THE TETHYAN JURASSIC STROMATOPOROIDS
STROMATOPORINA, DEHORNELLA, AND
ASTROPORINA

by R. G. S. HUDSON

ABSTRACT. Certain Tethyan Jurassic stromatoporoids, some formerly allocated to the Palaeozoic genus Stromatopora, are described with new morphological terms, and grouped in the family Parastromatoporidae (superfamily Milleporellacea). Dehorneella Leconpte 1952 is reassessed and Stromatopora cheffatici Dehorne 1917; sometimes erroneously allocated to Stromatoporidae Kuhn 1928 (Stromatoporidae Kuhn 1928) of which the type species Stromatopora turquisisi Deninger 1906 is redescibed, is allocated to it. Stromatopora harrenensis Wells 1943 is also allocated to Dehorneella and specimens from Oman, Sinai, and Israel are described. Newly described species are Dehorneella omanensis from Oman and D. erosaensis from Israel.

Astroporina gen. nov., characterized by a coenosmum consisting almost entirely of conjoined astrosystems, includes A. stiliforma sp. nov. and A. stilata sp. nov. from Oman, and A. orientalis sp. nov. and related forms from the Lebanon, Somaliland, and Oman.

INTRODUCTION

Some of the Jurassic clinogonals stromatoporoids, in which both reticulum and astrosystems are tabulate and dominantly vertical, have been variously allocated to the genera Parastromatopora, Tosalastraea, and Dehorneella: the continued allocation of others to the genera Stromatopora Goldfuss or Stromatoporidae Kuhn is, in the opinion of the author, erroneous. Such forms are abundant in the Upper Jurassic of the Middle East, particularly in the Beni Zaid Limestone, Musandam Limestone Group, of the Jebel Hagh area, Trucial Oman. It is to facilitate the naming of some of these that the genera Stromatoporidae and Dehorneella are here redefined and a new genus erected.

Acknowledgements. The specimens described in this paper include those from Somaliland collected by W. H. Macfadyen and lent to the author by A. G. Brighten of the Sedgwick Museum, Cambridge, and by H. Dighton Thomas of the British Museum (Natural History), London. The holotype of Stromatopora turquisisi (Deninger) was lent to the author by Professor Pfannenstiel of the University of Freiburg and that of Stromatopora cheffatici (Dehorne) by Professor P. Proven of the Sorbonne, Paris. The other described and recorded specimens are from the Middle East collections of the Iraq Petroleum Company and have been generously presented to the British Museum (Natural History) by that company; those from Sinai and the Lebanon were collected by S. Nasr and some of those from Oman by Z. R. Beydoun. The work of this paper was carried out in the Geological Laboratories of the Iraq Petroleum Company and permission to publish it has been generously given by the Directors and Chief Geologist of that company. To all those mentioned above the author here records his thanks.

Registration numbers proceed by the letter H are those of specimens in the collection of the Department of Palaeontology, British Museum (Natural History), London; those preceded by the letter F are of specimens from the Sedgwick Museum, Cambridge.

STRATIGRAPHY AND LOCALITY

Eastern Arabia. The specimens (H 4833 to H 4869) described in this paper, mainly as Dehorneella harrenensis (Wells) and D. omanensis sp. nov., are from the Musandam Limestone (Jurassic-Cretaceous), which is well exposed in the Jebel Hagh area of the Ruus al Jibal, the northern peninsula of the Oman Mountains, eastern Arabia (Hudson [Palaeontology, Vol. 2, Part 2, 1960, pp. 180–99, pl. 24–28.])
In this limestone series the Beni Zaid Limestone Formation, 77 metres thick, is of Oxfordian s.s. age, its type section being along the south bank of Wadi Bib in the Jebel Hagab area (Hudson and Chatton 1959). The top of the formation is a light-grey, massive, pseudo-oolitic limestone, 2.5 metres thick, containing abundant stromatoporoids: it was from this uppermost limestone that the above specimens were collected by Z. R. Beydoun and the author.

