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Albian Rudist Fauna from the Karaburun Peninsula, İzmir Region, Western Turkey

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Abstract: Platform carbonates bearing shallow water foraminifera and dasycladale assemblages with an Albian stratigraphic significance, crop out at two localities on the Karaburun Peninsula: Barbaros and Zeytineli. Rudist faunas collected from these localities include *Toucasia seunesi* Douvillé, *Pseudotoucasia catalaunica* Astre , *Mathesia darderi* (Astre), *Petalodontia* ? sp., and *Eoradiolites* sp. aff. *murgensis*. The overall stratigraphic significance of this fauna is consistent with the Albian age derived from micropalaeontological data. Some taxonomic elements, e.g. *Toucasia seunesi*, *Pseudotoucasia catalaunica* and *Mathesia darderi* possess a broad Mediterranean palaeobiogeographic distribution. By contrast, *Eoradiolites* sp. aff. *murgensis*, an advanced form resembling *Eoradiolites murgensis*, restricted to the Mediterranean South Tethyan margin, has a potential to be a marker for the corresponding biome. These findings fill a gap in our knowledge on Mediterranean Albian faunas considered hitherto virtually absent from Anatolia.

Key Words: rudist fauna, Albian, biostratigraphy, palaeobiogeography, Western Turkey

Karaburun Yarımdası'ndan Albiyen Rudist Faunası, İzmir Bölgesi, Batı Türkiye

Özet: Karaburun Yarımadası'nda Albiyen yaşlı sığ su foraminiferli ve dascylat algli topluluk iki alanda yüzlek verir: Barboros ve Zeytineli. Bu alanlardan *Toucasia seunesi* Douvillé, *Pseudotoucasia catalaunica* Astre, *Mathesia darderi* (Astre), *Petalodontia* ? sp., ve *Eoradiolites sp. aff. murgensis* rudist örnekleri toplanmıştır. Rudist faunası stratigrafik olarak Albiyen yaşlı mikropaleontolojik verilerle uyumluluk gösterir. Bazı türler Akdeniz kıyısı paleobiyolojik dağılımı gösterirler, örnegin *Toucasia seunesi*, *Pseudotoucasia catalaunica* ve *Mathesia darderi*. Buna karşın öncelikle *Eoradiolites murgensis* benzeyen *Eoradiolites sp. aff. murgensis* in dağılımı Güney Tetis Akdeniz kıyısıyla sınırlıdır ve bu topluluk için potensiyel belirleyici elemandır. Bu bulgular Anadolu'da bugüne kadar bilinmeyen Akdeniz Albiyen faunası ilgili bir boşluğu doldurur.

Anahtar Sözcükler: rudist faunası, Albiyen, biostratigrafi, palaeobiyocoğrafya, Batı Türkiye

Introduction

Early Cretaceous rudists from Turkey were hitherto essentially known from the Pontides and reported from Barremian–Aptian platform carbonates of the western Black Sea region (Douvillé 1896; Masse *et al.* 2002, 2004). The palaeobiogeographic significance of the Barremian–Lower Aptian fauna is European with a strong Balkanic affinity whereas the Upper Aptian fauna has only a broad European character. In contrast in the Taurus, belonging to the southern Tethyan Province, Lower Cretaceous rudist occurrences are rare (Fenerci-Masse 2006) and for most of them their systematic attributions are still poorly known.

The aim of the present paper is to describe Albian rudist faunas discovered in the Karaburun Peninsula, Aegean coast, west of İzmir. Their taxonomic description is complemented by data on the

corresponding geological and stratigraphic framework, and a discussion on their biostratigraphic, palaeoenvironmental and palaeobiogeographic significance is also provided.

Geological Setting

Mesozoic platform carbonates of the Karaburun Peninsula, west of İzmir (Figure 1a, b) represent the southern margin of the İzmir-Ankara tectonic zone identified in western Anatolia as the so-called 'Bornova mélange' (Erdoğan 1985). During the Eocene the 'Bornova mélange' was incorporated into nappes thrust over the southern flank of the Menderes Massif (Erdoğan 1990). Triassic sediments form the bulk of the Mesozoic carbonates from the Karaburun Peninsula, Jurassic and Cretaceous having a limited spatial extent (Erdoğan *et al.* 1990). Two Cretaceous fossil localities have been studied: Barbaros and Zeytineli (Figure 1c).

Stratigraphic Framework

At Barbaros the stratigraphic succession is relatively well exposed as are the stratigraphic relationships with the underlying Kimmeridgian carbonates and overlying Cenomanian conglomerates. The stratigraphic succession has been studied at two sites

