POST-MEETING FIELD TRIP (3)

EIGHTH INTERNATIONAL CONGRESS ON RUDISTS
*CRETACEOUS RUDISTS AND CARBONATE PLATFORMS*
*June 23-25, 2008, İzmir-Turkey*

# IRC 8
# EXCURSION GUIDE

**Post-meeting Field Trip (3)**
**June 28-29, 2008**

***Early Cretaceous rudist-bearing carbonates from the western Pontides. Black Sea Coast of Turkey***

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**Front cover photographs:**
Amasra panaromic view and the Black Sea.

**Back cover:**
Field Trip route map

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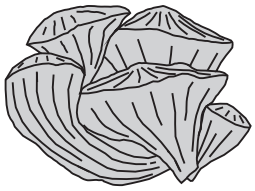
# EARLY CRETACEOUS RUDIST-BEARING CARBONATES FROM THE WESTERN PONTIDES. BLACK SEA COAST OF TURKEY



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## EXCURSION GUIDE

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## Geographical and Geological Framework of the Study Region

The study area belongs to the Istanbul zone also known as the Western Pontides (Fig. 1). The Istanbul zone is limited eastward from the Central Pontides by a regional fault infered to be the onshore prolongation of the Western Black Sea Fault, to the west by the Arac-Daday-Inebolu shear zone and to the south by the Intra-Pontide suture (Okay et al., 1994; Tüysüz, 1999) (Fig.2). The so-called Zonguldak and Ulus Lower Cretaceous sedimentary basins, presently separated by the late Cretaceous –Eocene Devrek basin, are considered a single basin prior to the development of the Tertiary Cide uplift, the former consists essentially of neritic deposits whereas the latter is made of relatively deep, basinal deposits, corresponding with the Ulus Formation (Tüysüz, 1999). The study area corresponds with the Zonguldak basin to the west and the western edge of the Ulus basin to the east.The study area runs from the vicinity Zonguldak to Amasra along the Black Sea coast (Fig. 3).

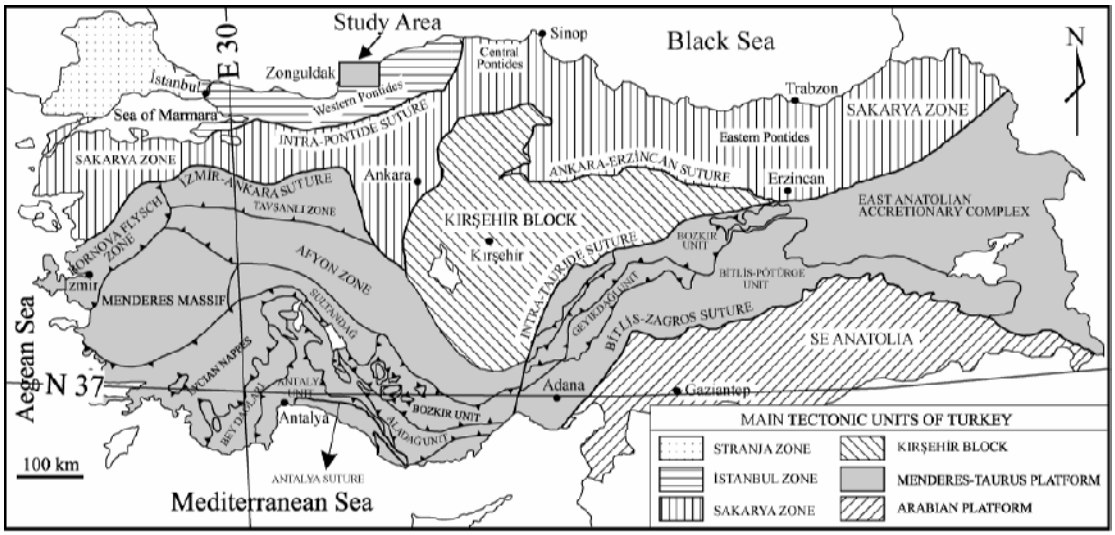


Fig. 1. Structural map of Turkey showing the study area (after Görür and Tüysüz, 2001).

