Journal of African Earth Sciences 129 (2017) 380–389

Contents lists available at ScienceDirect

Journal of African Earth Sciences

journal homepage: www.elsevier.com/locate/jafrearsci

# New record of *Durania cornupastoris* (rudist) from the Campanian of the Aruma Formation, Riyadh, Saudi Arabia: Description and biogeographic remarks

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ARTICLE INFO

*Article history:*
Received 4 November 2016
Received in revised form
9 December 2016
Accepted 11 January 2017
Available online 18 January 2017

*Keywords:*
Rudist
*Durania cornupastoris*
Biogeography
Campanian
Saudi Arabia

ABSTRACT

A Radiolitidae (rudist, bivalvia), *Durania cornupastoris* (Des Moulins) is a well-known species defined as an index fossil from the Turonian (mostly middle-upper) deposits in the Mediterranean Tethys and also in the USA. This study includes new rudist materials and well-preserved samples of the species from the Campanian Khanasir Limestone Member of the Aruma Formation outcropping around the Riyadh (Saudi Arabia) region. *Durania cornupastoris* is characterized by the many finely ribbed, generally flat, sometimes slightly or pronounced concave posterior and ventral radial bands and bulge interband with thick costae similar to the external ornament of the rest of the right valve surface. The width of the radial bands are variable. A comparison of the species with the well-known *Durania* species such as *Durania arnaudi* (Choffat), *Durania gaensis* (Dacqué) and *Durania apula* Parona is considered. The broadening of the stratigraphic range up to the Campanian and biogeographic distribution into the eastern part of the Arabo-African plate of the species are also emphasized.



## 1. Introduction

The rudists from the Campanian Khanasir Limestone Member of the Aruma Formation of central Saudi Arabia were firstly described by El-Asa'ad (1983a, b, 1987). Then a new canaliculate rudist bivalve *Eodictyoptychus* was defined by Skelton and El-Asa'ad (1992). The presence of *Durania cornupastoris* (Des Moulins) in this area was reported by Skelton in Cobban et al. (1991, p. D6) in his detailed description of the species from the samples in cluster of the Turonian (middle) Greenhorn Limestone in Colorado (USA). El-Asa'ad (1991, p. 153) also mentioned that "The rudistid reefal limestone yields an abundant Campanian rudist fauna; these comprise *Dictyoptychus morgani*. *Durania cornupastoris*, *D. gaensis* and *Biradiolites lumbricalis*" in his study on the Late Cretaceous Ammonites from central Saudi Arabia. Although these papers suggest significant data, in preparation, on the Campanian *Durania cornupastoris* and rudist material from central Saudi Arabia, the detailed descriptions of the species are not well documented until today from this area.

The new rudist material from the Khanasir Limestone Member of the Aruma Formation of central Saudi Arabia allowed us to describe the specimens of *Durania cornupastoris* and to compare with the some well-known *Durania* species recorded from the same area, Arabian-African plate and northern side of the Mediterranean Tethys. The geographic and stratigraphic broadening of the species are also emphasized.

## 2. Material and methods

*Durania cornupastoris* samples were collected from a biostrome, 2 m thick, caps the Khanasir Limestone Member in Khashm Buwaibiyat and Khashm Tawqi to the northeast of Riyadh (Figs. 1–3): 1) Khashm Buwaibiyat on the dipslope surfaces neighboring the crest of the escarpment, on either side of the road which runs NNE to Rumhiyah, at the intersection of latitude 25° 12′ 12″ N and longitude 46° 49′ 27″ E; 2) Khashm Tawqi to the northwest of Khashm Buwaibiyat at the intersection of latitude 25°

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http://dx.doi.org/10.1016/j.jafrearsci.2017.01.014
1464-343X/