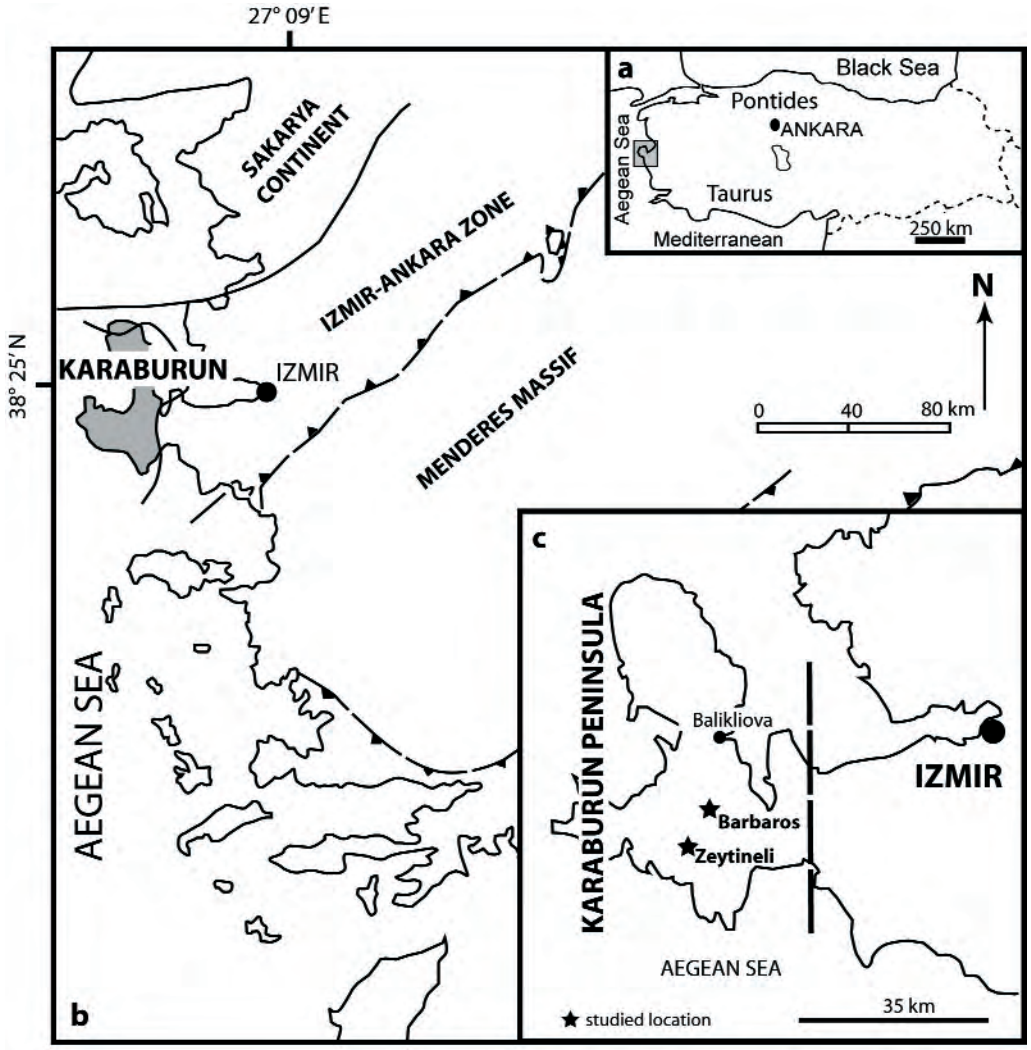

Figure 1. Geographical **(a)**, geological setting **(b)** of the study area and study localities of Albian rudist-bearing limestones from the Karaburun Peninsula **(c)**.

Akdağ and Karabey sırtı, described in recent papers (Işıntek & Altıner 1998; Işıntek *et al.* 1998; Masse & Işıntek 2000). These authors provide lithological and micropalaeontological data. The corresponding calcareous member of the Aktepe Formation yielded a shallow water foraminiferal assemblage, which consists of: *Neoiraqia* cf. *insolita*, *Cuneolina parva*, *Cuneolina pavonia*, *Involutina hungarica, Praechrysalidina infracretacea, Conicorbitolina* gr. *cuvillieri-corbarica*. This late Aptian–Albian assemblage characterizes the lower part of the stratigraphic succession. In the upper part of the succession deep water forms were recorded, including *Favusella washitensis* and *Rotalia mesogeensis* associated with Calcisphaerulidae, in particular *Bonetocardiella conoidea*. Dasycladale algae are represented by *Cylindroporella kochanskyae*, *Cylindroporella ivanovici*, *Hensonella urladanasi*, *Heteroporella lepina*, *Salpingoporella* cf. *milovanovici*. This fossil association typifies the Albian.

Stratigraphic data at Zeytineli are still incomplete concerning both the age of the underlying rocks, assumed to be Kimmeridgian, and the age of the stratigraphic succession, which is capped by Neogene volcanics. The overall lithology tends to conform to that of Barbaros rocks. The micropalaeontological content recorded so far consists of: *Pseudocyclammina* cf. *vasconica*, *Mayncina bulgarica*, *Vercorsella laurentii*, *Cuneolina pavonia*, *Sabaudia auruncensis*, and poorly defined *Mesorbitolina*. This assemblage has a broad late Aptian–Albian significance. Albian carbonates are exposed in the surrounding hills, and have been investigated on the northern side of the village of Zeytineli.

Systematic Palaeontology

The symbols used in the description and figures are as follows: LV– left valve; RV– right valve; D– dorsal side; V– ventral side; A– anterior side; P– posterior side; am– anterior myophore; pm– posterior myophore; pmp– posterior myophoral plate; t– tooth; s– socket; Lr– ligament ridge; Ab– anterior band; Pb– posterior band; Ib– interband; Vr– ventral ridge; cl– calcitic outer shell layer; al– formerly aragonitic inner shell layer. The study material is housed in the Musée de paléontologie, J.-P. Masse collection; Université de Provence (Marseille).

Order HIPPURITOIDA Newell 1965

Superfamily HIPPURITOIDEA Gray 1848

Family REQUIENIIDEA Douvillé 1914

Genus *Toucasia* Munier-Chalmas 1873

***Toucasia seunesi* Douvillé 1889**

(Figure 2)

According to Douvillé (1889) this species closely resembles *Toucasia carinata* (Matheron) with a

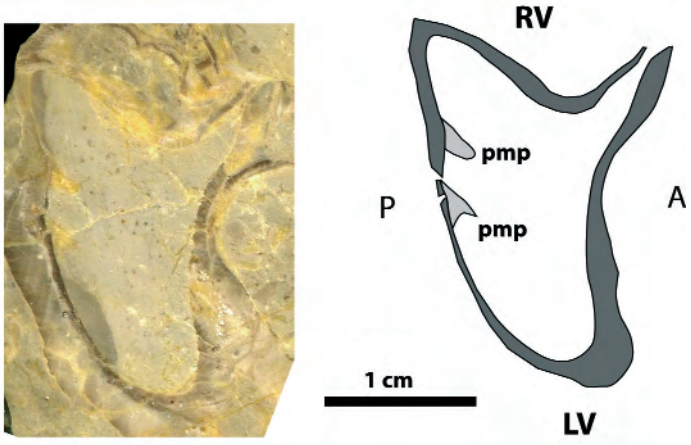

Figure 2. *Toucasia seunesi* Douvillé. Longitudinal section showing the posterior myophoral plates (pmp) on both valves (Barbaros, sample no: 14327).

transverse triangular outline of the right valve (RV) due to a well-defined ventral carina, and is characterized by a thin, lamellar, oblique myophoral plate on RV, located relatively far from the commissure; the corresponding plate on the left valve (LV) is also thin and lamellar. Our relatively small specimens, conform to the above description.

