Sedimentology and Diagenesis of the El Desastre unit, Los Banos Formation (upper Miocene) on El Jamon ridge, Fortuna Basin, Spain

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The study described in this paper started with extensive field work during the month of June 1989 near the resort village of Banos de Fortuna in southeastern Spain and is being completed as part of a senior thesis at Pomona College. The main focus of the study is general description of the El Desastre unit of the Los Banos Formation (upper Miocene) on a ridge we referred to as "El Jamon", with special attention to its sedimentology and diagenesis. The ridge is located about eight kilometers northwest of the town of Fortuna, and has a general north-south trend with western facing cliff exposures. Field study was conducted with a field partner and consisted of measuring four detailed stratigraphic sections in accessible areas on the scarp face. Samples were analyzed by X-ray diffraction and thin section petrography to determine facies and the diagenetic history of the coral limestones found along the length of the cliff face. Reconnaissance was conducted with an aerial photograph of the region and the data was later transferred to detailed sketches and photographs of the ridge face. The geologic map of the area published by the Instituto Geologico y Minero de Espana identifies the ridge as sandstones, conglomerates, and bioclastic limestones. Santisteban (1981) first described the ridge as consisting of reef slope sediments. In contrast, the paleodepositional environments we found are a patch reef with back and fore reef facies.

The El Desastre unit unconformably overlies Mesozoic deep water deposits. In all cases of exposure of the basement rock at the base of the the cliff face, the overlying bed is a carbonate pebble rudstone. The majority of the clasts in this rudstone are similar in composition to the basement. Above this basal rudstone there are four main rock types along the ridge: 1) buff, foraminiferal wackestones, 2) yellow and tan, bioclastic floatstones and rudstones, 3) coral limestones whose matrix consists of the lithologies described in either 1) or 2), and 4) carbonate pebble bioclastic floatstones and rudstones. All of the aragonite of the corals and shells has been replaced by sparry,

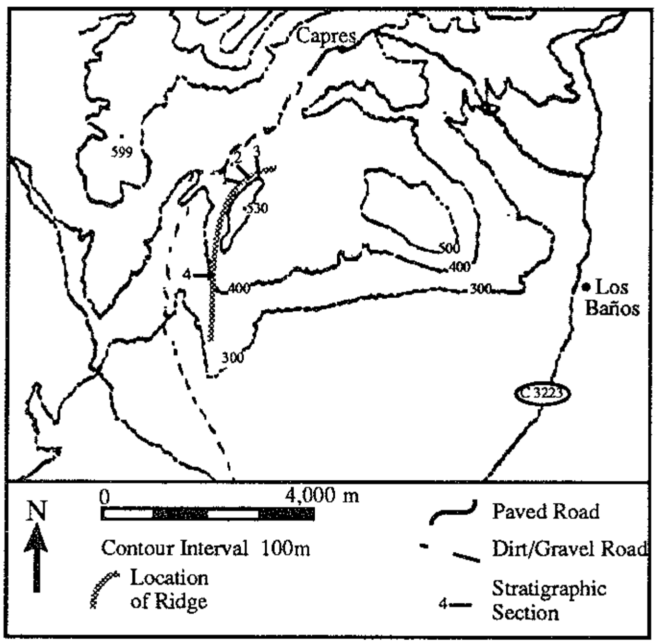


Fig.1: Topographic sketch map of study location. (after Mankiewicz, 1987)

equant calcite. Vuggy and moldic porosity dominate but account for less than 5% of the bulk volume. Sections 1, 2, and 3 were measured at the northernmost end of the study area and record a sequence of beds (Fig. 2b) very similar to that of Mankiewicz's measured section 12 (1987). Section 4 was measured at the southern end of the ridge (Fig.

