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## Lower Triassic Conodonts from the Lower Elikah Formation, Central Alborz Mountains (North Iran)

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### ABSTRACT

The Lower Elikah Formation of the Central Alborz Mountains (Iran) yields towards its base conodonts of the *typicalis* Zone of Lower Eotriassic age.

### ZUSAMMENFASSUNG

Die Untere Elikah-Formation im zentralen Elbursgebirge führt Conodonten der *typicalis*-Zone (Untere Eotrias).

### Introduction

Two sections of the Elikah Formation were studied in the lower Heraz Valley in the summer of 1970: section 1, about 5 km south of Emarat, section 2 about 500 m north of Mangol, both near the Teheran-Amol highway, North Iran (Fig. 1). Field work was done by P. Süssli, paleontological analysis by F. Hirsch.

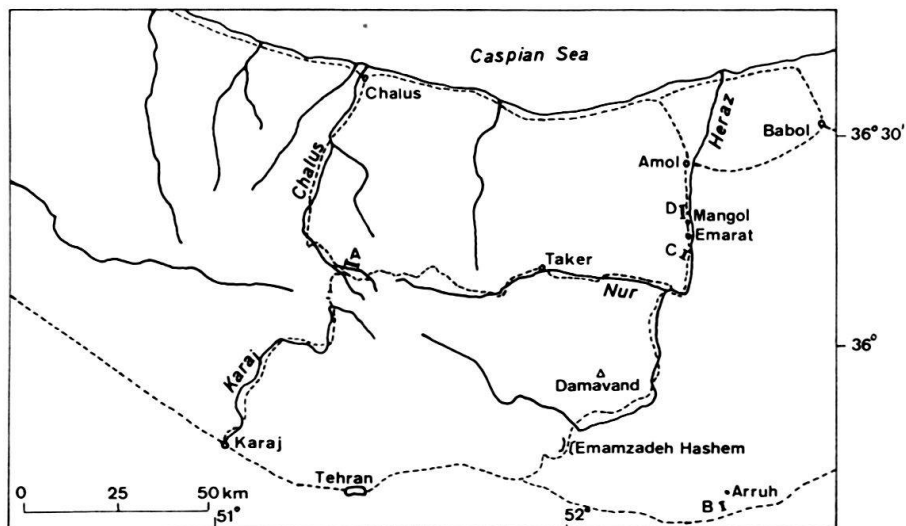


Fig. 1. Positions of the described sections (A: type section, GLAUS 1964, 1965, B: section of Arruh, STEIGER 1966, C: section 1, D: section 2).

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### Stratigraphy

The two sections show the same lithological sequence, which corresponds well with the one described by GLAUS (1964, 1965) from the type section in the Chalus Valley. It consists of a more calcareous lower part (Lower Elikah Formation) and of a more dolomitic upper part (Upper Elikah Formation). The Lower Elikah Formation, 100 m thick in the Chalus Valley type section (GLAUS 1964, 1965) and the Arruh section described by STEIGER (1966), increases northeastward up to 200 m in the lower Heraz Valley, 190 m in section 1, 220 m in section 2, and is characterised by an alternation of light gray limestone, "calcaire vermiculé", edge-wise conglomerate (GLAUS 1965), oolitic limestone and mollusc beds, and by occasional intercalations of marl. The Upper Elikah Formation, 170 m in section 1, 770 m in section 2, is characterised by whitish dolomite, usually thin laminated (Fig. 2). The notable changes in thickness in the Central Alborz is probably caused by differential block movements and by locally different, strong erosion during the pre-Liassic period, represented by the "bean-ore" horizon. The light gray limestone at the base of the lower Elikah Formation (*Claraia* beds) overlies conformably, in both sections, the Nesen Formation. In section 1, the uppermost Nesen Formation is represented by a rhythmic alternation of argillaceous shale and dark limestone containing numerous brachiopods: *Tyloplecta yangtzeensis* CHAO, *Spinomarginifera spinosocostata* ABICH, *Spinomarginifera helica* ABICH, *Spinomarginifera ciliata* ABICH (determinations made by N. Fantini-Sestini, University of Milano, Italy). In section 2, the shales contain *Orthotichia dorashamensis*, *Enteletes lateroplicatus*, *Spinomarginifera* cf. *helica* (STEPANOV et al. 1969). These fossils belong to the *Enteletes-Lateroplicatus*, *Spinomarginifera* Zone, of uppermost Permian age. The uppermost dolomitic beds of the Upper Elikah Formation are disconformably overlain by siltstones and sandstones of the Rhaeto-Liassic Shemshak Formation. The contact is marked by a "bean-ore horizon", up to 1 m thick, which covers the strongly eroded and weathered dolomitic beds of the Upper Elikah Formation.