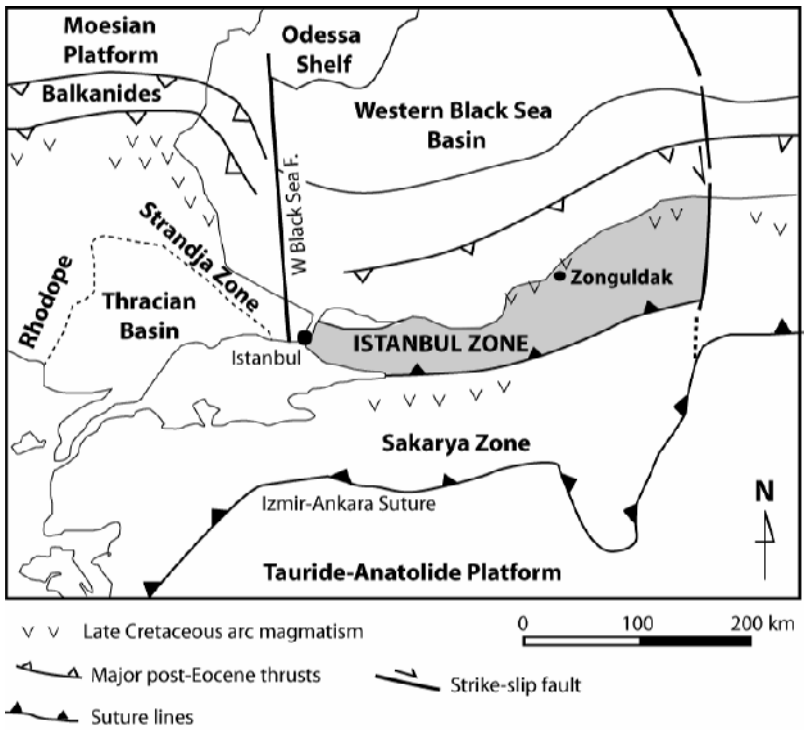


Fig. 2. Structural map of Western Pontides and surrounding regions (after Tuysuz, 1999).

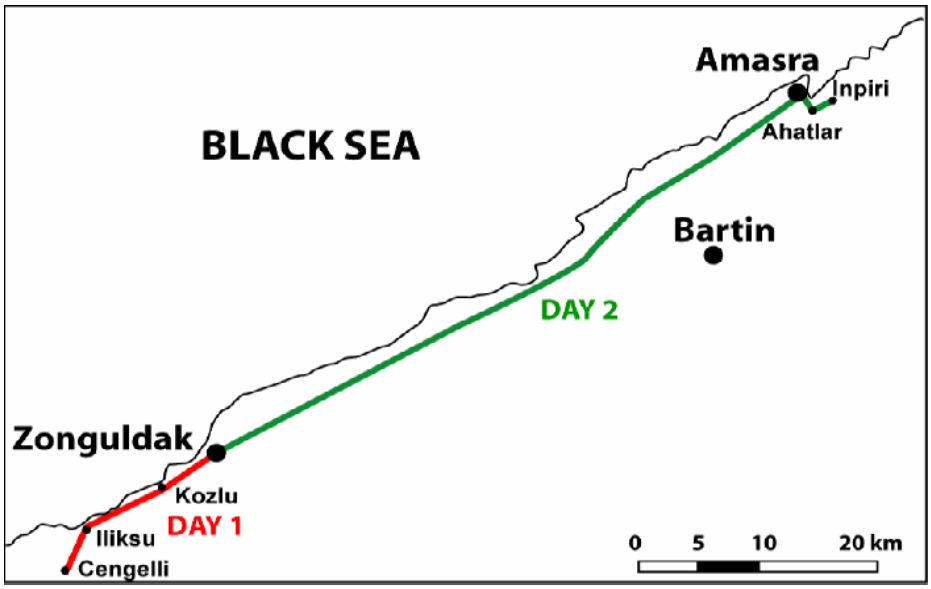


Fig. 3. Geographical setting showing excursion route of day 1 and day 2.