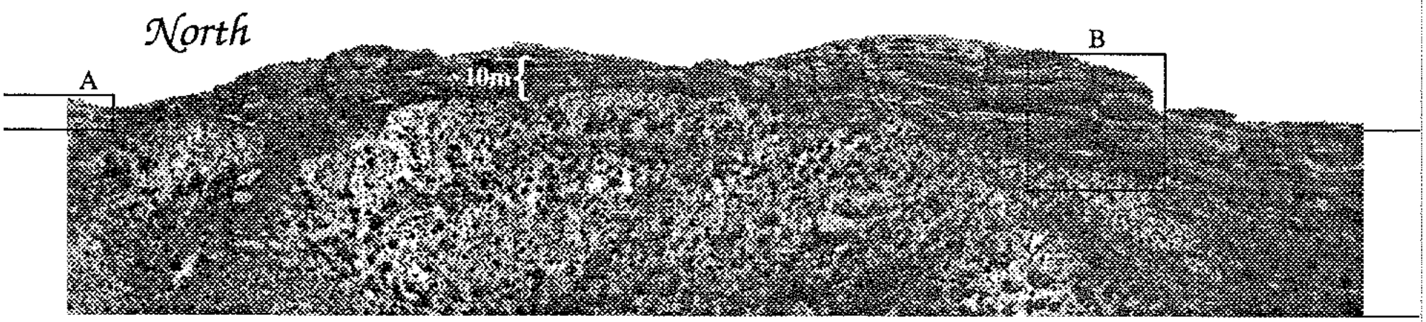


Fig.2a: Digitized photographic mosaic of El Jamon Ridge. Length of ridge is ~0.75 km. The view is to the east. Outlined areas A and B are described below. Areas D and E are described on facing page.

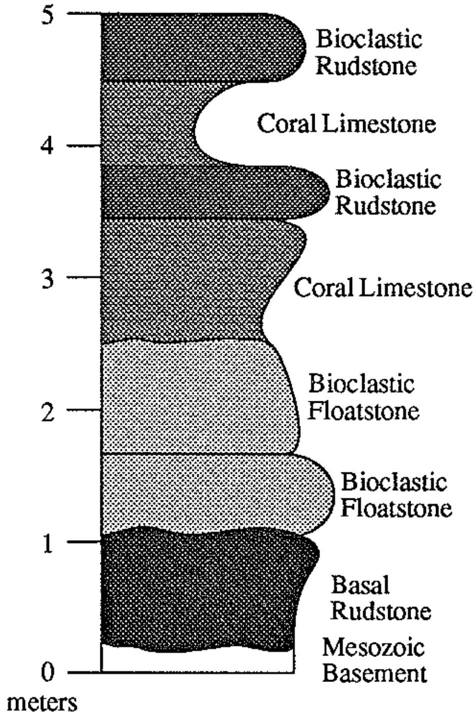


Fig.2b: Generalized schematic diagram of measured section I at locality A, whose southernmost extent is shown in outlined area A. All measured sections of locality A are found beyond the northern limit of Fig.2a. Due to the thinness of the exposure, enlargements of those areas of the ridge did not reproduce well.

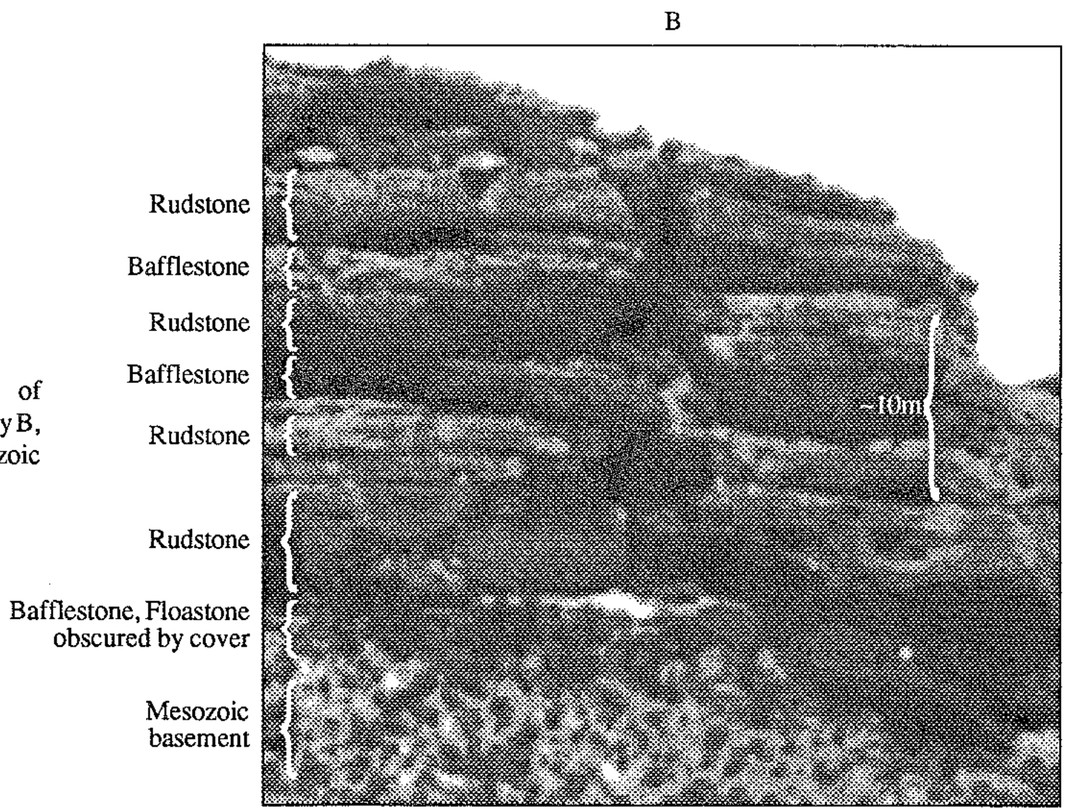
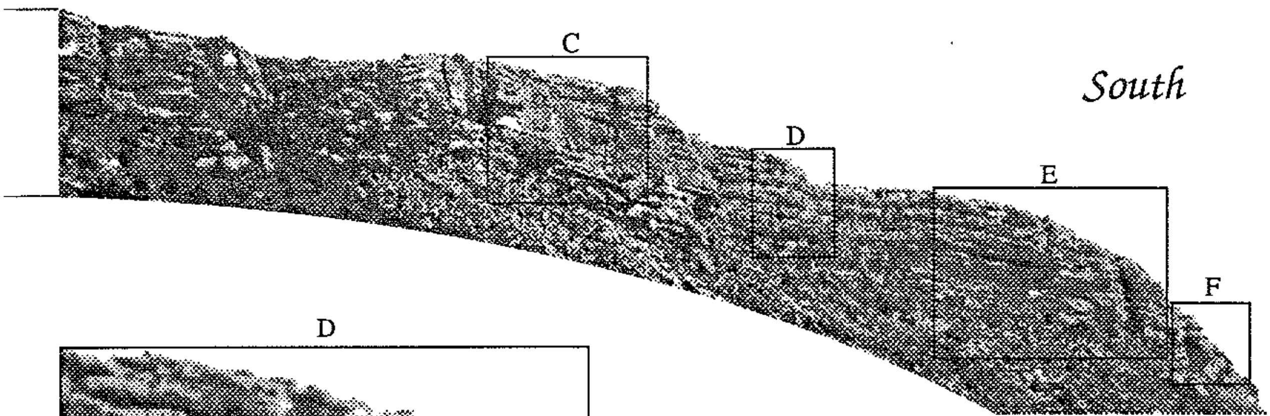


