

## *Iranognathus sosioensis* n.sp., a New Conodont Species from the Changxingian (Late Permian) of Western Sicily

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**Key words:** Conodonts, *Iranognathus sosioensis* n.sp., Changxingian, western Sicily.

### Abstract

*Iranognathus sosioensis* n.sp., a Changxingian (latest Permian) conodont species of western Sicily, is the youngest *Iranognathus* species occurring immediately below the Permian-Triassic boundary. The Middle Permian and part of the Late Permian pelagic conodont faunas of western Sicily are cold bottom-water faunas, very different from the contemporaneous pelagic warm water faunas. The facial pre-tensions of *I. sosioensis* are not yet known.

**Schlüsselworte:** Conodonten, *Iranognathus sosioensis* n.sp., Changxingian, West-Sizilien.

### Zusammenfassung

*Iranognathus sosioensis* n.sp., eine Conodontenart aus dem Changxingian (oberstes Perm) von Westsizilien, wird beschrieben. Es handelt sich um die stratigraphisch jüngste *Iranognathus*-Art, die unmittelbar unterhalb der Perm/Trias-Grenze vorkommt. Die mittelpermischen und ein Teil der oberpermischen pelagischen Conodontenfaunen von Westsizilien waren Bewohner des kalten Bodengewässers. Sie sind sehr verschieden von den gleichaltrigen pelagischen Warmwasserfaunen. Die Faziesansprüche von *I. sosioensis* konnten noch nicht geklärt werden.

## 1. INTRODUCTION

Pelagic Permian rocks of western Sicily contain very rich conodont faunas. The richest samples are Cathedralian and Changxingian calcarenites that partly contain more than 1000 conodonts per kg sample. Most of the occurring conodont species were described or figured by BENDER & STOPPEL (1965), KOZUR (1975, 1990a, b, 1992b, 1993a), CATALANO et al. (1988, 1989, 1991, 1992) and GULLO & KOZUR (1992, 1993). The age determinations of the Permian deep-water sequence of western Sicily are based mostly on these conodonts (CATALANO et al., 1988, 1991,



1992; KOZUR, 1989a, b, 1992a, b, c, 1993a, b, 1994, 1995; GULLO & KOZUR, 1992, 1993).

*Iranognathus sosioensis* n.sp. belongs to the rare conodont elements. Only one specimen of this species is found among 100-1000 specimens of other Changxingian conodont species and most of the conodont-rich samples did not yield any *I. sosioensis*.

## 2. GEOLOGICAL SETTING AND AGE OF THE INVESTIGATED FAUNA

The holotype of *Iranognathus sosioensis* was found in the Claystone Unit of the Torrente San Calogero section, SSW of the Pietra di Salomone block in the Sosio Valley (western Sicily), near Palazzo Adriano (Fig. 1). Locality and section data are given in CATALANO et al. (1991). The stratigraphic succession is shown in Table 1.

The predominantly red-coloured Claystone Unit is mostly of Changxingian age. Dzhulfian conodonts were found only in the lowermost part with predominating light-gray claystones, but this part is presently not exposed. The Claystone Unit contains some thin (0.6-2 cm) intercalations of calcarenites that represent distal turbidites. Only one, partly silicified bed is thicker (~20 cm), from which the holotype of *Iranognathus sosioensis* n.sp. was derived.

This bed also contains rich conodont and siliceous sponge spicule associations. The sponge spicules consist of forms that lived dominantly on the upper slope in water less than a few hundred metres deep. In contrast, all species restricted to shallow-pelagic warm water conodont faunas (*C. subcarinata* group), are absent.

