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General palaeontology (Biostratigraphy)

First record of Devonian orthoceratid-bearing limestones in southern Calabria (Italy)

Pilar Navas-Parejo [a,*], Roberta Somma [b], Agustín Martín-Algarra [a], Vincenzo Perrone [c], Rosario Rodríguez-Cañero [a]

[a] *Departamento de Estratigrafia y Paleontologia, Universidad de Granada, Campus de Fuentenueva, 18071 Granada, Spain*
[b] *Dipartimento di Scienze degli Alimenti e dell'Ambiente, Sezione Scienze della Terra, Università di Messina, 98166 Sant'Agata, Italy*
[c] *Istituto di Scienze della Terra, Università di Urbino, Campus Scientifico Località Crocicchia, 61029 Urbino, Italy*

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Abstract

Lower to Middle Devonian orthoceratid-bearing nodular limestones in Calabria are described here for the first time, along the Fiumara Assi section. The succession is tectonically inverted and has been dated by conodonts. The lower beds are Lochkovian–Lower Pragian, because they provided *Icriodus* cf. *steinachensis* and *Pelekysgnathus serratus*, which occur in the delta-sulcatus Zones. Upwards appear *Polygnathus* cf. *dehiscens*, corresponding to the dehiscens-gronbergi Zones, and *Ozarkodina* cf. *steinhornensis miae* of the dehiscens-inversus Zones, both indicating a topmost Pragian–Lower Emsian age. The Eifelian (or younger) age for the top of the succession is demonstrated by *Polygnathus linguiformis linguiformis*. This succession, as well as similar coeval deposits of the southern Variscan Chain (southwestern Sardinia, eastern Pyrenees), Betic–Rifian Maláguides-Ghomarides and southern Alps, made part of a western embayment of the Palaeotethys. ***To cite this article: P. Navas-Parejo et al., C. R. Palevol 8 (2009).***

Résumé

Présence de calcaires à orthoceratidés du Dévonien en Calabre méridionale (Italie). Le Dévonien inférieur et moyen à faciès de calcaires noduleux à orthoceratidés a été trouvé pour la première fois en Calabre, dans la coupe de la Fiumara Assi. La succession est renversée (tectonique varisque) et a été datée par des conodontes. La base de la succession est Lochkovien–Pragien inférieur, datée par *Icriodus* cf. *steinachensis* et *Pelekysgnathus* gr. *serratus*, appartenant aux zones delta-sulcatus. Les niveaux successifs, à *Polygnathus* cf. *dehiscens*, correspondant aux zones dehiscens-gronbergi et *Ozarkodina* cf. *steinhornensis miae* des zones dehiscens-inversus, indiquent un âge Pragien–Emsien. L'âge Eifelien (ou éventuellement plus jeune) de la partie supérieure de la coupe est démontrée par *Polygnathus linguiformis linguiformis*. Cette succession, comporte des dépôts comparables à ceux de la Chaîne varisque méridionale (Sardaigne sudoccidentale, Pyrénées orientales), des Malaguides-Ghomarides béticorifaines et des Alpes méridionales et faisait partie de la terminaison occidentale de la Paléotethys. ***Pour citer cet article : P. Navas-Parejo et al., C. R. Palevol 8 (2009).***

Keywords: Stratigraphy; Conodonts; Palaeozoic; Stilo Unit; Calabria–Peloritani Terrane; Italy

Mots clés : Stratigraphie ; Conodontes ; Paléozoïque ; Unité de Stilo ; Terrane Calabro-Péloritain ; Italie

* Corresponding author.
E-mail address: png@ugr.es (P. Navas-Parejo).

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1. Introduction

Orthoceratid limestones are typical facies of the Silurian and Early Devonian North-Gondwanic margins. In the Mediterranean Alpine Belts of southern Europe and North Africa these facies have been widely recognised: from the Pyrenees [12,28] to the Alps [29,30], from the Gibraltar Arc [23,27] to the northern Apennines [8,34], and also in Sardinia [15,16]. However, until now, such facies had never been seen in Calabria. In this article the presence of Lower to Middle Devonian orthoceratid-bearing limestones is reported for the first time in the basement of the Stilo Unit of southern Calabria. This is also the first record of Lowermost Devonian deposits, well dated by conodonts, in the Calabria–Peloritani Terrane (CPT). This opens new perspectives to the understanding of the complex Palaeozoic history of the perimediterranean Alpine areas.

