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FIRST RECORD OF ORDOVICIAN CONODONTS FROM SOUTHWESTERN SARDINIA

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Riassunto. Vengono segnalati e figurati per la prima volta conodonti ordoviciani nella Sardegna sud-occidentale che permettono una precisa collocazione stratigrafica dei livelli produttivi all'Ashgilliano inferiore-medio.

Abstract. A first illustration of Ordovician conodonts from Sardinia is briefly given. The assemblage, belonging to the HDS biofacies, indicates an early-middle Ashgillian age.

Conodonts are well known from Silurian, Devonian and Lower Carboniferous rocks of Sardinia, and numerous papers illustrating several assemblages and important new species have been published in recent years (see references in Olivieri & Serpagli, 1990).

Despite several attempts no Ordovician assemblages have been recovered to date and the few elements recorded by Helmcke & Koch (1974) from Sarrabus-Gerrei (SE Sardinia) give no ideas of the fauna and age either because not illustrated or because most of the elements are listed with dubious specific assignment or recognized only at a generic level. The difficulty to recover conodont elements from Ordovician sediments of Sardinia is certainly due to the lithology of the several formations, almost exclusively represented by terrigenous rocks (siltstones, sandstones, etc.), only sporadically interbedded with thin and discontinuous beds of biotritical limestones. However, ecological or biological incompatibility may be another important explanation of the lack of conodonts from most of the calcareous horizons not only in SW but also in SE Sardinia (i.e. Lago Mulargia area).

In the present paper a conodont fauna of Late Ordovician age is preliminary reported and illustrated, leaving to a further monographic contribution on the Upper Or-

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dovician conodonts from the marine sediments bordering the northern margin of Gondwana (Spain, Sardinia, Carnic Alps, Bohemia) all the descriptions and taxonomic remarks.

Four formations and six members have been recognized in the post-sardic Ordovician sequence of SW Sardinia, whose lithostratigraphy has recently been established by Leone et al. (1991) (Fig. 1). A fifth formation, more or less equivalent to the "Puddinga" of old authors, and three members, more or less equivalent to the subunits a1 (lower "Puddinga"), a2 (*Tariccoia* beds) and a3 (upper "Puddinga") of Hamman, Laske & Pillola (1990), will be introduced by Laske & Bechstädt (1991, in preparation). Such units replace and complete the informal ones (a-g) proposed by Coccozza & Leone (1977).

The conodont elements were recovered in one locality (Cannemenda) from an encrinitic limestones occurring towards the base of a red-brick horizon of calcareous shales (Punta S'Argiola Member of Domusnovas Formation). This level locally overlies the rich fossiliferous, greenish to dark-grey shales of the Portixeddu Formation unless a level of coarse sandstones ("Maciurru Member") is interposed in between, like near Domusnovas (Punta S'Argiola area). The encrinitic horizon, occurring in rare and thin beds, 7-15 cm thick, is usually about 100 cm thick (Cannemenda, M. Cortoghiana Becciu near Barbusi) but can be thicker (120-140 cm) elsewhere like in the excavations of

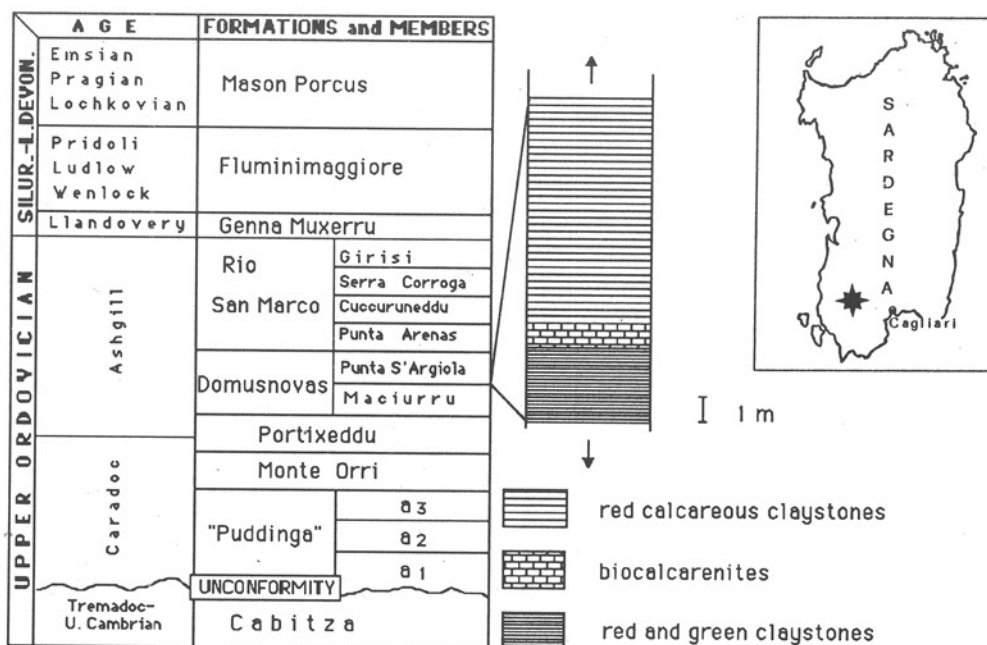


Fig. 1 - Location map and stratigraphic context of limestones yielding conodonts in SW Sardinia. Formal units based on Gnoli et al. (1990) and Leone et al. (1991), informal units ("Puddinga") based on old authors and Hamman et al. (1990).

