette and Martini, *Sphenolithus radians* Deflandre, *Sphenolithus obtusus* Bukry, *Sphenolithus editus* Perch and Nielsen, *Sphenolithus elongatus* Perch and Nielsen, *Pontosphaera plana* (Bramette and Sullivan), *Pontosphaera multipora* (Kamptner), *Discoaster saipanensis* Bramlette and Riedel, *Discoaster sublodoensis* Bramlette and Sullivan, *Discoaster barbadiensis* Tan, *Discoaster* sp., *Chiasmolithus grandis* (Bramlette and Riedel), *Reticulofenestra dictyoda* (Deflandre), *Reticulofenestra coenuna, Helicosphaera euphratis* Hag, *Micrantholithus* sp. This assembleage indicates Middle-Late Eocene. The species of planktonic foraminifers (determined by Prof. Dr. Ayşegül Yıldız-Niğde University) listed below occurs in the Seydiler Formation: *Globigerina eocaena* Güembel, *Globigerina inaequispira* Subbotina, *Globigerina higginsi* Bolli, *Globigerina lozanoi* Colom, *Turborotalia cerroazulensis frontosa* (Subbotina). Similarly, this assemblage reperesents the Middle-Late Eocene. The other important fossil association is that of the dinoflagellates: *Adnatosphaeridium multispinosum* Williams and Downie, *Areosphaeridium arcuatum* Eaton, *Areosphaeridium* sp., *Cleistosphaeridium* sp., *Cordosphaeridium eoinodes* Eisenack, *Cordosphaeridium microtriania* Eisenack, *Cordosphaeridium* sp., *Deflandrea oebisfeldensis* Albeti, *Deflandrea phosporitica* Eisenack, *Deflandrea* sp., *Glaphorocysta texta* (Bujak), *Glaphorocysta* sp., *Homotriblium abbreviatum* Eoton, *Homotriblium tenuispinosum* Davey and Willams, *Impagidinium dispertitum* (Cookson and Eisenack), *Kisselovia coleothrypta* (Williams and Downie), *Rhomboedinium perforatum* (Jan du Chene and Chateauneuf), *Samlandia chlamydohora* Eisenack, *Spiniferites* sp., *Wetzeliella articulata* Eisenack, *Wetzeliella* sp. This fossil flora association has been determined by Kaya Ertuğ (TPAO-Turkish Petroleum Corporation) and the stratigraphical range of the Seydiler Formation has been given as between Late Paleocene-Late Eocene.

CHRONOSTRATIGRAPHICAL, PALEOENVIRONMENTAL AND PALEOGEOGRAPHICAL INTERPRETATION

The chronostratigraphic correlations of the Seydiler Formation in the Devrekani basin are based on the determination of ostracod associations. The age of the ostracod assemblage is integrated with that of the calcareous nannoplanktons, benthic and planktic foraminifers and dinoflagellates.

A total of 19 ostracod species (nine family and eleven genera) have been determined from the Seydiler Formation in the Devrekani basin. A Late Lutetian-Bartonian age has been assigned, based on the occurence of *Cytherella ihsaniyensis* and *Krithe obesa* but the last occurence of *Cytherella triestina*, *Bairdoppilata gliberti*, *Trachyleberis aculeata*, *Xestoleberis gantensis* and *Echinocythereis dadayana*

suggests the Bartonian-Priabonian stages (Figure 12). Late Lutetian is indicated by the planktonic foraminifer association. Ostracod nannoplancton and planktonic foraminifers are good biostratigraphic markers for Late Lutetian-Bartonian deposits of the Tethys bioprovince. The geographic distribution of the determined species in Europe, Africa (Shahin et al., 2008) and Anatolia is given in figure 13.

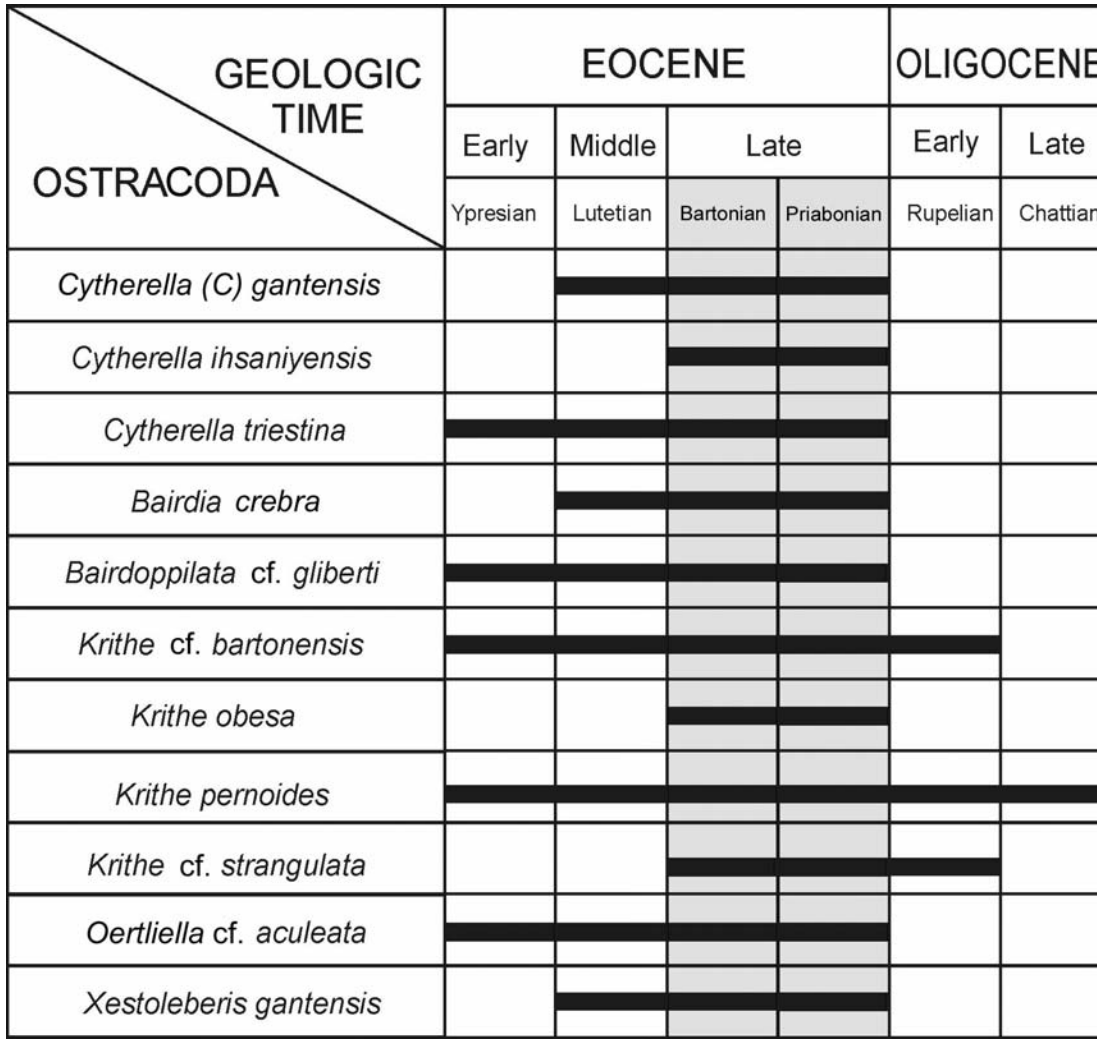

Figure 12. Chronostratigraphic ranges of ostracod species recognized in this investigation (Releated referances have been given in the sistematic).

