

An upper Viséan (Asbian-Brigantian) coral succession at Djebel Ouarkiz (northern Tindouf Basin, Morocco)

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The Tindouf Basin is a large syncline which crosses the border between NW Algeria and S Morocco, south of the Anti-Atlas Mountains. Four formations have been distinguished in the Carboniferous succession in southern Morocco (CONRAD 1972; CONRAD in WAGNER et al. 1985): Djebel Tazout Sandstones, Betaina Formation, Djebel Ouarkiz Formation and Betana Beds.

The Djebel Ouarkiz Formation is composed mainly of shales with interbedded limestones, dolomites and thin sandstone beds. It has been dated as upper Viséan-Serpukhovian by means of foraminifers (MAMET et al. 1966). Although some of the limestone beds are quite thin (less than 1 m in some cases), they are very persistent and can be followed along strike East-West for tens of kilometres. We have identified 19 limestone beds in two main sections; one logged along the road from Assa to Zag (Fig. 1), and the other in the Tisguiz-Rems Valley, 15 km to the east.

The first coral beds occur in the upper part of the Betaina Formation, which is mainly siliciclastic, but shows some thin marly beds in its upper part. Those marly beds provided large in situ colonies of *Siphonodendron* sp. (-A coral bed, Fig. 2). This species shows similar dimensions to *S. irregulare*, but the number of major septa is similar to *S. sociale*. Near the top of the Betaina Formation, several beds containing corals have been identified (coral beds A-D). The coral assemblage here is dominated by *Siphonodendron martini* and *S. sociale*. The next assemblages are more diverse, containing both solitary (*Axophyllum* sp. and *Palaeosmia* *murchisoni*) and colonial corals (*Siphonodendron martini* and syringoporoids, coral beds E and F).

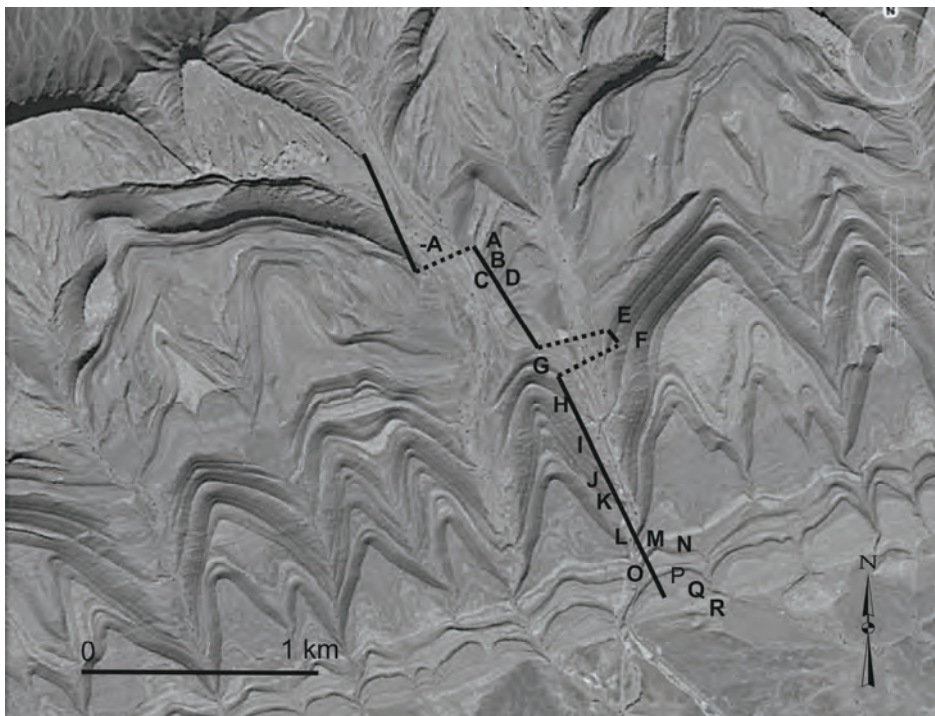


Fig. 1: Location of limestone/coral beds (A-R) in the section along the road from Assa (northwards) to Zag (southwards).