Genus *Pseudotoucasia* Douvillé 1911

***Pseudotoucasia catalaunica* Astre 1932**

(Figure 3)

The generic assignment of this form is based on the shape of the posterior myophoral plate on RV, characterized by a significant bend towards the

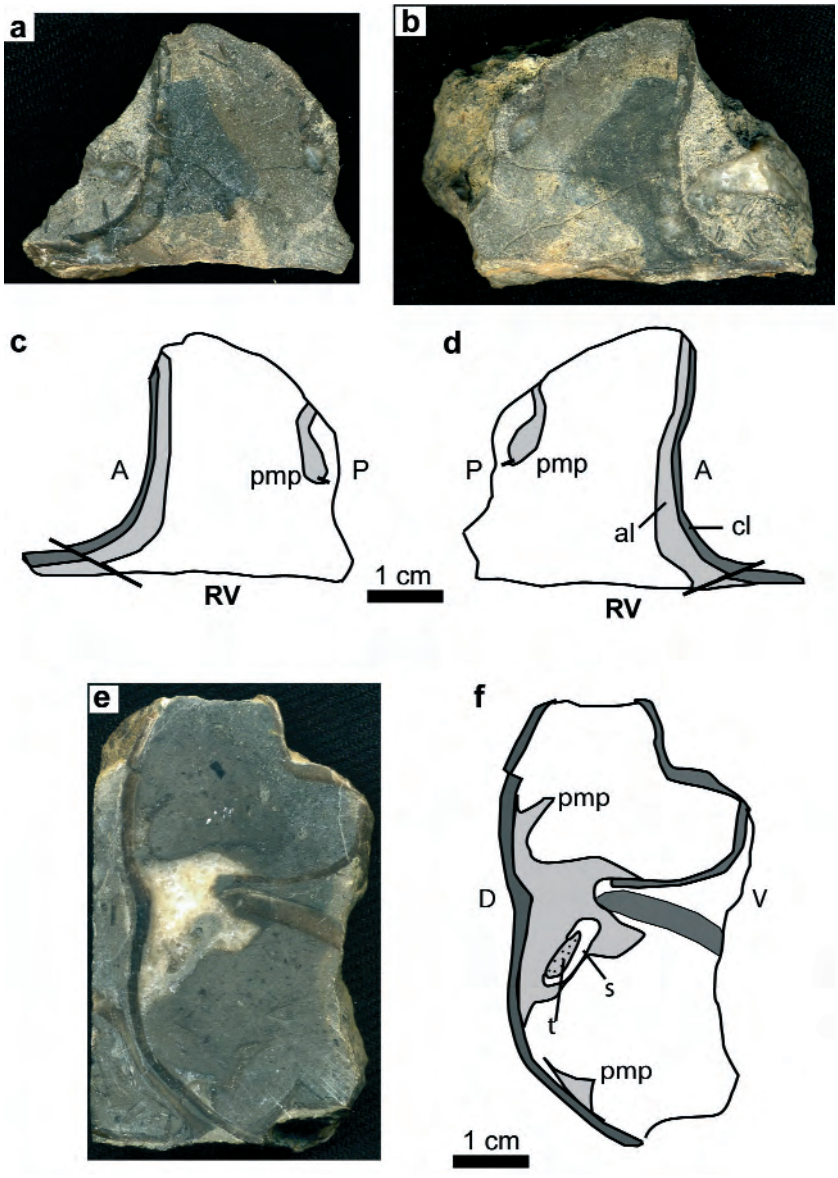

Figure 3. *Pseudotoucasia catalaunica* Astre, Barbaros. **(a, b)** Pair of sections of the RV and their interpretation **(c, d)** showing the posterior myophoral plate, bent and somewhat distally inflated; **(e, f)** section of the LV showing the myocardinal elements and their interpretation.

commissure and a moderate distal inflation. In contrast with *Pseudotoucasia santanderensis* (Douvillé) the RV possesses a well-defined ventral carina and the posterior myophore is not pediculated and lacks a strong distal inflation (Astre 1932). An additional character is the falciform outline of the posterior myophoral plate on LV on sections parallel to the commissure.

Family MONOPLEURIDAE Munier-Chalmas 1873

Genus Mathesia Mainelli 1996 emend. Masse & Fenerci-Masse 2010

***Mathesia darderi* (Astre)**

(Figure 4)

This form was identified from a slab collection including numerous sections randomly oriented,

