A NEW CANALICULATE RUDIST BIVALVE FROM THE ARUMA FORMATION OF CENTRAL SAUDI ARABIA

A new genus and species of canaliculate rudist bivalve, *Eodictyoptychus arumaensis*, is described from the topmost part (Campanian) of the Khanasir Limestone Member of the Upper Cretaceous Aruma Formation of Central Saudi Arabia. It shares a number of derived character states with the Maastrichtian *Dictyoptychus* Douvillé, although lacking certain other derived character states of that genus. It may thus be considered a primitive sister taxon to the latter genus, and perhaps even its ancestor. Its evolutionary relationships with other rudist taxa remain unclear, although it is unlikely that it evolved from any other caprinids (*sensu stricto*), plagiopectinids, antillocaprinids, ichthyosarcolitids or canaliculate radiolitids.

Introduction

In the course of a taxonomic study of the rudists of the Upper Cretaceous Aruma Formation of Central Saudi Arabia, we have recovered numerous specimens of a previously undescribed species of canaliculate rudist. It cannot be assigned to any currently available genus, although it shares certain distinctive derived character states with the larger-shelled, Maastrichtian *Dictyoptychus* Douvillé, 1905 (= *Polyptychus* Douvillé, 1904a). Here, we describe these specimens, propose a new genus and species for them, and discuss the evolutionary relationships of the new taxon, especially with *Dictyoptychus* itself. The holotype plus ten paratype specimens are lodged at the British Museum (Natural History) [B.M. (N.H.)], and further paratype material is lodged in the Geology Department collections of King Saud University (K.S.U.G.).

Geological background

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. The basement of the Arabian Shield crops out to the West (Fig. 1).

Upper Cretaceous strata are exposed along one of these escarpments, and over its eastern dip slope. They form a broadly arcuate outcrop passing to the East of Riyadh. Our studies have been concentrated along a section of the escarpment to the North of Riyadh, where the strike is approximately NW–SE (Fig. 1; and see Bramkamp and Ramirez, 1958).

The lower part of the escarpment exposes the continental siliciclastic Wastia Formation, of Cenomanian age (Steineke et al., 1958). The disconformably overlying marine carbonates and marls of the Aruma Formation crop out along the crest of the escarpment and over its dip slope, to the East, which forms the Al-Aramah Plateau. It was after the latter that the formation was originally named, by Steineke and Bramkamp (1952). Following the latter authors, Powers et al. (1966) considered the Aruma Formation to be of Campanian-Maastrichtian age. However, El-Asa’ad (1983, 1987a) subsequently recognized nine faunal zones in the formation, representing the Coniacian to Maastrichtian stages. He divided the formation into three lithostratigraphical members (Fig. 2).

The lowermost, Khanasir Limestone Member (up to ~ 50 m) comprises slightly dolomitised, burrow-nodular limestones (El-Asa’ad, 1987b). This member ranges in age from Coniacian at its base (where various tissotiid ammonites have been recovered; El-Asa’ad, 1983; in press), to Campanian in its topmost few metres, where the rudists described herein were found (see next section).

The Khanasir Limestone Member is overlain, with very low angle unconformity, by the Hajajah Limestone Member (up to over 76 m). The basal 5 to 13 m of this comprises a laterally variable association of shaley, marly and marly-limestone facies, in which solitary corals and oysters (*Lopha dichotoma* Bayle) are locally common (El-Asa’ad, 1989a). A (probably earliest) Maastrichtian age for this basal part of the member was thought to be indicated by the local presence of *Loftusia* (El-Asa’ad, 1989b), and this would be consistent with the presence of rare *Dictyoptychus*. The member becomes more calcareous upwards, with abundant larger foraminifera also suggestive of a Maastrichtian age [including *Omphalocyclus macroporus* (Lamarck), and see El-Asa’ad, 1989b]. However, a Late Campanian age for the Hajajah Limestone Member is now proposed by
El-Asa'ad (in press), following the discovery of the ammonites *Manambolites amardi* Collignon and Roman, *Libycoceras chargense* Blankenhorn and *Pachydiscus (P.) launayi* (De Grossouvre) in the calcareous part of the member. The apparent conflict of these biostratigraphical indications remains unresolved.

