

A NEW SPECIES OF THE GENUS *HIPPURITELLA* DOUVILLÉ, 1908 FROM THE MAASTRICHTIAN OF SOUTH YEMEN AND NORTHERN SOMALIA

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ABSTRACT

Hippuritella sharwaynensis sp. nov. is described from the Maastrichtian (Sharwayn Formation) of Yemen; this species also occurs in the lower part of the Auradu limestones in northern Somalia, from where two badly preserved specimens were identified as *Hippuritella* sp. gr. *toucasi* (d'Orbigny) by the first author. The pore-canal system of the left valve and the pattern of pillars and myo-cardinal apparatus relate this species with the Toucas' (1903-1904) group of *Hippuritella toucasi* (d'Orbigny), but the development of the ligamentary crest does not fit with the evolutive model currently accepted for this group of hippuritid species. This species occurs together with *Hippurites cornucopiae* DeFrance and larger Foraminifera, all of them indicating a late Maastrichtian age.

Key words: *Hippuritella*, *Hippuritella toucasi* (d'Orbigny), Maastrichtian, Yemen, Somalia, rudists.

RESUMEN

Se describe la especie nueva *Hippuritella sharwaynensis* del Maastrichtiano de Yemen. Esta especie también se encuentra en la parte inferior de la Caliza Auradu al norte de Somalia, donde fueron identificados dos ejemplares mal conservados de *Hippuritella* sp. gr. *toucasi* (d'Orbigny) por el primer autor. El sistema poro-canal de la valva izquierda y el patrón de los pilares y del aparato mio-cardinal relacionan a esta especie con el grupo de Toucas de *Hippuritella toucasi* (d'Orbigny), pero el desarrollo de la cresta ligamentaria no coincide con el modelo evolutivo generalmente aceptado para este grupo de especies de hipurítidos. Esta especie está asociada con *Hippurites cornucopiae* DeFrance y foraminíferos grandes que indican una edad de Maastrichtiano tardío.

Palabras clave: *Hippuritella*, *Hippuritella toucasi* (d'Orbigny), Maastrichtiano, Yemen, Somalia, rudistas.

INTRODUCTION

An interesting rudist assemblage from the lower part of the Auradu limestones, near Bosaso in northern Somalia (Figure 1), was recently described by Pons and coworkers (1992). This assemblage, of Maastrichtian age, includes several genera and among them two specimens referred to *Hippuritella* sp. gr. *toucasi* (d'Orbigny). The discovery in the opposite side of the Gulf of Aden, near Ras Sharwayn in south Yemen, of a complete specimen of the same rudist with the left valve almost entirely preserved, gives more information about this form and allows to propose a new species of Hippuritidae.

GEOLOGICAL SETTING

South Yemen and northern Somalia belong to the same palaeogeographic domain: the Afro-Arabic Plate evolving under extensional tectonics leading to creation during the Tertiary of the Gulf of Aden. Ras Sharwayn is a promontory located in the Gulf of Aden near Quishn town, along the coast of south Yemen. In this locality the type section of the Sharwayn Formation crops out.

This unit, defined by Wetzel and Morton (unpublished data, 1948; see Beydoun, 1964, 1966), is present in the eastern part of southern Yemen and Dhofar—Sultanate of Oman. At Ras Sharwayn it rests unconformably upon the Mukalla Formation, of Senonian age. The contact with the overlying Tertiary limestone is marked by another important regional unconformity (Beydoun, 1966; Platel and Roger, 1989; Roger *et al.*, 1989).

After the geological reconstruction proposed by Beydoun (1970), showing the relationships between southern Yemen and northern Somalia before the opening of the Gulf of Aden, it could be inferred that the sectors including Ras Sharwayn and Bosaso areas during the Cretaceous were very close. In fact, the Sharwayn Formation shows astonishing lithological affinities, besides the dominant yellowish and brown colours, with the Maastrichtian of northern Somalia—lowermost part of the Auradu limestones.

