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GENERAL INTRODUCTION AND STRATIGRAPHY

by F. Allemann

The present study is part of a Swiss National Funds research project (F.A.) on problems of the Lower Cretaceous stratigraphy in the western Mediterranean area. In a first series of articles ,the Berriasian stratigraphy is dealt with. In one of the papers by F. ALLEMANN, J. WIEDMANN & W. GRÜN (in press), the stratigraphic ranges of calpionellids (F.A.), ammonites (J.W.) and calcareous nannoplankton (W.G.) are discussed.

The present article comprises the systematic paleontology of the calcareous nannoplankton (W.G.) from one of the Berriasian sections (Miravetes section). A short introduction to the general stratigraphic setting and to the calpionellid and ammonite zonation of the Miravetes section is given. The estimated bathymetry of the Miravetes sediments and correlation of faunal zones with Berriasian sections in SE-France are shown on Fig. 1 (F.A.). Additional geological data on the Caravaca region are given in VAN VEEN (1969).

The Miravetes section is composed of three parts (Fig. 1). The lower part (*A*) covers the Upper Tithonian – Lower Berriasian and was sampled in the Barranco de Tollo. The middle part (*B*) comprises the Middle – Upper Berriasian. It is well exposed in an unnamed gully some 300 m west of *A*. The upper part of the section (*C*), covering the Upper Berriasian – Lower Valanginian interval, crops out in a hilly region some 150 m west of the top of *B*.

The sections *B* and *C* are easily correlatable by a 17 m thick marl bed. Because of the lack of a marker bed, the correlation between *A* and *B* is based on dip measurements. Slight faulting near the samples All. 71139–71143, however, makes this correlation somewhat unreliable. When correlated faunistically and by lithological indications, there would be no overlap of *A* and *B*. The total thickness of the Berriasian section at Miravetes would then amount to about 260 m, instead of 220 m as drawn on Fig. 1.

Among the Berriasian sections in pelagic basinal carbonate facies of the Mediterranean area, the Miravetes section belongs to the thickest ones (for example the sections in Tunisia, Sicily, N-Italy, SE-France, Swiss Prealps are less than 100 m thick and only a few are up to 200 m).

The Miravetes Berriasian sediments consist of a regular alternation of 20–60 cm thick micritic limestones and marls (calcareous shales). The marls are of equal bedding in the lower part. They become thicker (mostly over 100 cm) in the upper half of the section. In the upper third part, a 17 m thick marl bed, mentioned above, serves as a marker in the otherwise hardly subdividable monotony. Within the Lower Valanginian, the thickness of the marls increases rapidly and the limestones become more marly.

On the whole the section represents a continuous sequence of low energy sediments. Both limestones and marls are chiefly composed of more or less recrystallized nannofossils and their fragments, mostly *Nannoconus colomi*.

The Berriasian sediments of the Miravetes section have been deposited in a quiet basinal pelagic environment (Fig. 1). With the exception of a single limestone bed showing slump phenomena, there is no other evidence for disturbance of the bedding. Throughout the section, no sharp lithological break occurs and no sand and silt-