Şekil 12. *Bu çalışmada saptanan ostrakod türlerinin kronostratigrafik menzilleri (türlerin kronostratigrafik menzilleri ile ilgili referanslar sistematik kısmında verilmiştir).*

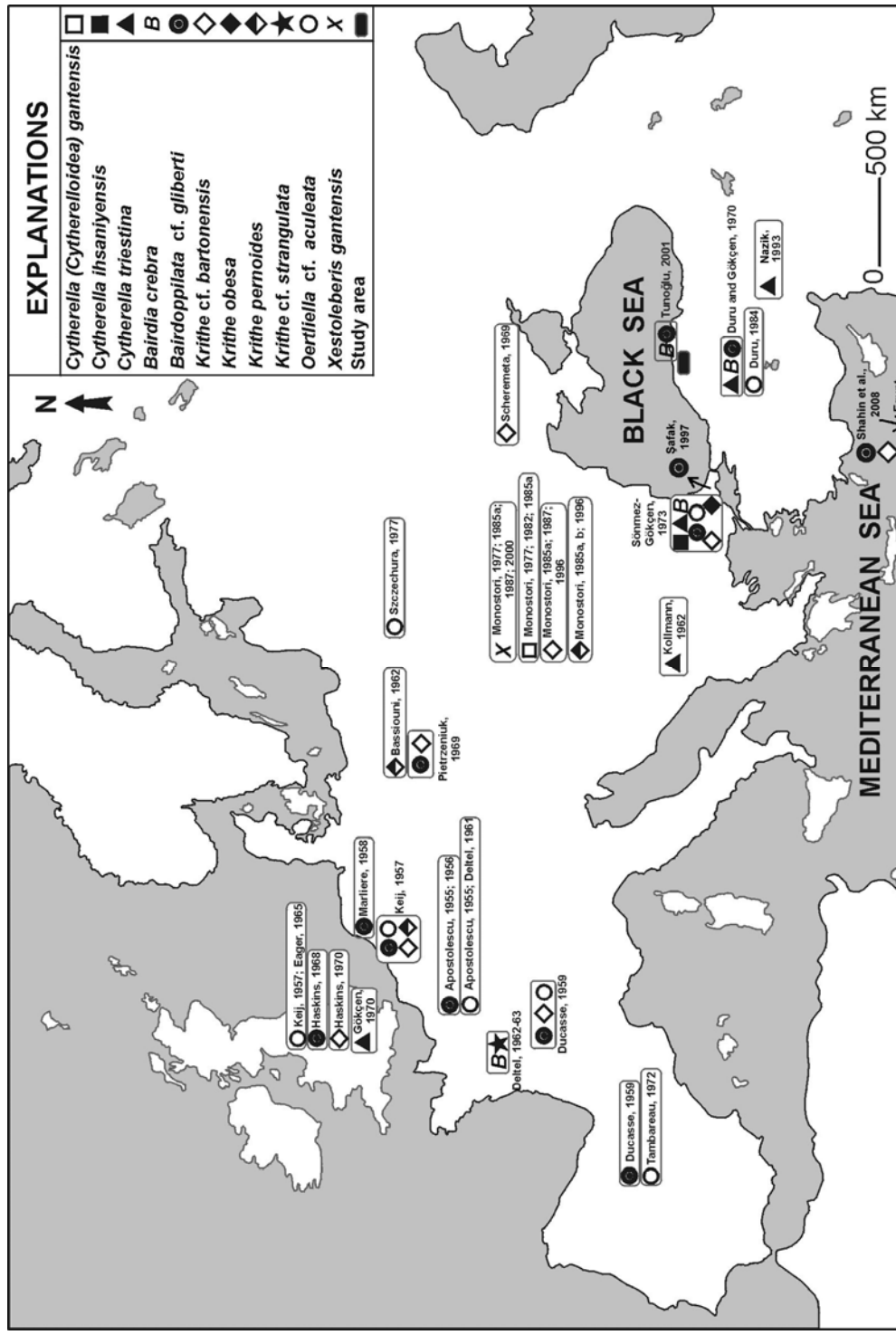

Figure 13. Geographic distribution in Europe, Africa and Turkey of ostracod species recognized in this study.

Şekil 13. *Bu çalışmada saptanan ostrakod türlerinin Türkiye, Avrupa ve Afrikada'ki coğrafik yayılımları.*

Northern Anatolian Late Lutetian-Bartonian and Priabonian outcrops are very difficult to correlate with the Upper Eocene and Oliocene shallow-water sediments of southern and eastern Turkey, because they have different facies. Sirel (2003) has used only foraminiferal biostratigraphy which does not correlate with any other microfossil group. At the same time, the ostracod associations are not very well known. In addition to the environment determinating the characteristics of the ostacod fauna in this region, taking into consideration the other microfauna and flora present, and the lithological aspects and their facies characteristics, the deposition of Seydiler Formation is thought to have occured in a marine environment and at depths changing from neritic to bathyal under transgressive conditions (Figure 14).

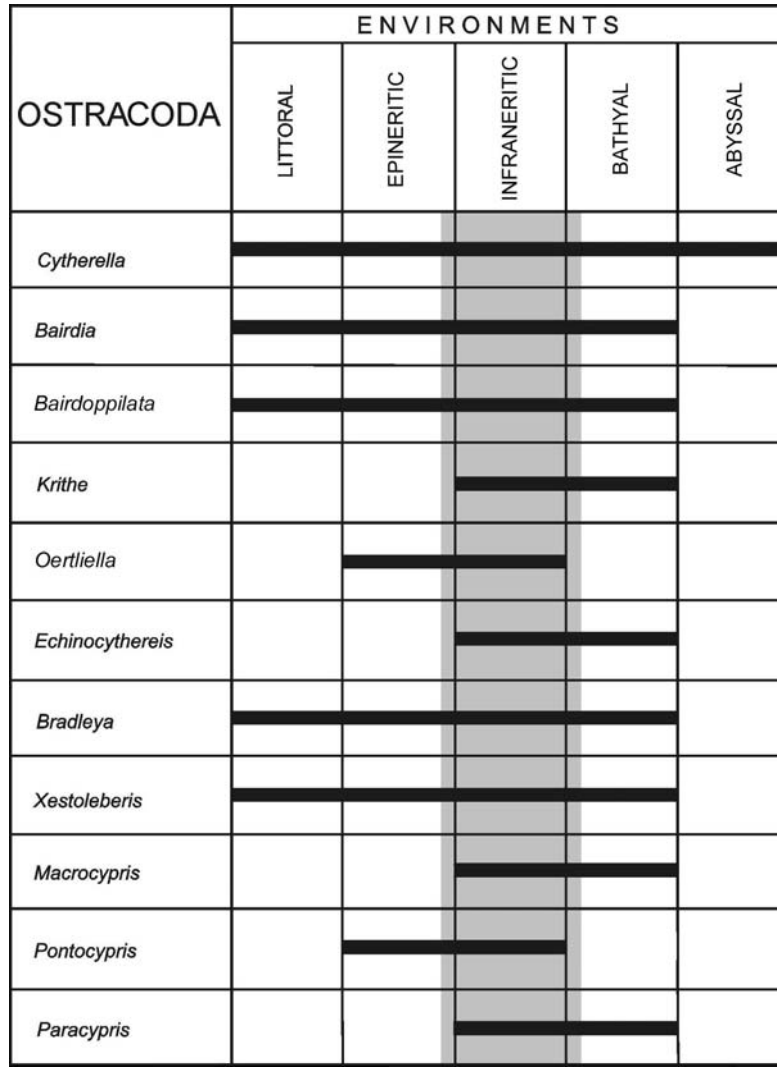

Figure 14. Paleoenvironment of ostracod genera recognized in this study (Moore, 1961; Morkhoven, 1962, 1963)

Şekil 14. *Bu çalışmada saptanan ostrakod cinslerinin paleo-ortamları (Moore, 1961; Morkhoven, 1962, 1963)*