The Sharwayn Formation is correlated with the Sinsima Formation, cropping out around the Oman Mountains (Nolan *et al.*, 1990; Skelton *et al.*, 1990), and the Aruma Formation of Saudi Arabia. In fact, this unit testifies a transgressive event that affected many sectors of the Arabian Shield at the end of Maastrichtian and allowed the diffusion of typical foraminiferal assemblages dominated by *Loftusia* and *Pseudedomia*. This unit reaches about 60 m of thickness at Ras Sharwayn and surroundings. The lower part consists of yellowish and brown

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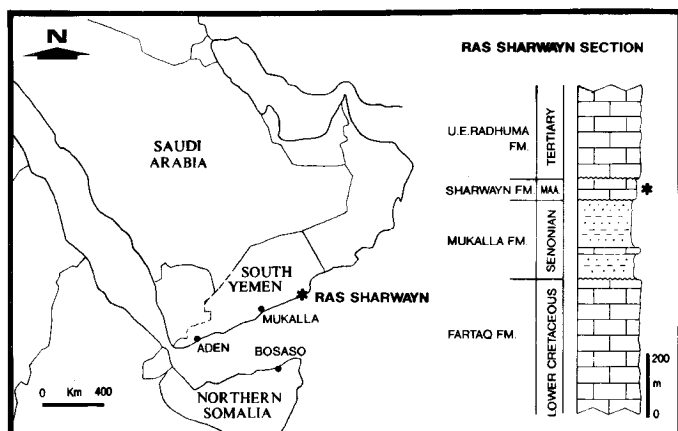


Figure 1. Location of the studied sample in the Ras Sharwayn section.

marls and shales with carbonate interbeddings. The upper part is dominated by brown yellowish, marly, detritic and hard limestones; the upper interval includes levels with rudists.

Fossils described in this paper were collected in a stratigraphical section ($51^{\circ}35'00''$ E, $15^{\circ}22'36''$ N) cropping out at about 10 km NW from the promontory of Ras Sharwayn. The sediment is a yellowish limestone with *Hippurites cornucopiae* DeFrance and *Hippuritella sharwaynensis* sp. nov. Microfacies analyses indicate this limestone is a fossiliferous wackestone with hippuritid and radiolitid fragments, gastropods, ostracods, corals, among them probable heliastreids; some dasycladalean algae as *Cymopholia eochoristosporica* Elliot and *Cymopholia* sp. are also present.

The underlying beds are dominated by very rich macroforaminiferal assemblages. They include *Loftusia persica* Brady, *L. morgani* Douvillé, *Pseudedomia hamaouii* Rahaghi, *Pseudochubbina globularis* (Smout), *Omphalocyclus macroporus* (Lamarck), *Lepidorbitoides socialis* (Leymerie), *L. minor* (Schlumberger), *Orbitoides* sp., *Siderolites calcitrapoides* (Lamarck), *Rotalia skourensis* Pfender, *Rotalia trochidiformis* (Lamarck), *Fissoelphidium operculiferum* (Smout), *Gavelinella* sp., Lagenidae, Nodosaridae and Textulariidae. These macroforaminifers are often associated with different genera of Corallinaceae algae and rare *Dissocladella* sp. This micropalaeontological assemblage is indicative of a late Maastrichtian age.

SYSTEMATIC PALAEOLOGY

Order Hippuritoida Newell, 1965
 Superfamily Hippuritacea Gray, 1848
 Family Hippuritidae Gray, 1848

Genus *Hippuritella* Douvillé, 1908

Type species—*Hippurites maestrei* Vidal, 1877 from de Santonian of Serra del Montsec (Pyrenees, Catalonia, Spain).