Fig.2c: Enlargement of outlined area B, locality B, above area of Mesozoic basement dropoff.



D

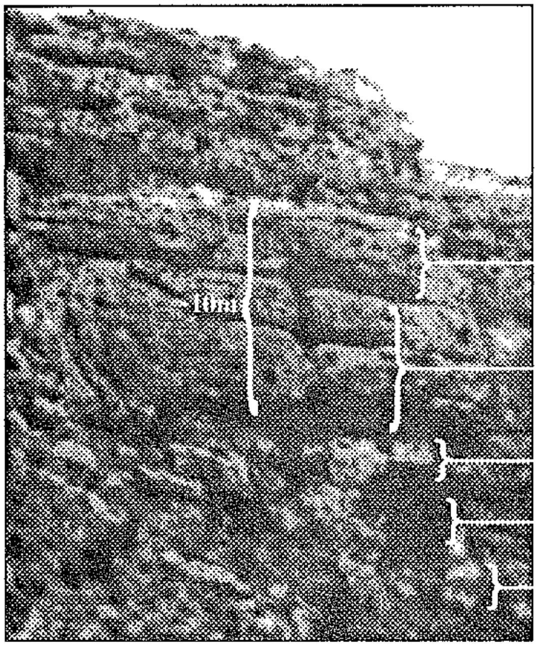


Fig.2d: Enlargement of outlined area D, locality D. The upper portions of the cliff were inaccessible.