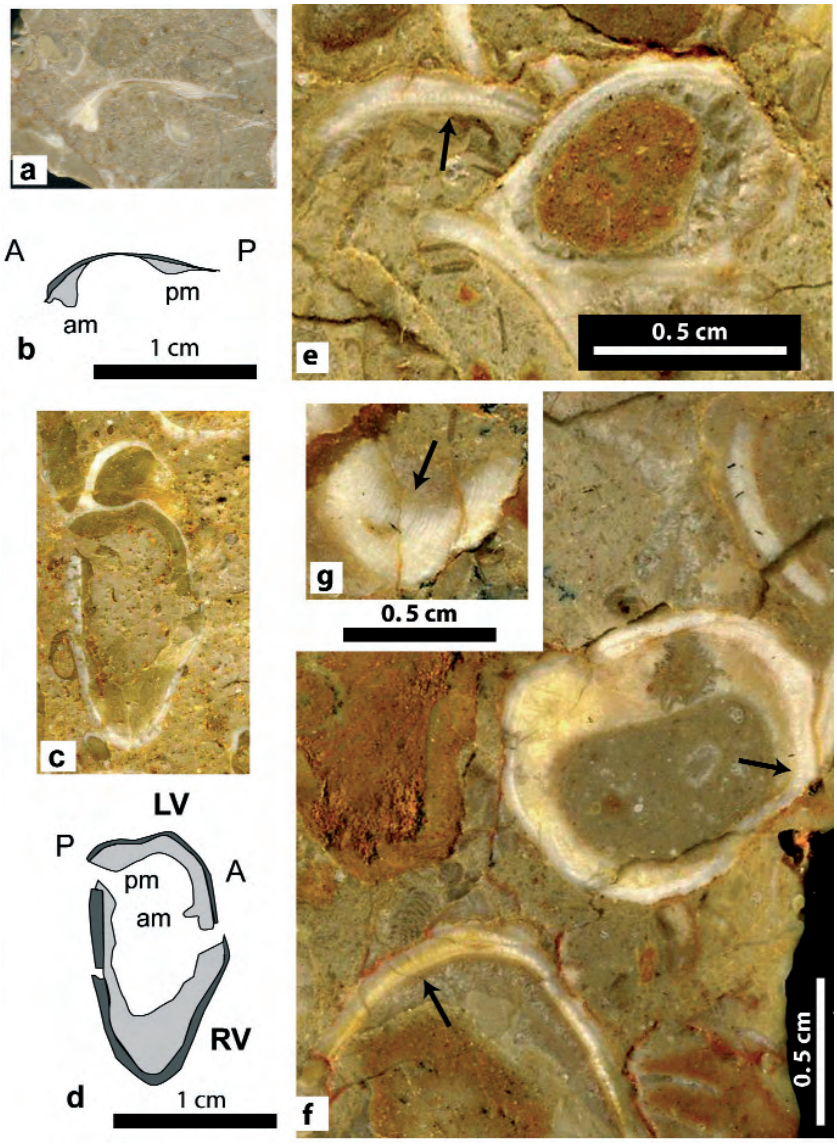

Figure 4. *Mathesia darderi* (Astre). Barbaros. **(a, b)** Section of the LV and interpretation showing the myophores; **(c, d)** longitudinal section of a bivalve specimen and interpretation of the myophores of the LV; **(e, f)** transverse sections of the RV showing the structure of the inner margin of the outer shell layer; **(g)** ibidem, oblique section.

essentially of RV but with some LV (samples JPMA 14325) and displays the following characters:

(i) RV cylindrical, relatively small (average commissural diameter 1.5–2 cm, maximum 3 cm) with a transverse rounded outline, somewhat elliptical, smooth, straight or slightly curved, maximum length observed 4–5 cm, shell wall relatively thin (2 to 3 mm) with the calcitic outer shell layer thicker than the inner (originally aragonitic) shell layer; boundary between the two layers scalloped in transverse sections (Figure 4e, f), longitudinal or oblique sections showing a striated habit (Figure 4g);

(ii) LV slightly convex (height of the apex above the commissural plane 0.5 cm). myocardinal apparatus relatively small and characterized by the presence on the LV of a myophoral ridge (height 3 mm, width 2 mm), possibly posterior, and an anterior? myophoral bulge (Figure 4a–d).

The scalloped inner margin of the outer calcitic shell layer, the myocardinal organisation of the LV and the overall shell habit conform to those of the genus *Mathesia* Mainelli (emended by Masse & Fenerci-Masse 2010). The absence of longitudinal ribs, even on the dorsal side, and the small size of our specimens depart from those of the type material of *Mathesia darderi* from Spain, nevertheless the corresponding populations also include small-sized and non-costulate specimens, therefore our specimens are considered to fall in the range of variability of the type species.

Petalodontia ? sp.

(Figure 5)

This form is represented by randomly oriented sections on slabs; a few large fragments are of the RV

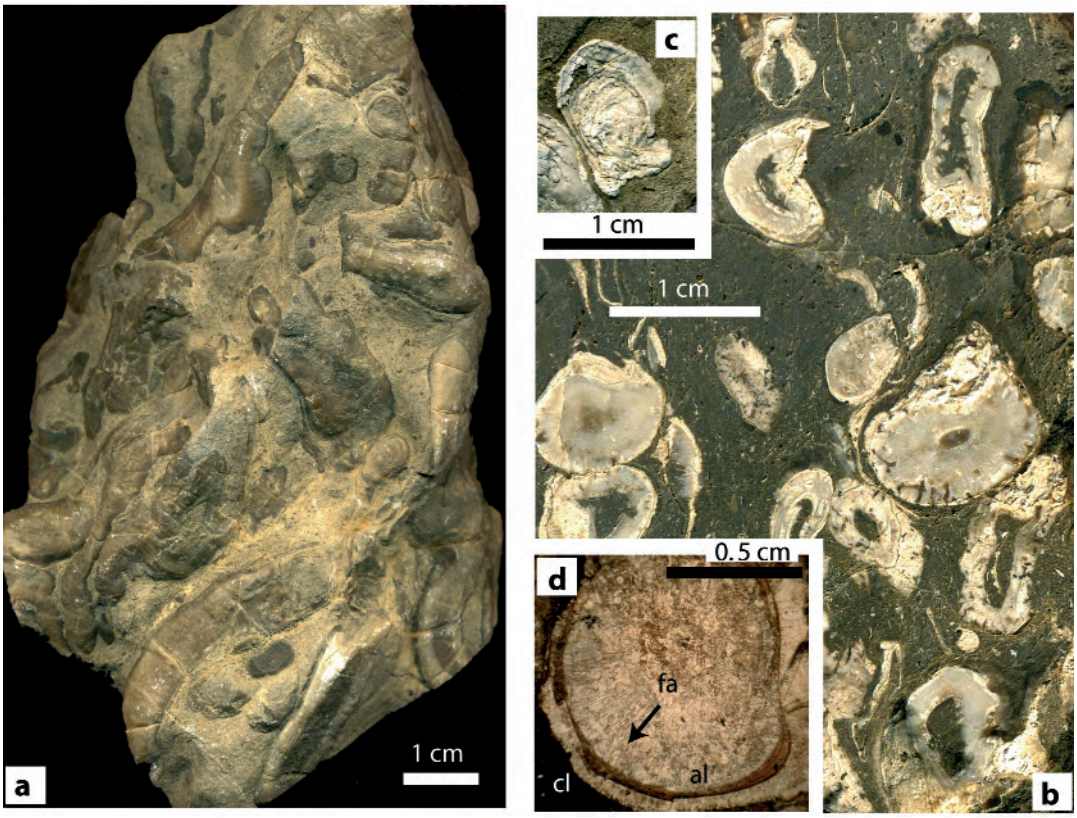

Figure 5. *Petalodontia* ? sp. Zeytineli. **(a)** Close up of a weathered surface showing an assemblage of RV (JPMA 15758-1); **(b)** slab showing transverse sections of RV, body cavity filled by whitish aragonite (JPMA 15756); **(c)** close up of LV (JPMA 15756); **(d)** thin section showing the outer shell layer (cl), the brownish inner layer (al) and the fibrous aragonite (fa) filling the body cavity.