Sinai. The Jurassic succession exposed in Jebel Moghara, Sinai (Arkell 1956, Said and Barakat 1958) was measured by the geologists of the Standard Oil Company of Egypt: the fossil collections of the Iraqi Petroleum Company, made by S. Nasr, were keyed to that succession. The uppermost part of the succession is as follows:

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
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<tr>
<td>6.</td>
<td>Light-grey and white limestone with abundant stromatoporoids as Shuqraia, &amp;c. (Argovian).</td>
<td>24.0</td>
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<tr>
<td>5.</td>
<td>Chalky limestone (Argovian)</td>
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<td>3.</td>
<td>Shale, gypsiferous</td>
<td>5.0</td>
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<td>2.</td>
<td>Limestone, light grey, hard, with fine, stromatoporoids as Dehoronella and Parestromatopora in upper part. Pachyderma sp. (as Desvallé 1916, pl. 8, figs. 4, 10) and Encyphiceras, det. Spars. (Oxfordian s.s.)</td>
<td>104.0</td>
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Both the lithological and faunal successions agree well with those of neighbouring areas. Beds 1 and 2 are the equivalent of the upper part of the Biham Limestone of Somaliland and that of the TuwaqMt. Limestone of Central Arabia. Beds 3 to 6 are the equivalent of the Gahodleh Shaales of Somaliland and the Hanifa Formation of Central Arabia. The non-sequence cuts out the Sequanian, Tithonian, and Neocomian as at Kurnub, Palestine. Said and Barakat (1958) give a totally different stage allocation to the Jurassic of Moghara, an allocation with which the author can in no way agree.

Israel. The fauna of the Jurassic exposed in Makkesh Hathira (Kurnub Anticline) has recently been summarized by the author (Hudson 1958). The stromatoporoid formations are the Shuqraia Limestones-with-Marls of Argovian age. They contain Shuqraia sp., Promilepora kuruhi Hudson, P. peringii Dehorne, P. dorvillei (Dehorne), Steiniera somaliensis (Zuff.-Com.), Actesiona dawesii Hudson, A. nasri Hudson, A. kweli Hudson, Dehoronella crustata sp. nov., and D. cf. harracensis (Wells).

British Somaliland. In this area the Jurassic includes the Biham Limestone (Callovian and Oxfordian), 83 metres thick, with, above it, the Gahodleh Shaales (Argovian), 113 metres thick. The upper part of the Biham Limestone (= Tuwaq Mt. Limestone of Central Arabia, the Shuqra Limestone of southern Arabia, and the Beni Zaid Limestone of eastern Arabia) contains corals and stromatoporoids, mostly Shuqraia zuffardiae (Wells) (Thomas in Macfadyen et al. 1935). It was from the upper part of the Biham Limestone that Astroporina stellata sp. nov. and A. cf. orientalis sp. nov. were collected. The exact horizon of A. stellata sp. nov. is not known.
STROMATOPOROID SKELETAL MORPHOLOGY

Fenestrate and cellular vertical lamellae. In morphological early forms the lateral processes arising from the pillars were usually transversely aligned and thus formed an open mesh of transverse lamellae, important structural elements in the reticulum and often as equally developed as the vertical pillars. In later forms, tending to verticality, the transverse lateral processes functioned differently since they occurred more or less vertically continuously on opposite sides of a pillar and linked one pillar to the other, thus forming vertical lamellae. In some forms the lateral processes may be still occasionally aligned giving sporadic transverse lamellae. Vertical lamellae so formed are often fenestrate (Hudson 1959) due to the intermittent vertical discontinuity of the lateral processes joining the pillars. Such openings are no more than temporary coenospaces between adjacent pillars and show as such in transverse section.

In morphologically advanced forms vertical lamellae are formed by the direct lateral welding of the pillars without the intervention of lateral processes. In such forms transverse structures other than tabulae and tabular laminae are absent. This joining of the pillars may proceed farther so that the vertical lamellae are two or more layers of pillars across or are compact vertical blocks of pillars. Such compound lamellae may not, however, be completely compact. They may enclose one or more small coenospaces, usually vertically elongate and thus form cellular vertical lamellae.