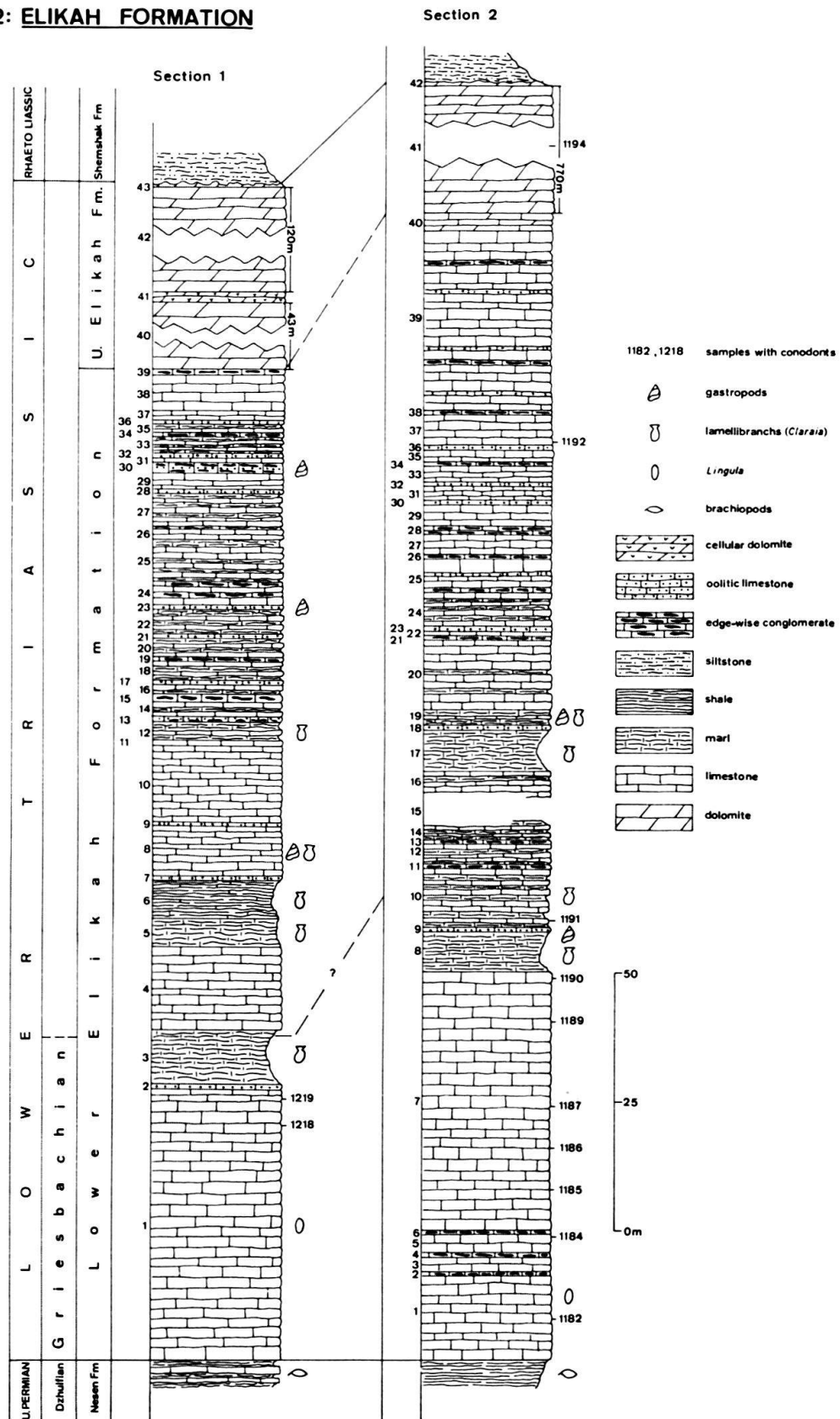
No major facies changes occur in the Lower Elikah Formation. Shallow-shelf conditions prevail (marine limestones), interrupted only by short periods with brackish influences (*Lingula*), and several short periods of subaerial (edge-wise conglomerate) and coastal conditions (oolitic and gastropod limestone). The Upper Elikah Formation shows intertidal conditions (dolomite, partly with cryptoalgae) followed by a pronounced pre-Liassic regression.