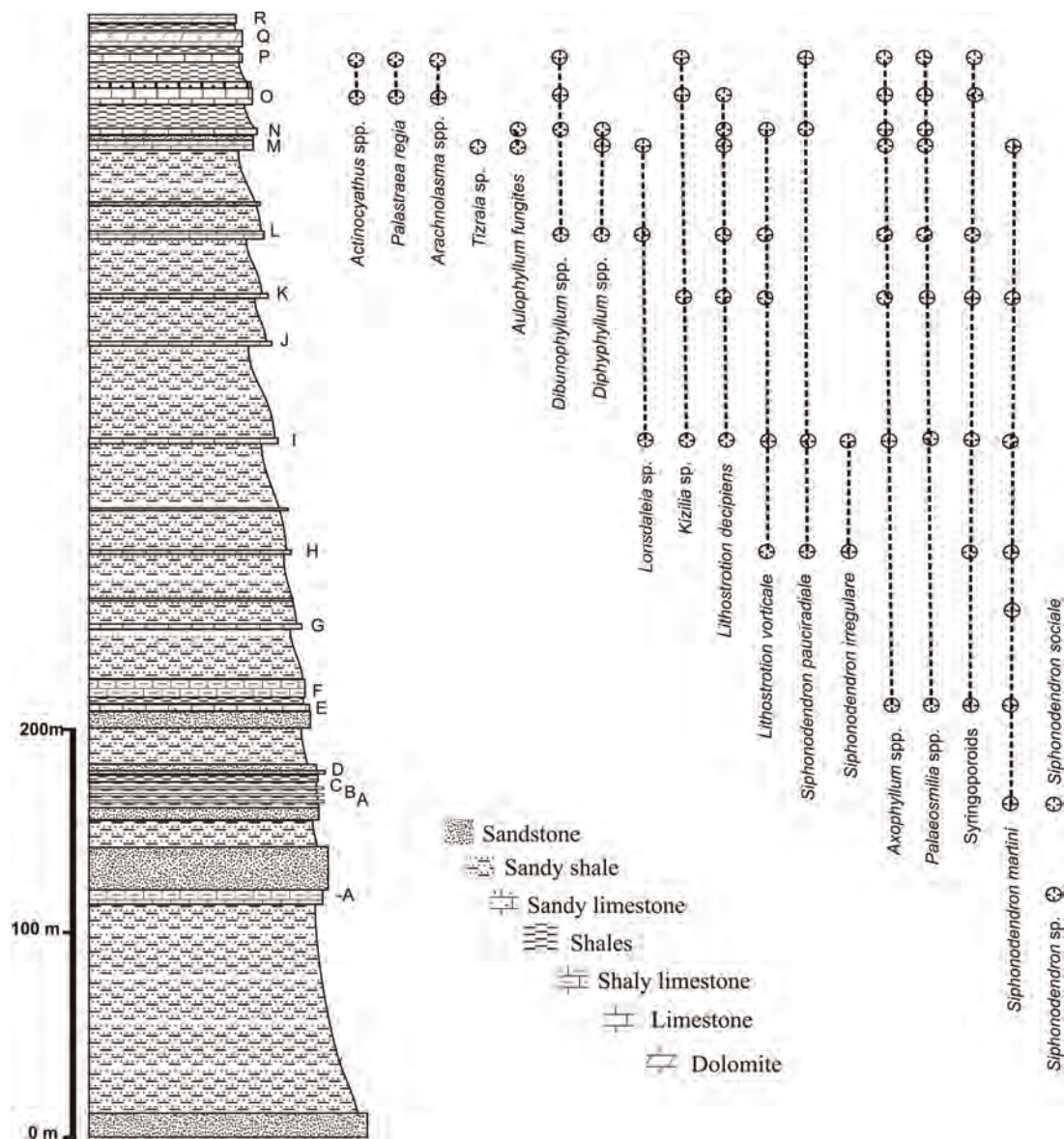


Fig. 2: Coral distribution in the section along the road from Assa to Zag.

Coral bed H shows a diversification of colonial corals with the first occurrence of *Siphonodendron pauciradiale*, *S. irregulare* and *Lithostrotion vorticale*. Diversification increases significantly in the next coral bed (I), where also *Lithostrotion decipiens*, *Lonsdaleia* sp. and *Kizilia* sp. have been recorded. A similar assemblage was recorded in coral bed K, whereas only fragmentary unidentifiable corals have been recorded in the oolitic limestone, bed J. First occurrences of *Diphyphyllum* spp. and *Dibunophyllum* spp. are recorded in coral bed L.

Coral beds M and N show the first occurrences of *Tizraia* sp. and *Aulophyllum fungites* and the last occurrences of *Diphyphyllum* spp., *Siphonodendron martini*, *Lonsdaleia* sp. and *Lithostrotion vorticale*. This part of the section shows important silicifications and corals show usually well preserved external morphology, but almost complete destruction of the microstructure. Coral beds O and P show new occurrences of *Palastraea regia*, *Arachnolasma* spp. and *Actinocyathus* spp. Corals are absent in limestone beds Q and R, which show pervasive dolomitization.

The coral assemblages from Djebel Ouarkziz Formation show some peculiarities:

- 1) Occurrence of a new species of *Siphonodendron* in the lowest coral bed.
- 2) Increasing diversity, that reaches its maximum in the coral beds M to P.

3) Occurrence of the genera *Lonsdaleia* and *Actinocyathus* that have never been recorded in the northern basins from Morocco or in Sierra Morena (SW Spain) (SAID et al. 2007; ARETZ 2010).

4) Abundance of the genus *Kizilia* in Viséan beds. This genus is common in the Serpukhovian, but has been rarely recorded in the Upper Viséan (POTY 1981).

5) Late occurrence of the genus *Tizraia*, which is common in the lower Brigantian from the Azrou-Khenifra Basin (SAID et al. 2007; RODRÍGUEZ et al. 2010), but in the Tindouf Basin occurs first in the late Brigantian.

The differences with assemblages from Northern Morocco and SW Spain could be explained by palaeogeography, but assemblages from Djebel Ouarkiz Formation show higher similarities with those from NW Europe (POTY 1981; MITCHELL 1989; ARETZ 2002; RODRÍGUEZ & SOMERVILLE 2007). Alternatively, the differences in the assemblages could be explained by ecologic factors; the succession in the Djebel Ouarkiz Formation shows some similarities with the successions described from the Brigantian in the British Isles (main intervals of shales with limestone intercalations), but are very different from the successions in SW Spain (CÓZAR & RODRÍGUEZ 1999) and North Morocco (SAID et al. 2007; ARETZ & HERBIG 2008; ARETZ 2010), where the formations contain large mud mounds.

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