GENİŞLETİLMİŞ ÖZET

Bu araştırma Kastamonu İli, Seydiler İlçesi kuzeyinde, yaklaşık 40 km^2 lik bir alanda gerçekleştirilmiştir. Bu kesimde geniş bir yayılıma sahip olan söz konusu birim, ilk kez Yeşilyurt vd. 2005 tarafından "Seydiler Formasyonu" olarak isimlendirilmiştir. Seydiler Formasyonu Lütesiyen yaşlı Gürleyikdere Formasyonu üzerine uyumlu olarak gelir. Ancak her iki birim arasında bir "hardground" aşınım ve kısa süreli bir oksidasyon yüzeyinin varlığı izlenmektedir. Üst birimi ise Güncel ve Kuvaterner alüvyon çökellerle uyumsuz olarak örtülür ve büyük bir kesim mera ve eklim alanı olarak kullanılmaktadır. Seydiler Formasyonu'nu inceleyebilmek ancak Seydiler-İnebolu ve Seydiler-Ağlı yolu boyunca yol yarmaları ve bazı küçük tepeler ile Gürleyikdere Formasyonu üzerinde aşınmadan geriye kalan bazı kalıntı parçalarda mümkün olabilmektedir. Seydiler Formasyonu, tabanda ince tabakalı kumtaşı-marn ardalanması ile başlar ve üst seviyelerde orta-kalın tabakalı koyu gri yer yer sarı marnlarla temsil edilir. Büyük oranda makrofosilsizdir. Formasyonun kalınlığı 30-215 metre arasında değişmektedir.

Paleontolojik çalışmalar daha çok yol yarmaları boyunca ölçülmüş, 7 stratigrafik kesit boyunca alınan 184 örnek üzerinde yürütülmüştür. Bu çalışmalara bağlı olarak, Cytherellidae, Bairdiidae, Krithidae, Pontocyprididae, Macrocpprididae, Candonidae Hemicytheridae, Xestoleberidae ve Trachyleberididae familyaları olmak üzere 9 familyaya ve 11 ostrakod cinsine bağlı toplam 19 tür tanımlanmıştır. Bunlardan biri "Echinocythereis anatolica n.sp." ilk kez bu çalışmada yeni tür olarak önerilmiştir. Cytherella ve Krithe cinsleri ile bunlara ait türler ostrakod faunası içinde en bol ve baskın olanlardır.

Özellikle Krithe obesa, K. cf. strangulata ve Cytherella ihsaniyensis ile diğer ostrakod türleri bu formasyonun yaşını Bartoniyen-Priaboniyen olarak göstermektedir.Bu yaş bulgusu ayrıca planktonik foraminifer, nannoplankton ve dinoflagellatlar ile de desteklenmiştir (Yıldız vd., 2007). Tüm fauna ve flora topluluğu, normal tuzluluk koşullarına sahip, neritikden batiyale kadar değişebilen bir derinlikteki, transgressif bir depolanma ortamının varlığını göstermektedi

PLATE 1

1-3. ***Cytherella (Cytherelloidea) gantensis*** (MONOSTORI, 1977)
Bartonian-Priabonian Collection no: H.Ü.JMB.O 2003 NY 001 (X50).
- **1.** Carapace, left side, (SA-1 Section, sample no: 18).
- **2.** Carapace, right side, (GC-1 Section, sample no: 49).
- **3.** Carapace, ventral side (GC-2 Section, sample no: 66).

4,5. ***Cytherella ihsaniyensis*** SÖNMEZ-GÖKÇEN, 1973
Bartonian-Priabonian. Collection no: H.Ü. JMB.O 2003 NY 002 (X50).
- **4.** Left valve, external view (GC-1 Section, sample no: 49).
- **5.** Left valve, internal view (GC-2 Section, sample no: 53).

6-9. ***Cytherella triestina*** KOLLMANN, 1962
Collection no: H.Ü. JMB.O 2003 NY 004 (X50). Bartonian-Priabonian.
- **6.** Carapace, right side (SA-1 Section, sample no: 16).
- **7.** Carapace, dorsal view (SA-1 Section, sample no: 17).
- **8.** Carapace, left side (GC-1 Section, sample no: 11).
- **9.** Carapace, right side (SA-1 Section, sample no: 17).

10, 11. ***Bairdia crebra*** (DELTEL, 1962-63);
Collection no: H.Ü. JMB.O 2003 NY 007 (X50). Bartonian-Priabonian.
- **10.** Carapace, right side (SA-3 Section, sample no: 57).
- **11.** Carapace, left side (SA-3 Section, sample no: 55).

12, 13. ***Bairdia*** sp.1
Collection no: H.Ü. JMB.O 2003 NY 008 (X50). Bartonian-Priabonian.
- **12.** Carapace, right side (SA-3 Section, sample no: 53).
- **13.** Carapace, dorsal view (SA-3 Section, sample no: 57).

14. ***Bairdoppilata gliberti*** KEIJ, 1957.
Collection no: H.Ü. JMB.O 2003 NY 010 (X50). Bartonian-Priabonian.
- **14.** Left valve, external (SA-3 Section, sample no: 58).

LEVHA 1

1-3. ***Cytherella (Cytherelloidea) gantensis*** (MONOSTORI, 1977)
Bartoniyen-Priaboniyen. Kolleksiyon no: H.Ü.JMB.O 2003 NY 001 (X50).
- **1.** Kabuk, sol taraf, (SA1 Kesiti, örnek no: 18).
- **2.** Kabuk, sağ taraf, (GC-1 Kesiti, örnek no: 49).
- **3.** Kabuk, ventral görüntü (GC-2 Kesiti, örnek no: 66).

4,5. ***Cytherella ihsaniyensis*** SÖNMEZ-GÖKÇEN, 1973
Bartoniyen-Priaboniyen. Kolleksiyon no: H.Ü. JMB.O 2003 NY 002 (X50).
- **4.** Sol kapak, dış görüntü (GC-1 Kesiti, örnek no: 49).
- **5.** Sol kapak, iç görüntü (GC-2 Kesiti, örnek no: 53).

6-9. ***Cytherella triestina*** KOLLMANN, 1962
Kolleksiyon no: H.Ü. JMB.O 2003 NY 004 (X50). Bartoniyen-Priaboniyen.
- **6.** Kabuk, sağ taraf (SA-1 Kesiti, örnek no: 16).
- **7.** Kabuk, dorsal görüntü (SA-1 Kesiti, örnek no: 17).
- **8.** Kabuk, sol taraf (GC-1 Kesiti, örnek no: 11).
- **9.** Kabuk, sağ taraf (SA-1 Kesiti, örnek no: 17).

10, 11. ***Bairdia crebra*** (DELTEL, 1962-63);
Kolleksiyon no: H.Ü. JMB.O 2003 NY 007 (X50). Bartoniyen-Priaboniyen.
- **10.** Kabuk, sağ taraf (SA-3 Kesiti, örnek no: 57).
- **11.** Kabuk, sol taraf (SA-3 Kesiti, örnek no: 55).

12, 13. ***Bairdia*** sp.1
Kolleksiyon no: H.Ü. JMB.O 2003 NY 008 (X50). Bartoniyen-Priaboniyen.
- **12.** Kabuk, sağ taraf (SA-3 Kesiti, örnek no: 53).
- **13.** Kabuk, dorsal görüntü (SA-3 Kesiti, örnek no: 57).

14. ***Bairdoppilata gliberti*** KEIJ, 1957.
Kolleksiyon no: H.Ü. JMB.O 2003 NY 010 (X50). Bartoniyen-Priaboniyen.
- **14.** Sol kapak, dış görüntü (SA-3 Kesiti, örnek no: 58).