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Fig. 1 Location of the investigated outcrops in western Sicily, Italy. Legend: Black) Predominantly Wordian Sosio Limestone klippes (slope facies with fusulinid-bearing shallow-water limestone blocks); a) Rupe di San Calogero and Pietra dei Saracini, three adjacent isolated limestone blocks, no longer accessible; b) Rupe del Passo di Burgio; Pietra di Salomone. Stars) Permian base of slope facies and Triassic cover; 1) Several outcrops c. 350 m south of Pietra dei Saracini covering the Roadian (basal Middle Permian, Guadalupian Series) to Julian (middle Carnian) interval; 2) outcrops c. 100 m SSW of Rupe del Passo di Burgio. Mainly lower Cathedralian (Cis-Uralian, Early Permian) turbidites well exposed west of a small road, along the road lower Cathedralian turbidites (partly exposed) and tectonically adjacent Changxingian red marls and thick calcarenites, no longer exposed, but small floated blocks of calcarenites still present. Crosses) Torrente San Calogero section, Permian deep basin facies and parts of the Triassic cover.

*Clarkina changxingensis* (WANG & WANG) and *C. sosioensis* GULLO & KOZUR dominate this fauna, but *C. deflecta* (WANG & WANG) and *C. cf. carinata* (CLARK) are subordinate elements. *H. latidentatus* (KOZUR, MOSTLER & RAHIMI-YAZD), *H. typicalis* (SWEET), *Sweetocristatus galeatus* (BENDER & STOPPEL) and the new *Iranognathus sosioensis* are very rare.

*Clarkina sosioensis* occurs in basal sections of northwestern Iran and Azerbaïdzhan in the uppermost 10 cm of the Changxingian. It is also rare at the same level in the stratotype of the Changxingian Stage in South China (Meishan). *C. changxingensis* and *C. deflecta* are dominating late Changxingian species, but their known ranges begin earlier, at least in the early Changxingian. *Hindeodus latidentatus* is a characteristic conodont of the uppermost Changxingian both in pelagic sediments (South China, Azerbaïdzhan, north-

western and central Iran) and from shallow-water deposits (Tesero Oolite of the Southern Alps), but is more common in the latter facies. The age of the fauna is therefore latest Changxingian.

Despite the fact that the characteristic shallow pelagic warm water conodont *C. subcarinata* and near related forms are missing, the sponge spicules indicate a strong input of faunal elements from the warm water upper shelf. Therefore, the absence of *C. subcarinata* may also be stratigraphically controlled, because this species is missing in the uppermost centimetres of the Changxingian in South China, Transcaucasia and Central Iran. For this reason, it is not obvious, whether *I. sosioensis* is a representative of the cold bottom-water fauna or of the warm water shallow pelagic fauna. *I. sosioensis* is absent both in typical cold bottom-water faunas of the red Changxingian deep sea clays, and in the late Changxingian slope facies (calcarenites without intercalations of red deep-water clays) with exclusively shallow pelagic warm water conodont faunas and fusulinids. On the other hand, most specimens were found in a facies, transitional between these two consisting of red deep-water clays with several thick calcarenite intercalations formerly exposed along a small road about 100 m south of the Rupe del Passo di Burgio block (Fig. 1). Seemingly *Iranognathus sosioensis* lived on the slope and is absent both in the basin and in the uppermost part of the slope and on the shelf.

### 3. DESCRIPTION OF *Iranognathus sosioensis*

**Genus:** *Iranognathus* KOZUR, MOSTLER & RAHIMI-YAZD, 1975

**Type species:** *Iranognathus unicostatus* KOZUR, MOSTLER & RAHIMI-YAZD, 1975

*Iranognathus sosioensis* n.sp.  
(Figs. 2, 3)

**Derivation of name:** According to its occurrence in the Sosio Valley area.

**Holotype:** The specimen on Fig. 2; rep.-no. KoMo 13-2-95/II-50.

**Type locality:** Torrente San Calogero section SSW of Pietra di Salomone (near Palazzo Adriano), western Sicily (Italy), see Fig. 1 and Table 1.

**Type stratum:** The only thick (about 20 cm) calcarenite within red clays of the Claystone Unit. Latest Changxingian.

**Material:** 4, partly broken specimens from the only thick (late Changxingian) calcarenite bank within the Claystone Unit of the Torrente San Calogero section, 12 broken specimens from late Changxingian thick calcarenites south of the Rupe del Passo di Burgio block.

