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Mailing address : Maden Tetkik ve Arama Enstitüsü,
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TRIASSIC ON THE WESTERN SIDE OF BOSPHORUS (KİLYOS, İSTANBUL): A RECENT DISCOVERY

Orhan KAYA

Ege Univ. Yerbilimleri Fak., Bornova-İzmir, Turkey

and

Maurice LYS

36. rue de Buzenval, 92210 St. Cloud, France

ABSTRACT.— Up to the present, the youngest part of a pre-Cretaceous rock sequence lying in the Black Sea coastal area near Kilyos has not been assigned to a reliable time scale. It apparently overlies the Carboniferous rocks and includes, in ascending order, basaltic lava, quartzose sandstone, dolomitized limestone, and lithic sandstone-shale units. An Early-Middle Triassic microfauna has been recognized first in the carbonate unit. This age assignment can be generalized for the underlying and overlying rock units, since they bear different lithologic aspects from those of the Carboniferous rocks.

In the study area, the recently established Kilyos Triassic sequence structurally underlies the Lower Carboniferous and overlies the Upper Cretaceous, in relation to an overthrust system.

INTRODUCTION

In the Black Sea coastal area, to the west of Kilyos, on the western side of Bosphorus, a pre-Late Cretaceous terrane is widely exposed (Fig. 1). It is internally faulted and structurally overlies the Late Cretaceous volcanic rocks and limestones, in relation to the Paleogene overthrust system. Where less deformed, the constituent rock units exhibit a remarkably parallel northwest-southeast alignment (Fig. 2). The order of succession of strata that would be inferred from bedding facings is reversed.

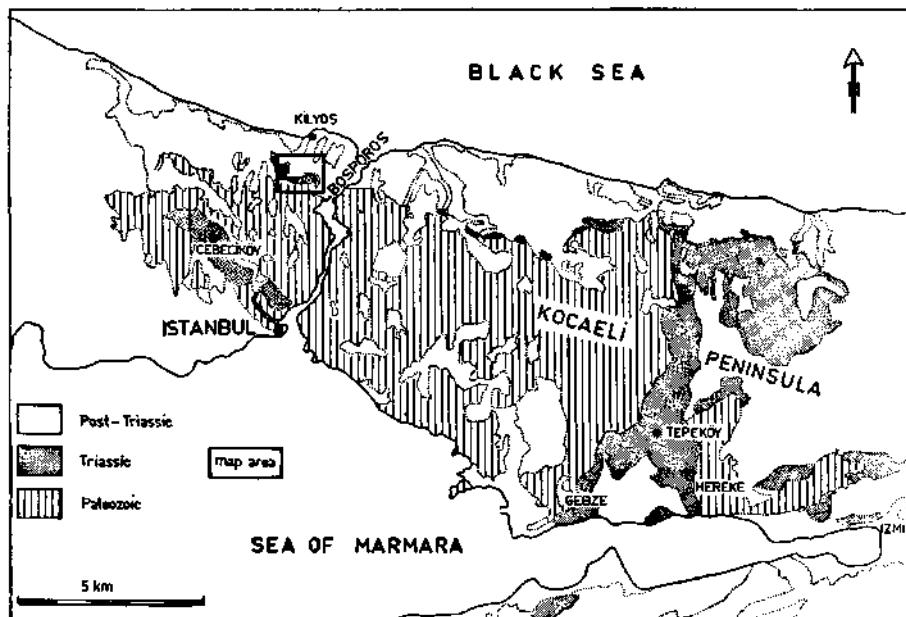


Fig. 1 - Geologic sketch map of Istanbul region.

