

Punta Malrepos: Urgonian transgressive limestones on Purbeckian facies

ANTONIETTA CHERCHI, ROLF SCHROEDER and LUCIA SIMONE

A. Cherchi – Dipartimento di Scienze della Terra, Università di Cagliari, Via Trentino 51, I-09127 Cagliari (Italy);
acherchi@unica.it

R. Schroeder – Forschungsinstitut Senckenberg, Senckenberg – Anlage 25, D-60054 Frankfurt am Main (Germany).

L. Simone – Dipartimento Scienze della Terra, Università di Napoli, Largo S. Marcellino 10, I-80138 Napoli (Italy);
lusimone@unina.it

LOCALITY Capo Caccia peninsula (approx. 7 km west of Alghero).

AGE Uppermost Berriasian (?) to lowermost early Valanginian.

LOCATION

Punta Malrepos (141 m) is the highest elevation of the basal Urgonian limestones cropping out as a marked ridge to the east and north of Cala d'Inferno. Immediately west of Punta Malrepos, the transition from the Purbeckian facies to the Urgonian can be studied.

HISTORICAL OUTLINE

For the first time, Pecorini (1965) pointed out the abundance of Trocholinas in the basal part of the Urgonian from this locality, dating this interval with reservation as early Barremian. Later on, Chabrier & Fourcade (1975) and Azéma *et al.* (1977), found above the *Trocholina* beds (determined by these authors as *Trocholina alpina*) within the lowermost 40 m of the Urgonian series a typical foraminiferal association (*Valdanchella miliani* (Schroeder), *Pfenderina neocomiensis* (Pfender), *Pseudocyclammina lituus* Yokoyama), indicating an early Valanginian age.

Cherchi & Schroeder (1985a) furnished additional micropaleontological data. They revised (1985b) the micropaleontological assemblage described by Pecorini (1972) *Lacrymorphus catenaeformis sardus*, found in a marine intercalation within the uppermost part of the Purbeckian, and classified it under the name *Sarfatiella sarda* n. comb. into the dasycladaceans. The type-locality of *Trocholina cherchiae*, described by Arnaud-Vanneau *et al.* (1988) from this section, is located near the base of the Urgonian series.

LITHOLOGY AND PALAEOBIOLOGICAL CONTENT

1. The Purbeckian cropping out immediately west of Punta Malrepos is tectonically strongly reduced. Generally, it consists of marls and marly limestones, rich in ostracods and charophytes. The upper part of this series is characterized by occasional, relatively short marine intercalations within the lagoonal sediments, which can be interpreted as episodic storm deposits. These intercalations announce the following continuous neritic milieu of the Urgonian.

One of these intercalated marine horizons is located some meters above the base of the Urgonian. It refers to a 10 cm thick grainstone bank containing a large quantity of

reworked greenish Purbeckian material. This bank is very rich in dasycladaceans and foraminifera:

Algae

Arabicodium cf. *jurassicum* Dragastan

Cayeuxia sp.

Porostromata

Sarfatiella sarda (Pecorini) Cherchi & Schroeder (isolated ampullae; see Fig. 1)

Actinoporella durandelgai (Jaffrezo & Fourcade)

Salpingoporella sp.

Foraminifera

“*Cribellopsis* sp.”, in Darsac, 1983: Pl. 7, fig. 6, 8 (1 section)

“*Trochamminidae* n. gen.” in Canérot, 1974: Pl. 7, fig. 9; Azéma *et al.*, 1979, Pl. 21, fig. 4

Miliolidae

Nautiloculina bronnimanni Arnaud-Vanneau & Peybernès

Trocholina cf. *sagittaria* Arnaud, Boisseau & Darsac

Trocholina sp.

Other microfossils

Favreina sp.

