


Informationen zur Umwelt und für Naturreisende auf Kreta:
 Information about the Environment and for travellers in Crete:

Fossil find spots on Crete (III)
Foraminifers-find spot east of *Plakias* (*Damnóni-Bay*) / South Crete


Foraminifera are single celled; shell bearing animals from the root of the protozoa. There are three groups according to shell substance: Agglutinantia (shell from cemented foreign bodies), Miliolina (shell of CaCO₃, porcelain-like, without pores) and Rotaliina (shell from calcite or aragonite with pores). Depending on the size of the shell which can consist of one or up to several hundred chambers, a distinction is made between small- (up to 1 mm) and large foraminifers (> 1 mm to 150 mm diameter). The known number of foraminifer's species is approximately 80.000. From the age of the Cambrian until today they live in the sea on the ground as benthos (vagile soil animals) and since the Jurassic age in water floating as plankton. The importance of foraminifera for the Earth Sciences is that the empty shells exist in very large quantities in marine sediments, often even Rock-forming. Because the foraminifera, in the course of Earth's history, have gone through an intensive evolution, many of them, which exist only for a short period of time (in the geological time scale), are well as "index" fossils for age determination (biostratigraphy). They provide important information for the reconstruction of the deposit conditions in the geological past (Paleo-environment). By comparing the today living fauna with them from past geological times (Actou-Palaeontology) it is possible to draw conclusions on then prevailing water temperatures (Paleo-Oceanography) and climate (Paleo-climate). Foraminifera provide excellent data based due to their commonness and wide distribution, their long geological occurrence and their unique fossil report, a brilliant data basis for the documentation of biodiversity pattern and their changes over the Earth's history. Analyses of the geographical extension of Cretan large foraminifera show concentrations within the Caribbean and in the whole area of the Tethys. Based on these distribution patterns we can assume 4 faunal provinces during the Cretaceous period: 1. Central America, 2. European Tethys, 3. African Tethys and 4. Asia. The flow patterns indicate that spreading the large foraminifera took place mainly in a western direction from the Indian Ocean through Tethys¹ into the Atlantic Ocean.

¹Since the Pangaea (Greek "all the land"), as single continent, had shared about 200 million years ago (in the age Triassic and Cretaceous period) in the two ancient-continent Laurasia and Gondwana, arose between the marine Tethys. During the Oligocene age the Tethys largely disappeared, until only the present Mediterranean has left. The countryside of Crete has changed several times since about 12 million years (the upper Miocene) and its modern character is only a snapshot of a gradual process, where the crust behind the accumulation wedge of an active subduction zone (in the Libyan Sea of SW Crete) is further thinning and is modified by an intense burst tectonics. **The forecasts for Crete, based on Keupp & Bellas (2001) must "therefore assume of a continuing earthquake activity, until the collision process between Europe and Asia comes to rest. From this not foreseeable date of remittent compression pressure is to expected that the stacked by it and at isostatically abnormal depth held sediment masses appear as new mountain range from the Mediterranean".**

An **excursion report** from our NAOM member **Gabriele Moschner**, Frankfurt a.M.:



Fig. 1: Damnóni- and "Bay of Pigs"

Approach:

Coming from **Plakias** drive around 1 mile on the South coast to the East towards **Damnóni**. Then the road branches off to the right, leads along a grove to an apartment complex and further to the Western side of **Damnóni** Bay slightly uphill. From here you have a beautiful panoramic view over the Bay (fig. 1) and the old port, from which only a derelict building survived. However, taking the second junction, coming from **Plakias**, after 1.5 miles, right behind the creek at the sign "**Damnóni Beach**", the road leads to the beach of **Damnóni**. The gravel road meanders between the beach and the two restaurants along the Bay towards East. At its end it leads upward with a right, then a left turn to the next, much smaller Bay, so-called "Bay of Pigs"



fig.2: outcrop



fig. 3: „Bay of Pigs“



fig. 4: Nummuliten bank



fig. 5: *Nummulites perforatus*
and *Nummulites striatus*

On the way you pass on the left a small-scale, about 10 metres wide foraminifers' outcrop. On the right you can see the "Bay of pigs" (fig. 2). This path leads to the beach of *Lefkoja* and further on to the village *Lefkoja*, it is interspersed by water channels and sometimes poorly accessible.