The Hajajah Limestone Member passes upwards gradationally into the Lina Shale Member (over 37 m), comprising shales and marly nodular limestones, with common nautiloids, burrowing bivalves and gastropods. Ammonites and foraminifera from this member suggest a late Maastrichtian age (El-Asa'ad, 1983). The sequence is overlain disconformably by the Palaeogene *Umm er Radhuma Formation* (Powers et al., 1966).
Fig. 2 — Synoptic lithostratigraphy of the Aruma Formation in Central Saudi Arabia (based on El-Asa’ad, 1983). The formation is divided into three members, as indicated. The horizon with Eodicytopychus is indicated by a black square.


Lithology and age of the rudist beds described here

The new taxon was found at the top of the Khasanir Limestone Member at two localities. The type locality is at Khashm Buwaibiyat, on the dipslope surfaces neighbouring the crest of the escarpment, on either side of the road which runs NNE to Rumihiyah (Fig. 1). Here, a single prominent biostrome, 2 m thick, caps the member, and this is overlain to the East, with very low angle unconformity, by a local marly nodular limestone facies at the base of the Hajjah Limestone Member. Specimens of both the new taxon and of Biradiolites cf. aquitanicus Toucas are abundantly distributed throughout the biostrome.

This same biostromal horizon continues to the NW, and was studied by us at a second locality, Khashm Tawqi (Fig. 1), where it crops out on the slopes and gullies beside the road which cuts through the escarpment there. Here, the biostrome may reach about 2.5 m thickness in places, with a marly interbed separating a lower (1.2 m), from an upper (1.0 m) unit. The abundant specimens of the new taxon and Biradiolites are locally accompanied by branching corals.

Despite their abundance in the biostrome, the rudists show relatively little contact with each other, although smaller individuals of both genera may be found encrusting other shells (e.g. Pl. 1. fig. 4). The matrix is a fine bioclastic packstone with thin marly lenses. The fine-grained, but condensed nature of the deposit implies relatively calm conditions of formation, though with very slow sediment accumulation. This may either have been because of a lack of transported sediment, or because gentle current activity inhibited the settlement of mud (causing sediment bypassing), or even winnowed the existing sediments.

Yet further to the NW, around Khashm Hajjah and Wadi Itk, a pair of biostromal units with abundant Durania and a third with stromatoporoids are the probable lateral equivalents of the biostrome discussed above, comprising the “Durania assemblage zone” of El-Asa’ad (1987a: a corrected replacement name for his earlier “Sphaerulites/Biradiolites assemblage zone”, in El-Asa’ad, 1983). Here, however, a further 2 m or so of nodular marly limestones (of the “Cardium/Protocardium assemblage zone” of El-Asa’ad, 1983) overlie the biostrome, beneath the unconformity at the base of the Hajjah Limestone Member, illustrating the low-angle truncation of the Khasanir Limestone Member by the unconformity surface.

The lateral persistence of the biostromal horizon (extending NW-SE well beyond the 90 km of strike studied by us) is remarkable. Also remarkable is the high density of individuals but low diversity of its rudist fauna: Durania dominates to the exclusion of other taxa in the northwestern part of the area, while the new taxon, plus Biradiolites overwhelmingly dominate along the 60 km stretch from Khashm Tawqi to Khashm Buwaibiyat. A fuller analysis of the faunal diversity and distribution will follow in a subsequent paper on the Aruma rudists. The intention of this work is simply to establish the new taxon.

The age of the Durania assemblage zone was originally suggested by El-Asa’ad (1983) to be Santonian, since the overlying Cardium/Protocardium assemblage zone, containing the foraminifera Monolepidorbis sanctaepelagiae Astre and Orbitoides tissot Schlumberger, was dated as Campanian. However, there is nothing in the Durania assemblage zone to exclude the possibility of its being Campanian as well, and, in view of the conformable junction between the biostromal limestones and the immediately overlying Cardium/Protocardium assemblage zone limestones, this seems likely.
Systematic palaeontology

Superfamily Hippuritacea Gray, 1848
Family Incertae Familiae
Genus Eodictyopychus n. gen.

Type species. Eodictyopychus arumaensis n. sp., by monotypy.