Except for possible nondeposition during the earliest Triassic (see discussion of age), the environments of sedimentation found in the Upper Paleozoic continued through the Lower Triassic.

### Paleontology

The conodont fauna found in the Lower Elikah Formation comprises species studied by HUCKRIEDE (1958) from the Salt Range (Pakistan), by HUCKRIEDE (1958) and STAESCHE (1964) from the Lower Seis beds of the Dolomite region (Italy) and by SWEET (1970, 1971) from Kashmir and Pakistan.

Fig.2: ELIKAH FORMATION



Form-genus *Spathognathodus* BRANSON et MEHL 1941*Spathognathodus isarcicus* HUCKRIEDE

Pl. I, Fig. 1-2

1958 *Spathognathodus isarcica*, HUCKRIEDE, p. 162, Pl. 10, Fig. 6-71964 *Spathognathodus isarcicus*, STAESCHE, p. 288 (partim), Fig. 62-641970b *Anchignathodus isarcicus*, SWEET, p. 233, Pl. 1, Fig. 18-19

Material: 1 specimen.

The Iranian specimen has a strongly inflated left platform-side which bears a typical platform-tooth. Its carina bears 7 teeth, the anterior teeth being the main cusp.

Distribution: Basal Seis beds of the Dolomite region (northern Italy), Dolomite Unit of the Kathwai member (Mianwali Formation), Kishor and Salt Range (Pakistan), and Lower Elikah Formation, Iranian Dzhulfa Kuh-e-Ali Bashi and Central Alborz (Iran).

*Spathognathodus typicalis* (SWEET)

Pl. I, Fig. 3-4

1958 *Spathognathodus* cf. *minutus* (ELLISON), HUCKRIEDE, p. 162, Pl. 10, Fig. 81964 *Spathognathodus isarcicus* HUCKRIEDE, STAESCHE, p. 288 (partim), Fig. 60-611969 *Anchignathodus typicalis* (nom. nud.), STEPANOV et al., p. 641970a *Anchignathodus typicalis* SWEET, SWEET, p. 7, Pl. 1, Fig. 13, 221970b *Anchignathodus typicalis* SWEET, SWEET, p. 222, Pl. 1, Fig. 12, 201971 *Anchignathodus typicalis* SWEET, SWEET et al., p. 444, Pl. 1, Fig. 34

Material: 18 well preserved specimens.

The specimens of this species have a variable number of teeth on the carina, from 5 (Staesche, No. 1252/48) up to 12 (Sweet, Holotype, O.S.U. 28017): the anterior teeth being a massive conical main cusp with a very large base (the apical angle may reach 45°).

Distribution: Worldwide, Uppermost Permian to Lower Eotriassic.

Multielement-genus *Ellisonia* MÜLLER 1956

Pl. I, Fig. 5-8

SWEET (1970) includes in this multielement a number of species which comprises a large number of "skeletal" hibbardelliform (U-type), ligonodiform, lonchodini-form, prioniodiniform and enanthiognathiform (L-type) elements.

The fauna described here comprises elements which are classified by SWEET (1970) under the multielement-species *Ellisonia teichertii* SWEET and *Ellisonia triassica* MÜLLER.

Material: 2 lonchodini-form elements of *Ellisonia triassica*, 3 lonchodini-form elements of *Ellisonia teichertii*, 1 hibbardelliform element of *Ellisonia teichertii*.

Distribution: Elements of *Ellisonia teichertii* are found together with *Spathognathodus typicalis*, but may have a longer range (SWEET 1970b). *Ellisonia triassica* has a worldwide distribution from Upper Permian to Lower Triassic.

Form-genus *Neohindeodella* KOZUR 1968*Neohindeodella triassica* MÜLLER

8 specimens belonging to this form-species were found.