Hippuritella sharwaynensis sp. nov.
 (Plate 1, figures 1, 2; Figures 2, 3)

- v• 1949 *Hippurites (Orbignya) radiusus* des Moulins; Tavani, p. 12, pl. 1, fig. 5; pl. 4, fig. 8.
- v• 1949 *Hippurites (Orbignya) aff. radiusus* des Moulins; Tavani, p. 12, pl. 4, fig. 3.
- v• 1949 *Hippurites (Orbignya) sp.*; Tavani, p. 13.
- v• 1992 *Hippuritella* sp. gr. *toucasii* (d'Orbigny); Pons in Pons and coworkers, p. 223, text-figs. 6a-b, 7.

Derivation of name—After the promontory of Ras Sharwayn, the type locality.

Holotype—A complete specimen with both valves (PUAB-28.817), housed in the Palaeontological Collections of the Universitat Autònoma de Barcelona, from the Sharwayn Formation, late Maastrichtian, in a stratigraphical section ($51^{\circ}35'00''$ E, $15^{\circ}22'36''$ N) cropping out at about 10 km NW from the promontory of Ras Sharwayn in South Yemen.

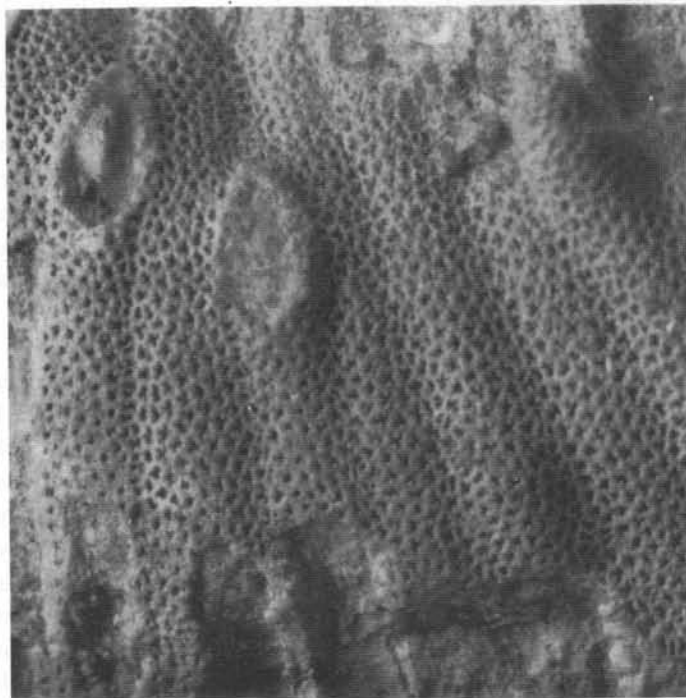
Additional material—Two fragments of right valves from the type locality (PUAB-28.818 and 28.819).

Diagnosis—Hippuritid with simple pore-canal system, polygonal pores, presenting spines (three to five) when well preserved, and developing pustules at the beginning of each canal, in the left valve. In the right valve, the three inner folds are very close together and develop, externally, well marked radial furrows. In the transverse section, the ligamentary crest appears poorly developed, triangular, normally pointing towards the anterior side and with truncated apex; the first pillar is short but longer than the ligamentary crest; the second pillar is pedunculated in fully developed specimens; teeth are located far from the ligamentary crest and from the antero-dorsal inner margin of the shell; the posterior myophore, long and thin, clearly passes the end of the first pillar.