Derivation of name. The conjunction of Eo- (eos, "dawn", in Greek) and Dictyopychus is intended to imply that the genus may be considered a primitive sister group to the latter genus.

Diagnosis. Attached right valve (RV) obtusely conical; cap-shaped left valve (LV) dorsally enrolled. Calcitic outer shell layer thin on LV, but thicker, with prominent radial ribs, on the RV. Inner (originally aragonitic) shell of both valves with pallial canals of rounded to polygonal section throughout. No trace of ligamentary invagination on outer surface of shell, and ligament absent. LV has dorso-ventrally flattened posterior tooth and a conical anterior tooth, separated by socket for the ridge-like tooth in the RV (Fig. 3). Prominent accessory cavity, in each valve, dorsal to posterior tooth. Broad anterior myophoral platforms in both valves, sub-parallel with the commissural plane. Posterior myophore of LV projecting from posterior extension of hinge plate, with its muscle scar facing out towards embayed posterior wall of RV (Fig. 3). Cystose tabulae in shell umbones.

Discussion. Several groups of rudists possess pallial canals (Skelton, 1978; the Caprinidae sensu lato, as assembled in the "Treatise" classification of Cox et al., 1969, is an unsatisfactory polyphyletic grouping of such forms). Few of these compare closely with Eodictyopychus (Table 1).

The marked contrast in thickness of the calcitic outer shell layer in the two valves is not seen in the caprinids (sensu stricto), Ichthyosarcolites, the antilocaprinids, Rousselia and most species of Sabinia. In these it is thin in both valves, and may indeed be altogether missing in Ichthyosarcolites and, perhaps, Titanosarcolites (Antilocaprinidae).

In "Sabinia" klinghardtii Böhme the outer layer of the RV has a typically radiolitid celluloprismatic structure (MacGillavry, 1937; Skelton, 1978) and so differs from that in Eodictyopychus. This distinction also applies to the RV outer shell layer of the various other radiolitids in which pallial canals are present, such as Chiapasella and the Joufininae of Karacabey-

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Fig. 3 — Internal features of Eodictyopychus arumaensis n. gen. n. sp. Left valve (LV) drawn from holotype (Pl. 1, fig. 1); right valve (RV), from a paratype specimen (Pl. 1, fig. 2). Legend: am, anterior myophore; at, anterior tooth; ats, anterior tooth socket; bc, body cavity; ct, central tooth; cts, central tooth socket; pm, posterior myophore; pme, posterior myophoral embayment; pt, posterior tooth; pts, posterior tooth socket; x, accessory cavity.

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Caratteri interni di Eodictyopychus arumaensis n. gen. n. sp. Disegno della valva sinistra (LV) dell’olotipo (Pl. 1, fig. 1); valva destra (RV), di un individuo paratipo (Pl. 1, fig. 2). Legenda: am, mioforo anteriore; at, dente anteriore; ats, fossetta del dente anteriore; bc, cavità del guscio; ct, dente centrale; cts, fossetta del dente centrale; pm, mioforo posteriore; pme, rientranza del mioforo posteriore; pt, dente posteriore; pts, fossetta del dente posteriore; x, cavità accessoria.
<table>
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<th>Derived character state in Eodictyoptychus</th>
<th>Palial canals in RV</th>
<th>Thickened outer shell layer in RV</th>
<th>Ligament absent</th>
<th>Dorsally extended anterior myoporal platforms</th>
<th>LV posterior myophore projecting into recess in RV body cavity</th>
<th>Accessory cavity dorsal to posterior tooth and socket</th>
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<tr>
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Table 1. Comparison of character states in Eodictyoptychus n. gen. and other palial canal-bearing rudists. Ticks indicate derived character states shared with Eodictyoptychus. Ticks are in brackets where the comparisons are qualified (numbered comments below).