Aeolisaccus dunningtoni Elliott

2. Resting on the grey-greenish marls with charophytes of the topmost levels of the Purbeckian, neritic calcareous deposits (Urgonian facies) appear. A detailed study of these limestones shows the main sedimentological and micropaleontological aspects characterizing the Valanginian transgressive event. The transition from the brackish, lacustrine-lagoonal sediments of the Purbeckian facies to the subsequent open-marine sediments is gradual. As we have seen, the former show repeated intercalations of grainstones (episodic contributions by storms) made up of benthic marine skeletal grains plus rounded intraclasts, rich in green algae, benthic Foraminifera and bioeroded mollusc and echinoderm fragments.

The studied outcrop (beds 1 to 14; all together approx. 3 m; see Fig. 2) show from the bottom to the top:

Pellettiferous wackestones characterized by a slight lamination and dolomitization (beds 1-2). These partially dolomitized limestones contain mollusc fragments, rare miliolids and *Nautiloculina bronnimanni* Arnaud-Vanneau & Peybernès. Wackestones-packstones with rounded intraclasts and a few benthic skeletal grains follow (bed 3) and pass to bioclastic packstones rich in benthic components (green algae, benthic Foraminifera, ostracods, mollusc and echinoderm fragments).

First significant marine contributions (upper part of bed 3, lower part of bed 4) are represented by *Macroporella embergeri* Bourrollec & Deloffre, *Nautiloculina bronnimanni* Arnaud-Vanneau & Peybernès, *Trocholina* sp., Miliolidae, which contribute to form graded packstones-grainstones. A thin level of silty wackestones-mudstones with rare ostracods (upper part of bed 4) seems to end the fresh water influx preluding to the bio- intraclastic grainstones containing large clasts of the above mudstones plus gastropod and echinoderm fragments and few superficial ooids (bed 5). Micropaleontological content is similar to the preceding bed 4.

Large to very large rounded intraclasts and minor rounded and bioeroded skeletal fragments characterize the following deposits (beds 6-7). They change from silty, mud-supported to grain-supported sediments whose palaeontological content does not change related with the underlying bed 5. Packstones-wackestones follow, in which rounded

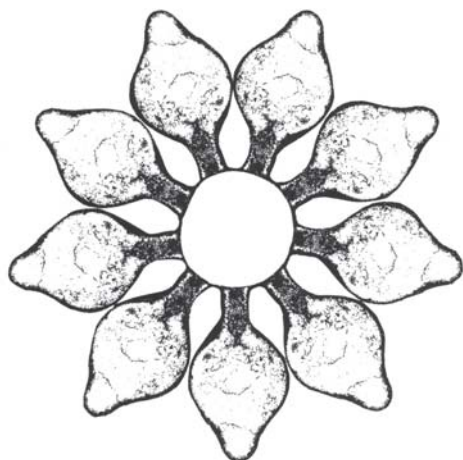


Fig. 1 – Schematic transverse section of *Sarfatiella sarda* (Pecorini) Cherchi & Schroeder. The model is based upon a combination of isolated ampullae.

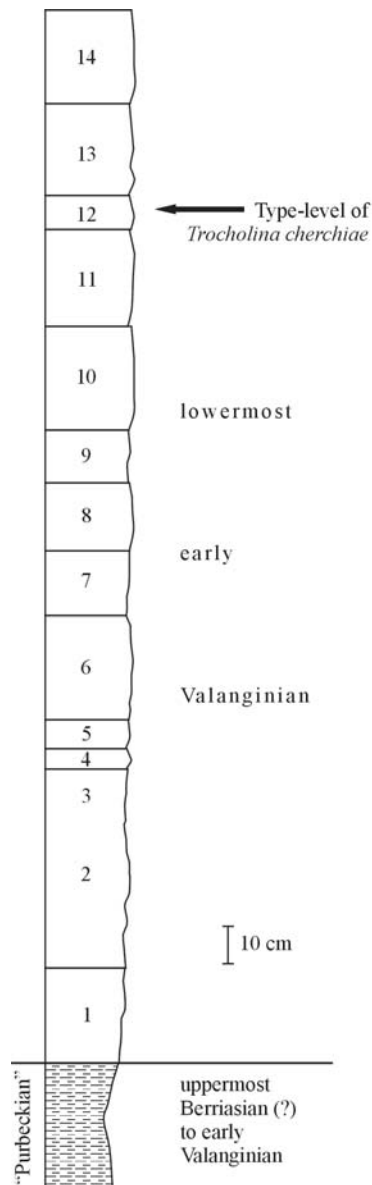


Fig. 2 – Section of the basal early Valanginian at Punta Malrepos showing the position of the *Trocholina cherchiaie* type-level.