**Diagnosis:** An *Iranognathus* species with numerous small pustulose nodes on the platform. Nodes partly fused to narrow, irregular, but generally longitudinal ribs.

	Series	Stage	Lithology - Fossils		
P E R M I A N	Upper Permian = Lopingian	Changxingian	Red, mainly in the lower part also light-gray, deep-water claystones, with a few thin intercalations of calcarenites. Claystones with albailellid radiolarians, deep-water sponge spicules, palaeopsychrospheric ostracods and a few conodonts. Calcarenites with common pelagic conodonts, transported sponge spicules from the slope, palaeopsychrospheric deep-water ostracods and transported ostracods from the slope.	■	
		Dzhulfian			
	Middle Permian = Guadalupian	Capitanian	unknown		
		Wordian	Gray, yellowish weathering claystones. Conodonts ( <i>M. siciliensis</i> ), radiolarians.		
		Roadian	Olistostrome Unit: Matrix of gray claystone with reworked sand and garnet grains. Olistoliths up to 1m diameter consisting of turbiditic sandstones, siltstones (often with flute casts and plant debris) and rare sandy calcarenites. Matrix with conodonts ( <i>Mesogondolella phosphoriensis</i> , <i>Sweetognathus subsymmetricus</i> ), albailellid radiolarians and sporomorphs. Olistoliths with conodonts ( <i>M. idahoensis</i> , <i>M. intermedia</i> ), albailellid radiolarians and sporomorphs.		■
	Early Permian = Cisuralian	Cathedralian (Kungurian)	Gray and red flyschoid turbidites: Graded sandstones, partly fine-conglomeratic, siltstones, shales and few calcarenites. Agglutinating foraminifers, conodonts, deep-water trace fossils. Calcarenites also contain fusulinids, ammonites, trilobites, brachiopods, bryozoans, calcareous algae.		■
Artinskian				■	

Table 1 Basinal Permian suite in the Sosio Valley, western Sicily. Legend: ■ - present in the Torrente San Calogero section SSW of Pietra di Salomone; ■ - present in form of olistoliths in the Roadian Olistostrome Unit.

**Description:** Platform broadly arrow-like, covered with numerous pustulose small nodes that are partly fused to narrow, irregular, but generally longitudinal ridges or connected by elevated single rows of pustules.

Free blade very long, bearing up to 9 denticles decreasing in size posteriorly. Carina fused to a pustulose ridge that is in its anterior half often undulate, indicating the position of the fused denticles.

The flaring basal cavity comprises the entire lower surface of the platform.

**Occurrence:** Single thick calcarenite bank in the late Changxingian red part of the Claystone Unit of the Torrente San Calogero section and from Changxingian thick calcarenites intercalated with red claystones south of the Rupe del Passo di Burgio block.

**Remarks:** The platform sculpture of the Wuchiapingian to early Changxingian *Iranognathus tarazi* KOZUR, MOSTLER & RAHIMI-YAZD, 1975 and *I.*

*unicostatus* KOZUR, MOSTLER & RAHIMI-YAZD, 1975 consists of a few high and rather broad longitudinal ribs (one in *I. unicostatus* and two-three in *I. tarazi*).

The Early Permian *Iranognathus huecoensis* (RITTER, 1986) displays broad longitudinal ribs that may disintegrate into several large, high pustulose nodes. These latter representatives are similar to *I. sosioensis*, but their platform is suboval and the nodes are considerably larger and higher than in *I. sosioensis*.