Comments:
1. Only in the more advanced and the New World genera (MacGillivray, 1937); 2. Only in the advanced Tiansosarcolites (MacGillivray, 1937), and hence convergent; 3. As a small ligamentary relic (MacGillivray, 1937), probably convergent; 4. Only in Coralliochamach (Douville, 1904a); 5. Only in some species of this probably polyphyletic genus, including the type species; 6. In S. 's. klinghardtii, which is a radiolitid (Skelton, 1978) and S. serbica; Philip (1986) argues that all Sabina species may be derived from the Radiolitidae, with secondary reduction of the RV outer shell layer (and loss of its cellular fabric) in most species. However, other features (e.g. presence or absence of an accessory cavity in the LV) suggest that the genus is polyphyletic and in need of further taxonomic revision; 7. Of characteristic cellulose-prismatic form - a derived shell fabric not found in other rudists (including Eodictyoptychus); 8. Only in the New World genus, Chiapastella: the other taxa (especially the "Joufiniae" of Karacabey-Ottemur, 1981) have prominent arêtes cardinales; 9. Feature only very weakly expressed; the posterior myophoral arrangement is basically like that in Monopleura (Douville, 1904a); 10. The abundance of canals in the inner shell makes it difficult to define the limits of the anterior myophores with precision; that in the LV is also projecting and blade-like, facing out towards a ledge in the RV (Cox, 1934).

The only consistent and clear affinities of Eodictyoptychus are thus with Dictyoptychus (Table 1). Particularly striking is the presence in both of an accessory cavity, in each valve, situated on the dorsal side of the posterior tooth and of its socket, as well as the dorso-ventrally flattened aspect of that tooth (see Douville, 1904a, figs. 1 and 2; Cox, 1934; and Fig. 4 herein).
Dictyoptychus does possess some features not present in Eodictyoptychus. Its projecting anterior myophore in the LV, somewhat more socket-like development of the recess in the RV for the LV posterior myophore, its flattened LV and its giant size, including vastly expanded polygonal canals in the RV are derived features not shared by the latter. Eodictyoptychus may thus be considered a primitive sister group to Dictyoptychus and is, indeed, a strong candidate to include its direct ancestors (see p. 112).

Eodictyoptychus arumaensis n. sp.
Pl. 1, figs. 1-6; Pl. 2, figs. 1-6

Holotype. An isolated LV [B.M. (N.H.) LL 35376] from the tomost biostrome of the Khashm Buwaibiat is selected as holotype (Pl. 1, figs. 1 and 3). It comes from the dipslope surface at the crest of the main Aruma escarpment beside the road running from Khashm Buwaibiat to Rumhiyah (Fig. 1).

Other material (paratypes). Ten further specimens have been deposited at the B.M. (N.H.) (LL 35377 to 35386), comprising two isolated RVs, two isolated LVs and an articulated specimen from the type locality, as well as a large eroded RV and an articulated specimen from the same horizon about 1 km to the South, and part of a LV and two articulated specimens from the equivalent horizon at Khashm Tawqi (Fig. 1). We have also studied another nine specimens from the type locality, as well as two from southern Buwaibiat and six from Khashm Tawqi, which have been deposited in the King Saud University collection (K.S.U. G. Rud 10-25).

Derivation of name. The specific name refers to the El Arama plateau, after which the Aruma Formation was named (see Steineke et al., 1958), and from which the type material was collected.

Diagnosis. As for genus.

Description. The external form of the smaller specimens is reminiscent of Plagioptychus: the RV is obtusely conical, though with a spirally coiled apex attached to some hard object (Pl. 1, fig. 4), and the LV is of inflated cap-like form with its umbo dorsally enrolled in a somewhat anterior position (Pl. 1, fig. 3). In larger specimens, however, the LV is greatly extended in an openly curved fashion (Pl. 1, fig. 5; Pl. 2, fig. 4) and may thus exceed the RV in size. Individuals may reach some 14 cms in commissural diameter, though most achieve little more than half this [dimensions of the specimens in the B.M. (N.H.) are given in Table 2, below]. Some specimens at the type locality have LVs up to 20 cm long.

The dark calcitic outer shell layer shows a marked difference in thickness and external ornamentation in the two valves. In the right valve it is relatively thick.
A NEW CANALICULATE RUDIST BIVALVE

Table 2. Dimensions of Eodicyopterus aramaensis n. sp. from the Aruma Formation (Khanasir Member) of central Saudi Arabia.
— Dimensioni di Eodicyopterus aramaensis n. gen. n. sp. della Aruma Formation (=Khanasir Member) dell’Arabia Saudita centrale.