intraclasts and bioclasts, peloids and coated grains have been found (beds 8-9). No changes in the palaeontological content occur. Upwards in the succession, clean bio-, intraclastic grainstones follow. The benthic components become richer and varied. Green algae, benthic Foraminifera, bryozoans, gastropods, serpulids characterize these limestones and still show well rounded, sharp and abraded margins; in addition large bioeroded intraclasts and molluscs are recognizable (bed 10). In the subsequent coarse grainstones and packstones (beds 11-14) among the benthic Foraminifera *Trocholina cherchiaie* Arnaud-Vanneau, Boisseau & Darsac becomes particularly abundant. Bed 12 is the type-level of this species. These Foraminifera are frequently at the core of well rounded muddy

intraclasts associated with superficial ooids. Ooid-rich grainstones characterize the top of the studied interval.

From the above observations, evidences of repeated and locally intensive reworking episodes can be recognized in a depositional setting, in which oolitic and bioclastic shoals were formed during a progressive increase of the water energy.

In the following we present a list of the microfossils found in the studied interval:

Algae

Macroporella embergeri Bourrollec & Deloffre

Salpingoporella annulata Carozzi

Foraminifera

Glomospira sp.

“Trochamminidae n. gen.” in Canérot, 1974: Pl. 7, fig. 9

Choffatella pyrenaica Peybernès & Rey

Miliolidae

Nautiloculina bronnimanni Arnaud-Vanneau & Peybernès

Trocholina cherchiai Arnaud-Vanneau, Boisseau & Darsac

Trocholina cf. *sagittaria* Arnaud-Vanneau, Boisseau & Darsac

Melathrokerion cf. *valserinense* Brönnimann & Conrad

Microproblematica

Koskinobullina cf. *sarda* Cherchi & Schroeder

Aeolisaccus dunningtoni Elliott

AGE

1. The marine intercalation within the uppermost part of the Purbeckian series does not contain any important marker which could give a precise age. *Actinoporella durandelgai* was cited from the Berriasian – early Valanginian of the eastern Betic Chains (S. Spain; Fourcade, 1973). In the Spanish Pyrenees, *Nautiloculina bronnimanni* appears in the late (?) Berriasian (Arnaud-Vanneau & Peybernès, 1978). The orbitolinid section can be assigned to the forms described by Darsac (1983) from the late Berriasian and early Valanginian of the southern Jura Domain (France). All these data suggest an uppermost Berriasian (?) – early Valanginian age for the studied marine intercalation.

2. The stratigraphically most important species of the foraminiferal association, discovered by Chabrier & Fourcade (1975) and Azéma *et al.* (1977) in the lowermost 40 m of the overlying Urgonian series is the orbitolinid *Valdanchella miliani* (Schroeder). According to Azéma *et al.* (1976), this species occurs in southern France (Dep. Gard; Provence) together with *Pfenderina neocomiensis* (Pfender), *Pseudocyclammina lituus* (Yokoyama) and *Pseudotextulariella salevensis* Charollais *et al.* in the early Valanginian (dated by ammonites and calpionellids), and actually it is regarded as an excellent marker of this stratigraphic interval.

At Punta Malrepos, the studied basal Urgonian section with abundant Trocholinas is located below the *Valdanchella miliani* beds. Also on the Island of San Antioco (SW Sardinia), an horizon with rares *Valdanchella miliani* is underlain by micritic limestones (35 m) containing abundant “*Trocholina alpina*” (= *T. cherchiai*?); above the middle part of these limestones, early Valanginian calpionellids have been found (Azéma *et al.*, 1977).