and one sample is the LV. RV is tubular elongated (4–6 cm long) frequently bent or even with multiple torsions (possibly exaggerated by compaction) (Figure 5a), transverse outline subcircular, commissural diametre 0.5 to 1 cm (Figure 5b). Shell thickness is thin, in the range of 2 to 3 mm. Samples collected at Zeytinli are commonly associated with organic-rich limestones and the inner shell layer still preserved in aragonite, with a light brown colour (Figure 5d) (microscopic observations) whereas the body cavity is commonly filled by white, fan-like, fibrous aragonite (Figure 5d). LV flat, internal characters not observed (Figure 5c). Uncertainty on their myophoral organisation does not allow a clear taxonomic placement of our specimens, however due to their overall shell habit they are tentatively ascribed to *Petalodontia* Pocta (1889). Preserved aragonite in fossil shells is relatively uncommon but not exceptional for rudists (see Skelton 1974), and usually observed in organic-rich limestones (Hall & Kennedy 1967).

Family RADIOLITIDAE d'Orbigny 1847

Genus *Eoradiolites* Douvillé 1909

***Eoradiolites* sp. aff. *murgensis* Torre**

(Figure 6)

Commissural transverse sections are elliptical to subtriangular, the antero-posterior diameter being smaller than the dorso-ventral one (2 versus 2.5 cm). The dorsal side of the LV displays relatively numerous (10 to 12) short ribs (with a triangular section and separated by concave depressions) interrupted at the edge of the posterior band (Figure 6a); this habit is observed only at adult stage, the juvenile shows a smooth dorsal side (Figure 6c, e). Shell structure becomes wavy and irregular on the anterior side (Figure 6a, c), an anteroventral carina is well marked ('arête V' sensu Douvillé 1910). The anterior band (Ab on Figure 6c, d), is represented by a well-marked, moderately salient, flat and wide (6 mm) area, slightly depressed in the middle, adjacent to a relatively narrow depressed interband (Ib) flanking a relatively narrow (4 mm) salient rounded posterior band (Pb); a small ridge is at the junction between the anterior band and the interband (Figure 6a, c & e). The ligament ridge (Lr) is poorly preserved and the myophoral organisation conforms to the 'radiolitid mode' with the RV myophores protruding into the opposite valve, the posterior being more ventrally elongated than the anterior.

The outer shell layer is relatively thick (5 to 6 mm) and cellular (Figure 6b, c & e) with a robust network of radially short rectangular cells. Growth plates (sets of growth laminae) consist usually of 10 to 12 rows of cells; they are oblique to the shell axis and give to longitudinal section a foliated aspect (Figure 6a, c). On the anterior side, transverse undulations of growth plates result in a change of cellular pattern from rectangular to radially ameboid, elongated (Figure 6b, c). On ventral bands shell thins, a compact structure dominates the juvenile stages, cellular structure tends to increase in the adult stage. The morphology of radial bands and shell microstructure of our specimens warrant their placement in the genus *Eoradiolites* Douvillé.

Comparisons with Late Aptian–Albian species of this genus shows that the Karaburun form departs from the *Eoradiolites cantabricus* (Douvillé) group by its relatively small size and structural patterns (Masse *et al.* 2007). A recent (unpublished) reappraisal of late Aptian–Albian specimens from Levant belonging to *E. plicatus* (Conrad) and *E. liratus* (Conrad) (Conrad 1852) (topotype material) allows us to point out the similarities and differences between our specimens and these species; similarities with *E. murgensis* Torre will be also discussed.

Eoradiolites plicatus is not ribbed dorsally, ventral bands are markedly dissymmetric with aposterior band strongly projecting outward, and there is a continuous relatively thick outer shell compact lamina. Observations on specimens from the type locality in Lebanon (JPM and MFM) show that the description and figures provided by Douvillé (Douvillé 1910, figure 74; Fenerci-Masse *et al.* 2006, figure 3b) focusing on the small amount of cellular versus compact portions of the shell, usually considered as a significant specific attribute of *Eoradiolites plicatus* (Gallo-Maresca 1994) apply to juvenile specimens or sections cut far from the commissure. Commissural sections of adult (i.e. relatively large) specimens document an overall