(2-4 mm) and has sharp, narrow radial ribs 2-5 mm apart (Pl. 1, fig. 6), though these flatten out on the larger individuals, leaving only coarse growth ruge (Pl. 2, fig. 1). That in the LV, in contrast, is less than 0.5 mm thick and is usually smooth, apart from fine growth lines (Pl. 2, fig. 2). Some specimens, however, show radial rows of small tubercles on the earlier-formed parts of the LV, corresponding to the ribs in the RV (Pl. 2, fig. 3). The outer layer is commonly worn off (as in the holotype), revealing the inner shell beneath.

The dorsal flanks of the shell show no trace of ligamentary invagination; nor is there any indication of it within the shell. The ligament seems, then, to have been absent.

The inner shell, now altered to white sparry calcite from its original aragonitic composition, is entirely penetrated by fine pallial canals in both valves, including the myophoral buttresses (Pl. 1, figs. 1 and 2). Canal diameters are finest around the peripheries of the valves, where they are about 0.5 mm (Pl. 2, fig. 6). Here, the canals are rounded in cross-section. They become larger in parts of the valve interiors where they take on a more irregularly polygonal cross-sectional form. This is particularly the case in the shallow depressions around the outer margins of the myophores, where their diameters may reach at least 6 mm (Pl. 2, figs. 5 and 6). The canals are tabulate.

The hinge plates occupy a large proportion of the shell interior. The rounded body cavity of the holotype, for example, has a diameter of only 2.5 cm, as against the valve’s commissural diameter of over 5 cm (Pl. 1, fig. 1). Likewise, a slightly larger RV, LL 35377 (Pl. 1, fig. 2), still only has a body cavity diameter of 2.5 cm. The teeth and myophores (Fig. 3) are arrayed around the inner parts of the hinge plates, with broad shallow depressions running around outside them (Pl. 1, figs. 1 and 2). The ridge-like tooth of the RV curves around the prominent conical anterior tooth of the LV. The posterior tooth of the LV forms a dorso-ventrally flattened projection at the ventral margin of the hinge plate, and is flanked dorsally by a prominent accessory cavity (Pl. 1, fig. 1). The latter tooth is received in the RV in a correspondingly narrow socket, again with an accessory cavity on its dorsal side (Pl. 1, fig. 2 and see Fig. 3 for explanation). No other accessory cavities are present. The anterior myophores form elongate, wide platforms extending from near the ventral margin of each valve, around to the dorsal sides of the anterior tooth and its socket. Their muscle attachment surfaces lie more or less parallel with the commissural plane and are closely approximated. The posterior myophore of the LV forms a tooth-like projection from a postero-ventral extension of the hinge plate (Pl. 1, figs. 1 and 2, figs. 5 and 6). Its muscle attachment scar faces outwards, posteriorly, towards the posterior shell wall of the RV. In LL 35385 (Fig. 5) there is a recessed groove in the posterior wall of the RV, corresponding to the site of insertion of the LV posterior myophore, though this does not form a complete socket, as such.

Cystose tabulae fill out the umbonal spaces either side of the body cavity. Together with the tabulate canals, these give broken or eroded sections across the valves the appearance of a vesicular calcareous foam (Pl. 2, fig. 1).

Autecology. Smaller individuals commonly show an encrusting habit, attached by the anterior face of the RV to some hard object, such as another shell (Pl. 1, fig. 4). The larger individuals were recumbent, with the extended left valve lying upon the substratum; several such individuals were noted in situ at Khashm Tawqi (unfortunately most of the specimens found on the dipslope surface at Khashm Buwaiybiyat were loose, and so their life positions could not be directly observed).
Evolutionary relationships of Eodictyoptychus

In cladistic terms, *Eodictyoptychus* and *Dictyoptychus* form a monophyletic pair of sister taxa with respect to all other rudists, united by several derived character states (synapomorphies), as shown in Table 1. However, *Dictyoptychus* also shows several unique derived character states (autopomorphies) not shared by *Eodictyoptychus* (p. 109). The latter, in contrast, lacks any clear autopomorphies of its own. It is therefore a highly plausible hypothesis that some species of *Eodictyoptychus* (of which only *E. arumaensis* is so far known) was the ancestor of *Dictyoptychus*. The stratigraphical data for the two genera (Campanian for *Eodictyoptychus* and Maastrichtian for *Dictyoptychus*; Douville, 1904b) are consistent with such an interpretation. The morphological transformation from one to the other could readily have been accomplished by heterochronous change: *Dictyoptychus*, with its flattened LV (like that in juvenile *Eodictyoptychus*) and giant size, could have been the product of neoteny.