**Stratigraphic Framework and Objectives of the Field Trip**

In the Western Pontides early Cretaceous shallow water carbonates with rudists are represented by three main stratigraphic entities.

1- The lower one corresponds to the Inaltı Formation, ascribed to the Kimmeridgian-Valanginian, rudits are represented by scarce diceratids, associated with corals.

2- The middle one corresponds to the Öküşmedere Formation, ascribed to the Barremian-Lower Aptian (Derman, 1990; Derman and Sayılı, 1995; Tüysüz et al., 1997; Masse et al., 2002, 2004). Outcrops of the Öküşmedere Formation, the type locality of which is close to Kozlu, near Zonguldak, are extending eastward from this locality to the Kurucasile area, over nearly 80 km (Figs. 3, 5). The so-called Inpiri Formation in the sense of Tüysüz (1999), the type locality of which is close to Amasra, which includes both siliciclastic and carbonate sediments, is in part equivalent to the Öküşmedere one. Stratigraphical and palaeontological data on the Öküşmedere Formation of the Kozlu-Zonguldak and Amasra areas, and its relationships with the underlying and overlying rocks have been described by Charles and Flandrin (1929), Astre and Charles (1931), Derman (1990), Derman and Sayılı (1995), Tüysüz (1999) and Masse et al. (2002, 2004). By contrast stratigraphic data on the Inpiri- Kurucasile area were hitherto relatively poor and or limited to unpublished technical reports, precluding the establishment of precise stratigraphic relationships with the western region. Rudist faunas from the Öküşmedere formation have been publised by Masse et al (2002) and are represented by families: Requieniidae, Monopleuridae and Caprinidae.

3-The upper one corresponds with the Cengellidere Formation, late Aptian in age. Rudists faunas were first described by Douvillé (1896), then revised by Masse et al. (2002) and Fenerci-Masse et al. (2006).

The present excursion aims at visiting rudist bearing localities corresponding with the Inpiri-Öküşmedere and Cengellidere formations which encompass the Barremian-Aptian. Observations of rudist beds and their fauna will be complemented by data on the stratigraphic and palaeoenvironmental context, including palaeogeographic and palaeobiogeographic data.

Figure 4 illustrates the stratigraphic organisation of the western part of the study area, that is the Zonguldak region, to show:

- the three main shallow water carbonate episodes, corresponding with the Inalti, Öküşmedere and Cengellidere formations,
- the Inalti formation (upper Jurassic; lowermost Cretaceous ?) is only preserved locally in between the Palaeozoic basement and the overlying Incigez clastics, partly continental; the stratigraphic architecture and termination of the carbonate episode is interpreted as the result of a truncation subsequent to structural deformations ( late Valanginian ? - Hauterivian),
- the Öküşmedere formation represents a transgressive carbonate episode onto the antecedent clastics and grade laterally southwards to coastal clastics; platform carbonates are drowned below and pass laterally northwards to early Aptian, ammonite bearing marls;
- the Cengellidere formation, of late Aptian age, is interbedded with and grades southwards to coastal and fluviatile clastics, and northwards to ammonite bearing marls.

An overall deepening phase characterizes the region during the early Albian, otherwise marked by black shales.