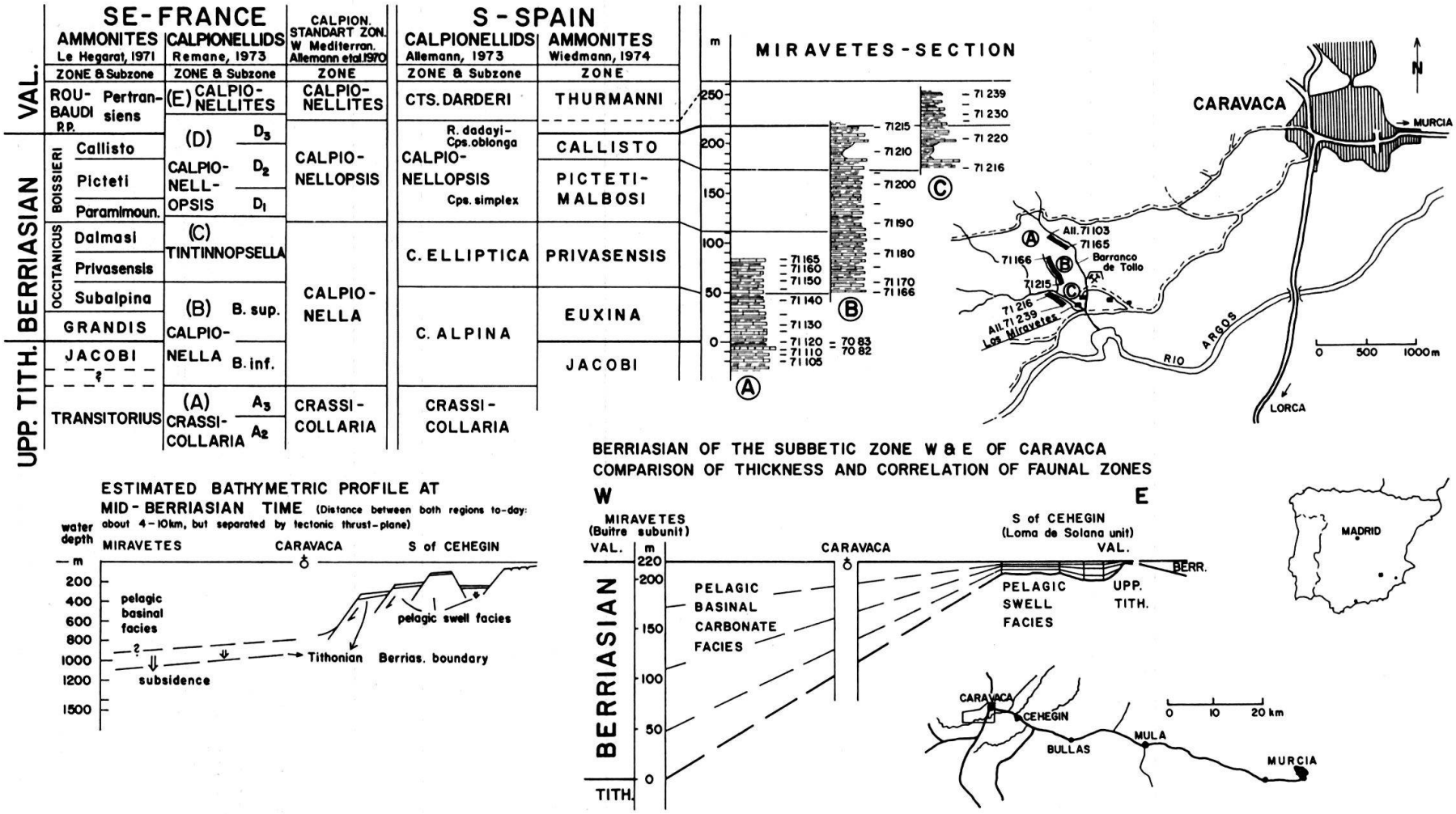

Fig. 1. Faunal and stratigraphic correlation, and bathymetric interpretation of the Miravetes section.

sized detrital material is found. The sediments are further characterized by the absence of nodular bedding and absence of chert.

The Miravetes section thus contrasts with the 0.5–20 m thick Berriasian sections in the area S of Cehegin (Fig. 1). These show many nodular beds, small stratigraphic gaps and disclose a reduced sedimentation rate. In cases, chert layers and nodules are present. In most instances, macrofossils are abundant (ammonites, belemnites, echinids, brachipods, lamellibranchs). The bathymetric interpretation of this swell facies as well as of the basinal facies at Miravetes is drawn schematically on Fig. 1. It will be discussed in a forthcoming paper.

Fauna and zonation of the Miravetes section: Ammonites are found abundantly throughout. A great number of specimens from stratigraphically unimportant species is found. Index ammonites are rare and frequently deformed. According to the results of J. Wiedmann (Tübingen), the zonal boundaries are, therefore, not very reliable. The ammonite zonation also differs from the one established by LE HÉGARAT (1973) in SE-France. The Berriasian of the two regions cannot be correlated directly with the help of ammonites only.

Determinable calpionellids, although rather rarely, occur in each thin-sectioned sample of the Miravetes section. This low frequency of calpionellids per thin-section contrasts with the extreme abundance and excellent preservation of calpionellids in the swell facies S of Cehegin. However, even in the Miravetes section, calpionellids are found consistently enough to place any sample in its proper zone. Considering the great thickness and monotonous facies of the Miravetes sequence, its calpionellid stratigraphy is of utmost importance for checking the zonation gained from the reduced sections of the swell facies. It is of equal importance for interregional zonal correlation. At present, the calpionellid zonation is apparently more reliable than the one based on ammonites or any orther fossil group for interregional correlation of Berriasian basinal sediments. This is especially true for the correlation with the well known sections in SE-France (Fig. 1).

On the basis of 220 m total thickness of the Berriasian section at Miravetes and a time span of approximately 6 m.y. for the Berriasian stage, an average sedimentation rate of 36 m/m.y. results. Considering a possible total thickness of 260 m, the rate would amount to 43 m/m.y.

SYSTEMATIC NANNOFOSSIL PALEONTOLOGY

by W. Grün

Introduction

One of the Berriasian sections SW of Caravaca has yielded a relatively rich Nannoflora. From the 220 meters of the Miravetes section (Fig. 2), 154 samples were collected. Nannofossils from these samples have been studied by light and electron microscopy. In addition to *Nannoconus colomi*, which is found throughout the section, 33 coccolithophorid species are recognised. 13 of these occur in strata older than those represented in this section. It is uncertain whether *Micrantholithus crenulatus* occurs as early as the Jurassic. THIERSTEIN in 1972, reported the first occurrence of *Micrantholithus hoschulzi* (= *M. crenulatus*) as upper Tithonian; in 1973 he gives it an upper