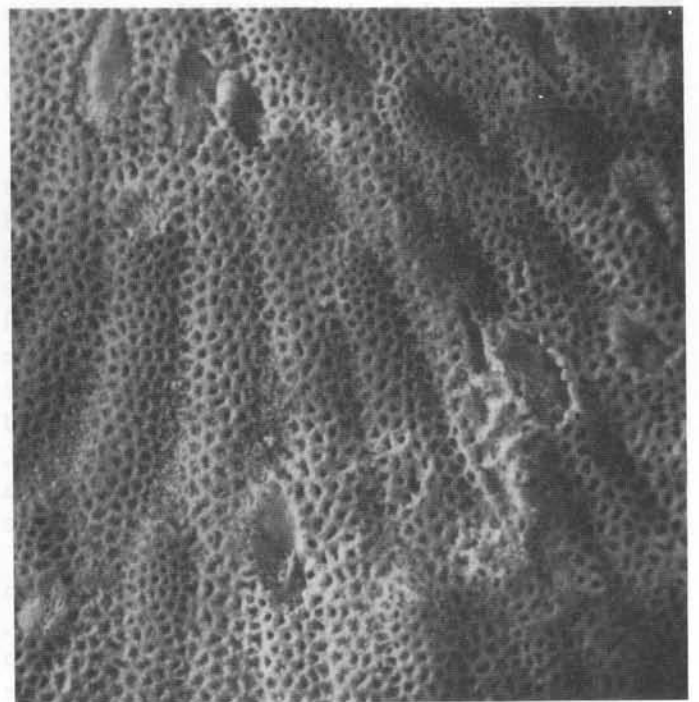
Description—Total height of the shell, measured perpendicularly to the commissural plane, is 13 cm. As far as it can be deduced from right valve's growth lines, at the beginning growth was faster at the antero-ventral side, and later at the postero-dorsal side; the result was the horn-shape of the valve. The outer surface, without any rib, is only affected by the growth lines and three deep radial furrows corresponding to the three inner folds. The transversal section is sub-circular, flattened at the side corresponding to the two pillars. The maximum diameter measures 7.7 cm; a diameter of 6 cm was reached at only 4 cm height.



1



2



3

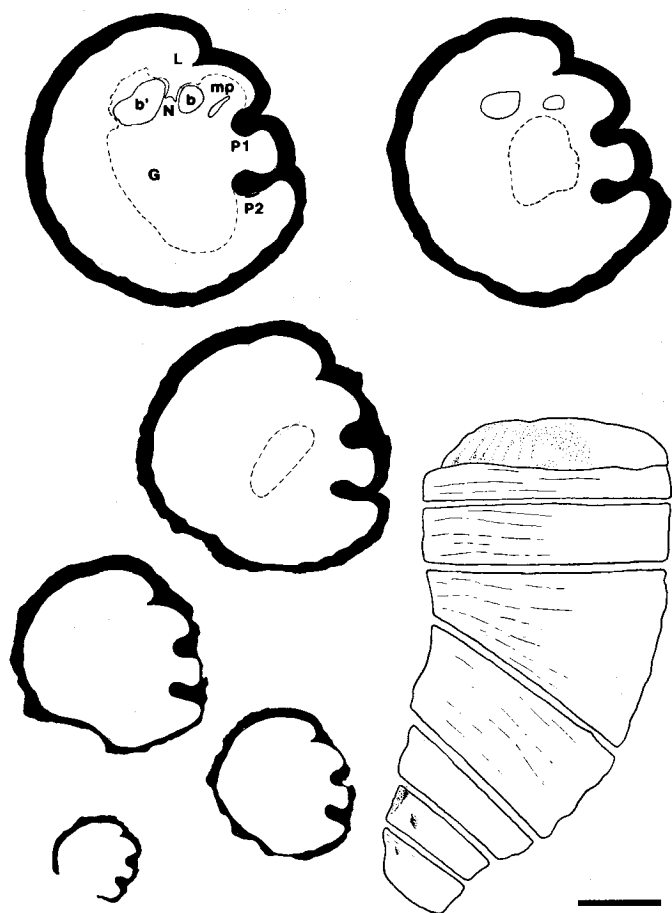


Figure 2. *Hippuritella sharwaynensis* sp. nov. Palaeontological Collections of the Universitat Autònoma de Barcelona, PUAB-28.817, seriate transverse sections of the right valve, their position is indicated at the lower right corner. Scale bar represents 20 mm. Legend: L, ligamentary crest; P1, first pillar; P2, second pillar; b', anterior tooth; b, posterior tooth; N, right valve tooth; mp, posterior myophore; G, general cavity.