The origin of *Eodictyoptychus* itself, and the family placement of the pair of genera, remains unclear (hence the ‘Incertae familiæ’ given in the Systematic Palaeontology). There are two broad possibilities: either *Eodictyoptychus* arose within some other, already caniculate group of rudists; or it independently evolved canals, and was derived from one of the caprotini genera.

Most of the other caniculate groups can be rejected for plausible ancestry. The two major families, the Caprinidae and Plagiopychidae, are both characterised by the presence of a large accessory cavity in the LV, separating the anterior-facing posterior myophore from the body cavity. No such (derived) feature is present in *Eodictyoptychus* or *Dictyoptychus*, which have, in contrast, a simply projecting posterior myophore in the LV, facing back towards the (recessed) posterior wall of the RV. Skelton’s (1978) speculative suggestion that *Dictyoptychus* might be an advanced plagiopychid should be rejected on this basis. Evidently the thickened outer shell layer of the RV in the two groups is convergent.

The antillocaprids are so far only known from the Maastrichtian of the Caribbean Province (MacGillavry, 1937), although this does not rule them out of consideration, as the evidence of disjunct endemics either side of the Pacific shows (Skelton and Wright, 1987). Nevertheless, the extreme thinness of the outer shell layer in *Antillocaprina*, and the simple monopleuriform myophores of that genus, make it an unlikely candidate for the ancestry of *Eodictyoptychus*.

Likewise, *Ichthyosarcolites* may be rejected since it may even have lacked an outer calcitic shell layer. Besides, there is no evidence to suggest that any *Ichthyosarcolites* survived beyond the Cenomanian/Turonian extinction event (Masse and Philip, 1986).

The canaliculate radiolitids (including “Sabinia” klinghardti) are readily rejected since there is no vestige in *Eodictyoptychus* of the cellular prismatic structure of the calcitic outer shell layer, typical of radiolitids.

Thus the only remaining contenders among the canaliculate rudists comprise the other species of *Sabinia*, *Rousselina* and *Paracaprina*. The first genus is in need of taxonomic revision and the other two are incompletely known (and in any case are so far only recorded from the Maastrichtian). Nor, on the other hand, are there any late Cretaceous caprotini showing any particular similarity with *Eodictyoptychus*. It would probably be unproductive to speculate further on the likely ancestry of *Eodictyoptychus* on our present knowledge; this is a problem for future years, when the late Cretaceous rudist faunas of eastern Tethys, in particular, are better known.

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NEL CORSO DELLO STUDIO TASSONOMICO DELLE RADISTE DEL CRETACEO SUPERIORE DELLA "ARUMA FORMATION" DELL'ARABIA SAUDITA CENTRALE ABBIAMO RILEVATO NUMEROSI INDIVIDUI DI UNA SPECIE DI RADISTA CANALICULATA PRECEDENTEMENTE NON DESCRITTA. QUESTA NON PUÒ ESSERE ATTRIBUITA AD ALCUN GENERE ESISTENTE ANCHE SE CONDIVIDE ALCUNI CARATTERI DISTINTIVI CON DICTYOPHYCUS DOUVILLE, 1905 (= POLYPHYCUS DOUVILLE, 1904A) DEL MAESTRICHITANO CHE HA GUSEO PIÙ SPESO. IN QUESTO LAVORO DESCRIVEREMO INFINITI EODICTYOPHYCUS ARUMAEUS NUOVO GENERE E NUOVA SPECIE DALLA PARTE PIÙ ALTA (CAMPANIANO) DEL "KHANASIR LIMESTONE MEMBER" DELLA "ARUMA FORMATION".