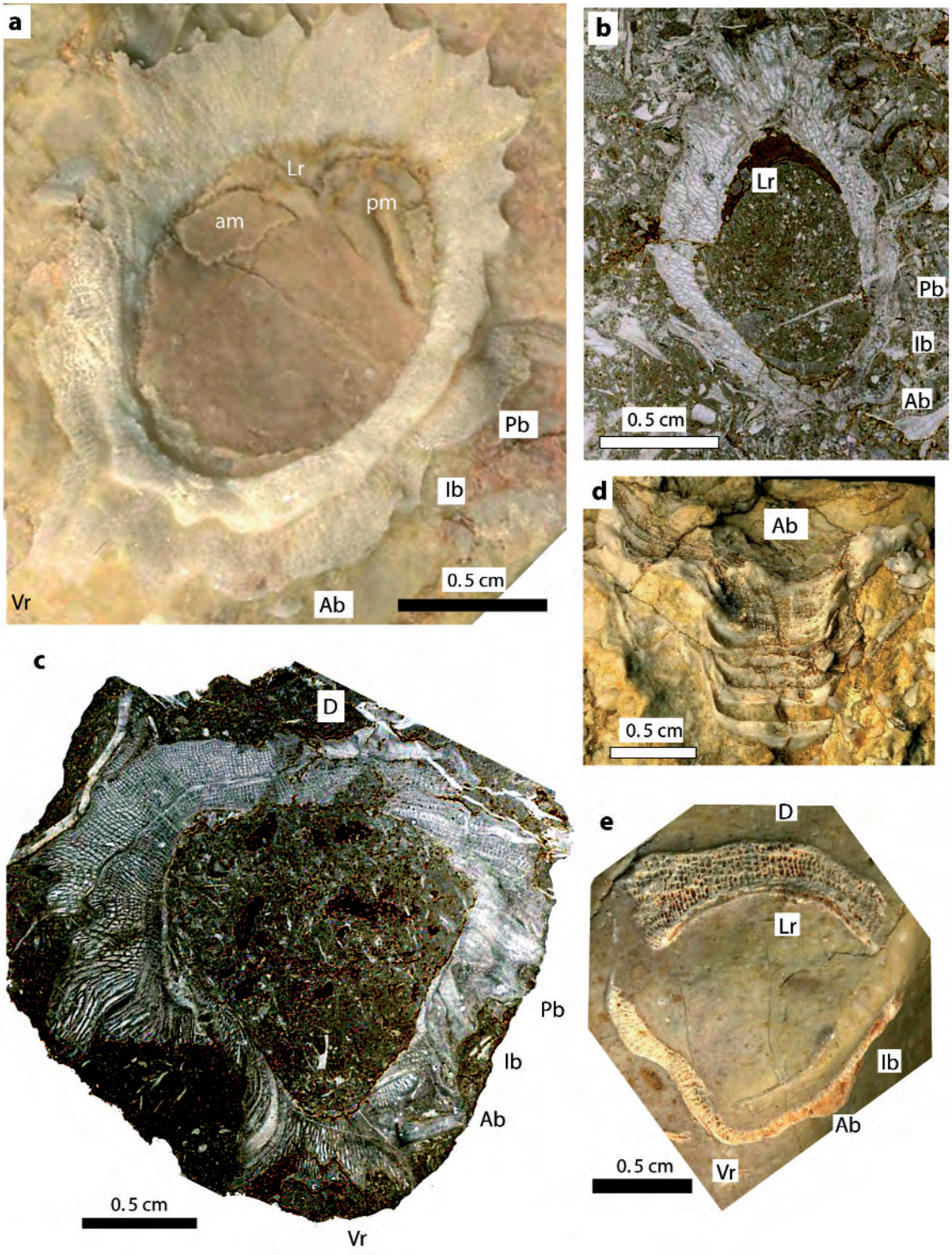

Figure 6. *Eoradiolites* sp. aff. *murgensis*. Barbaros. **(a)** Transverse section (slab) of RV showing the main attributes (JPMA 14326-1); **(b)** thin section of the same specimen showing the cellular habit; **(c)** transverse section of the RV showing changes in cellular pattern of the different portions of the shell (JPMA 14326-2); **(d)** RV, close up of the anterior band (JPMA 14235-6); **(e)** transverse section of RV (JPMA 14235-4).

cellular structure rimmed by a relatively thick compact cortical layer which is not interlayered with the cellular one. Steuber & Bachmann (2002) observed the same relationships between size and cellular patterns in the specimens from Egypt.

Eoradiolites liratus (Conrad), mainly described (topotypes) by Parona (1909) and Douvillé (1910), is densely ribbed and displays ventral bands similar to those of our specimens, nevertheless the corresponding descriptions did not address precisely the shell microstructure but indicate that the shell is very thin. Observations on specimens from Lebanon (JPM and MFM), the external characters of which conform to former descriptions, show a specific ontogenetic sequence regarding both morphological and structural traits: the juvenile part of the shell consists of embodied conical growth plates, closely resembling conical, foliated and squamose morphotypes figured by Parona (1909, figure 3) or Klinghardt (1929, figure 5), whereas the adult part is cylindrical and non-foliated, the longitudinal ribbing being prominent in correspondence with the vertical stacking of cylinders connected by zigzag sutures; this morphology closely matches the Douvillé figures (Douvillé 1910, plate I, figures 2, 3, plate IV, figure 6). Shell structure reflects this dual external habit; the conical foliated portion shows a multilayered, moderately thick, typical rectangular cellular habit, whereas the very thin (adult) cylindrical part consists of a limited number of rows of vertically elongated cells giving to some eroded parts of the shell a longitudinal striated aspect.

Eoradiolites murgensis described by Torre (1965) and revised by Gallo-Maresca (1994) has a subtriangular transverse outline, is ribbed dorsally at adult stage and is foliated transversally on the anterior side, features also found in the Karaburun specimens. Dissimilarities with our species regard radial bands, which are strongly convex and poorly costulated, and the cellular network which consists of delicate rectangular, radially elongated cells with a limited number of rows (usually 8) in a given growth plate. Notwithstanding some affinities between the Italian and Turkish specimens, some dissimilarities (mainly structural) also exist and suggest a placement in a distinctive but closely related species.

Sedimentology and Palaeoecology

At both Barbaros and Zeytineli muddy facies are dominant and rudist beds represent a small portion of the sedimentary pile.

At Barbaros the stratigraphic succession (Figure 7) consists of parasequence sets including 1 to 3 meters-thick packstones or wackestones with gastropods and bacinellid oncoids, usually capped by an exposure surface and followed by decimetre-thick nodular muddy limestones. Evidence for exposure consists macroscopically of irregular perforated surfaces with black pebbles, locally encrusted by oysters, and microscopically of the early dissolution of inner rudist shells or gastropod shells, formerly