The left valve, quite well preserved, is free of sediment on most of its ventral half (Plate 1, figures 1, 2). The pore-canal system is simple, the porose layer is very thin and the pores open directly to the radial canals. Canals can reach a width as much as 3 mm and new canals begin to develop over the old ones, until there is enough space to accommodate, forming pustules. The pores are polygonal, densely packed and do not present any particular arrangement. From six to eight pores can be counted along the width of a canal. The pores, when well preserved, present three to five inward growing small spines, provoking a star-shaped aperture. Oscules are not observable because the corresponding surface of the valve is covered by sediment.

The transverse section of the right valve (Figure 2), 1 cm below the commissure, shows that the three inner folds, marked externally by deep furrows, are very close one to another, covering less than one fifth of the total perimeter. The ligamentary crest is triangular and poorly developed, the apex is turned towards the anterior side and truncated. The first pillar is robust and short—length equals width—but longer than the ligamentary crest. The second pillar is pedunculated,

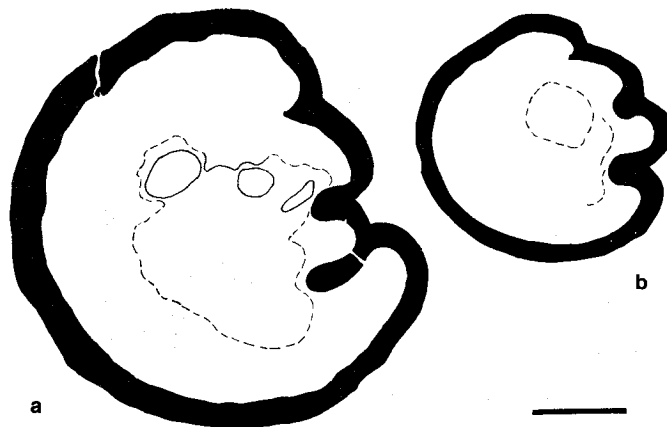


Figure 3. *Hippuritella sharwaynensis* sp. nov. Palaeontological Collections of the Universitat Autònoma de Barcelona. Transversal section of left valves. a, PUAB-28.818. b, PUAB-28.819. Scale bar represents 20 mm.

the head is slightly thinner than the first pillar and turned towards it. The section of the anterior tooth is more than twice the area of the posterior one; both teeth are located far from the ligamentary crest and from the antero-dorsal inner margin of the shell. The posterior myophore is long and thin, it is centered between the posterior tooth and the first pillar and clearly passes the end of this last.

As can be observed in the seriate transverse sections (Figure 2), major variations, affecting the shape of the pillars, occur during growth. The first pillar, wider than long in the first sections, becomes squared. The second pillar, very similar to the first one at the beginning, becomes rectangular and long, and later, pedunculated. No variation is observed in the ligamentary crest.

Two other specimens have been sectioned (Figure 3); the first one corresponds to an adult specimen with the two pillars very close to each other, compared with the holotype, the myocardinal apparatus is still farther from the ligamentary crest and from the antero-dorsal inner margin of the shell; the ligamentary crest is a little bit more developed. The second section corresponds to a young specimen with the second pillar still not pedunculated.

Remarks— The left valve's pore-canal system described above for *Hippuritella sharwaynensis* sp. nov. shows no difference with that of the species of the Toucas' (1903-1904) group of *H. toucasi* (d'Orbigny)—see detail of *H. sulcatissima* (Douvillé) in Plate 1, figure 3—the pattern of the pillars and the myocardinal apparatus is also very similar. Apparently, there is no problem including the new species in that group, as its Maastrichtian representative, but the ligamentary crest, although poorly developed, is triangular and presents a truncated apex, currently considered to be a primitive character. In the authors' opinion, the succession of characters used in the evolutive models in hippuritids is not properly established and a completely new approach to the systematics of Hippuritidae is urgently needed.

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