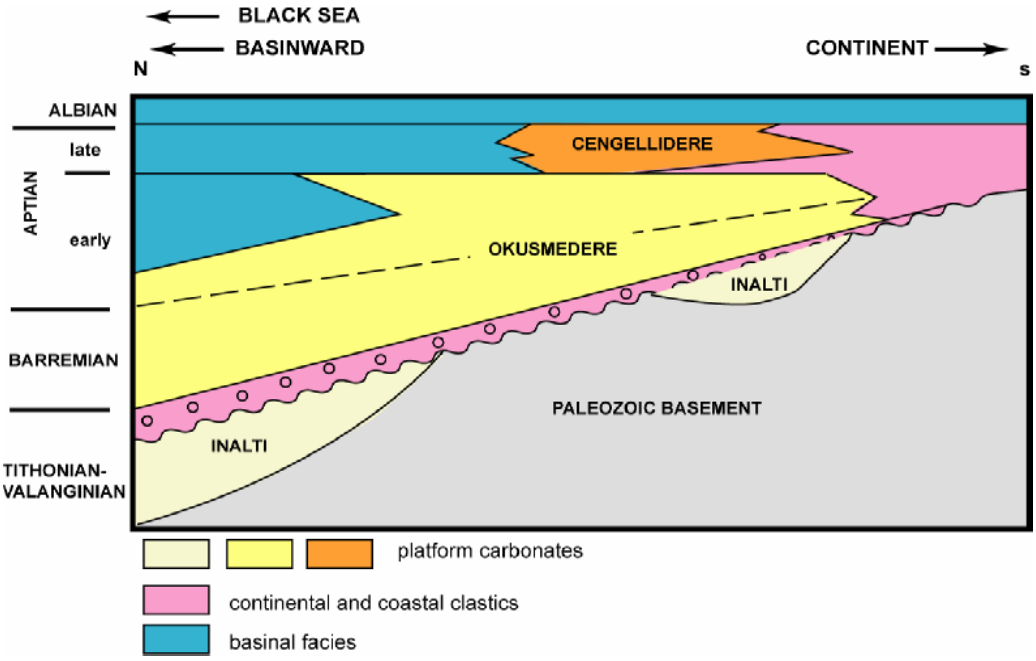


Fig. 4- Stratigraphic organisation of the early Cretaceous sedimentary system of the Zonguldak region.

Figure 5 shows the palaeogeographic configuration of the Öküşmedere platform during the late Barremian -early Aptian.

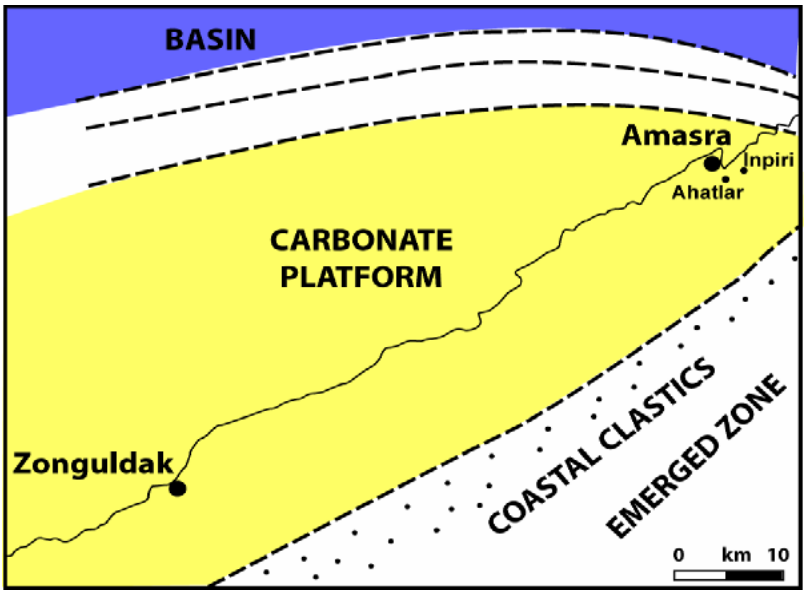


Fig. 5. Palaeogeographic reconstruction of the Öküşmedere carbonate system showing the spatial reduction of the western carbonate platform grading eastward to a narrow ramp, flanking an emerged zone, and the inferred location of the adjacent basin.

**DAY-1: June 28th, 2008**

**Zonguldak Area**

This area (route map on figs. 3, 6) gives the opportunity to examine typical aspects of the Barremian-Early Aptian Öküşmedere (pro Urgonian) formation and the Late Aptian Cengellidere formation.

