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Contributions to the geology of Algarve, Portugal

I – The miocene facies of Olhos de Agua

BY

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The Faculty of Science of Lisbon and the Center of Geology of the University of Lisbon have developed some work in applied geology specially in central and eastern parts of Algarve, South of Portugal, since 1975. In many cases there was a need for detailed lithostratigraphic mapping, because if there are geological maps on 1/50.000 scale for the west side of Algarve, in the east side the only geological information available comes from a geological map on the 1/500.000 scale and a sketch on 1/100.000.

Such maps are inadequate for the studies under course, specially the hidrogeological ones. That is why much of the field had to be done and simultaneously was paid great attention to the classical geological problems.

Although the program under execution is pointed to another direction, it is important to call the attention for some stratigraphic and other important problems which were not expected.

The only Miocene rocks known for many years in Central and Western Algarve have been assigned Helvetian (CHOFFAT, 1950), although without much support of detailed paleontological studies.

Those so called Helvetian rocks are marine limestones which form a kind of platform about 40 to 50 metres high and a few kilometres wide and can be followed from Porto de Moz beach where they contact unconformably with Cretaceous rocks to Olhos de Agua beach, near Albufeira.

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The Helvetian marine limestones are very much alike but the lithology is heterogeneous at some places. They are locally rich in terrigenous material and in some levels the fossils are abundant forming a coniferous limestone, other levels being highly silty.

The Miocene limestones have a uniform stratification in general dipping SE and are gently folded. The continuity of the outcrop is only interrupted in some places by deposited material, obviously younger, due to erosion, sedimentation and perhaps to tectonism.

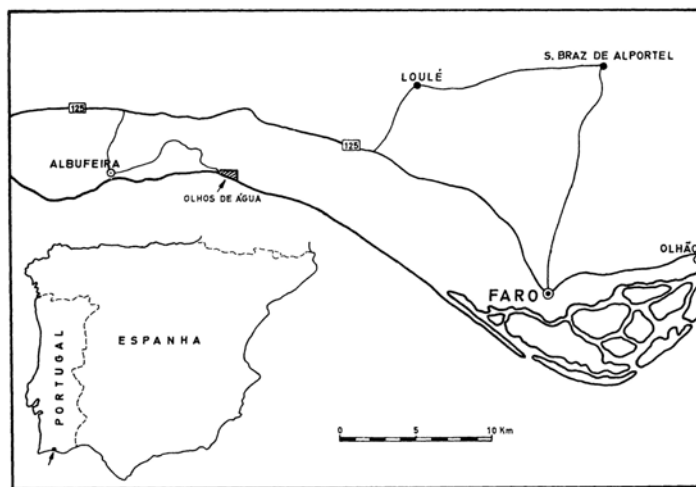


Fig. 1 – Geographical references.

Ocasionaly some minor gravitic faults can be recorded.

In spite of very few bibliographic references it is generally known that so called Helvetian limestones have been deeply affected by karstification.

Plio-Pleistocene argillaceous sandstones filled and preserved many karstic forms (sink-holes and pits) in a well advanced stage of development.

Today, marine erosion and weathering, has lead to the formation of a highly irregular shoreline, very much impressing in the scientific as well in the scenic point of view.

The development of the Miocene Karst required the existence of special continental conditions which had to occur before the fill up of those karstic structures.

The Miocene Karst forms important local aquifers, frequently used for water supply of litoral localities.



Fig. 2 – Log in the Praia da Falésia, Albufeira, with some petrographic references from the detrital sequence of miocene sandstones.



Fig. 3 – View of Falésia Beach and Olhos de Água.