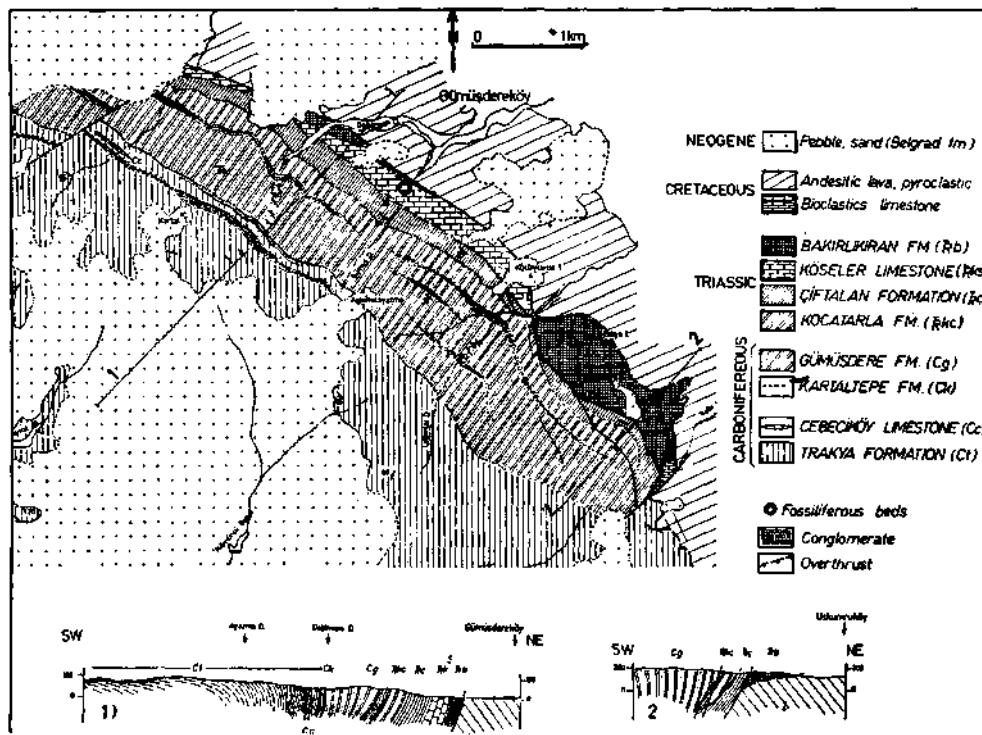


Fig. 2 - Geological map of the study area.

The oldest beds of this sequence (Fig. 3) are assigned to Visean-Namurian on the basis of fossil evidence and stratigraphic correlations with farther southerly-lying areas (Kaya, 1969, 1971, 1973, 1980; Kaya and Mamet, 1971). Earlier workers (Penck, 1919; Paeckelmann, 1938), who did not recognize the overturning, regarded the older beds as Upper Devonian, and the younger beds as Middle and Upper Devonian. Kaya (1969, 1971) assigned the younger beds to Carboniferous (post-Dinantian) on the basis of the existence of coalified plant material, unidentifiable however, and their areal structural conformity with the Visean-Namurian strata.

The younger beds of this sequence incorporate four rock units (Fig. 3). In particular, the dolomitized limestone unit has been sampled for several times for a decisive age assignment. The eventual collection studied by the second author has revealed that part of the sequence is Triassic in age.

STRATIGRAPHY

Carboniferous

The Trakya formation consists of over 2000 m of interbedded shale, sandstone, and subordinate lithic conglomerate and pebbly mudstone, which form a thick series of turbidites. Shales predominate over litharenites. The sequence, except the lowermost and uppermost parts, contains most of the sedimentary characteristics of a regularly stratified epiclastic flysch facies. The Çamurluhan member consisting primarily of shales, is the uppermost part of the formation. The Trakya formation ranges in age from late Tournaisian to late middle Visean.