Questa forma può essere così considerata un taxon primitivo, apparentemente genere Dictyophyclus e, forse, addirittura il suo antenato. La relazione evolutiva con altri taxa di radistere rimane però non chiara, anche se è improbabile che esso si sia evoluto dalle caprinidi (senza stricto), plagioptichidi, antilocaprinidi, ichniosarcoliti o da radioliti provvisti di canali.

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PLATE I

*Eodictyopychus arumaensis* n. gen. n. sp. from the Aruma Formation of Central Saudi Arabia.

Fig. 1 — LV interior (holotype), × 1. BM (NH) LL 35376. Campanian. Khashm Buwaibiyat. See Fig. 3 for explanation.

Fig. 2 — RV interior, × 1. BM (NH) LL 35377. Campanian. Khashm Buwaibiyat. See Fig. 3 for explanation.

Fig. 3 — LV anterior (holotype), × 1. Details as in Pl. 1, fig. 1.

Fig. 4 — RV, encrusting larger LV, × 1. BM (NH) LL 35378. Campanian. Khashm Buwaibiyat.

Fig. 5 — LV, lateral view, × ¾. K.S.U.G. Rud 10. Campanian. Khashm Buwaibiyat.

Fig. 6 — Articulated shell, ventral view, × 1. B.M. (NH) LL 35387. Campanian. Khashm Tawqi.

TAVOLA I

*Eodictyopychus arumaensis* n. gen. n. sp. dalla «Aruma Formation» dell'Arabia Saudita centrale.

Fig. 1 — Interno della LV (olotipo), × 1. BM (NH) LL 35376. Campaniano. Khashm Buwaibiyat. Per spiegazioni, vedere Fig. 3.

Fig. 2 — Interno della RV, × 1. BM (NH) LL 35377. Campaniano. Khashm Buwaibiyat. Per spiegazioni, vedere Fig. 3.

Fig. 3 — Parte anteriore (olotipo), × 1. Dettaglio di Pl. 1, fig. 1.

Fig. 4 — RV con la più grande ed incrostante LV, × 1. BM (NH) LL 35378. Campaniano. Khashm Buwaibiyat.

Fig. 5 — LV, vista laterale, × ¾. K.S.U.G. Rud 10. Campaniano. Khashm Buwaibiyat.

Fig. 6 — Guscio articolato, vista ventrale, × 1. BM (NH) LL 35387. Campaniano. Khashm Tawqi.
PLATE II

_Eodictyoptychus arumaensis_ n. gen. n. sp. from the Aruma Formation of Central Saudi Arabia.

Fig. 1 — Articulated shell, anterior view, × ¾. BM (NH) LL 35384. Campanian. Southern Buaiibiyat.
Fig. 2 — LV, lateral view, × 1. BM (NH) LL 35380. Campanian. Khashm Buaiibiyat.
Fig. 3 — LV, lateral view, × 1. BM (NH) LL 35385. Campanian. Khashm Tawqi.
Fig. 4 — Articulated shell, ventral view, × 1. BM (NH) LL 35381. Campanian. Khashm Buaiibiyat.
Fig. 5 — LV interior, × 1.5. BM (NH) LL 35379. Campanian. Khashm Buaiibiyat.
Fig. 6 — Detail of postero-ventral part of Pl. 2, fig. 5, × 2.

TAVOLA II

_Eodictyoptychus arumaensis_ n. gen. n. sp. dalla «Aruma Formation» dell’Arabia Saudita centrale.

Fig. 1 — Guscio articolato, vista laterale, × ¾. BM (NH) LL 35384. Campaniano. Buaiibiyat meridionale.
Fig. 2 — LV, vista laterale, × 1. BM (NH) LL 35380. Campaniano. Khashm Buaiibiyat.
Fig. 3 — LV, vista laterale, × 1. BM (NH) LL 35385. Campaniano. Khashm Tawqi.
Fig. 4 — Guscio articolato, vista ventrale, × 1. BM (NH) LL 35381. Campaniano. Khashm Buaiibiyat.
Fig. 5 — Interno della LV, × 1.5. BM (NH) LL 35379. Campaniano. Khashm Buaiibiyat.
Fig. 6 — Dettaglio della parte postero-ventrale di Pl. 2, fig. 5, × 2.