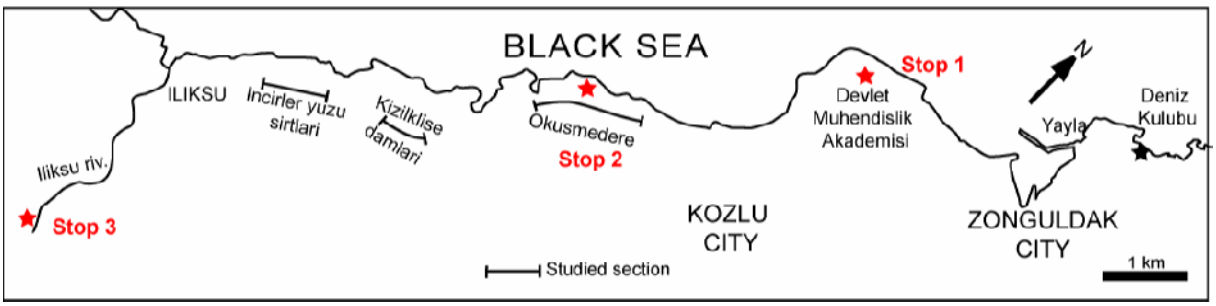


Fig. 6. Excursion route and location of geological sites

**Öküşmedere formation** (Fig. 7)

Two aspects of the stratigraphic succession outcrop along the road from Zonguldak to Eregli (pro Heraclee) corresponding with stops 1 and 2. A detailed stratigraphy of the formation, including lithostratigraphic divisions and their paleontological content, is given in the paper from Masse et al. (2004), see enclosure 1. The biostratigraphic interpretation is based on dasycladale algae and foraminifera, complemented by rudists.

In the Zonguldak-Kozlu area the index biostratigraphic markers: *Actinoporella nigra* (Conrad and Peybernes), *Montseciella arabica* (Henson), with a late Barremian significance, and Caprinidae and

*Rectodictyoconus giganteus* Schroeder, indicative of the early Aptian, have been identified. The Upper Barremian beds are relatively thick, about 100 m, the Lower Aptian being in the same range, 110 m.