#### 4. REMARKS ON THE PALAEOECOLOGY OF THE MIDDLE/LATE PERMIAN CONODONTS IN WESTERN SICILY

The Middle Permian pelagic conodont faunas of western Sicily consist exclusively of cold bottom-water faunas despite the fact that shallow-water faunas from

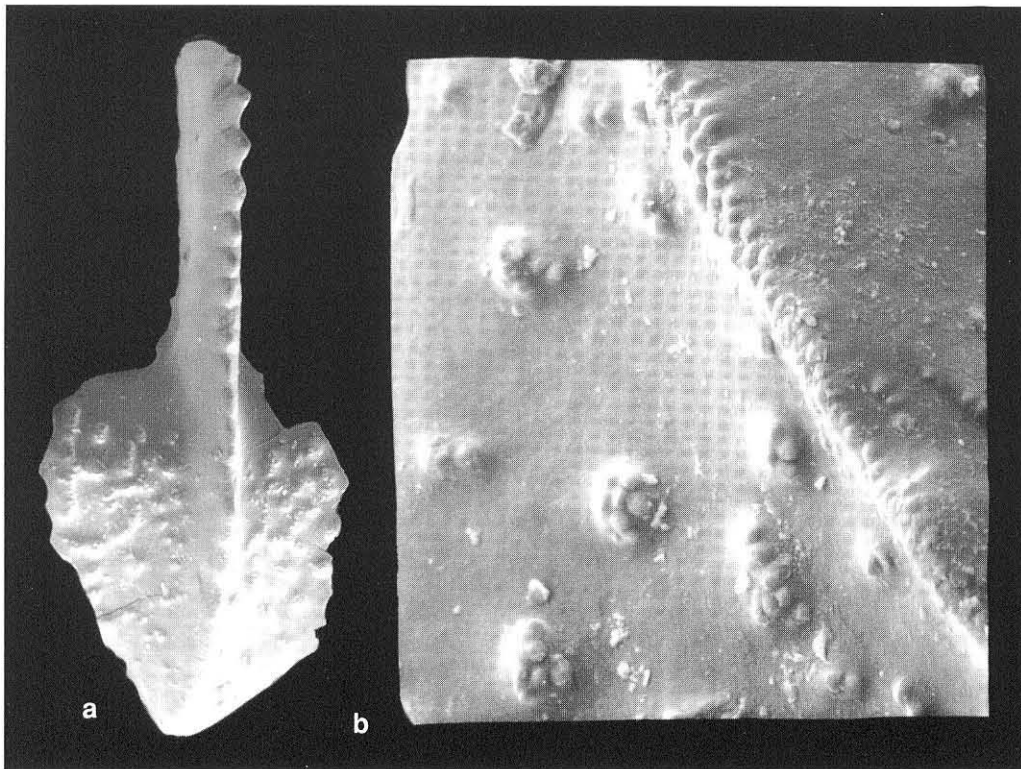


Fig. 2 *Iranognathus sosioensis* n.sp., upper view, Torrente San Calogero section, from the only thick calcarenite bed within red late Changxingian claystones, sample TSC 1/94; a) x100, b) detail of the pustulose nodes, x500.

adjacent shelves indicate a tropical climate. The existence of cold bottom-water conditions of an open sea environment at the margin of an ocean is also indicated by the presence of palaeopsychrospheric ostracod faunas (KOZUR, 1989c, 1991a, b). In the cold bottom-water conodont faunas serrated *Mesogondolella*, the decisive Guadalupian guideforms of pelagic warm water faunas, are missing. They are replaced by unserrated *Mesogondolella* of the *M. phosphoriensis* - *M. siciliensis* group. The exact correlations of these smooth *Mesogondolella* with the Middle Permian time