Astrocorridors. In morphological early forms the astrosystem may consist of an axial astrotube from which radiate out at regular or irregular vertical intervals single or groups of transverse astrotubes. In the forms described in this paper astrosystems do not include axial astrotubes and the transverse astrotubes are vertically extended so that they form a group of narrow radial spaces extending vertically throughout the reticulum and usually bounded by vertical lamellae which meet more or less at the axis of the astrosystem. Such vertical spaces, normally tabulate, are here called astrocorridors: they are the superimposed astrocorridors of other authors.

SYSTEMATIC PALAEONTOLOGY

The systematic position of the Mesozoic ‘stromatoporoids’ is a matter of argument, the main point of issue being the structural, and hence systematic, independence, at both family and order level, of the Palaeozoic and Mesozoic genera. To a less degree there is the same doubt of allocation of certain Mesozoic genera to groups which are essentially Tertiary-Recent. Thus there is no certainty of allocation of the various Mesozoic genera to one or more of the variously proposed orders such as the Stromatoporidea Nicholson and Murie, Sphaeractinioidea Kühn, Hydroida Dana nor Johnston, Spongiosomorphida Alloiteau, Millocorina Hickson, or Styelasterina Hickson and England.

In 1936 the author agreed with Kühn (1939) that the Milleporididae were morphologically more closely comparable to the Hydroidea Dana than to the Stromatoporidea Nicholson and Murie, and allocated them to the former order. Whatever their relation to the Hydroidea, the family is closely linked to the Milleporididae and the Parastromatoporidea, and is here grouped with them in the superfamily Milleporidae. The Mesozoic forms show little stratigraphical continuity with the Palaeozoic Stromatoporidea or the Tertiary-Recent Hydroidea; the three groups are also more or less morphologically independent. It may be that they evolved independently, their generally similar structural
pattern being based on common ancestry: it may be, therefore, that they should be allocated to independent orders. It is, nevertheless, convenient to refer to most of the Mesozoic forms as stromatoporoids rather than hydroids or sphaeractinoids and they are therefore, purely for a matter of convenience, provisionally grouped in the Stromatoporoids.

The systematic position of the genera discussed in this paper is shown in the part-list of Jurassic and Cretaceous stromatoporoids given below.

**STROMATOPOROIDA** Nicholson and Murie 1878
  (order)
  **ACTINOSTROMARIIDAE** Hudson 1959 (superfamily)
  *Actinostromaria* Murier-Chalmas in Haug 1909
  *Actinostroma* Lecompte 1952
  *Actinostrophia* Gerv Mountain 1954
  *Actinostromatoides* Hudson 1957 (family)
  *Stromatohiza* Bakalow 1906
  *Actinostroma* Hudson 1959
  *Spionostromatoides* Steiner 1932 (family)
  *Siphonostroma* Steiner 1932

**MILLEFORDIIDAE** Yabe and Sugiyama 1953
  (family)
  *Millefodiun* Steinmann 1903
  *Mylopora* Volz 1904
  *Parastromatopora* Dehorne 1920
  *Schnegelbergia* Hudson 1954
  *Sporialesporidina* Gerv Mountain 1954
  *Steineckera* Hudson 1956
  *Parastromatoporidae* Hudson 1959 (family)
  *Cerastromena* Kühn 1926
  *Parastromatopora* Yabe and Sugiyama 1930
  *Tastromena* Yabe and Sugiyama 1935
  *Dehorneicella* Lecompte 1952
  *Steineckleria* Lecompte 1952
  *Astropolina* Hudson gen. nov.
  *Tastromaporidae* Kühn 1928 (family)
  *Tastromapora* Kühn 1928
  *Tastromaporia* Lecompte 1952