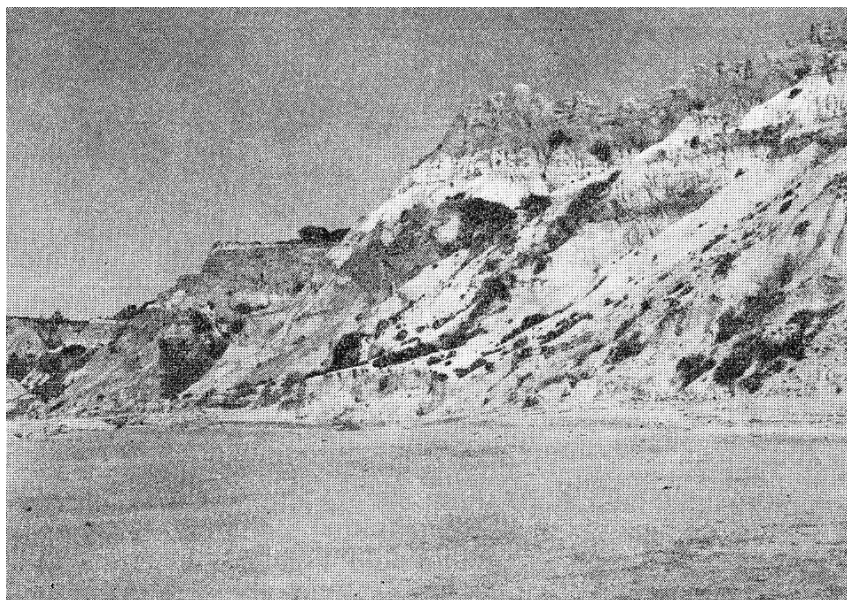


Fig. 4 – View of the bluffs of Falésia Beach showing Miocene sandstones underlain Plio-quaternary reddish sandstones.

Important fresh water exurgences at Olhos de Água discharge on the beach. That village name means precisely such a phenomenon. In fact there are tens of exurgences specially seen during low tide. Some of them such as «Olheiro Grande» has a high discharge; another one discharges off shore and seems to be strong enough to deviate a small boat.

The Miocene carbonate facies suddenly disappears east of Olhos de Água beach and is limited there by the detrital bluffs of Falesia beach. The contact might well be through faulting.



Fig. 5 – Result of erosion in the sandstones referred in fig. 4.

The detailed sedimentological study of the arenitic cliff of the Falesia beach is important because a level of vertebrate fossils was discovered there. It contains fossils perhaps important to the understanding of Miocene stratigraphy in Algarve. Such fossils as well as their precise location were supplied to Prof. Telles Antunes, a specialist in vertebrates. It is expected this specialist will confirm the importance of the discovery for the interpretation of the stratigraphy.

Since a lithological log might be helpful for the understanding of the Miocene of the Algarve, one of the bluffs of Olhos de Água beach was done, (Fig. 2). Emphasis is placed in some sedimentological aspects of the defined levels and some ideas that can be helpful to stratigraphists are put forward.

The arenitic complex of Falesia beach is formed of a series of detrital facies, probably Miocene in age and definitely younger than the Helvetian marine limestone series. They contact each other through an erosion surface, and at the easternmost point of Olhos de Água beach the top of the carbonate series is faulted.

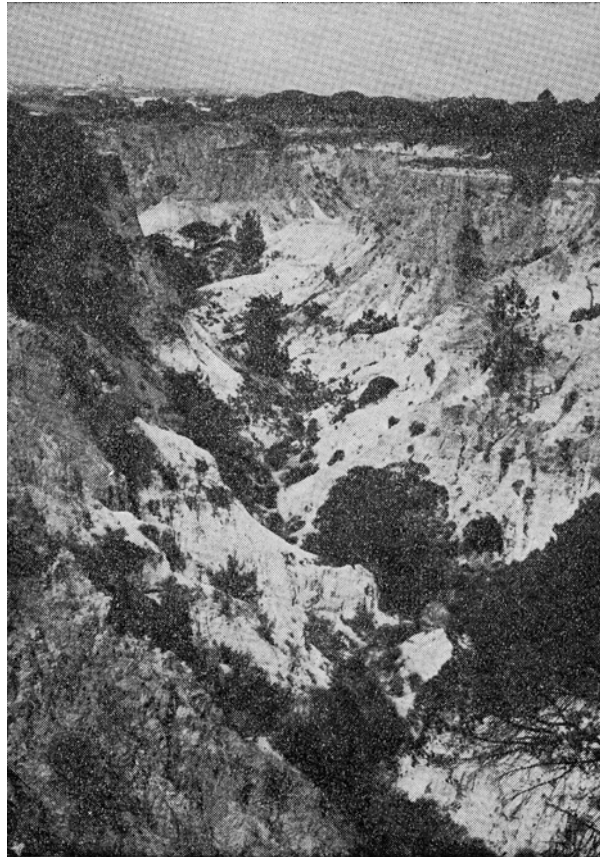


Fig. 6 – Result of erosion in the sandstones referred in fig. 4.

The series of Falesia is 30 to 50 metres thick and is formed from bottom to top by the following and well defined levels:

- 1) – Overlying arenitic limestones with Miocene fossils and superficial advanced karstic effects, poorly defined layers of fine grain, ferruginous, yellowish colour and well sorted sandstones.