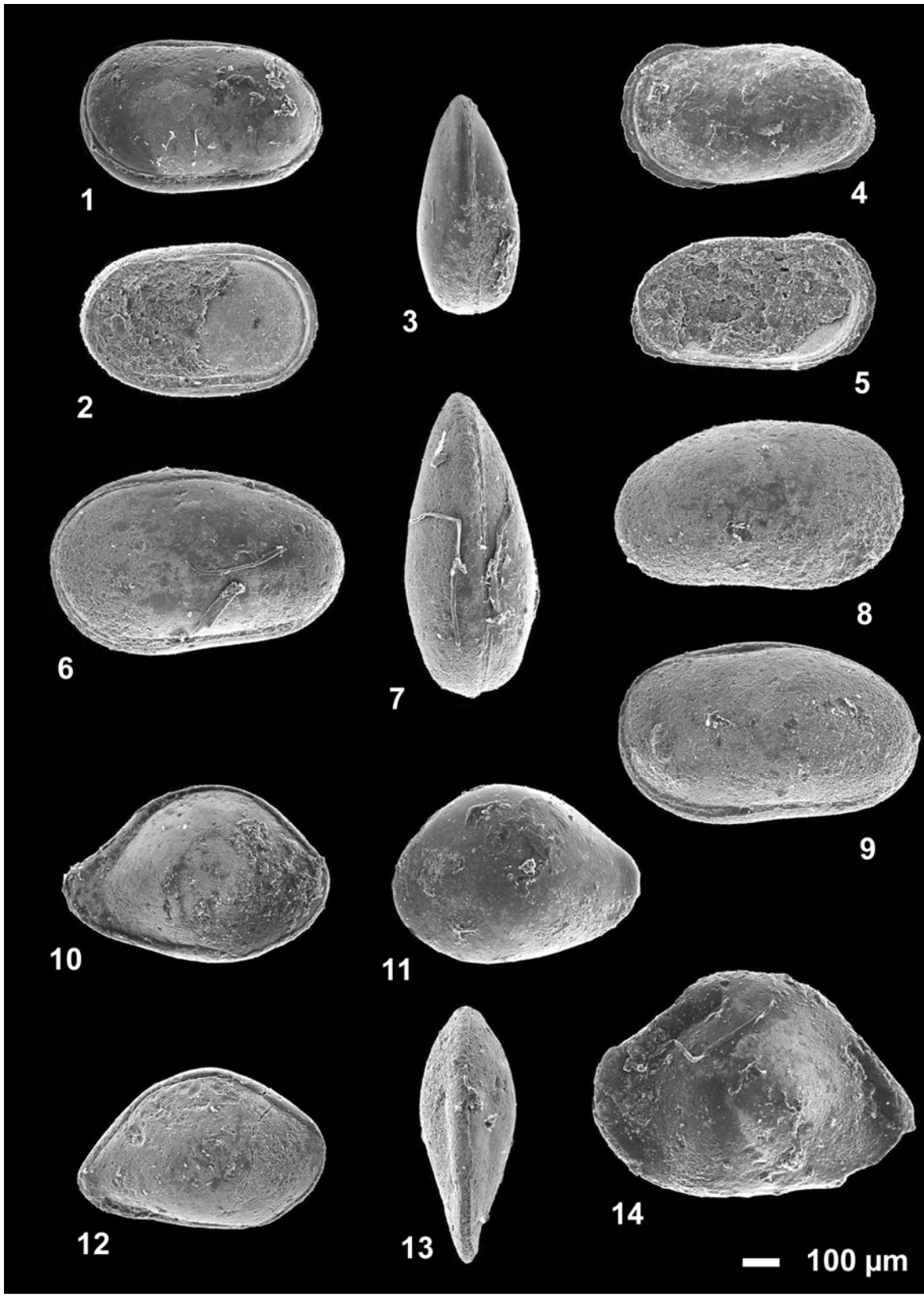
1
2
3
4
5
6
7
8
9
10
11
12
13
14
100 µm

PLATE 2

1-3. ***Krithe* cf. *bartonensis*** (JONES, 1857).
Collection no: H.Ü. JMB.O 2003 NY 011 (X50). Bartonian-Priabonian.
1. Carapace, left side (SA-4 Section, sample no: 65).
2. Carapace, right side (SA-4 Section, sample no: 65).
3. Carapace, dorsal view (SA-1 Section, sample no: 21).

4, 5. ***Krithe obesa*** SÖNMEZ-GÖKÇEN, 1973.
Collection no: H.Ü. JMB.O 2003 NY 012 (X50). Bartonian-Priabonian.
4. Carapace, right side (SA-3 Section, sample no: 45).
5. Carapace, left side (SA-3 Section, sample no: 45).

6-8. ***Krithe pernoides*** (BORNEMANN, 1855).
Collection no: H.Ü. JMB.O 2003 NY 013 (X50). Bartonian-Priabonian.
6. Carapace, left side (SA-3 Section, sample no: 70).
7. Carapace, right side (SA-4 Section, sample no: 58).
8. Carapace, dorsal view (SA-3 Section, sample no: 58).

9-11. ***Krithe* cf. *strangulata*** DELTEL, 1962-63
Collection no: H.Ü. JMB.O 2003 NY 014 (X50). Bartonian-Priabonian.
9. Carapace, left side (SA-1 Section, sample no: 18).
10. Carapace, right side (SA-2 Section, sample no: 30).
11. Carapace, dorsal view (SA-1 Section, sample no: 18).

12. ***Krithe* sp. 1**
Collection no: H.Ü. JMB.O 2003 NY 015 (X50). Bartonian-Priabonian.
12. Carapace, left side (SA-1 Section, sample no: 18).

13,14. ***Oertliella aculeata*** (BOSQUET, 1852)
Collection no: H.Ü. JMB.O 2003 NY 016 (X50). Bartonian-Priabonian.
13. Carapace, right side (SA-2 Section, sample no: 36).
14. Carapace, dorsal view (SA-2 Section, sample no: 36).

15-18. ***Echinocythereis anatolica* n.sp.**,
Collection no: H.Ü. JMB.O 2003 NY 017 (X50). Bartonian-Priabonian.
15. Carapace, left side (SA-4 Section, sample no: 72).
16. Carapace, right side (SA-1 Section, sample no: 16).
17. Carapace, right side (SA -1 Section, sample no: 16).
18. Carapace, dorsal view (SA-1 Section, sample no: 1).

LEVHA 2

1-3. ***Krithe* cf. *bartonensis*** (JONES, 1857).
Kolleksiyon no: H.Ü. JMB.O 2003 NY 011 (X50). Bartoniyen-Priaboniyen.
1. Kabuk, sol taraf (SA-4 Kesiti, örnek no: 65).
2. Kabuk, sağ taraf (SA-4 Kesiti, örnek no: 65).
3. Kabuk, dorsal görüntü (SA-1 Kesiti, örnek no: 21).

4, 5. ***Krithe obesa*** SÖNMEZ-GÖKÇEN, 1973.
Kolleksiyon no: H.Ü. JMB.O 2003 NY 012 (X50). Bartoniyen-Priaboniyen.
4. Kabuk, sağ taraf (SA-3 Kesiti, örnek no: 45).
5. Kabuk, sol taraf (SA-3 Kesiti, örnek no: 45).

6-8. ***Krithe pernoides*** (BORNEMANN, 1855).
Kolleksiyon no: H.Ü. JMB.O 2003 NY 013 (X50). Bartoniyen-Priaboniyen.
6. Kabuk, sol taraf (SA-3 Kesiti, örnek no: 70).
7. Kabuk, sağ taraf (SA-4 Kesiti, örnek no: 58).
8. Kabuk, dorsal görüntü (SA-3 Kesiti, örnek no: 58).

9-11. ***Krithe* cf. *strangulata*** DELTEL, 1962-63
Kolleksiyon no: H.Ü. JMB.O 2003 NY 014 (X50). Bartoniyen-Priaboniyen.
9. Kabuk, sol taraf (SA-1 Kesiti, örnek no: 18).
10. Kabuk, sağ taraf (SA-2 Kesiti, örnek no: 30).
11. Kabuk, dorsal görüntü (SA-1 Kesiti, örnek no: 18).