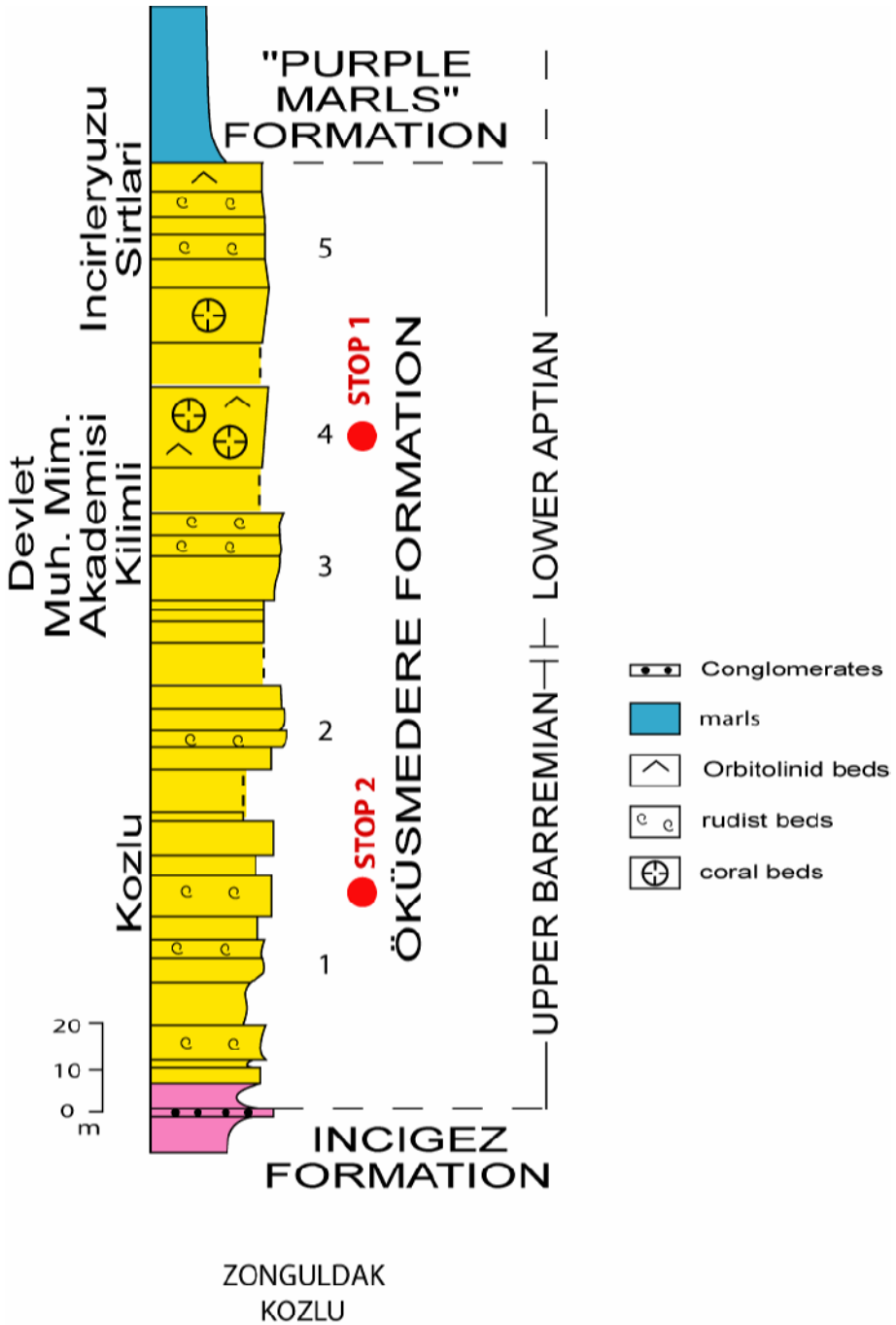


Fig. 7. Stratigraphic section of the Öküşmedere formation (Kozlu area) (Masse et al. 2004).

**Stop-1: Devlet Mühendislik Akademisi (early Aptian)**

The coresponding stratigraphic segment, ascribed to the early Aptian, shows "coral facies" which forms the uppermost part of the Öküşmedere formation.Scleractinian corals with various morphologies are associated with a muddy matrix and are encrusted by microbial accretions, and contain large orbitolinids, mainly *Palorbitolina lenticularis*. Rudists are rare.

This part of the stratigraphic succession marks the retrogradation of the antecedent prograding, rudist dominated, carbonate platform; it predates the drowning of the Öküşmedere shallow carbonates, below the "purple marls" in which early Aptian ammonites have been described by

Charles and Flandrin (1929). At Kozlu coral beds are capped by *Mesorbitolina parva* (Douglass) beds overlaid by ammonite bearing marls.

**Stop-2: Kozlu – Öküşmedere (Late Barremian)**

The corresponding stratigraphic segment illustrates the "rudist facies" in which requienids are dominant but rarely abundant. Requieniids are represented by: *Lovetchenia sp.*, *Toucasia sp.*, and *Requienia cf. migliorinii*. Notice that the succession includes charophyte bearing micrites and is punctuated by exposure surfaces.

**Cengellidere formation (Gargasian)**
The type section of this formation is given in the Masse et al.(2002) paper (see fig. 2 in enclosure 2).

**Stop-3: Ilıksu**

The corresponding outcrop represents the northernmost distributional area of the Çengellidere formation the type locality of which is located a few kilometers southward. Dating of this succession was based on foraminifera: mainly orbitolinids *Mesorbitolina texana* (Roemer), *"Dictyoconus" pachymarginalis*, associated with *Sabaudia aruncensis,* and rudists:*Toucasia* sp., *Pseudotoucasia catalaunica* Astre, *Eoradiolites* sp., *Horiopleura almerae* Paquier and *Polyconites verneuili* (Bayle) (see figures on enclosed paper). Most of the elements of this rudist assemblage were first reported from the Eregli region ("Heraclea") by Douvillé (1896).