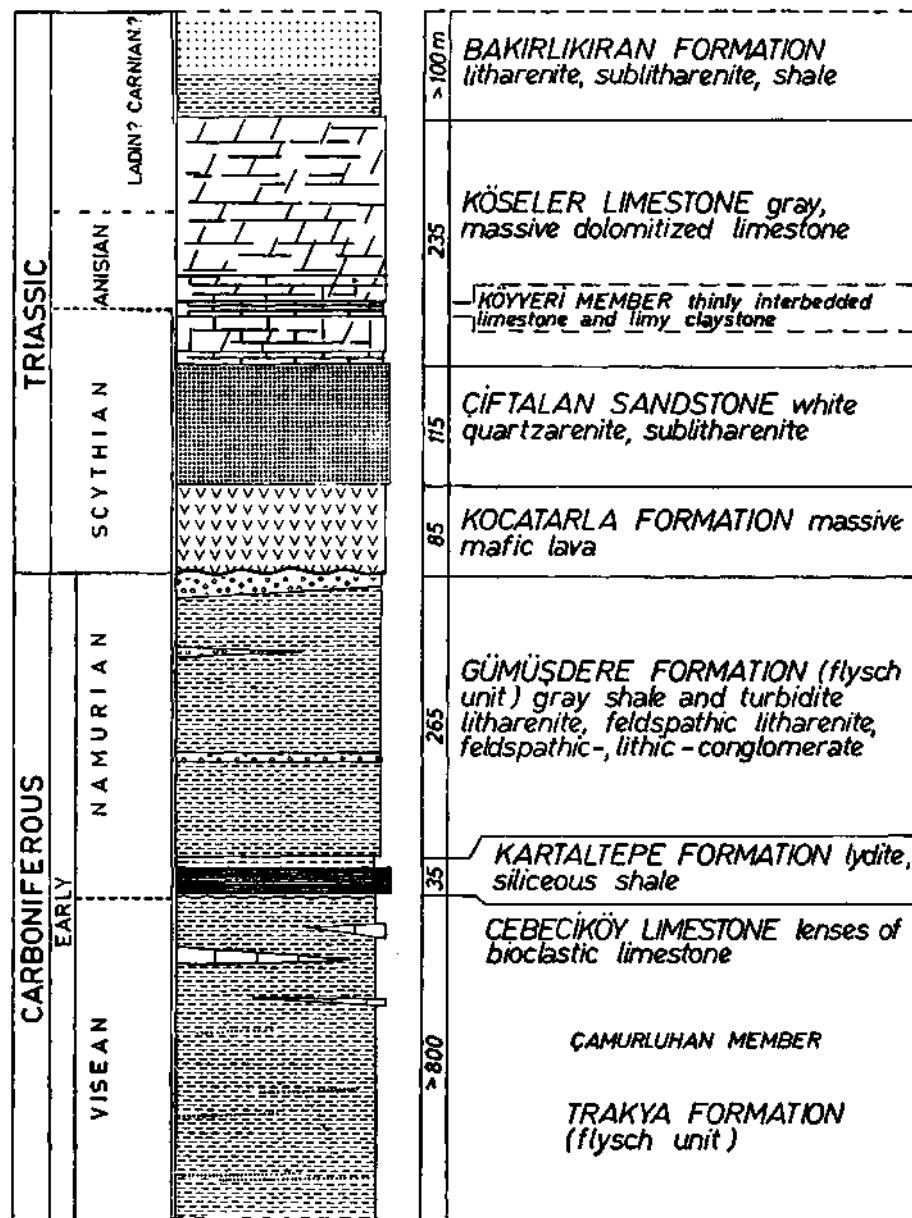


Fig. 3 - Stratigraphic column of the Carboniferous and Triassic of the study area.

The Cebeciköy limestone consists primarily of dark gray, thickly bedded, recrystallized bioclastic limestones and subordinate interbeds of clayey limestone and calcereous shale. It conformably and gradationally overlies the Trakya flysch sequence. In the study area it occurs as small lenses within the youngest Trakya shales, and contains late middle Visean foraminiferal assemblage.

The Kartaltepe formation consists of lydite and siliceous shale. In the study area the lydite disconformably overlies the Trakya formation. The siliceous shale conformably and gradationally rests on the Cebeciköy limestone at the south. On the basis of plant fragments a latest Visean (or most probably a Namurian) age is assigned to the unit.

The Gümüşdere formation consists mainly of interbedded sandstone and shale, and subordinate conglomerate, forming a thick series of turbidites in epiclastic flysch facies. It conformably and gradationaly overlies the Kartaltepe formation. On the basis of this contact relationship, the fossil-free Gümüşdere is suggested to be Namurian in age.

Triassic

The Triassic sequence is composed of marine rocks incorporating four main rock units of formation rank (Fig. 3). The «Kocatarla» and «Çiftalan» formations were named by Kaya (1971). The «Köseler» and «Bakırlıkırın» were designated the related rock units of the Kocaeli Triassic sequence by Kaya and Özdemir (in prep.).