12. ***Krithe* sp. 1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 015 (X50). Bartoniyen-Priaboniyen.
12. Kabuk, sol taraf (SA-1 Kesiti, örnek no: 18).

13,14. ***Oertliella aculeata*** (BOSQUET, 1852)
Kolleksiyon no: H.Ü. JMB.O 2003 NY 016 (X50). Bartoniyen-Priaboniyen.
13. Kabuk, sağ taraf (SA-2 Kesiti, örnek no: 36).
14. Kabuk, dorsal görüntü (SA-2 Kesiti, örnek no: 36).

15-18. ***Echinocythereis anatolica* n.sp.**,
Kolleksiyon no: H.Ü. JMB.O 2003 NY 017 (X50). Bartoniyen-Priaboniyen.
15. Kabuk, sol taraf (SA-4 Kesiti, örnek no: 72).
16. Kabuk, sağ taraf (SA-1 Kesiti, örnek no: 16).
17. Kabuk, sağ taraf (SA-1 Kesiti, örnek no: 16).
18. Kabuk, dorsal görüntü (SA-1 Kesiti, örnek no: 1).

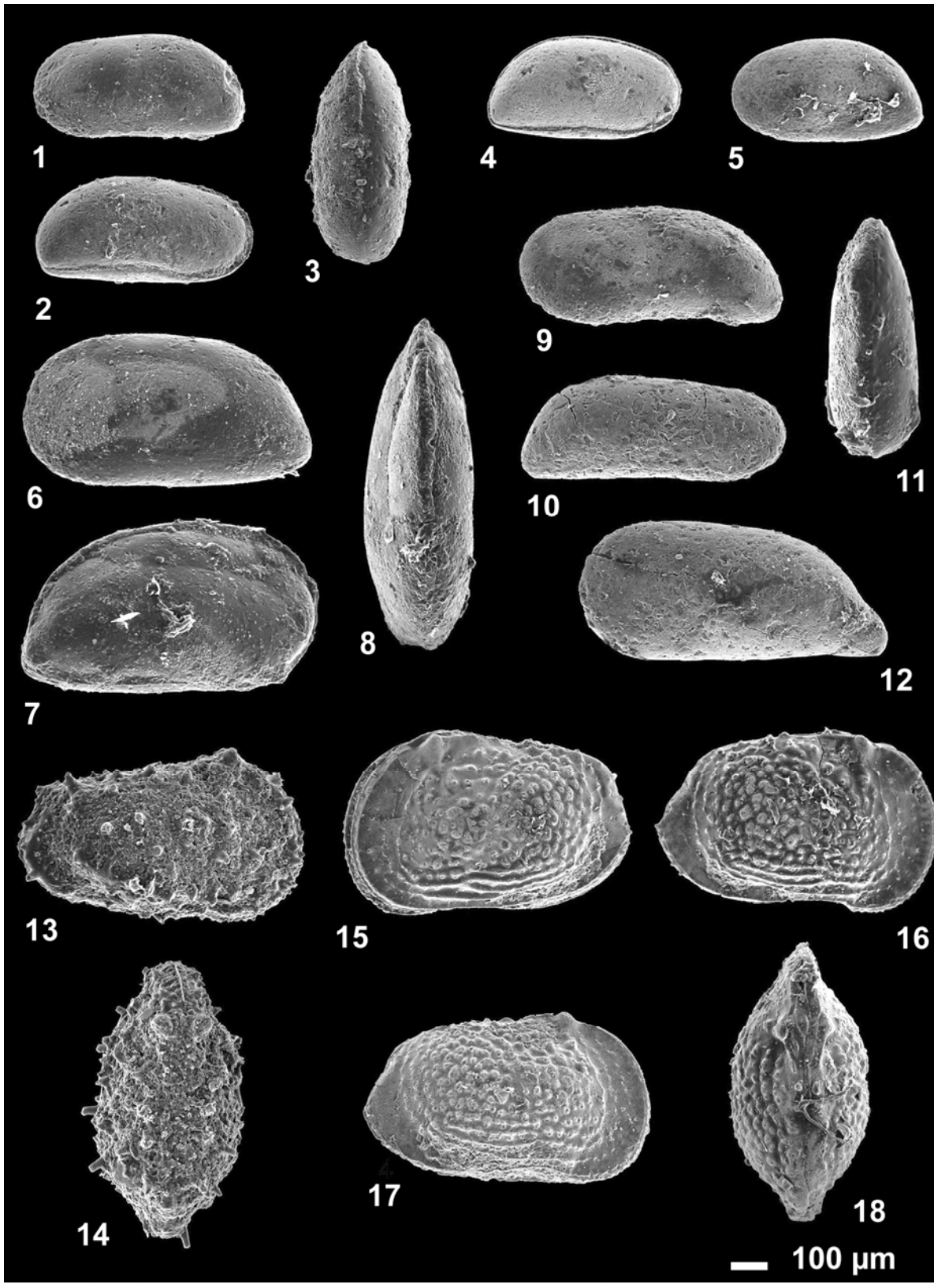
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
100 µm

PLATE 3

1. ***Bradleya*** **sp.1**
Collection no: H.Ü. JMB.O 2003 NY 018 (X50). Bartonian-Priabonian.
1. Carapace, left side (SA-2 Section, sample no: 40).

2. ***Xestoleberis gantensis*** MONOSTORI, 1977;
Collection no: H.Ü. JMB.O 2003 NY 019 (X50). Bartonian-Priabonian.
2. Carapace, right side (SA-1 Section, sample no: 6).

3. ***Xestoleberis*** **sp 1**
Collection no: H.Ü. JMB.O 2003 NY 020 (X50). Bartonian-Priabonian.
3. Carapace, left side (GC-2 Section, sample no: 72).

4. ***Macrocypris*** **sp.1**
Collection no: H.Ü. JMB.O 2003 NY 021 (X50). Bartonian-Priabonian
4. Carapace, left side (GC-1 Section, sample no: 8).

5-7. ***Pontocypris*** **sp.1**
Collection no: H.Ü. JMB.O 2003 NY 022 (X50). Bartonian-Priabonian
5. Carapace, right side (SA-4 Section, sample no: 66).
6. Carapace, left side (SA-4 Section, sample no: 66).
7. Carapace, dorsal view (SA-4 Section, sample no: 66).

8-10. ***Paracypris*** **sp.1**
Collection no: H.Ü. JMB.O 2003 NY 024 (X50). Bartonian-Priabonian.
8. Carapace, left side (SA-4 Section, sample no: 77).
9. Carapace, left side (SA-4 Section, sample no: 77).
10. Carapace, right side (SA-3 Section, sample no: 58).

LEVHA 3

1. ***Bradleya*** **sp.1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 018 (X50). Bartoniyen-Priaboniyen.
1. Kabuk, sol taraf (SA-2 Kesiti, örnek no: 40).

2. ***Xestoleberis gantensis*** MONOSTORI, 1977;
Kolleksiyon no: H.Ü. JMB.O 2003 NY 019 (X50). Bartoniyen-Priaboniyen.
2. Kabuk, sağ taraf (SA-1 Kesiti, örnek no: 6).

3. ***Xestoleberis*** **sp 1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 020 (X50). Bartoniyen-Priaboniyen.
3. Kabuk, sol taraf (GC-2 Kesiti, örnek no: 72).

4. ***Macrocypris*** **sp.1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 021 (X50). Bartoniyen-Priaboniyen
4. Kabuk, sol taraf (GC-1 Kesiti, örnek no: 8).

5-7. ***Pontocypris*** **sp.1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 022 (X50). Bartoniyen-Priaboniyen
5. Kabuk, sağ taraf (SA-4 Kesiti, örnek no: 66).
6. Kabuk, sol taraf (SA-4 Kesiti, örnek no: 66).
7. Kabuk, dorsal görüntü (SA-4 Kesiti, örnek no: 66).