the old abandoned Nanni Frau mine, east of Buggerru. However, in such locality about 20 km NW from Cannemenda, conodonts have not been found up to now from this horizon. The conodont-bearing limestones which can be referred to bioclastic wackestones, are rich in fragments of crinoids, trilobites, bryozoans, ostracods, gastropods, microsponges and brachiopods. Sometimes the crinoids are so abundant that the rock can be better defined as an encrinitic packstones. The rich fauna occurring in the Portixeddu and Domusnovas formations (Leone et al., 1991) and consisting mainly of brachiopods, bryozoans, cystoids and crinoids (trilobites, gastropods, conularids, cornulitids and solitary tetracorals are subordinate) indicates a not well defined late Caradocian-Ashgillian age.

The Ordovician sequence continues locally with volcanoclastic intercalations (Rio San Marco Formation: Punta Arenas Member) and ends with a thick rhythmic alternations of sandstones, siltstones and argillites with Tabd Bouma sequences and several current structures (Cuccuruneddu, Serra Corroga and Girisi members of Rio S. Marco Fm.). In all southwestern Sardinia a graptolitic black shale unit of Llandoveryan age, recently named Genna Muxerru Formation (Gnoli et al., 1990), conformably overlies the top of the post-sardic Ordovician sequence (Fig. 1) and characterizes the beginning of the Silurian sedimentation throughout the region.

The conodonts preliminary recovered and occurring with more or less complete apparatuses are the following (Pl. 1, 2):

- Amorphognathus ordovicicus* Branson & Mehl
- Dapsilodus mutatus* (Branson & Mehl)
- Hamarodus europaeus* (Serpagli)
- Icriodella* cf. *superba* Rhodes
- Eocarniodus gracilis* (Rhodes)
- Panderodus gracilis* (Branson & Mehl)
- Scabbardella altipes* (Henningsmoen), morphotype A
- Scabbardella altipes* (Henningsmoen), morphotype B
- Gamachignathus* sp.
- Walliserodus* sp.

In general, the various elements are not particularly well preserved, showing microfractures and obliterations as is common with conodonts from regions that have experienced major tectonic disturbances. This is also confirmed by the colour which corresponds to CAI 5. The assemblage, typical of the *Amorphognathus ordovicicus* zone, falls in the HDS (*Hamarodus europaeus*-*Dapsilodus mutatus*-*Scabbardella altipes*) biofacies (Sweet & Bergström, 1984) which has been recovered in several European localities (Baltoscandia, England, Wales, Carnic Alps) in the lower-middle part of the Ashgill. Although our data are at the moment still incomplete, the Sardinian late Ordovician conodonts seem to fit very well in the Mediterranean Province, whose cold-water character is widely accepted, being representative of the polar or subpolar region during Ashgillian time.

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PLATE 1

- Fig. 1-9 - *Amorphognathus ordovicicus* Branson & Mehl, 1933.
1-3) Upper and lateral view of Pa element; x 90.
4) Lateral view of Pb element; x 120.
5) Lateral view of M element; x 120.
6) Lateral view of Sd element; x 120.
7) Lateral view of Sa element; x 120.
8) Lateral view of Sb element; x 150.
9) Lateral view of Sc element; x 150.
- Fig. 10, 11 - *Panderodus gracilis* (Branson & Mehl, 1933).
10) Lateral view of compressiform element; x 60.
11) Lateral view of graciliform element; x 60.
- Fig. 12, 14 - *Scabbardella altipes* (Henningsmoen, 1948), morphotype B.
12) Lateral view of ac. element; x 45.
14) Lateral view of dr. element; x 65.
- Fig. 13 - *Scabbardella altipes* (Henningsmoen, 1948), morphotype A.
Lateral view of ac. element; x 45.

PLATE 2

- Fig. 1-6 - *Hamarodus europaens* (Serpagli, 1967).
1) Lateral view of Pa element; x 60.
2, 3) Lateral view of Pb element; x 60.
4) Lateral view of M element; x 60.
5) Lateral view of Sa element; x 125.
6) Lateral view of Sc element; x 80.
- Fig. 7-9 - *Icriodella* cf. *superba* Rhodes, 1953.
7, 8) Lateral and upper views of two Pa fragments; x 105 and x 135 respectively.
9) Lateral view of M element; x 90.
- Fig. 10, 11 - *Dapsilodus mutatus* (Branson & Mehl, 1933).
10) Lateral view of ds. element; x 65.
11) Lateral view of ds. element; x 130.
- Fig. 12 - *Gamachignathus* sp. Lateral view of Pa element; x 110.
- Fig. 13, 14 - *Eocarniodus gracilis* (Rhodes, 1955). Lateral view of two elements; x 125.