Exactly 20 years ago I discovered the "Bay of pigs" (fig. 3). At that time neither here nor in *Damnoni* Bay were sun loungers or sunshades available for rent. Also you could not drive so close to the Bay. Because of the wind I was looking for some stones as "towel ballast". A strange stone attract my attention, dark grey, with some upstanding white, oval-to circular, lattice-like structured shapes that were barely 1 cm in diameter. The stone fascinated me to the point that I took it with me to Germany. Some years later, I had started my interest for fossils; I took him back into the hand and knew little more about what I had found at that time. They are laid open cases from shell carrying protozoon's, so-called foraminifera. As for 2004, Crete was clear as my travel destination, I wanted to back to *Damnoni*, to find the "source" of my former detection. I actually found it. The stone was transported from the slope on the way down to the Bay.

The upcoming bedrock is bright-, in the freshly broken dark-grey. The fossil containing area is limited to a few meters in width. The surrounding rocks are "deaf", as far as I could see it. The rocks are strongly eroded on the surface, rugged and adamant. I could hardly find up-blown material; therefore you need hammer and chisel.

Fig. 4 shows deposited sediment from formerly flat sea in the age of the Eocene (duration: 56.5 million to 35.4 million years), probably in the top middle Eocene more still: in the "Biarritzien". From this time there are many mass deposits of Nummulites. The here occurring Nummulites encounter in a number of times which are called rock-forming, so make the most of sediment. It is believed that they were shallow water life and inhabited areas up to 30-50 m within the shaft base. They thus formed a bank facies, i.e. sublime structures of oblongness expansion. The here to find foraminifera are "Nummulites" from the group "*Nummulites perforatus*", according to BARTHOLDY. They are quite robust, lenticular cases with numerous pillars, aligned to the centre of the shell. They are readily identifiable within the axial cracked cases, in their longitudinal out-stretching or within the weathered surfaces of the shells as sublime buttons. Usually two forms of a kind dominate, but there are 1 or 2 more, much smaller, associated shapes, these mostly are "*Nummulites striatus*"¹. The largest Nummulites indicate a diameter of up to 3.3 cm. (Fig. 5)

By the forces of continental drift the rock was pushed in the height. The process of this change in the course of millions of years can be well understood with a small hand piece, if 2 boreholes from piddocks are visible. After the sediment was solidified to stone and was decided in the tidal area, the piddocks have left their marks. Today this rock forms a part of the mountain. To walk over former seabed, today as mountain, is truly an experience

¹ Determination: Dr. Jan Bartholdy, Institut der Paläontologie der Universität Bonn
Pictures: G. Moschner (15.07.2004)

Literature:

- EIKAMP, H. & KLUGE, U. (2004a): Fossil find spot's on Crete: Fossil find spot Gouves (Miocene), Prefecture Iraklion / North Crete. CRETEenvironment info, leaflet No. 011-04/E: 2 pages, 7 fig.; NAOM e.V, Obertshausen.
- EIKAMP, H., KLUGE, U. & MOSCHNER, G. (2004b): Fossil find spot's on Crete: Fossil find spot Gouves II (Miocene), Prefecture Iraklion / North Crete. – CRETEenvironment info, leaflet No. 036-04/E: 2 pages, 9 fig.; NAOM eV, Obertshausen.
- KEUPP, H. & BELLAS, S. (2001): Zur Paläontologie der Jungtertiär-Becken in NW-Kreta (Prov. Chania, Griechenland). – Natur und Mensch (Jubiläumsausgabe 200 Jahre NHG), S. 109-121, 21 Abb.; Nürnberg.

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