8-10. ***Paracypris*** **sp.1**
Kolleksiyon no: H.Ü. JMB.O 2003 NY 024 (X50). Bartoniyen-Priaboniyen.
8. Kabuk, sol taraf (SA-4 Kesiti, örnek no: 77).
9. Kabuk, sol taraf (SA-4 Kesiti, örnek no: 77).
10. Kabuk, sağ taraf (SA-3 Kesiti, örnek no: 58).

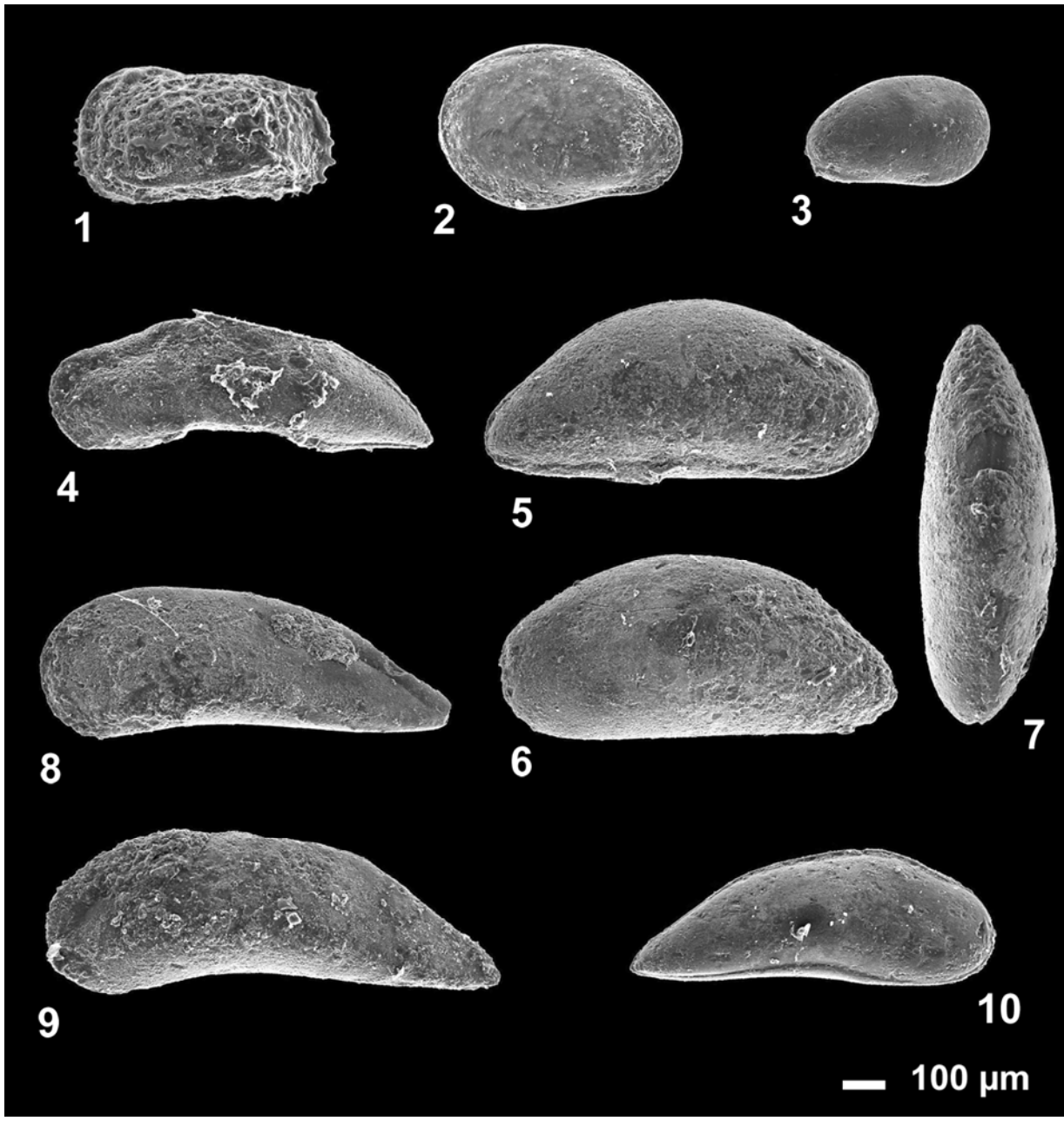

Plate 1-3. Scanning Electron Microscope photographs of ostracod species determined in this study.

Levha 1-3. *Bu çalışmada saptanan ostrakod türlerinin Taramalı Elektron Mikroskobu görüntüleri.*

PREFERENCES

Apostolescu, V., 1955. Description de quelques Ostracodes du Lutetian du Bassin de Paris. Cahiers Geologiques, 28-29, 241-279.

Apostolescu, V., 1956. Contribution à l'étude des ostracode de l'Eocène inférieur (s.1.) du Bassin de Paris . Rev. Inst. Franç. Pétrole Ann. Combust. Liquides, 11, 1327-1352.

Baird, W., 1838. The Naturel history of the British Entomostraca. Mag. Zool. Bot., 1. 35-41, 514-526.

Baird, W., 1850. Description of several new species of Entomostraca. Proc. Zool. Soc.18, 254-257.

Bardet, N., Tunoğlu, C., 2002. First Mosasaurid (Squamata) from Late Cretaceous from Turkey. Journal of Vertebrate Paleontology, 22, 3, 712-715.

Bassiouni, M., A., 1962. Ostracoden aus dem Mittelmiozän in NW-Deutschland. Romeriana, 3,1-99, Taf. 1-9 Clausthal-Zellerfeld.

Bilen, C., 1996. Kasaba (Kaş) Neojen Havzası'nın Ostrakod Biyostratigrafisi, H.Ü. Fen Bilimleri Enstitüsü, Yüksek Mühendislik Tezi, 116 s.

Blumenthal, M., 1948. Bolu civarı ile Aşağı Kızılırmak mecrası arasındaki Kuzey Anadolu silsilelerinin jeolojisi, M.T.A Enst., B-13.

Bornemann, H., 1855. Die Microkopische Fauna des Septarienhones von Hermsdorf bei Berlin. Z. Detsch. Geol. Ges., Bd. VII. 137.

Bosquet, J., 1852. Description des Entomostraces fossiles des terraines de la France et de la Belgique. Mem. Sav. Etrang., Acad. Roy. Sci. Belgique, 24,10-142, pls. 1-6.

Brady, G. S.,1868. A monograph of the Recent British Ostracoda. Trans. Linnean Soc., 26, 2. 353-495.

Brady, G. S.,1880. Report on the Ostracoda dregged by HMS Challenger during the years 1876-76. Chall. Rep., Zool.1.

Brady, G. S., Crosskey, H. W. and Robertson, D., 1874. A monograph of the Post-Tertiary Entomostraca of Scotland including species from England and Ireland, Paleontogr. Soc., Mon., p. I-v, 1-274.

Bragin, N., Bragina, L., Tunoğlu, C. and Tekin, U. K., 2001. The Cenomanian (Late Cretaceous) Radiolarians from the Tomalar Formation, Central Pontides, Northern Turkey. Geol. Carpath., 52, 6, 349-360, Bratislava.

Coryell, H. N., Sample, C. H. and Jennings, P.H., 1935. *Bairdopillata*, a new genus of Ostracoda, with two new species. Am. Museum Novitates, 777, 1-5.

Deltel, B., 1961. Les Ostracodes du Paleogene moyen et superieur d'Aquitaine meridionale. Univ. de Bordeaux, 3 Cycle no. d' ordre, 95 p.

