A NEW DISCOVERY OF THE LOWER CRETACEOUS IN ISTANBUL, TURKEY

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ABSTRACT. — Limestone-pebble conglomerates in the Kocaeli Peninsula have so far been widely accepted as either Triassic carbonates or basal elastics of the Upper Cretaceous. New evidence of age and stratigraphic relations indicate that part of the conglomerate, together with some shale and coralgal limestone units, formerly considered as being Triassic, is early Cretaceous in age.

INTRODUCTION

Previous authors (e.g., Endriss, 1926; Böhm, 1927; Erguvanlı, 1949; Altınlı, 1968; Altınlı et al., 1970; Özdemir et al., 1975; Zaninetti and Dağer, 1978) considered the post-Triassic rocks of the Kocaeli Peninsula, with particular reference to the surroundings of Gebze (Fig. 1), as being late Cretaceous in age. The only exception is Arthaber's (1914) record of «probably Liassic» brachiopods *(Spiriferina moeschi* Haas and *Terebratula* cf. *punctata* Sowerby) in gray limestones intervening between the Triassic and Hippurites-bearing limestones».

In the present paper, the limestone-pebble conglomerate, shale and coralgal limestone units younger than Carnian Halobia-shales and older than rudistid-bearing Upper Cretaceous beds, have been assembled in a heterogeneous rock unit, namely the Çerkesli formation.

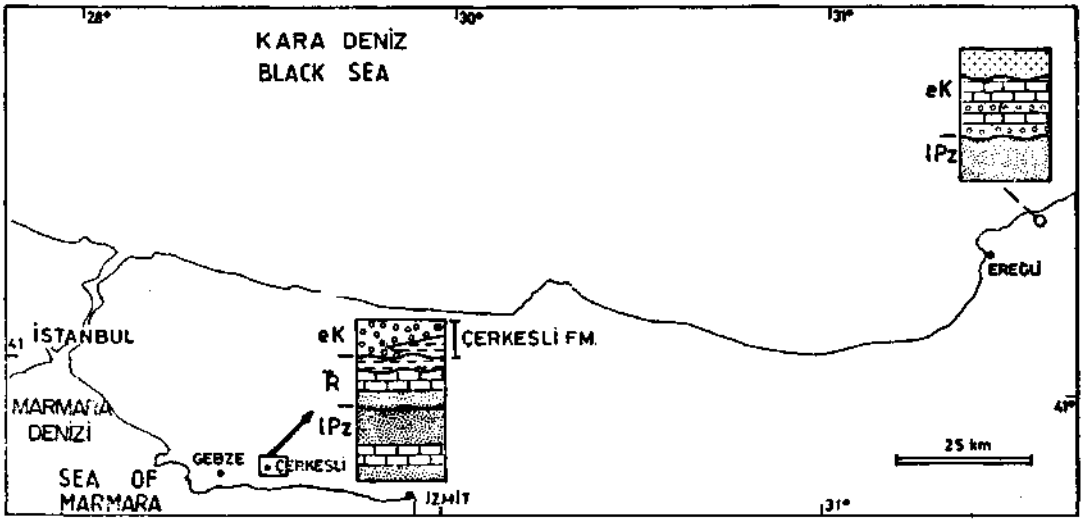

Fig. 1 - Lower Cretaceous sequences in the study and Ereğli areas.

STRATIGRAPHY

Çerkeşli formation

The name Çerkeşli formation is here used for the sequence of gray limestone-pebble conglomerate, shale and minor coralgal limestone (Fig. 2-4). Each major rock division of the formation is established as an informal member: the conglomerate, shale and limestone members. The composite type section is based on the type sections of the members.