Distribution: Worldwide Upper Permian–Triassic.

TABLE I Conodont-Fauna

Location	Sample No.	Species				
		Spathognathodus		Ellisonia		Neohindeo- -della
		isarcicus	typicalis	teichertii		
"L"	"U"					
N-Mangol	1182		1			
	1184		3			
	1185		1			
	1186		2			
	1187	1	2			
	1189			1		
	1190		1	2		1
	1191		4			4
	1192					1
	1194					3
S-Emerat	1218		2		1	
	1219		2			
Total		1	18	3	1	2
						8

## Age

GLAUS (1964, 1965) who studied the Elikah Formation in the Central Alborz Mountains, reports megafossils of the genera *Lingula*, *Pecten*, *Pseudomonotis* (*Claraia*) and (?) *Halobia*.

ALLENBACH (1966) found a questionable specimen of *Ophiceras* sp. at the Emanzadeh Hashem Pass on the Teheran-Amol highway (see also ALAVI-NAINI 1972, p. 96, SEYED-EMAMI 1971, p. 45, and DAVOUDZADEH and SEYED-EMAMI 1972, p. 15). STEPANOV, GOLSHANI and STOECKLIN (1969, with paleontological contributions of Kuemmel and Sweet) have listed from the Lower Elikah Formation of the Iranian Julfa region: *Gyronites* sp. (not *Meekoceras*!), *Claraia stachei*, *C. aurita* and the following conodonts: *Neogondolella carinata*, *Ellisonia teichertii*, *Ellisonia triassica*, *Spathognathodus typicalis*. TOZER (1967) regarded the *Claraia* beds of Julfa as Upper Griesbachian equivalents of the *Ophiceras commune* Zone and considered that the *Otoceras* beds might be missing in Iran.

A somewhat different view is held by KOZUR (1972) who considers the *Ophiceras* Zone as the oldest Triassic Zone (his Tozerian substage) and the Uppermost Permian Dzhulfian Stage as a time equivalent of the missing *Otoceras* beds. The conodonts

of our samples Mangol 1182–1191 and Emarat 1218–1219 belong to the assemblage which characterises the *typicalis* Zone (SWEET 1970a). This zone is considered by SWEET (1970a and b) as “straddling the Permo-Triassic boundary” and represents according to this author the Griesbachian *Otoceras concavum*, *Otoceras boreale* and *Ophiceras commune* Zones. As can be inferred from the presence of the conodont *Spathognathodus isarcicus* so as from the ammonites of the *Ophiceras* Zone, the conodonts found in the sections of Mangol and Emarat belong to the upper part of the *typicalis* Zone, which represents the Upper Griesbachian of Tozer.

Thus the conodonts found in the Lower Elikah Formation of the Central Alborz Mountains confirm the Lower Eotriassic (Upper Griesbachian) age of the basal beds of the Triassic in that region, and allow their correlation with the Lower Elikah Formation at Iranian Julfa.

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## Plate I

*Spathognathodus isarcicus* HUCKRIEDE  
(Sample 1187/1, N-Mangol, Iran)

Fig. 1 Lateral view showing platform-cusp.

Fig. 2 Aboral view, basal area.

*Spathognathodus typicalis* (SWEET)  
(Sample 1218/1, S-Emarat, Iran)

Fig. 3 Lateral view.

Fig. 4 Oral view of carina and platform.

*Ellisonia teichertii* SWEET

Fig. 5 U-type (Sample 1218/3, S-Emarat, Iran).

Fig. 6 L-type (Sample 1189/1, N-Mangol, Iran).

Fig. 7 Detail of L-type showing anterior bar in detail (Sample 1190/2, N-Mangol, Iran).

Fig. 8 L-type (same specimen as in Fig. 7), anterior and posterior bars.

Scale: Scale-line below each Figure is 100  $\mu$ .

Material: The conodonts figured are deposited in the Geological Division of the Museum of Natural History, Basel (Switzerland), No. 0-135 (on S.E.M. Stub).

Photographs: Films No. 136, 138 and 139, KV: 7,5, Spot Size 4 (Kodak Plus-X). S.E.M. Cambridge S-600, Geological Survey of Israel, Paleontology Division.