Deltel, M. B. 1962-63. Nouveeaux Ostracodes de l'Éocène et de l'Oligocène de l'Aquitaine Méridionale, Extrait des Actes de la Société Linnéenne de Bordeaux, 100, 127-221.

Dizer, A., 1953. Kastamonu nummulitiğinin paleontolojik etüdü, İ.Ü.F.F. Mecm., B, 18/ 3-4, 207-299.

Donze, P., Colin, J.-P., Damotte, R., Oertli, H.J., Peypouquet, J.-P. and Said, 1982. R.-Les Ostracodes du Campanien terminal a l'Éocene inferieur de la coupe du Kef, Tunisie nord-occidentale. Bull. Centres Rech. Explor.-Prod. Elf-Aquitaine, 6, 2, 273-375.

Ducasse, O., 1959. Les Ostracodes de l' Éocene du sous-sol Bordelais. Répartition, intérêt stratigraphique et paleogeograpghique. Thèse 3^{e} cycle, Univ. Bordeaux, 40, 28l. 134.

Duru, M., 1984. Polatlı (GB Ankara) Güneyindeki Alt Paleosen istifinin ostrakod biyostratigrafisi, M. sc. Thesis, Hacettepe Üniversitesi, 141 pp.

Duru, M. and Gökçen, N., 1985. Polatlı (GB Ankara) güneyi Alt Paleojen'in beş yeni türü kapsayan ostrakod faunası ve stratigrafik

yorumu, Türkiye Jeoloji Kurumu Bülteni, 28, 2, 147-157.

Eager, S. H., 1965. Ostracoda of the London clay (Ypresian) in the London Basin, 1 Reading district. Rev. Micropal., 8, 1, 2, 71-74.

Ellis and Messina, 1953-1981. Catalogue of Ostracoda and their supplements, American Museum of Naturel History, New York.

Geiss, H.P., 1954. Karadeniz taşkömürü prospeksiyon dahilinde İnebolu-Küre- Abana sahasında yapılan jeolojik löve neticeleri, M.T.A. Rap. No: 2973, Ankara (unpublished).

Gökçen, N., 1970. Londra Havzası batısının İpresiyen Ostrakodları, MTA Derg., 75, 91-107.

Göktunalı, K., 1955. Devrekani-Daday-Küre ilçeleri arasında kalan Ağlıpazarı- Seydiler bölgesi hakkında jeolojik rapor, M.T.A. Enst., Rapor No: 2533, Ankara (unpublished).

Guernet, C., 1985. Ostracodes Paleogenes de Quelques sites "D.S.D.P." de L'Ocean Indien, Revue de Paleobiologie 4, 2, 279-295.

Hartmann, G. and Puri, H., 1974. Summary at neontological and paleontological classification of Ostracoda. Mitt. Hamburg Zool., Mus. Inst., 70, 7-73.

Haskins, C. W., 1968. Tertiary Ostracodafrom the Isle of Wight and Barton, Hampshire, England, Part I, III, rev. Micropal., (10,11), 4, 3; 250-260, 161-175.

Haskins, C. W., 1970. Tertiary Ostracoda from the Isle of Wight and Barton, Hampshire, England. Part V. Rev. Micropal., 13, 1,13-29.

Hazel, J. E., 1965. Notes on the Ostracode genus *Trachyleberiidea* Bowen. J, Paleont, 28, 804-826. 97-100.

Hornibrook, N. de B., 1952. Tertiary and Recent marine Ostracoda of New Zeland. Their origin, affinities and distribution. New Zeland Geol. Surv., Paleontol. Bull., 18, 82 pp.

Howe, H. V. and Mc Cuirt, 1935. Ostracoda of the Arca Zone of the Choctawhatchee Miosene of Florida. Florida Geol. Bull.,13, 1-37.

Jones, T.R., 1849. A monograph of the Entomostraca of the Cretaceous Formation of England. Palaontol. Soc. 41 pp.

Jones, T.R., 1857. A monograph of the Tertiary Entomostraca of England, Palaeontograph. Soc. London, 68.

Kaufmann, A., 1900. Ueber zwei neue *Candona*-Arten aus der Schweiz. Zool. Anz., 23, 108-110.

Keij, T.A., 1957. Eocene and Oligocene Ostracoda of Belgium. Mém. Inst. Roy. Sci. Nat. Belg., 136, 210.

Ketin, İ., 1962. 1/ 500 000 ölçekli Türkiye Jeoloji Haritası Sinop paftası ve izahnamesi, M.T.A. Enst. yayını, Ankara.

Ketin, İ., 1966. Tectonic units of Anatolia, M. T. A. Derg., 66, 23-24.

Kollmann, K., 1962. Ostracoden aus dem mitteleozänen "Flysch" des Beckens von Pazin (Istrien, Jugoslawien). Verhand.Geol. Bundesanstalt, 2, 187-227.

Mandelstam, M. I., 1960. Current data on ostracodes from Permian, Triassic, Cretaceous, Tertiary and Quaternary sediments, Translation of seminar on microfauna, All. Union Petrol. Sci., Res. Geol. Expl. Inst. Trans., 287-311.

Marlière R., 1958. Ostracodes du Montien de Mons et résultats de leur étude, Mém. Soc. Belge Géol. Paleont. Hydrol., Bruxelles, 8, 5, 1-53.

Mc Coy, F., 1844. Synopsis of the Characters of the Carboniferous Fossils of Ireland (Crustacea). Dublin Univ. Pres, Dublin, 159-168.

Monostori, M.,1977. Ostracode fauna from the Eocene of Gánt (Transdanubian Central Mountains, Hungary), Ann. Univ. Sci. Budapest, Sect. Geol., XIX., 75-129.

Monostori, M.,1982. Oligocene ostracoda from the surroundings of Budapest, Ann. Univ. Sci. Budapest, Sect. Geol., XXI., 31-102.

Monostori, M., 1985a. Eocene ostracods from the Dorog Basin (Northern Transdanubia, Hungary), Akadémai Kiadó, Budapest, 1-213.

Monostori, M., 1985b. Ostracods of Eocene/Oligocene boundary profiles in Hungary, Annales Univ. Sci. Budapest., Sec. Geol., XXV., 162-243.

Monostori, M., 1987. Ostracod fauna and paleoecology of the Lutetian (Eocene) mollusc sand at Dudar, Hungary. Ann. Univ. Sci. Budapest, Sect. Geol., XXV., 135-183.

Monostori, M., 1996. Eocene ostracods of Hungary Systematical part 1. (Cythereeacea 1.), Annales Univ. Sci. Budapest., Sect. Geol. 31, 27-74.

Monostori, M., 2000. Eocene ostracods of Hungary, Systematical part 3 (Cytheracea 3), Ann. Univ. Sci. Budapes., Sec. Geol., 33, 63-103.

Moore, R. C., 1961. Treatise on Invertebrate Paleontology, Part Q, Artropoda, 3, Crustacea, Ostracoda. Geol. Soc. Amer., Univ. Kansas Press, New York, 1- 442.

Morkhoven, F. P. C. M., van, 1962. Post-Paleozoic Ostracoda, their morphology, taxonomy and economic use, I, Elsevier Publ. Comp., Netherlands, Amsterdam, 1-204.

Morkhoven, F. P. C. M., van, 1963. Post-Paleozoic Ostracoda, their morphology, taxonomy and economic use, II, Elsevier Publ. Comp., Netherlands, Amsterdam, 1-478.

Müller, G. W., 1894. Die Ostracoden des Golfes von Neapal und der angrenseden Meeres-Abschnitte. Fauna und Flora des Golfes von Neapel, 21, Monogr., Ostracoden,1-404, Berlin.

Müller, G. W., 1912. Ostracoda in das Tierreich. Eine zusammenstellung und kennzeichnung der rezenten tierformen: im auftrage der Königl. Preuss. Akad. Wiss., Lief. 31, p.k-xxxiii, 1-434.