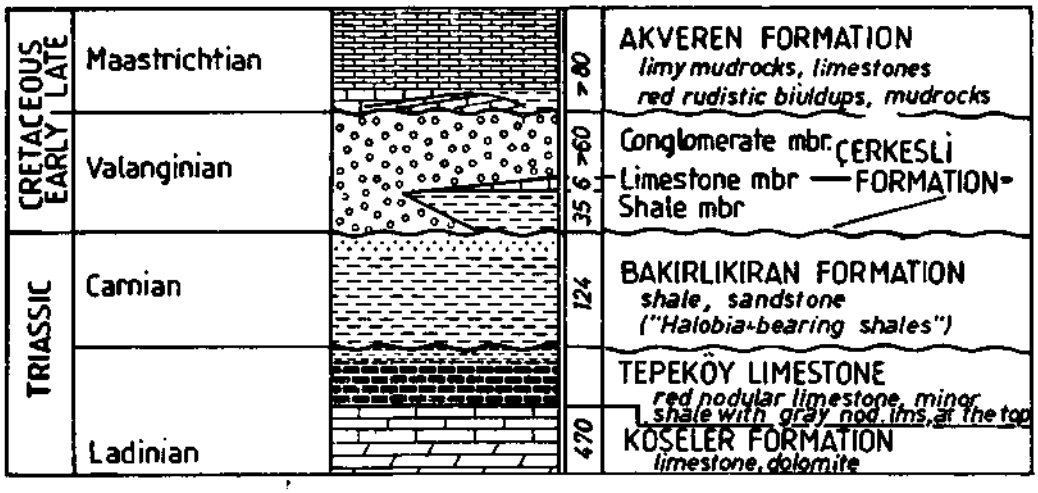

Fig. 2 - Generalized columnar section of the study area. The Triassic stratigraphic elements introduced here are based on Kaya and Kozur (in prep.).

The Çerkeşli formation rests unconformably on the Triassic rocks, with limestone-pebble conglomerate derived almost entirely from the Triassic carbonates.

The foraminifers in the matrix of the limestone-pebble conglomerate and an ammonite in the shale indicate an early Cretaceous (Valanginian) age for the Çerkeşli.

The limestone-pebble conglomerate is lithologically identical to the conglomerate interlayers in the early Cretaceous, İnaltı limestone typically exposed in the Ereğli area. Tokay (1952) and Kaya et al. (1984) suggested the Valanginian-Aptian and Aptian ages for the İnaltı limestone, respectively.

Conglomerate member. — The conglomerate member consists of gray limestone-pebble conglomerate and very subordinate pebbly limestone. It is divisible into a lower and an upper part. The type section representing the lower part of the member is exposed at 16.15:21.65 (Fig. 4).

The conglomerate is moderately to well indurated, massive to thick-bedded, grain-supported, closely packed, and moderately to well sorted in size. The clasts are round to subrounded, in average 4 to 8 cm in size, and include primarily Triassic limestones. The interstitial material is mainly gray microcrystalline limestone, which locally occurs as thin interlayers, and less commonly yellowish gray weathering limy claystone.