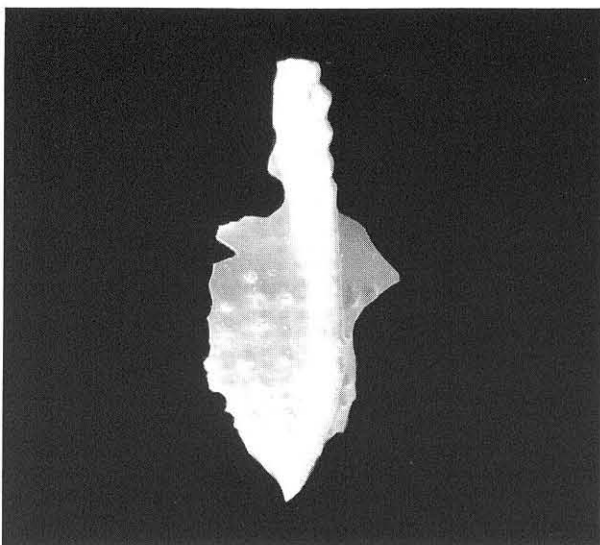


Fig. 3 *Iranognathus sosioensis* n.sp., upper view, Torrente San Calogero section, from the only thick calcarenite bed within red late Changxingian claystones, sample TSC 1/94; specimen with somewhat damaged cup, rep.-no. KoMo 13-2-95/II-18, x100.

scale is not yet known in detail, but the first appearance of the serrated *Mesogondolella*, *M. serrata* (CHING), at the base of the Guadalupian Series nearly coincides with the first appearance of *M. phosphoriensis* YOUNGQIST, HAWLEY & MILLER and related forms.

During the Changxingian, both pelagic cold bottom-water conodont faunas and pelagic warm water faunas are present in western Sicily. The cold bottom-water faunas characterise the basin and lower slope, the pelagic warm water faunas the upper slope. The Changxingian cold bottom-water fauna is characterized by common *C. cf. carinata* (CLARK), *C. changxingensis* (WANG & WANG) and *C. sosioensis* GULLO & KOZUR (only in the deep-basin facies) and a few *C. procerocarinata* KOZUR, *C. tulongensis* (TIAN) (only in the late Changxingian), *C. taylorae* (ORCHARD) and *Hindeodus typicalis* (SWEET). The pelagic warm water conodont fauna is characterized by *C. changxingensis*, *C. deflecta* (WANG & WANG), *C. dicerocarinata* (WANG & WANG), *C. postwangi* (TIAN), *C. subcarinata* (SWEET), *C. wangi* (DAI & ZHANG) and *C. xiangxiensis* (TIAN). Some species, like *C. changxingensis* (WANG & WANG) and *H. typicalis* occur both in cold water and warm water pelagic environments. The latter species is a dominant shallow-water conodont, but occurs subordinately also in pelagic deposits. The Changxingian pelagic cold (cool) water conodont fauna is very similar to the conodont fauna of the Boreal *Otoceras* Beds.

Wuchiapingian cool water faunas are known from the Salt Range, Kashmir and from eastern Greenland. The early Wuchiapingian conodont faunas are characterized by *Clarkina rosenkrantzi* (BENDER & STOP-

PEL) and its related forms, *Hindeodus typicalis* and in the peri-Gondwana faunas additionally by undescribed species of *Iranognathus* and *Vjalovognathus*. In the late Wuchiapingian with *Cyclolobus* (e.g. upper Zewan Formation of Kashmir and upper Chhidru Formation of the Salt Range) a low diversity conodont fauna is known which is similar to that of the Boreal *Otoceras* faunas. This fauna is dominated by *C. cf. carinata* and *H. typicalis*.

The Changxingian warm water conodont fauna of western Sicily corresponds to the typical Changxingian conodont faunas of South China (e.g. from the Changxingian stratotype at Meishan), Armenian and Azerbaidzhanian Transcaucasia (with the stratotype of the Dorashamian at Dorasham) as well as northwestern and central Iran.

In calcarenites (distal turbidites) pelagic cold and warm water faunas may occur together because of the transport of faunas from the upper slope into the basin. *Iranognathus sosioensis* n.sp. is only known from calcarenites. It co-occurs both with cold water conodont faunas (but not in the red deep-water clays without the input of slope material), with mixed cold and warm water conodont faunas and with warm water conodont faunas. Because calcarenites with cold bottom-water conodont faunas also contain sponge spicules and ostracods transported from the upper slope, it is not clear, whether *I. sosioensis* lived in the cold bottom-water or whether it is a transported element from the warm water conodont faunas. Perhaps this species lived both in cold bottom-water and in warm surface water, because *Iranognathus* is known both from the tropical Changxingian warm water conodont faunas and from peri-Gondwana cool-water faunas.

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