Rend. Soc. Paleont. Ital., 1 (2002): 209-213

The Archaeocyathan-Calcimicrobes mounds of Rocca Bianca Quarry (Matoppa Fm., Early Cambrian, SW Sardinia, Italy)

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Locality	Rocca Bianca Quarry, Buggerru.
Stratigraphic unit	Matoppa Formation (Nebida Group), upper part of the Sa Tuvara Member.
Age	Early Cambrian (Late Atdabanian- Early Botomian), N2 trilobite assemblage zone.

Location

The Rocca Bianca Quarry is easily reached from Genna Bogai Pass, elevation 549 at km 49.9 of the State Road S.S. N°126, Iglesias -Fluminimaggiore, following the indication Grugua. The Archaeocyathan limestones crops-out in correspondence to the toponym Case Rocca Bianca, close to the Funtana Calomba drinking trough. From this site is possible to have a panoramic view of the Antas valley and the homonym Roman-Punic Temple.

Historical outline

First studies on the carbonatic bodies of Sa Rocca Bianca-Funtana Calomba was provided by Debrenne (1964); later on, both faunal composition and sedimentological analysis allowed to propose a more detailed framework for this complex bioconstruction (Debrenne *et al*., 1980). Mitzel (1994) listed the previous known taxa and proposed a taxonomic reassignment for some of them.

Lithology

The calcareous body of Rocca Bianca is not significantly different from those cropping out in the Serra Scoris area (Gonnesa), Monte San Pietro (Nebida) or Cuccuru Contu (Iglesias) and many other localities of the central and western Iglesiente. This buildup shows the classical arrangement described at Serra Scoris (Pillola & Mitzel, 1994; Pillola *et al*., 1995), and, although the tectonic disturbances are particularly severe, the vertical succession can be followed after the recognition of the lenticular massive grey to white calcimicrobial dominated limestones, towards frequent erosional surfaces into abundant reddish limestones and shales at the top of the bioconstruction. Laterally, green and red shales rich in Archaeocyathan remains occurs as well.

The exhaustive description of facies and microfacies has been carried out by Debrenne *et al*. (1980); in addition, stromatactis fabrics have been recorded by Bechstädt *et al*., (1994).