Nazik, A., 1993. Darende Havzası Tersiyer istifinin mikropaleontolojik (Ostracod ve foraminifer) incelemesi,TJK Bülteni, 36,1, 13-36.

Norman, A. M., 1862. Contributions to British Carcinology II. On species of Ostracoda new to Great Britain, Ann. Mag. Nat. Hist., 9, 3, 43-52.

Oertli, H.J., 1956. Ostrakoden aus der oligozänen und miozänen Molasse der Schweiz. Paläont. Abh., Bale, 74 pp.

Okay, A. İ. and Göncüoğlu, C., 2004. The Karakaya Complex: A Review of Data and Concepts, Turkish Journal of Earth Sciences, 13, 2, 77-95.

Pietrzeniuk, E., 1969. Taxonomische und biostratigraphische Untersuchungenan ostracoden des Eozän 5 im Norden der Deutschen Demokratischen Republic, Paläontol Abh., Abt. A, IV, 1-162.

Pokorny, 1958. Grandzüge der zoologischen Mikropälaontologie, Bd. II, Deutscher Verlag Wiss., 1-453, Abb. 550-1077.

Pokorny, V., 1964. The taxonomic delimitation of the subfamilies Trachyleberidinae and Hemicytheridinae (Ostracoda, Crustacea), Acta Univ. Carolinae, Geol., 3, 275-284.

Puri, H. S., 1954. Two new ostracode genera from Florida, J. Paleont., 30, 274-277.

Roemer, F. A., 1841, Die Versteinerungen des norddeustschen Kreidegebirges, Hannover, 1-145.

Sars, G. O., 1866. Oversigt af Norges marine ostracoder, Förhandl. Vidensk. Selskab, Chiristiania, 7, 1-130.

Sars, G. O., 1923. An account on the Crustacean of Norway. Bergen Museum (Norway), 9, 1-27.

Sars, G. O., 1927. Notes on the crustacean fauna of the Caspian Sea, In. Festschrift Knipowitsch.

Scheremeta, V., G., 1969. Ostracody Paleogena Ukrainy. Lvovskij Universitet, Lvov, 1-273.

Serra-Kiel, J., Hottinger, L., Caus, E., Drobne, K., Ferràndez, C., Jauhri, A.K., Less, G.,

Pavlovec, R., Pignatti, J., Samsó, J.M., Schaub, H., Sirel, E., Straugo, A., Tambareau, Y., Tosquella, J. and Zakrevskaya, E., 1998. Larger foraminiferal biostratigraphy of the Tethyan Paleocene and Eocene. Bull. Soc. Géol. France, 169, 2, 281-299.

Sirel, E., 2003. Foraminiferal description and biostratigraphy of the Bartonian, Priabonian and Oligocene shallow-water sediments of the southern and eastern Turkey. Rev. Paléobiol, 22, 1, 269-339.

Shahin, A., El Halaby, O. and El Baz S., 2008. Middle Eocene Ostracodes of the Qattamiya area, Nortwest Eastern Desert, Egypt: Systematics, biostratigraphy, paleobiogography, Revue de Paléobiologie, 27, 1, 123-157

Sönmez-Gökçen, N., 1973. Etude Plaeontologique (Osracodes) et stratigraphique de niveaux du Paleogene du Sud-Est de le Thrace. MTA Derg., 147, 1-117.

Sylvester-Bradley, P. C., 1946. Some ostracod genotypes. Ann. Mag. Nat. Hist.,11,13, 192-199.

Sylvester-Bradley, P. C., 1948. Bathonian ostracods from the Boueti Bed of Langton Herring, Dorset. Geol.Mag. 85, 4, 185-204.

Szczechura, J., 1977. Ostracodes from the Upper Eocene of East Poland. Acta Paleontologica Polonica, Warszawa, 22, 1, 55-92.

Şafak, Ü., 1997. Bakırköy Havzası (İstanbul) Tersiyer Çökellerinin ostrakod faunası, Yerbilimleri, 30, 255-285

Şengör, A. M. C., 1984. The Cimmeride Orogenic System and the Tectonics of Eurasia, Geological Society of America, Special Paper 195, 82 p.

Tambareau, Y., 1972. Thanétian Supérior et Ilerdien Inférieur des Petites Pyrénés, du Plantaurel et des Chaînons audois. Thèse, Toulouse, 377 pp.

Tunoğlu, C., 1991a. Devrekani kuzey yöresinin (Kastamonu) jeolojik incelenmesi, Phd. Thesis, Hacettepe University, Institute of Pure and Applied Science, 269 p. (unpublished).

Tunoğlu, C., 1991b. Orta Pontidlerde Devrekani Havzasının (Kastamonu Kuzeyi) Litostratigrafik Birimleri, Suat Erk Sempozyumu, Bildirileri, A.Ü. Fen Fakültesi, 24.

Tunoğlu, C., 1992a. Devrekani Havzası (Kastamonu kuzeyi) Üst Jura-Alt Kretase yaşlı karbonat istifinde mikrofasiyes analizleri, T.P.J.D. Bült. C 3/1, 75-86.

Tunoğlu, C., 1992b. Devrekani Havzası'nın (Kastamonu kuzeyi) Maastrihtiyen yaşlı pelajik karbonat istifinde mikrofasiyes analizleri, Türkiye 9. Petrol Kongresi ve Sergisi, Bildiriler Kitabı, 84-91.

Tunoğlu, C., 1993. Devrekani Havzasında (Orta Pontidler) İncigez ve Davutlar Formasyonları Kumtaşlarının Çökelme Koşullarının İncelenmesi, Yerbilimleri, 16, 145-160.

Tunoğlu, C., 1994. Devrekani Havzası (Kastamonu kuzeyi) Üst Paleosen-Orta Eosen yaşlı karbonat istifinde mikrofasiyes analizleri, Türkiye Jeoloji Bülteni, 37, 2, 43-51.

Tunoğlu, C., 2001. Eocene (Lutetian-Bartonian) Ostracoda of the Sinop Basin, Black Sea Coast of Turkey. Proceeding of the 2nd International Symposium on the Petroleum Geology and Hydrocarbon Potential of the Black Sea Area, 22-24 September 1996, Şile-İstanbul-Turkey, Turkish association of Petroleum Geologists Special Publication 4, 149-163.

Tunoğlu, C. and Bilen, C., 2001. Burdigalian-Langhian (Miocene) Ostracod biostratigraphy eand chronostratigraphy of the Kasaba Basin (Kaş/Antalya), SW Turkey, Geologica Carpathica, 52, 4, 247-258, Bratislava.

Yeşilyurt, N., 2004. Seydiler (Kastamonu) Kuzeyi Geç Lütesiyen-Bartoniyen yaşlı Seydiler formasyonu'nun ostrakod topluluğu-Ostracoda association of Late Lutetian-Bartonian Seydiler formation at the north of

Seydiler (Kastamonu), Msc Thesis, Hacettepe University, Institute of Pure and Applied Science, 108 p. (unpublished).

Yeşilyurt, N., Ertekin, İ. K. and Tunoğlu, C., 2005. Batı Pontidlerde (Seydiler/Kastamonu) yeni bir litostratigrafik birim önerisi: Geç Lütesiyen-Bartoniyen yaşlı Seydiler Formasyonu, Türkiye Jeoloji Bülteni, 48, 1, 41-54.

Yıldız, A., Yeşilyurt, N. and Tunoğlu, C., 2007. Eosen yaşlı Seydiler formasyonunun (Kastamonu, KB Türkiye) planktonik foraminifer, kalkerli nannoplankton biyostratigrafisi, ostrakod topluluğu ve eskiortam yorumu, Yerbilimleri, 28, 1, 33-55.

Makale Geliş Tarihi: 22 Ocak 2009
Kabul Tarihi : 18 Nisan 2009

Received : January 22, 2009
Accepted :April 18, 2009