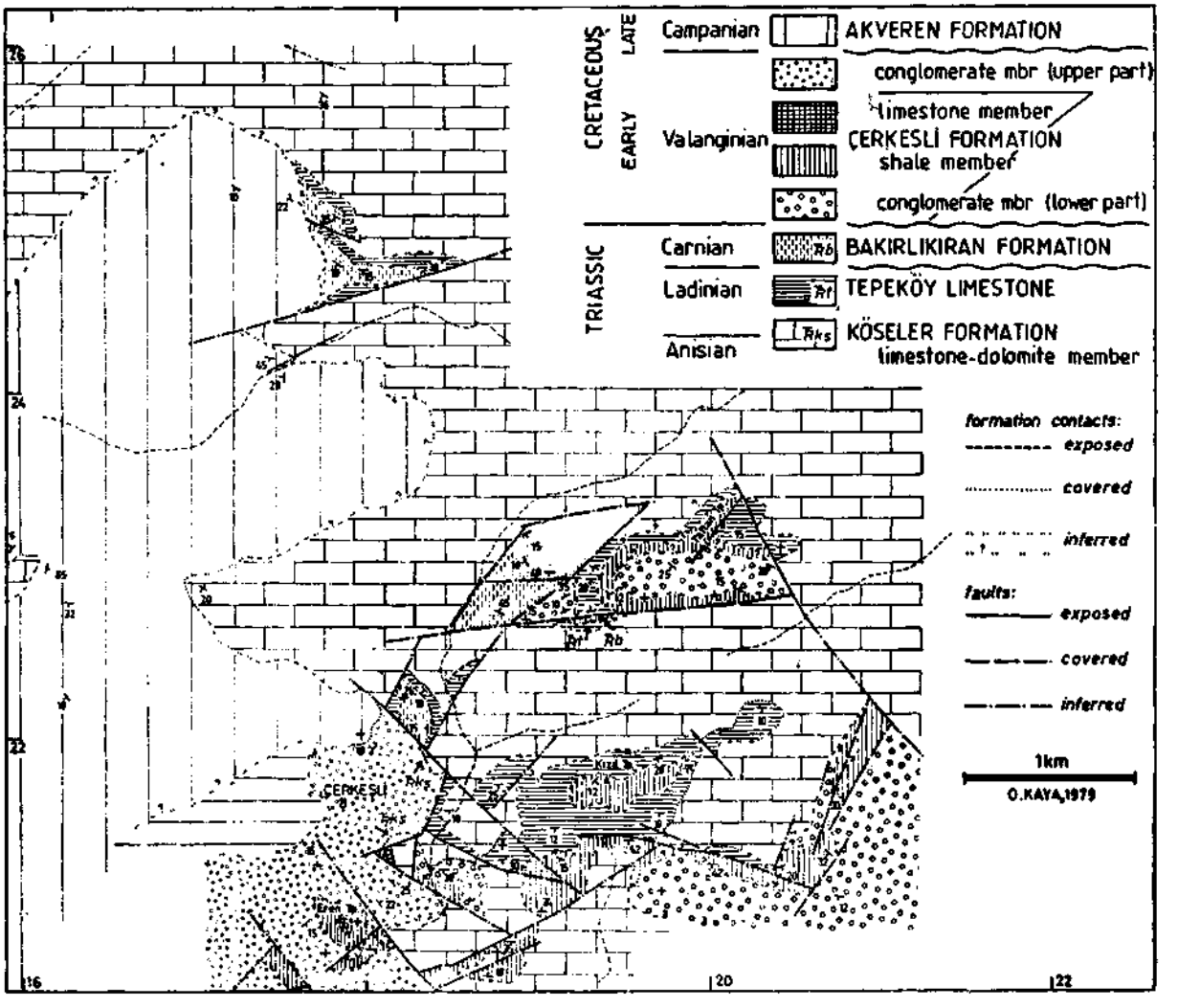

Fig. 3 – Geologic map of the study area.

The lower part of the conglomerate member rests on the Middle Triassic carbonates (18.12: 21.42; 17.90:20.76; 18.61:21.38). It is locally overlain by the shale member. The upper part of the conglomerate member overlies both the shale member (17.90:20.76) and the limestone member (17.88:20.98). The contacts are abrupt, structurally conformable, and represent stratigraphic breaks.

The limestone matrix of the upper part of the conglomerate member yields foraminifera *Cyclammina* sp., *Gavellinella* sp. and *Trocholina* cf. *valdensis* (Reichel), the latter indicating a Valanginian age. The coral *Cladophyllia dichomota* (Goldfuss) occurs as reworked masses up to small block in size. It is known only from the Upper Jurassic of Germany and France.

In the map area, the conglomerate member is indicated by Erguvanlı (1949) as «semi-conglomeratic limestone», and by Altınlı et al. (1970) as the Hereke formation, both being early to Middle Triassic in age.