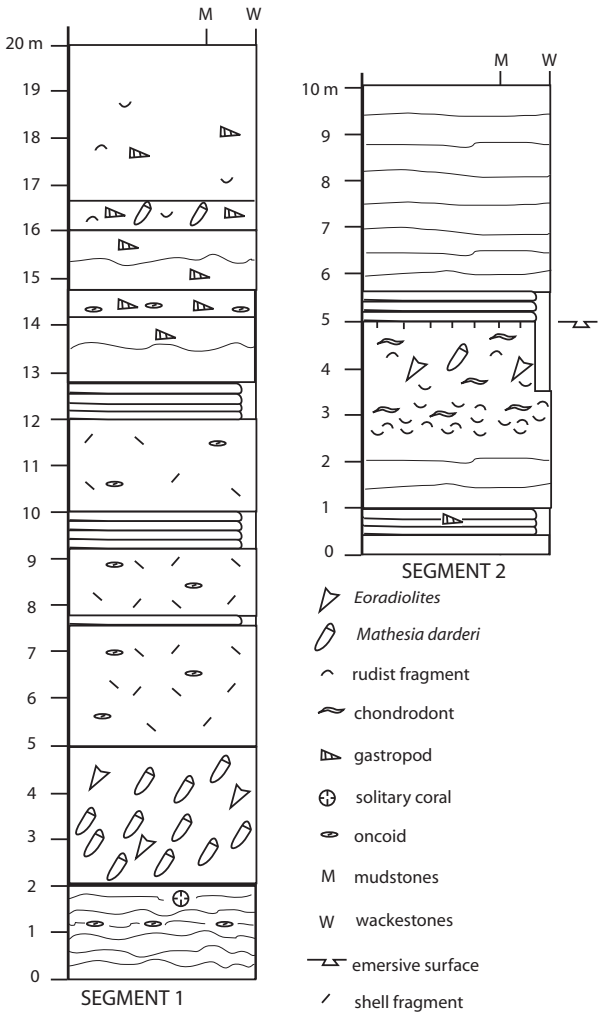

Figure 7. Stratigraphic sections (segments 1 and 2) showing the distribution of rudist assemblages (Barbaros).

made of aragonite. Rudist-free and rudist-rich beds are interpreted as very shallow settings whereas evidence for inter- or supratidal conditions are absent.

Rudists are essentially present in relatively thick beds and are represented by two main types of associations:

(i) a *Mathesia darderi* association, which plays the major physiognomic role; for instance the lower part of the Karabey sırtı section (segment 1) is marked by a 3-m-thick lithosome, which consists of a dense assemblage of this form; this mode of congregation with a relatively high packing density and coverage is commonly observed in *Mathesia darderi* assemblages, for example in Italy (Cestari & Sartorio 1995) and Spain (Fenerci-Masse 2006);

(ii) an *Eoradiolites* sp. aff. *murgensis* association, less common, in which shell density is less and organisms other than rudists are present, including chondrodonts and nerineid gastropods; mollusc shell fragments are relatively abundant in the corresponding beds (Figure 7, segment 2)

At Zeytineli *Petalodontia* ? sp. tends to form dense assemblages in decimeter-thick, muddy, organic-rich wackestones, interbedded with rudist-free beds; *Mathesia darderi* is also common. Requieniidae play an overall limited role at the two localities.

Biostratigraphic and Palaeobiogeographic Significance of the Rudist Fauna

The stratigraphic significance of the fauna: Late Aptian–Albian, with some Albian markers, fits well with that of calcareous algae (Masse & Işıntek 2000) and foraminifera, which Işıntek *et al.* (1998) refered to the Albian.

The Karaburun rudist fauna has a Mediterranean character (Figure 8). *Pseudotoucasia catalaunica* has a significant record in the Late Aptian of Spain and SW France (Astre 1932, 1935; Masse 1996; Masse *et al.* 1998b; Malchus 1998), and has been recently reported from the Gargasian of the Outer Pontides (Masse *et al.* 2002). *Toucasia seunesi*, known from Late Aptian and Albian p.p. of Spain and SW France (Douvillé 1889; Masse 1996; Masse *et al.* 1998b), is reported for the first time outside its type region of southwestern Europe. *Mathesia darderi*, documented from the Late Aptian and the Albian of SW France, Spain, Italy, Algeria, Tunisia and Egypt (Astre 1933; Chikhi-Aouimeur 1983; Tlatli 1980; Cestari & Sartorio 1995; Mainelli 1996; Masse *et al.* 1998b; Steuber & Bachmann 2002) is recorded for the first time in the Near East. Affinities between *Eoradiolites* sp. aff. *murgensis* and *Eoradiolites murgensis*, also an Albian species defined from southern Italy, need some comments. This species, formerly regarded as restricted to Apulia (Masse *et al.* 1998a), has also been reported from Egypt (Steuber & Bachmann 2002), whereas the specimens figured from Bulgaria (Pamouktchev 1983) are not diagnostic of the species in question. Therefore *Eoradiolites* sp.aff. *murgensis*, as *E. murgensis*, has a potential to be a reliable South Tethyan, Mediterranean radiolitid.

The asssumption that the late Aptian palaeogeographic reconstruction of the eastern Mediterranean region (Masse *et al.* 2002) also mainly applies to the Albian suggests that the Karaburun Peninsula was included in or adjacent to the Dinaro-Hellenic platform domain extending to Anatolia. An alternative hypothesis is that the Karaburun-Menderes system was attached to the Pelagonian zone (Robertson 1998). The two hypotheses agree in placing the Karaburun area on the southern Tethyan margin. The presence in the Karaburun fauna, mainly composed of cosmopolitan Mediterranean forms, of *Eoradiolites* sp. aff. *murgensis*, a potential South Tethyan Mediterranean index, is in agreement with the foregoing palaeotectonic reconstruction. It is also consistent with the Arabo-African character of the associated calcareous algal assemblage (Masse & Işıntek 2000). Comparisons with Albian faunas from adjacent regions, belonging to the South Tethyan margin, show the absence of:

(i) Polyconitidae (*Horiopleura-Polyconites*) found in Greece (Combes *et al.* 1981; Steuber 1999), Italy (di Stefano 1889; Masse *et al.* 1998a), and North-Africa (Chikhi-Aouimeur 1983; Masse 1984);

(ii) the *Himeraelites-'Caprotina'-Sellaea* group found in Italy and Egypt (di Stefano 1889; Masse *et al.* 1998a; Steuber & Bachmann 2002).