*Previous assessment of Stromatopora.* In 1928 Kühn considered that the allocation by Dehorne, Osim, Vinassa, Deninger, and others of a number of Mesozoic Tethyan stromatoporoids to the genus *Stromatopora* was an error for, in his opinion, all such Mesozoic forms had simple vertical elements whereas all species of *Stromatopora* from the Palaeozoic had compound vertical elements. He therefore founded a new genus *Stromatoporia* for the Mesozoic forms including in the genus *Stromatopora* tortuqui *S. chaffai* Dehorne 1917, *S. costai* Osim 1910, *S. franci* Osim 1910, *S. moluccana* Vinassa 1915, *S. virgili* Osim 1910, choosing the first of these as his type species. He also considered that the straight and parallel course of the vertical elements of the reticulum was a characteristic feature of his new genus. Unfortunately the description and illustration by Deninger of *Stromatopora* tortuqui is inadequate and possibly Kühn's conception of the species was based on a redescription by Osim in 1910, not from the holotype. This is the more probable since in 1939 he defines *Stromatoporia* as having vesicular structure like *Stromatopora* and having astorhizae well developed, illustrating the genus by reproducing Osim's figure (1910, pl. 1, fig. 1) of *S. franci* Osim. It is also evident from Deninger's description and illustration of *S. tortuqui,* inadequate as they are, that the vertical elements in the reticulum of that species are not straight and parallel as they are in the other species of *Stromatoporia* cited by Kühn, especially in *Stromatopora* chaffai Dehorne. *Stromatoporia* was therefore, as admitted by Kühn (1939, p. A46), a genus of convenience to which various species of differing
character could be allocated, the species having only one feature in common, that they were not Stromatopora.

In 1952 Lecompte redefined the genus Stromatopora Künn, unfortunately basing his definition on Stromatopora choffaii Dehorne and ignoring the type species S. tornquisti Deninger. This practice he also followed in 1956 illustrating the genus by figures of S. choffaii Dehorne. The author in 1955 attempted to avoid this misconception by redefining the genus on the basis of the type species. He failed to find the holotype and redefined the genus on the basis of the toptotype figured by Osimo (1910, pl. 7, figs. 7a, 7b) as S. tornquisti, a specimen he made a neoholotype. Fortunately, from information supplied by E. Flügel, the holotype has now been found in the collections of the Geolisch-Palaontologisches Institut of the University of Freiburg and has been lent to the author. It is redescribed in this paper: it has no similarity to S. choffaii and thus the concept of the genus Stromatoporina based on that species must be abandoned, and Stromatoporachoffaii and related forms be allocated to other genera (see also Flügel 1958, work which did not come to the attention of the author until after this paper was written).

Order stromatoporoidae Nicholson and Murie 1878

Family stromatoporinidae Künn 1928b


Diagnosis. Stromatoporoidae in which rods or short pillars, often joined by lateral processes to form lamellae, are linked to form a fine, irregular, approximately evenly meshed reticulum in which the lamellae may have no dominant direction or may be generally vertical. Reticulum traversed by regular, parallel, transverse laminae. Astrophysmata, variously developed, of vertical and radially grouped lateral astrotubes, usually much wider than the coenosporas: may be very indefinite. Reticulum and astrosystems variously tabulate. Structure of skeletal tissue not definitely known.

Genus Stromatopora Künn 1928a


Type species (by original designation). Stromatopora tornquisti Deninger 1906.

Diagnosis. Stromatoporoid with reticulum of fine rods linked to form a fine, subequal irregular angular mesh which, radially, tends to be open but not reticulate, and, trans-