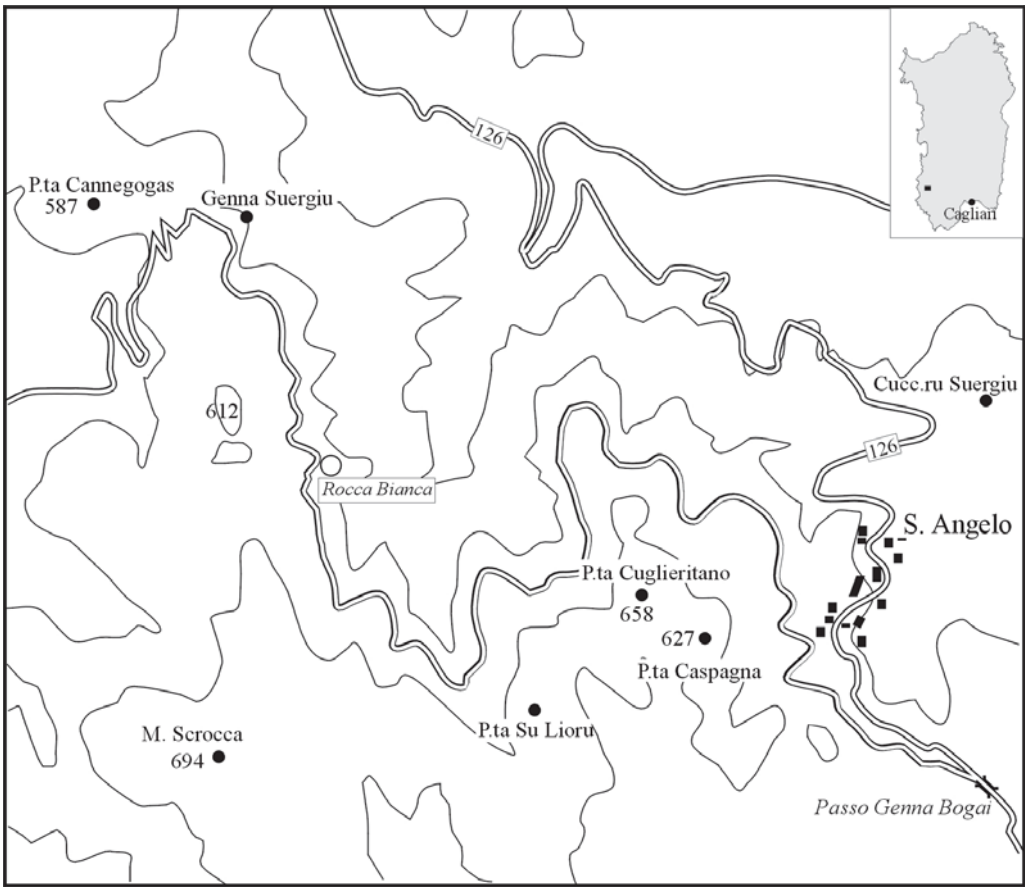

Fig.1 - Location map of the Rocca Bianca Quarry.

Paleobiological content

This locality is suitable for the sampling of Archaeocyathan and *Epiphyton* (Cherchi & Schroeder, 1985) dominated facies, and for the observation of large surfaces exposed in the quarry and on polished slabs, showing the relationships between different facies, fillings and cements (many broken slabs can be collected!).

Excepted rare trilobite debris, chancellorid rosettes, sponge spicules, probable hyolithis, lingulids and echinoderm plates recorded by Debrenne *et al*. (1980), the bulk of organisms from Rocca Bianca - Funtana Calomba is represented by calcimicrobes (mainly *Epiphyton*) and Archeocyathans. Among this latter the following taxa can be mentioned (after Debrenne, 1964, 1972; Debrenne *et al*., 1980; *in* Mitzel 1994):

Archaeocyatha

Regulars: *Afiacyathus alloiteaui* Debrenne 1964, *Afiacyathus* sp., *Antoniocoscinus anthemis* (Bornemann 1884), *Coscinocyathus tener* Bornemann 1884, *C. cancellatus* Bornemann 1884, *Erismacoscinus elongatus* (Bornemann 1884), *E. calathus* (Bornemann 1884), *E. pandora* (Bornemann 1884), *Inessocyathus spatiosus* (Bornemann 1884), *Porocoscinus flexibilis* Debrenne 1964, *Rasetticyathus acutus* (Bornemann 1884), *Taylorcyathus vologdini* Debrenne 1964, *Tubicoscinus cupulosus* (Debrenne 1964), *T. tuba* (Bornemann 1884).

Irregulars: *Anthomorpha margarita* Bornemann 1884, *A. sisovae* (Vologdin 1940), *Anthomorpha* sp., *Bicyathus* sp., *Bottonaecyathus* sp., *Chouberticyathus* sp., *Dictyocyathus arctus* Debrenne 1964, *D. verticillus* (Bornemann 1884), *Metaldetes*? *dissutus* Debrenne 1964, and *Protopharetra* sp.

Sedimentology and Palaeoevironment

As pointed out in several papers (see Pillola *et al*., 1998, 2000 and cited references) the mounds of the Sa Tuvara Mb. of the Matoppa Fm. from SW Sardinia are principally built up by *Epiphyton*, *Renalcis*, rare *Girvanella* and a variable amount of Archaeocyathans. The reoccurrence of this discontinuous calcareous bodies within a ciclic siliciclastic dominated succession has been studied at Serra Scoris (Gonnesa), in order to clarify the mechanisms of onset of carbonate deposition (Pillola *et al*. 2000, cf. Fig. 3). The investigated deposits shows different orders of cyclically arranged depositional sequences, their hierarchy clearly indicate an eustatic control of depositional dynamics. More developed mounds occur in correspondence of sensible acceleration of sea level rise of the medium frequency sequences. Finer terrigenous facies, eteropic with the mounds (assigned to the middle and distal portions of the upper offshore), testify the rapid deepening compared to the underlying deposits (coarse to medium grained sandstones