The median has low value at the base but increases gradually towards the top;

2) – White sandstone, showing clear cross-bedding, poorly sorted and with a high median value. The uniformity of the bed is interrupted by various levels of pebbles;

3) – Medium grain, pink and whitish colour sandstone showing poor stratification; the value of the median is lower than the one of 2) and sorting is poor;



Fig. 7 – General Level of vertebrate fossils of the Falésia Beach. Collecting vertebrate fossil
At the main fossiliferous level.

4) – Fine grain, white and well sorted sandstone. At the bottom there are levels with vertebrate fossils (bone fragments and teeth) mixed with pebbles of eruptive rocks. At the top the sandstone contains shells and casts, mainly of mollusca.

5) – Very fine, yellow and well sorted sandstone;

6) – Red argillaceous sandstone, medium to coarse grain and reasonably sorted.

In conclusion, the sandstone series of Falesia starts with a fine grain, reasonably sorted sandstone, with coarser levels interbedded.

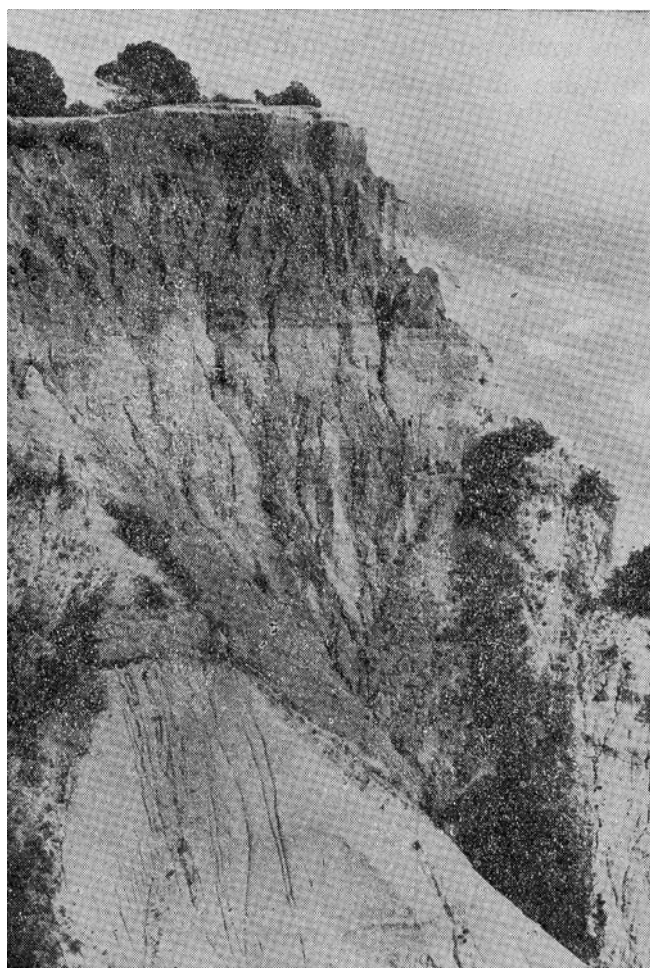


Fig. 8 – General Level of vertebrate fossils of the Falésia Beach.

One important fact, is the presence of a level with vertebrate fossils in the upper zone of the sandstone series (level 5). This fossiliferous deposit might be important for the understanding of the Miocene in the south of Portugal.

According to our observations the detrital series of Falesia, overlaying unconformably the so called Helvetian limestone facies is at least partially Miocene in age.

That series probably belonged initially to a fluvatile facies, passed to estuarine and at the end to a marine detrital facies.

The fine grain, yellowish argillaceous sandstone, that changes to brownish mudstone is possibly the uppermost level of Miocene rocks.

The detrital series described and attributed to the Miocene has an overall thickness of 25 to 35 metres and is unconformably overlaid by red sandstones (level 6). These red sandstone, non-fossiliferous anywhere in Portugal, might be Plio-Pleistocene in age and have a thickness of 8 to 10 metres at Falesia beach.

Ancient beaches of Quaternary age mainly formed by clay sands, with fossils fauna in some places, as for example at Maria Luisa beach, cover here and there the Falesia sandstone series.

These Quaternary marine beaches form a level at an altitude of 40-45 metres that corresponds to the flat surface that borders the bluffs of Olhos de Água and Falesia. There are other levels of marine beaches in the central coast of Algarve. If the observations are correct then the karstic morphogenesis of the Helvetian limestone is probably related in time with the deposition of the base levels (levels 1 to 4) of the detrital series of Falesia.

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