E

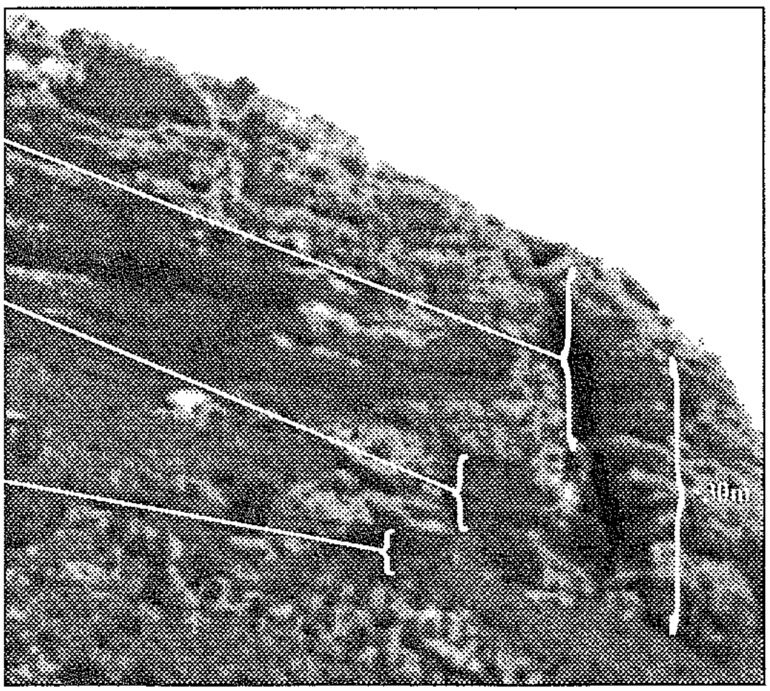


Fig.2e: Enlargement of outlined area E, locality E, showing measured section 4.

2e) and includes a thick section of Tarbellastraea and Porites bafflestones. I have chosen six repesentative localities of differing facies relationships from north to south and labeled them A-F. Their locations are shown in Figure 2a and their facial sequences are described below. The northernmost locality is A, part of which is represented by outlined area A in Fig. 2a. It includes sections 1 (see Fig. 2b) and Mankiewicz's section and is typified by an ascending sequence as follows : Mesozoic basement; basal rudstone; buff, foraminiferal wackestones or tan, bioclastic floatstones; and a coral limestone. South of Mankiewicz's section the basement drops off in elevation rapidly and is next exposed at the bottom of the cliff face at the southernmost end of the study area. Figure 2c is an enlargement of locality B, the area overlying the basement dropoff, where thick alternations of carbonate pebble rudstones and coral bafflestones constitute the sequence. The latter are considered to be in-place patch reefs if a large number of vertically oriented Porites or Tarbellastraea branches are found in the bed. Locality C, located in outlined area C of Fig. 2a, contains a general ascending sequence of the following: channelized floatstones; carbonate pebble bioclastic rudstones; and coral bafflestones. North of measured section 4 are sequences of thick, interbedded fine floatstones and coral bafflestones, whereas the measured section includes the following from the base up: carbonate pebble rudstones; bioclastic floatstones and rudstones; and coral bafflestones with lenses of rudstone and floatstone. These are localities D and E, respectively, and are shown in Fig. 2a by outlined areas D and E (see Fig. 2d and 2e for enlargements). Locality F (Fig. 2a) is at the southernmost occurrence of the bafflestones, where the beds below and above the bafflestones are rudstones and floatstones with coral and red coralline algal fragments as their major constituents. These rock types dominate the cliff face to the southernmost extent of the study area.

The geology of the ridge represents a patch reef and its associated environments affected by incursions of clastic carbonate material. The basal rudstone was deposited on top of an erosional surface and the overlying beds were deposited with a rise of sea level. Patch reefs in association with fan deltas have been reported by Martin (1989) in the Tortonian strata of nearby Neogene basins. The relationships of the bafflestones and rudstones at localities B and C are similar to that of small patch reefs growing in association with conglomeratic wedges of a carbonate fan. The carbonate matrix of the patch reef at locality E and the back and fore reef environments in localities D and F probably were deposited quickly and could include distal deposits of a carbonate fan. Locality A contains corals that are of a laminar morphology, which has not been defined as in situ. The 1-2 meter average thickness of individual bafflestone layers suggests that the depth of the living surface of the corals was never greater than a few meters.

The diagenetic textures of these rocks reflect marine phreatic and meteoric phreatic conditions with fresh-water vadose textures superimposed on them. The secondary porosity is produced by solution in the vadose zone.

Instituto Geologico y Minero de Espana, 1973, Mapa Geologico de Espana. Escala 1:50.000. Fortuna (892). Servicio de Publicaciones - Ministerio de Industria y Energia, Madrid .

Mankiewicz, C., 1987, Sedimentology and calcareous algal paleoecology of middle and upper Miocene reef complexes, near Fortuna (Murcia Province) and Nijar (Almeria Province), southeastern Spain [Ph.D. thesis]: Madison, Univ. of Wisconsin, 341 p.

Martin, J. M., Braga, J. C., and Rivas, P., 1989, Coral successions in Upper Tortonian reefs in SE Spain. Lethaia, v. 22, p. 271- 286.

Santisteban, C., 1981, Petrologia y sedimentologia de los materiales del Mioceno superior de la cuenca de Fortuna (Murcia), a la luz de la 'Teoria de la Crisis de Salinidad'. Thesis, PhD, Barcelona Univ.