The Kocatarla formation is essentially a unique, altered basaltic lava flow. The rock is uniform, massive, and contains sporadic vucouls. The contact with Carboniferous Gümüşdere formation is suggestive of a disconformity.

The Çiftalan sandstone consists of whitish, thick-bedded to massive sublitharenite, quartzarenite, and minor interbeds of shale and micaceous litharenite. The sandstones are mainly fine-to medium-grained, and cemented with silica. The contact between the Çiftalan and Kocatarla formations is not exposed. No identifiable fossil material was obtained from the unit except a few very poorly preserved plant fragments.

The Köseler limestone consists mainly of medium gray, cliff-forming, massive, and lately dolomitized limestone. On the basis of its lithologic and age significance the unit is correlated with "Köseler limestone" of the Kocaeli Triassic sequence (see conclusions). Kaya (1969, 1971) named the unit the "Değirmendere formation" and considered it to be Carboniferous (post-Dinantian) in age. Penck (1919) and Paeckelmann (1938) recorded the unit and correlated it with the Early Devonian "Pendik series and limestones" widely exposed around Bosphorus.

The lower and upper contacts of the unit are everywhere obscured.

A thin interval of alternating limestone, intraformational limestone breccia and calcareous shale in the lower section of the unit is the only less dolomitized portion. It includes in part bioclastic and oolitic grainstones which yield Triassic foraminifers (Zaninetti, 1976) known to be present in the Late Scythian-Early Anisian Köyperi member of the Köseler formation (cf. Dağer, 1978):

- Ammodiscus parapriscus* Ho
- Calcitornella gebzeensis* Dağer
- Diplotrema* sp.
- Endothyra* sp.
- Glomospira silensis* Dağer
- G. sinensis* Ho
- G. tenuifistula* Ho
- Glomospirella facilis* Ho
- G. irregularis* (Moeller)
- G. shengi* Ho
- Meandospira pusilla* (Ho)
- M. dinarica* K. Devide and Pantic (*sensu* Dağer)
- Nodosaria* cf. *djulfensis* Reitlinger
- N. ex gr. geinitzii* Reuss (*in* Reitlinger)

N. n. sp.

N. sp.

'*Nodosaria' erikliensis* Dağer

Trochammina aff. *Tr. alintalensis* Koehn-Zaninetti

In view of the presence of microfaunal elements, such as *Diplotrema* sp., *Endothyra* sp., which appear only in Anisian, an early Anisian age can be assigned to the lower part of the Köseler limestone, in the study area.

Bakırlıkırın formation is a heterogeneous sequence of gray sublitharenite, quartzose litharenite, pebbly litharenite, greenish-gray shale. However, moderately consolidated sublitharenites are more diagnostic components of the unit. They may contain randomly distributed coalified plant fragments and very thin coal seems, which are unfavorable for a palynological study. As supported by scarce crinoid stalks, a shallow shelf environment is suggested. The unit is commonly in thrust contact with the Cretaceous rocks. The contact with the underlying Köseler limestone is not exposed.

CONCLUSIONS

The Kilyos Triassic sequence is correlative with the well known Kocaeli Triassic sequence (Özdemir et al., 1975; Gedik, 1975; Dağer, 1978) on the eastern side of the Bosphorus, on the basis of lithic and sequential similarity, and available age criteria. The suggested correlations with the Kocaeli Triassic succession revised by Kaya and Özdemir (in prep.) may help to postulate the nature of the overall obscured contact relationships and time subdivisions of the Triassic sequence of the study area (Fig. 4).

The base of the Kilyos Triassic sequence corresponds to the base of the Kocatarla lava unit, as suggested by (a) the subaerial nature of the lava unit which apparently overlies the Carboniferous flysch unit, (b) the strict absence of volcanic material in the Carboniferous flysch sequences, and (c) the lithology and the implied sedimentary environment of the Çiftalan sandstone, which are in marked contrast with those of the Carboniferous sequence. The Kocatarla lava unit may correspond to subaerial volcanic rocks intercalated with the red beds of the Kapaklı formation in the Kocaeli sequence. The absence of the Kapaklı in the study area may suggest either that it has been eroded at the marginal unconformity, or that the Kocaeli Triassic is an onlap sequence.