EXPLANATION OF PLATE 24

Thin sections of Astroporia gen. nov., photographed by transmitted light and untouched. Figs. 1-3: all of holotype, F 1775, Upper Jurassic, Ahankon Tug, Inda District, British Somaliland, 1, 3, Tangential section, F 1775b, showing stellate astroid or with bounding vertical lamellae enclosing coenosporas. 2, 4, Radial section, F 1775c, mainly parallel to astroid or, showing tabulate astroid or, tabulate coenosporas, and alignment of tabulae. The larger spaces are along astrocorridors. 5, Oblique radial section, F 1775a, mainly across astrocorridors. Note pillars joined to form compound vertical lamellae cross astrocorridors. Figs. 6-7. Astroporia stellata sp. nov., all of holotype, F 1774, Bihen Limestone (Upper Jurassic), Daghani Section, Bihendula, British Somaliland. 6, Radial section, F 1774a, mainly parallel to astrocorridors. The larger spaces are along astrocorridors. 7, Tangential section, F 1774a. Note interfacing astroid or and merging of astrocorridors and vermiculate coenosporas. Note compound vertical lamellae with coenosporas.
versely, to be closed and irregularly polygonal. Abundant entire transverse laminae, regular, and approximately parallel and even-spaced. Ill-defined astrosystems of groups of irregular, wider tubes, approximately vertical, and occasional inclined lateral tubes. Astrotubes slightly tabulate.

Remarks. The definition of the genus is strictly based on the type species. To have widened it to include the related species Stromatopora franchi Osimo and S. tornquisti Osimo non Deninger (see later) would probably have relegated the genus Syringostronia Lecompte 1952 to the status of a junior subjective synonym.

Stromatopora tornquisti (Deninger)

Plate 27, figs. 3–5; text-fig. 1

Stromatopora sp. Tornquist 1901, p. 19.
Stromatopora tornquisti Deninger 1906, p. 66, pl. 7, figs. 7a, 7b; Steiner 1932, p. 81; Yuhe and Sugiymura 1935, p. 162; Flügel 1958, p. 179. Nut Osimo 1910, p. 286, pl. 1, figs. 2, 2a, 2b; Dehorne 1920, p. 82.
Stromatopora tornquisti Kühn 1928a, p. 550; 1928b, p. 90.

Holotype (only recorded specimen), Sections a (Deninger 1906, pl. 7, fig. 7b; Hudson, this paper, Pl. 27, fig. 3, and text-figs. 1a, 1b), b, and c (Deninger 1906, pl. 7, fig. 7a; Hudson, this paper, Pl. 27, figs. 4, 5, and text-fig. 1c). Coll. Geological-Palaeontological Institut, University of Freiburg, Austria. ?Keuper (Tornquist 1901), or Bathonian (Deninger 1906); Monte Zirra, Nurra, north-west Sardinia.

Neoholotype (chosen Hudson 1955 and here abandoned). Specimen from Bathonian of Sardinia figured Osimo (1910, pl. 1, figs. 2, 2a, 2b) as Stromatopora tornquisti Deninger.

Diagnosis. Stromatopora with nodular coenosteum. Reticulum of linked rods (0.04–0.075 mm. across) forming an irregular monomorphic mesh which, transversely, is either open and vermiculate or closed and approximately polygonal (0.06–0.1 mm. across); vertically the reticulum mesh is irregularly open and continuous. Regular, entire, and parallel transverse laminae are of approximate constant thickness (c. 0.05 mm.) and c. 0.2–0.5 mm. apart. In parts of the coenosteum, the laminae are conically raised (concentric-circular in cross-section). Astrosystems very ill-defined with slightly tabulate axial and lateral astrotubes (c. 0.1–0.15 mm. across). Laminae cross the astrosystems.

Remarks. The reticulum of Stromatoporia tornquisti shows no evidence of pillars or pillar-lamellae as generally understood in stromatoporoid morphology. The reticulum apparently consists of rods angularly linked, mainly laterally, so that in transverse section they form an irregular polygonal mesh, but in vertical section there is no regular pattern and many of the rods show isolated cross-sections. Each of these rods consists of dark-coloured small rounded ‘nodes’ (c. 0.02–0.05 mm. across) linked by lighter-coloured lateral processes. These ‘nodes’ usually form the angles of the polygonal mesh. The reticulum is therefore a close scaffolded of rods which tend to have a lateral linkage.