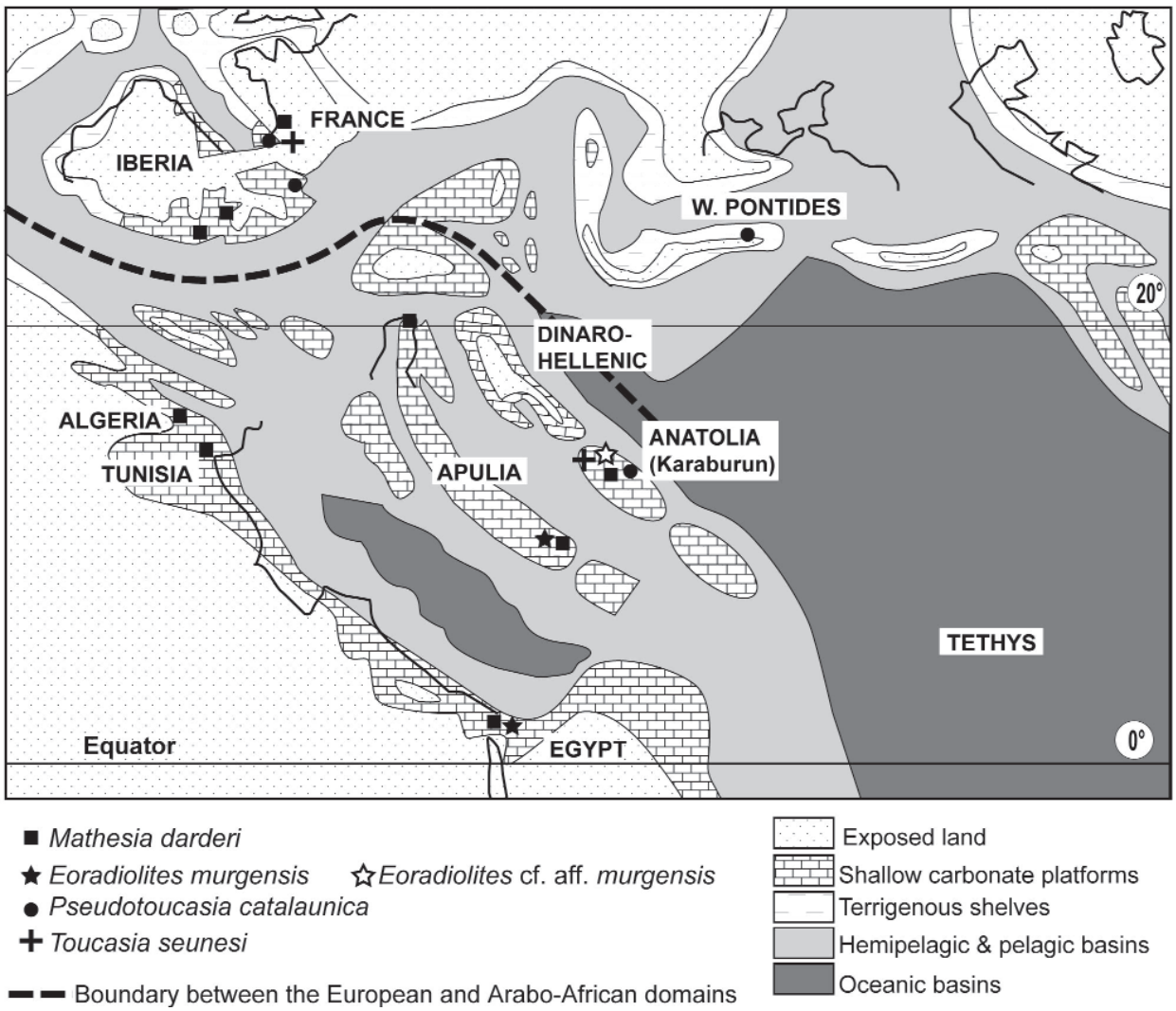

Figure 8. Palaeobiogeographic distribution of rudist species from the Karaburun Albian fauna in the Mediterranean region. (palaeogeographic map after Masse *et al.* 2002).

(iii) *Eoradiolites plicatus* and *E. liratus* which have a significant record in Italy, Levant and Egypt (Douvillé 1910; Masse *et al.* 1998a; Steuber & Bachmann 2002).

This absence may be due to environmental control. Evidence of this is that rudist beds at Karaburun represent small size, low diversity, somewhat monospecific assemblages from the innermost part of the rudist-bearing platform domain where large Polyconitidae and the *Himeraelites*-'*Caprotina*'-*Sellaea* group, thriving in more open marine settings, were excluded. Some ecological controls, possibly water restriction, may be also invoked to explain the absence of large radiolitids, i.e. *E. plicatus* and *E. liratus*, which are also found in relatively open marine settings.

Conclusions

Northern Anatolia was hitherto the only region of Turkey where Early Cretaceous rudists were reported, mainly from the Barremian–Aptian. Near İzmir, platform carbonates bearing rudists, associated with shallow water foraminifera and

dasycladale assemblages of Albian age, crop out at two localities on the Karaburun Peninsula: Barbaros and Zeytineli. Rudist faunas collected from these localities include: *Toucasia seunesi* Douvillé, *Pseudotoucasia catalaunica* Astre , *Mathesia darderi* (Astre), *Petalodontia* ? sp., and *Eoradiolites* sp. aff. *murgensis* Torre. The overall stratigraphic significance of this fauna is consistent with the Albian age derived from micropalaeontological data. *Eoradiolites* sp. aff. *murgensis* is a potential marker of the Mediterranean South Tethyan margin. *Toucasia seunesi* is documented for the first time outside its type region of Western Europe. The distribution of *Pseudotoucasia catalaunica* does extend to the Southern Tethyan margin whereas *Mathesia darderi* has a broad Mediterranean palaeobiogeographic distribution. Rudists may therefore contribute, as calcareous algae do, to the recognition that the Karaburun region was an element of the South Tethyan margin, which is in agreement with palaeotectonic reconstructions. The absence of some key southern Tethyan forms (*Himeraelites*-'*Caprotina*'-*Sellaea*, *Horiopleura*-*Polyconites* and some *Eoradiolites* species) may be due to local ecological factors, mainly water restriction. These findings fill a gap in our knowledge of Mediterranean Albian faunas considered hitherto virtually absent from Anatolia.

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