The Ilıksu section (Fig. 8) differs from the type section at Cengellidere by a reduction in silicliclastic content, due to its more distal palaeogeographic position relatively to the palaeoshoreline located southwards. Rock mechanical instability and vicinity with the main road preclude detailed stratigraphic investigations, observations on facies types are possible on cobbles lying on the southern side of the main road.

Fig. 8. Field view of Ilıksu outcrop (Late Aptian carbonates).

**DAY-2: June 29th, 2008**

**Amasra Area**

The excursion route from Zonguldak to Amasra is indicated on figure 3. Day-2 focuses on the so-called Inpiri formation, an equivalent of the Öküşmedere formation.

**Stop-4: Ahatlar-Inpiri**

The core of the Inpiri hill anticline exhibits a well exposed section of the Öküşmedere carbonates (= Inpiri formation in the sense of Tüysüz) (Fig. 9) and their overlying sediments whereas the underlying rocks do not outcrop. The stratigraphic succession consists of three segments bounded by faults. The lower segment, about 20 m thick, is dominated by grainstones.The middle segment is 40 m thick and consists of skeletal grainstones with corals and large rudist fragments with interbedded muddy, sandy, black muddy intercalations with charophytes in its middle. Early exposure surfaces punctuate the entire succession. Microfossils and rudists are the same, the latter being represented by problematic Caprinidae and poorly defined requieniids. The associated micropalaeontological assemblage is made of *Cylindroporella lyrata* Luperto-Sinni and Masse, *Acroporella radoiciciae* Praturlon, *Suppiluliumaella cf. praebalkanica* Bakalova, *Pseudoactinoporella fragilis* Conrad, *Salpingoporella muelhbergii* (Lorenz), *Actinoporella nigra* (Conrad and Peybernès), *Montseciella arabica*, *Palorbitolina lenticularis* (Blumenbach), *Falsurgonina cf. pileola* Arnaud –Vanneau and Angot, and «*Neotrocholina*» *aptiensis*, ascribed to the Upper Barremian- Lower Aptian, whereas the presence of Caprinidae is more diagnostic and suggests a Lower Aptian age (Masse et al., 2004). The upper segment is 54 m thick and dominated by grainstones with coral and rudist fragments interbedded with wackestones which contain either charophytes or miliolids (*Istriloculina*) and gastropods, the upper part is grainy and rich in corals and rudists fragments whereas the topmost part (5 m) is a coral-*Lithocodium* bafflestone. Caprinidae are still present in this segment and are associated with *Rectodictyoconus giganteus* Schroeder and *Palorbitolina lenticularis* (Blumenbach).The transition to the overlying ammonite bearing marls corresponds with an *Palorbitolina* rich, glauconitic marly limestone (2 m). Ammonites found in the marly beds belong to the *Deshayesites weissi* zone, probably the upper part, these beds are therefore tentatively placed at the transition between the lower and upper Bedoulian.

Fig. 9. Field view of Inpiri outcrop (Lower Aptian carbonates).

**Stop-5: Amasra-Boztepe island**

In the Boztepe section the overall thickness of the Öküşmedere formation is 170 m, the Upper Barremian part, with *Actinoporella nigra,* is 70 m thick, and the Bedoulian part, with *"Rajkaella" banatica* Dragastan and Bucur, *Salpingoporella hasi* Radoicic et al. *Montseciella arabica* (base), *Caprinidae* and *Rectodictyoconus giganteus* (top) is 100 m thick, which is in the same thickness range of the corresponding Bedoulian beds of Inpiri.

The Öküşmedere formation overlies dolomites which may represent the Inalti formation. Barremian limestones outcropping near the Byzantine bridge (which connects the Boztepe island to the continent) are interbedded with sandstones and punctuated by exposure surfaces. Coral beds from the topmost part of the section outcrop on top of the island.