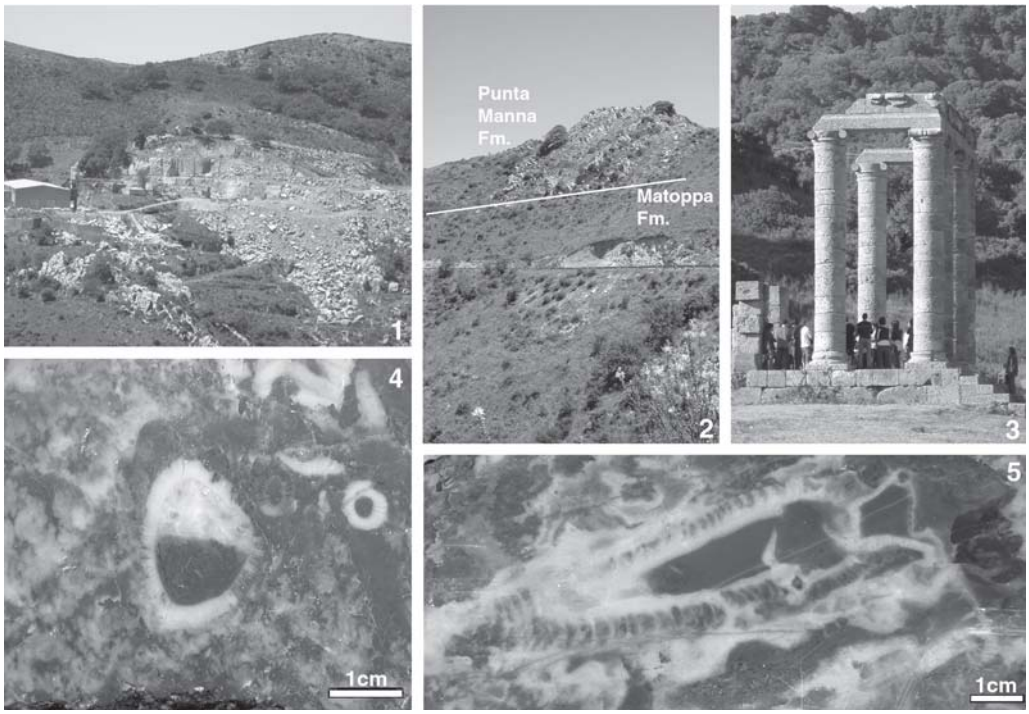

Fig.2 - 1. Panoramic view of the Rocca Bianca Quarry; 2. Detail of the Matoppa Fm – Punta Manna Fm. transition at Schina sa Gruxi (250 m NNW from Punta Cuglieritano, facing the Rocca Bianca Quarry); note the prominent Monte Azzieddas Mb., clearly interrupted by a fault; 3. Detail of the Roman-Punic temple of Antas (Fluminimaggiore); 4. Transverse section of a large Archeocyatha cup showing a distinct biogeopetal structure, reddish calcisiltitic limestone of Rocca Bianca (Buggerru); 5. Oblique section of a very large coscinocyathid, reddish calcisiltitic limestone of Rocca Bianca (Buggerru); note the several phases of fillings and cementation.