2. Geological setting and previous studies on Calabrian Palaeozoic successions

The Calabria–Peloritani Arc, or Terrane [4], is an arc-shaped orogenic belt connecting the Apennine and the Maghrebian Chain. It is characterised by Alpine continental crust nappes which thrust over H-P ophiolite-bearing thrust sheets, these latter originating from the central-western Tethys. In the CPT, two sectors, characterised by different nappe architecture and Alpine tectonic evolution, have been recognised [3,4]. The southern sector of the CPT is formed only by continental crust nappes and slices, which override the Maghrebian Monte Soro Unit. The highest tectonic unit of this sector is the Stilo Unit. The nappe stack was established, and underwent a very rapid exhumation and erosion, in the Aquitanian–Early Burdigalian. This orogenic evolution is testified to the Aquitanian terrains involved in the nappe stack, and to the Burdigalian Stilo-Capo d'Orlando Formation (Fm.), sealing the nappes (Fig. 1A) [5].

The nappes are characterised by pre-Triassic basements, made up of both metamorphic and plutonic rocks, and by Meso-Cenozoic covers. In these basements, fossiliferous beds are very scarce, and the knowledge of the stratigraphic features of the successions is scanty and poorly defined. Consequently, different tectonosedimentary reconstructions have been proposed for these fragments of the Variscan orogeny involved in the Alpine Chains. In particular, the location of the CPT basements in the Variscan Chains of the central-western Mediterranean area is subject of debate [1,32].

In the 1970s, studies on the pre-Alpine basements of the CPT showed the only presence of Middle-Upper Devonian dacryoconarids and conodonts in metacalcareous lenses of both Stilo and Longi-Taormina Units [2,9,14,20]. Later, successions starting in the Cambro-Ordovician and ending with Carboniferous Culm facies were recognised in the Sila, Stilo and Longi-Taormina Units [6,7,21,22]. However, only Cambro-Ordovician and Middle-Upper Devonian layers have been dated by means of a very few specimens of acritarchs and conodonts, respectively. Consequently, the reconstructed successions and their ages are questionable because they are based mainly on facies similarities and/or field characters of volcanics occurring in them (see discussion in Spalletta and Vai [32]).

3. Stratigraphy of the Stilo Unit

The Stilo Unit is the highest thrust-sheet of the Calabrian nappe stack and crops out only in southern Calabria. It consists of both a pre-Alpine basement and a Meso-Cenozoic cover, this latter severely reduced by erosion (Fig. 1A). The basement is made up of Variscan metamorphites in which a gradual transition from amphibolite facies to greenschist facies is recognisable [3]. The low-grade metamorphites consist mainly of phyllites and metarenites, with minor metabasites, metalimestones and black cherts. The metamorphites are intruded upon by Late-Variscan calc-alkaline plutonic rocks. The sedimentary cover starts with continental redbeds a few metres thick, followed by Upper Triassic?–Lower Jurassic? dolostones and limestones. The succession continues up to the Jurassic–Cretaceous boundary with platform facies, consisting of limestones and calcareous breccias, with frequent lacunae marked by bauxitic clay layers. Upper Cretaceous–Eocene marine rocks have never been documented. The Earliest Oligocene is represented by marsh marls, marly limestones and algal limestones, followed by a layer of red clays and by Upper Rupelian–Chattian calcarenites and calcareous breccias with *Lepidocyclina*, rich in metamorphic and granitoid clasts fed by the underlying basement. The succession ends with a few metres of Aquitanian turbiditic sandstones. Alpine metamorphism is lacking, and the whole succession is unconformably covered by the Stilo-Capo d'Orlando Fm.

The Palaeozoic low-grade metamorphic succession widely outcrops in the Stilo-Bivongi area, along the Fiumara (stream) Stilaro and its tributaries, Pardalá and Crocco, where it constitutes the so-called Bivongi series [7,21], in which six main lithostratigraphic units have been distinguished. The lowest layers are represented by