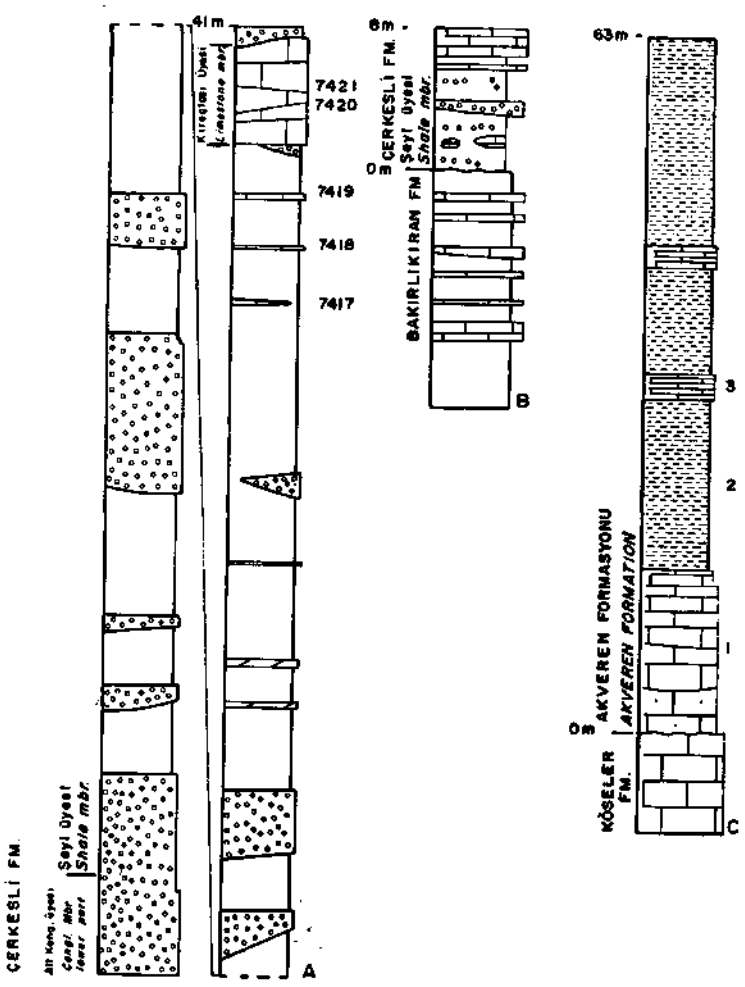

Fig. 4 - Composite type section of the Çerkeşli formation (A, B); reference section of the Akveren formation, and its basal interval on the Triassic rocks (C).

Shale member. — The member consists of gray shale with widely spaced thin interbeds of limestone, and laterally discontinuous interlayers of limestone-pebble conglomerate. The composite type section is located between 18.03:20.97 and 18.00:20.98, and at 17.91:21.00 (Fig. 4). A reference section is situated between 20.40:21.35 and 20.62:21.32.

The shale is homogeneous and moderately indurated. The limestone-pebble conglomerate is poorly indurated and lithically similar to the conglomerate member. However, it contains abundant reworked clasts of limestone -pebble conglomerate. The limestone is dark gray, thinly bedded, fetid, clayey and fine-grained. The limestone beds in the lowermost part of the member contain fine-grained limestone pebbles.

The shale member rests on the Triassic carbonates (19.25:22.80; 19.38:21.90) and the shales of the Triassic Bakırlıkıran formation (18.27:22.80; Fig. 4B). The contact between the shale member and the lower part of the conglomerate member is abrupt and structurally conformable (18.02:20.80, 18.12:21.42), and suggests a synsedimentary, erosion.

An early Cretaceous lytoceratid *Protetragonites quadrisulcatus* (d'Orbigny) indicates an upper age limit of Valanginian.

The early workers referred to the shale member as the Triassic Halobia-shales.

Limestone member. — The member consists of small-sized coralgal buildups and related detritus, randomly scattered in the shale bulk of the Çerkeşli formation. The type outcrop of the member is situated at 17.90:20.76 (Fig. 4A). The other exposures are located at 19.02:21.18; 20.75:18.40; 18.85:22.87.

At the type exposure the core is about 3 m in vertical extent, and has an algal and coral frame supported by bioclastic limestone. Vertically and laterally it changes into stratified, fine-grained and bioclastic limestone. In other localities the core may be represented by a unique colony of corals, or by structureless dolomite. The corals of the genus *Cladophyllia* d'Orbigny seem to be the most common and identifiable elements.

The contact between the limestone member and the enclosing shales is abrupt (17.91:21.00). It may be represented between the limestone-conglomerate interlayer of the shale member and the limestone member (17.88:22.90; Fig. 4A).

Akveren formation

Ketin and Gümüş (1963) applied the name Akveren formation to a sequence of mainly white, thin to thick-bedded, calcareous to limy mudrocks and limestone. The type section is outside the study area. A reference section of the Akveren is exposed between 16.63:23.05 and 16.10:22.95 (Fig. 4C).

The basal section of the Akveren formation is characterized by different and laterally interchanging rocks, lying directly on the Triassic rocks: (1) yellowish gray-weathering, thickly-bedded to massive bioclastic limestone (18.03:23.05; Fig. 4C); (2) pink to pale red rudistid patch reefs (17.42: 25.38); (3) light gray to grayish green, and pale red mudrocks (17.25:24.35) and (4) pale red limestone conglomerate with interlayers of rudistid debris (Hereke conglomerate: Erguvanlı, 1949).

Böhm (1927) documented in detail the faunal content of the basal beds of the Akveren formation in the investigated area, and concluded a Campanian age. Erguvanlı (1949), Altınlı (1968), and Altınlı et al. (1970) adopted this age assignment. In the map area, the rudistid patch reefs and detritus include *Pironaea timacensis* Milovanovic *Vaccinites braciensis* Sladic-Trifunovic, *Sabinia klinghardti* Böhm, *Schosia bilingius* Böhm, *Hippurites* cf. *cornucopiae* Defrance and three new species of the *Gorjanovicia* Polsak (G. *akyoli, G. kayae, G. polsaki: Ö*zer, 1982), which indicate a Maastrichtian age.

Manuscript received July 14, 1986

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