On the basis of all these data it becomes clear, that the installation of the Urgonian platform in both regions started in the early Valanginian.

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

REFERENCES

- ARNAUD, A., BOISSEAU, T. & DARSAC, C., 1988, Le genre *Trocholina* Paalzow 1922 et ses principales espèces au Crétacé: Rev. Paléobiol., vol. spéc. 2 (Benthos '86): 353-377.
- ARNAUD-VANNEAU, A. & PEYBERNÈS, B., 1978, Les représentants éocrétaqués du genre *Nautiloculina* Mohler, 1938 (Foraminifera, Fam. Lituolidae?) dans le Chaînes Subalpines septentrionales (Vercors) et les Pyrénées franco-espagnoles: Géobios, 11(1): 67-81.
- AZÉMA, J., CHABRIER, G., FOURCADE, E. & JAFFREZO, M., 1977, Nouvelles données micropaléontologiques, stratigraphiques et paléogéographiques sur le Portlandien et le Néocomien de Sardaigne: Rev. Micropaléont., 20(3): 125-139.
- AZÉMA, J., FOUCAULT, A., FOURCADE, E., GARCIA-HERNANDEZ, M., GONZALEZ-DONOSO, J.M., LINARES, A., LINARES, D., LOPEZ-GARRIDO, A.C., RIVAS, P. & VERA, J.A., 1979, Las microfacies del Jurásico y Cretácico de las zonas externas de las Cordilleras Béticas: Universidad de Granada: 83 pp.
- AZÉMA, J., FOURCADE, E., JAFFREZO, M. & THIEULOUY, J.P., 1976, Sur l'âge valanginien inférieur de la biozone à *Valdanchella miliani* (Foraminifère). Intérêt pour la stratigraphie dans le domaine méditerranéen occidental: C.R. Acad. Sc. Paris, (D), 282: 1411-1414.
- CANÉROT, J., 1974, Recherches géologiques aux confins des Chaînes ibérique et catalane (Espagne) : Enadimsa ediciones, ser. 5, 4 : 1-517.
- CHABRIER, G. & FOURCADE, E., 1975, Sur le Crétacé du Nord-Ouest de la Sardaigne (présence de Valanginien à faciès pyrénéo-provençal): C. R. Acad. Sci. Paris D, 280: 563-566.
- CHERCHI, A. & SCHROEDER, R., 1985a, Site C.1 – “Purbeckian” – Lower Aptian of Cala d’Inferno – Torre del Bulo. In Cherchi, A. (Ed.), 19th European Micropaleontological Colloquium – Sardinia October 1-10, 1985, Guide-book: 156-168.
- CHERCHI, A. & SCHROEDER, R., 1985b, *Sarfatiella sarda* (Pecorini, 1972) n. comb. (Dasycladaceae) from the basal Lower Cretaceous of NW Sardinia and some comments on *Lacrymophus* Radoicic and *Humiella* Sokac & Velic Boll. Soc. Paleont. Ital., 23(2) (1984): 355-360.
- DARSAC, C., 1983, La plate-forme berriaso-valanginienne du Jura méridional aux massifs subalpins (Ain, Savoie): Thesis Univ. Grenoble: 319 pp.
- FOURCADE, E., 1973, Le Crétacé dans la partie orientale des zones externes des Cordillères bétiques. III – Les confins du Prébétique et des Chaînes ibériques entre le Rio Mundo et le Rio Júcar (stratigraphie et paléogéographie): Enadimsa ediciones, ser. 7, 1, [Primer Coloquio de Estratigrafia y Paleogeografia del Cretácico de España]: 233-244.
- PECORINI, G., 1965, Stratigrafia e distribuzione delle bauxiti nella Nurra (Sardegna Nord- Occidentale): Symp. Ass. Min. Sarda, ser. 1, v. B-6: 1-15, Cagliari – Iglesias.
- PECORINI, G., 1972, Microflora “Purbeckiana” della Nurra (Sardegna): Boll. Soc. Geol. It., 91: 373-385.