In the Amasra region the Cengellidere formation has not been identified, basinal marls overly the Öküşmedere carbonates. Eastward the Öküşmedere formation is represented by siliciclastic rich carbonates grading northward to outer shelf deposits, this transition documents the existence of a narrow, mixed carbonate-siliciclastic ramp, adjacent to an emerged area.

**Conclusions**

Barremian-Aptian rudist-bearing carbonates of the Western Pontides are mainly represented by Requieniidae, Polyconitidae, Caprinidae and Radiolitidae with European, Balkanic affinities. There is a drastic change in faunal composition at the early-late Aptian boundary, marked by the extinction of Caprinidae and some Requieniidae, and appearance of Radiolitidae associated with the development of Polyconitidae. These changes illustrate the mid-Aptian crisis, with a gobal extent.

The Öküşmedere platform, of Urgonian type, has a wide regional extent (nearly 80 km) as shown on figures 5 and 10, and shows limited east-west facies and thickness variations.

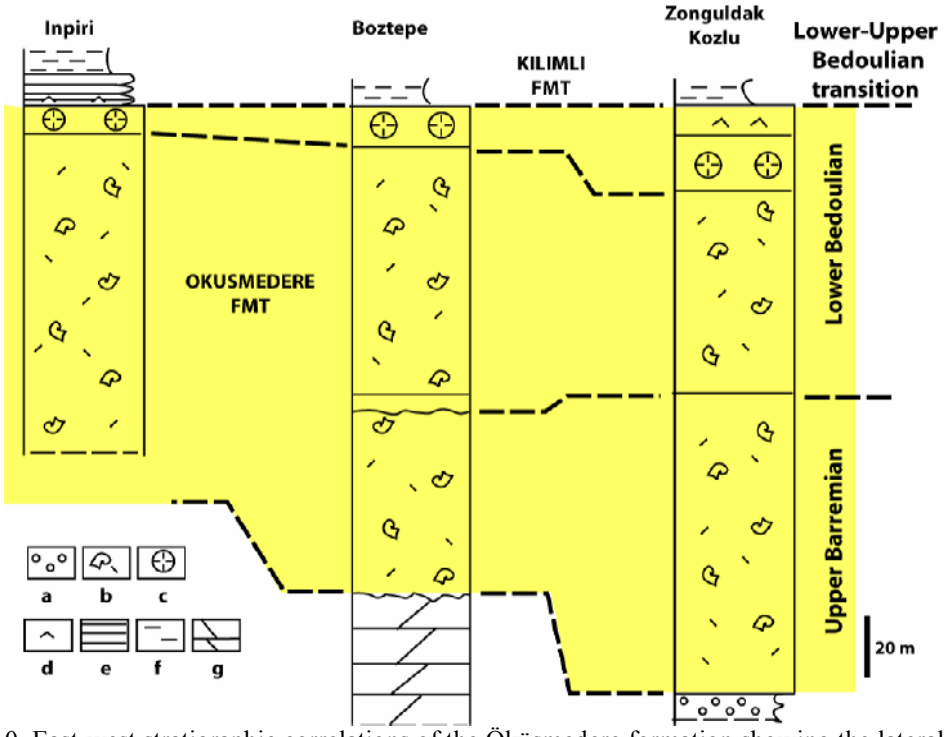


Fig. 10. East-west stratigraphic correlations of the Öküşmedere formation showing the lateral continuity of the Upper Barremian-Lower Bedoulian limestones from Inpiri to Zonguldak. Facies legend: a, conglomerates; b, rudist bearing platform carbonates; c, coral facies; d, orbitolinids; e, outer shelf carbonates; f, marls; g, dolomites.

The Öküşmedere carbonates grade southwards to continental clastics and northwards to basinal marls. This configuration is similar to that of the "Urgonian" Prebalkan platform from southern Bulgaria, adjacent to the Rhodope "continent". Palaeogeographic connections between the Pontides and Prebalkanic systems are likely.

**Acknowledgements**

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