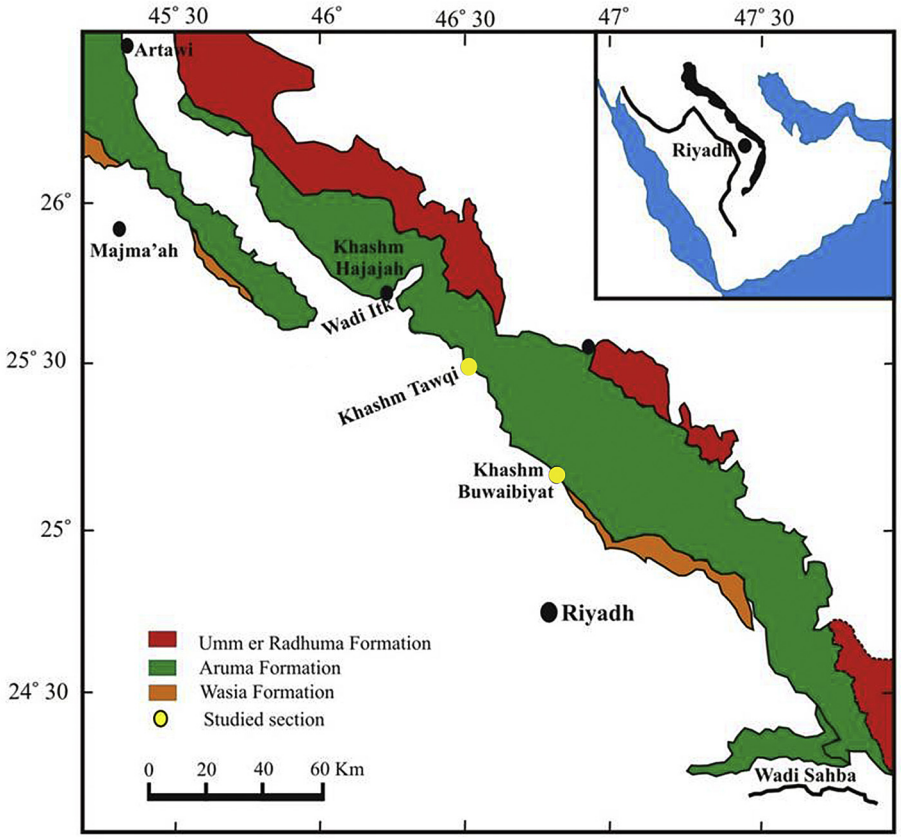


**Fig. 1.** Geological map (simplified after Gameil and El-Sorogy, 2015) showing the studied localities.

27′ 11″ N and longitude 46° 30′ 08″ E, where the same biostromal horizon crops out on the slopes and gullies beside the road which cuts through which the escarpment there. Three both valves nos MGD-CSc-KSU 18, 22 and 35 from Khashm Buwaibiyat, nine RV nos MGD-CSc-KSU 12, 17, 19, 20, 21, 26, 30, 31 and 32 from Khashm Tawqi and eleven RV nos MGD-CSc-KSU 13, 14, 16, 23, 24, 25, 27, 28, 29, 33 and 34 from Khashm Buwaibiyat. The transverse sections of the rudist specimens were prepared in the laboratories of King Saud University, Riyadh, Saudi Arabia and Dokuz Eylul University, İzmir, Turkey. The studied specimens are housed in the Dokuz Eylul University and King Saud University collections.

## 3. Geological setting and stratigraphy

The Mesozoic sequence of central Saudi Arabia dips very gently towards the Aruma basin to the east forming a series of extensive westward-facing escarpments. Upper Cretaceous strata are exposed along one of these escarpments, and over its eastern dipslope. They form a broadly arcuate outcrop passing to the east of Riyadh (Powers et al., 1966). Steineke and Bramkamp (1952) gave the name "Aruma Formation" to the Upper Cretaceous sequence that outcrops in Central Saudi Arabia (Fig. 1). It was named for its occurrence in the Al'Aramah plateau, a broad upland surface related to the easternmost of the Najd escarpments. The Aruma Formation was subdivided by El-Asa'ad (1977, 1983a, 1983b) into three members, namely the Khanasir Limestone Member, Hajajah Limestone Member and Lina Shale Member. The Khanasir Limestone Member is overlain by the Hajajah Limestone Member and the Lina Shale Member is seen at the top of the sequence. These members were recently restudied in detail by Gameil and El-Sorogy (2015) and Al-Kahtany et al. (2016). The Aruma Formation is underlain by various colored clastic sediments of the Wasia Formation. A distinctive lithologic change from yellow-brown dolomitic shale to gray crystalline *Lockhartia*-bearing dolomite of the Umm er Radhuma Formation is seen at the upper boundary of the formation.

Our study concentrates on the upper most part of the lower Khanasir Limestone Member in Khashm Buwaibiyat and Khashm Tawqi to the northeast of Riyadh. The following is a detailed description of the Khanasir Limestone member, from base to top, in the two studied localities (Figs. 2 and 3):

1. Unfossiliferous, reddish-brown, dark red to brown in parts, granular, sandy dolomite (1.5–3 m) with a few small pebbles and abundant vugs, many filled with white coarsely crystalline calcite. It disconformably overlies the continental Cenomanian siliciclastics of the Wasia Formation (Steineke et al., 1958) with a sharp contact.
2. Calcarenitic, cream-colored, chalky, nodular limestone (16–20 m) with abundant clastic carbonates debris. Nodules are set in a matrix of sandy marl. It is fossiliferous with few gastropod and bivalve molds and echinoids.
3. Molluscan calcarenitic limestone (2–4.5 m) with abundant biostromal rudists, oysters, and large gastropods set in matrix of chalky limestone.

The rudist biostrome forms the top most part of the Khanasir Member. The rudists are apparently single generation, embedded in growth position (autochthonous) with very rare the left valves. This unit is of thin vertical extent (2–3 m) and a broad lateral extent (about 400 km, El-Asa'ad, 1987). He stated that it does not maintain the same thickness on its whole lateral extent. It is well developed