The lithologic equivalent of the Çiftalan sandstone is missing in the Kocaeli sequence. However, it may correspond to the quartzose sandstone beds in the contact interval between the Kapaklı and Köseler formations.

The dolomitized limestone unit is closely comparable to the Köseler limestone of the Kocaeli sequence. The less dolomitized fossil-bearing section in Kilyos is closely correlative with the Koyyeri member, on the basis of lithic similarity and age.

The correlation between the sandstone-shale unit of the Kilyos section and the Carnian Bakırlıkırın formation of the Kocaeli sequence is based on similarities in lithology and stratigraphic position. Although *Halobia* is apparently lacking in Kilyos, the quartzose litharenites and abundant plant fragments are the most remarkable common features. In the study area, the condensed section of the Köseler limestone, and the missing Anisian-Ladinian nodular limestone in *Ammonitico Rosso* facies, may suggest a stratigraphic break between the Köseler and Bakırlıkırın formations.

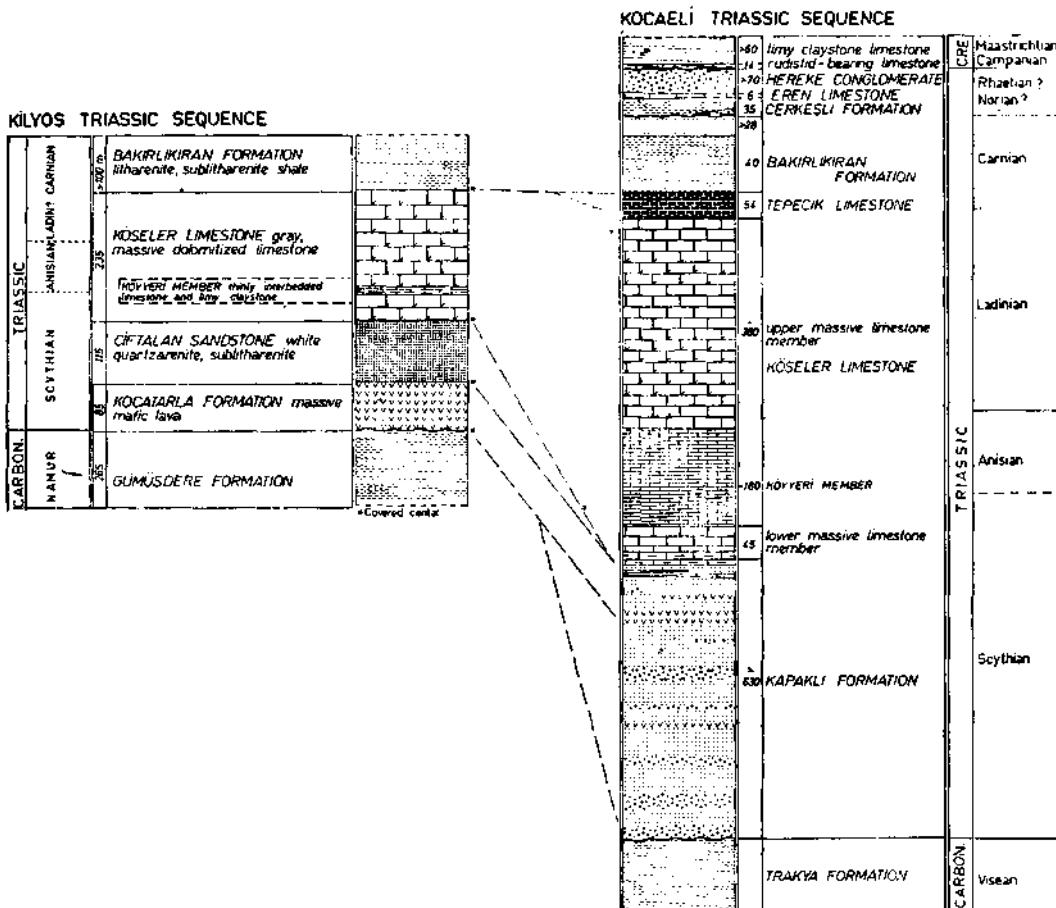


Fig. 4 - Comparison of the Kilyos (this study) and Kocaeli (Kaya and Özdemir, in prep.) Triassic sequences.

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