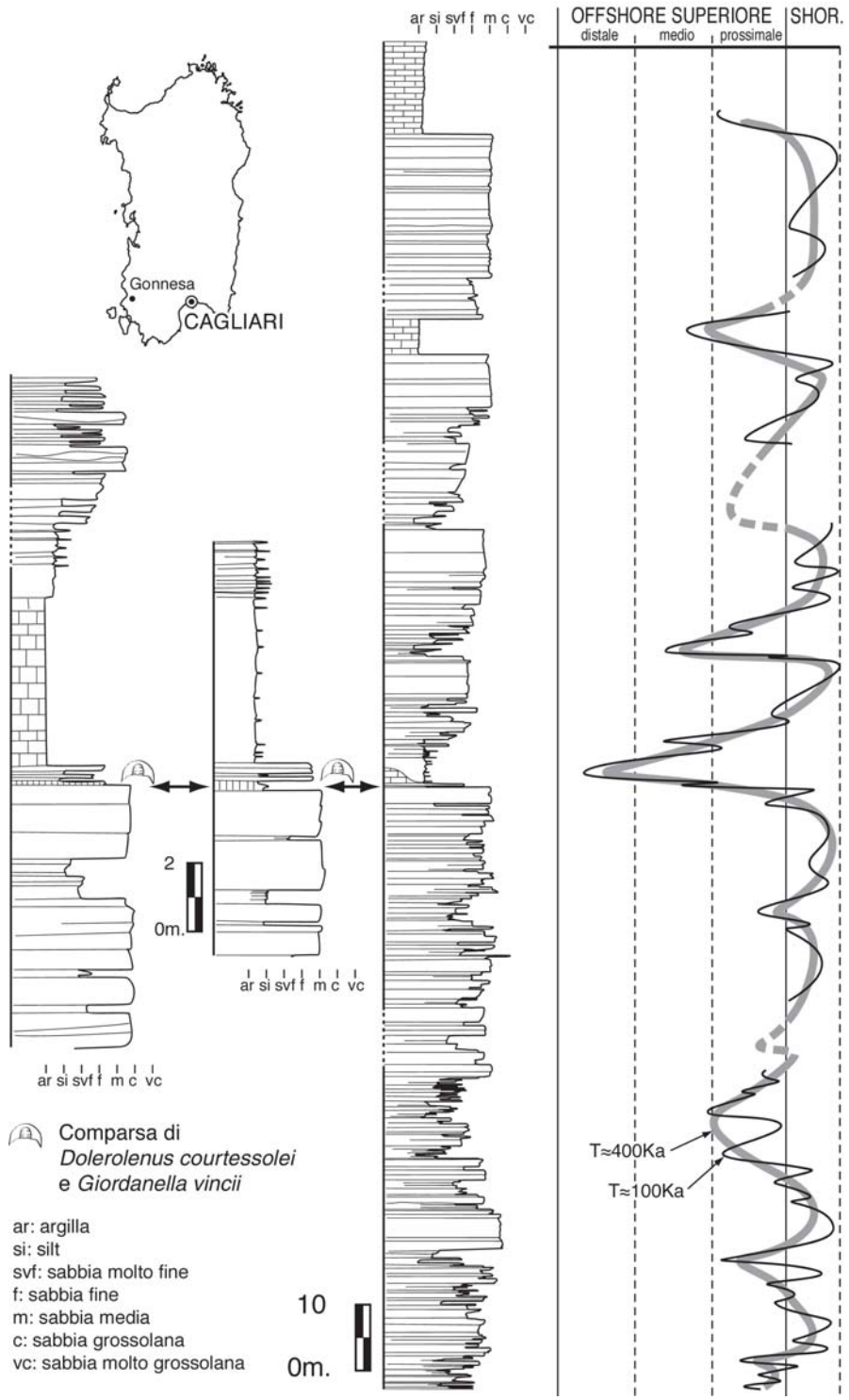

Fig. 3 - Log and stacking pattern diagram of genetic sequences in the Serra Scoris section (Gonnesa). After Pillola *et al*., 2000.

with HCS, SCS, etc., indicating a shoreface environment). In this context, the Calcimicrobial-Archaeocyathan mounds can be considered as expression of sedimentary condensation linked to strong eustatic rises. Surfaces at the top of each buildups alignment represents a maximum flooding surface, which are of high stratigraphic value (isochronous and correlatable surfaces).

Summarising, the onset of widespread development of Archaeocyathan-Calcimicrobes mounds is triggered by rapid eustatic rise which induce (a) the strong reduction of terrigenous input and (b) the subsequent stabilisation of the sea bottom by calcimicrobes and cyanobacteria.

Calcimicrobes and Archaeocyathan settle this firm bottom and may coexist with silty-clay material which can fill empty spaces not previously occupied by primary constructors and/or cements. Later on the massive lenticular limestones, dominated by *Epiphyton*, *Renalcis*, with minor Archaeocyathans develops. These massive bodies may also have reoccurrences within the interconnected Archaeocyathan floatstones in more complex bioconstructions (Pillola *et al*., 1995).

Financial support was provided by grants from MURST (Cofin and ex 60%).

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