Comparisons. The form from the Bathonian of Sardinia figured by Osimo (1910) as Stromatopora tornquisti Deninger and redescribed from the figures by Hudson (1955, p. 236) has a tabulate reticulum in which the rods tend to be dominantly vertical, and common to well-developed astrosystems, each confined to a space between laminae. The species is not ‘tornquisti’ nor is it considered to be a Stromatopora, as defined above. It is here named Stromatopora osimoae new name (holotype: specimen figured Osimo 1910, pl. 1, figs. 2, 2a, 2b).
Stromatopora franchi Osimo (1910, pl. 1, figs. la, b, c), also from the Bathonian of Sardinia, differs even more from Stromatoporia torquista since both its reticulum and

TEXT-FIG. 1. Stromatoporina torquista (Deninger). Thin sections, a and c, × 40, of holotype. Bathonian, Mt. Zirra, Nurra, north-west Sardinia. A, Part of vertical section a, showing area of close laminae. B, Part of vertical section a, showing vertical and transverse astrotubes. C, Part of transverse section c, showing astroplasts. Darker areas laminae, secondary after pillars.
abundant astrosystems have a dominant verticality, and thickened laminae are not common. Nevertheless, the similarity of the fineness and general pattern of the reticulum of both Osimo's forms to that of *S. tornquisti* suggests that they too belong to the Stromatoporinae.

The general pattern of the reticulum and its fineness when compared with the coarse astrosystems is not unlike the general coenosteal pattern of *Syringostromina pruvosti* Lecompte gen. et sp. (1952, pl. l, figs. 2, 2a) and it may be that *Stromatopora osima* nom. nov. and *S. franchi* Osimo should be allocated to that genus. They, with *S. pruvosti*, may be expressions of a trend to verticality within the Stromatoporinae.

**Superfamily MILEPORELICAE Hudson 1959**
Stromatoporoids with clinogonal-fibrous skeletal tissue

**Family PARASTROMATOPORIDAE Hudson 1959**

Mileporelliae with reticulum mainly of fenestrate vertical lamellae formed by pillars joined directly or by lateral extension. Lamellae variously bound coenospaces, enclose coenotubes, or outline astrocorridors. May be some subordinate transverse lamellae. Astrosystems, variously developed, generally composed of astrocorridors, variously stellate or irregular; no transverse astrotubes. Tabulae common or abundant, may be closely spaced vertically in coenospaces, coenotubes, and astrocorridors; may be aligned. Laminae generally absent. Not markedly lattilamellate.

**Morphological trends within the Parastromatoporidae.** The similarity linking the various forms in this family is the verticality of both reticulum and astrosystem: the differences separating them are partly the relative proportion in the coenosteum of reticulum and astrosystem and partly the extent to which verticality has become dominant in these structures. The structure of the morphological ancestral form seems to be that of *Stromatopora choisai* in which the coenosteum is almost equally composed of reticulum and astrosystem and in which the reticulum retains some element of horizontality. A closely related form is *Dehornella hydrastinoides* in which the thinly encrusting coenosteum has an even more horizontally lamellate reticulum. Parastromatoporidae with this approximately equal division between reticulum and astrosystem may persist throughout the Upper Jurassic and Lower Cretaceous, in which latter they may be represented by *Stichorella* in which the astrosystems are better though not more abundantly developed and tend to be divided into vertical astrotubes.

From such forms as *Stromatopora choisai*, structure seems to evolve in two directions. The one is represented by *Parastromatopora* and *Tosastronia* in which the coenosteum consists mainly or wholly of reticulum, astrosystems being absent or more probably not distinguishable; the other is represented by forms, here grouped as *Astroporina* gen. nov., in which the coenosteum tends to be wholly of conjoined astrosystems.

**Genus Dehornella Lecompte 1952**
Dehornella Lecompte 1952, p. 16; 1956, p. 1133.

_Type species* (by original designation), *Stromatopora hydrastinoides* Dehorne 1920.

**Diagnosis.** Parastromatoporidae usually nodular and encrusting reticulum of pillars
and vertical lamellae, often composite and thick, bounding irregular labyrinthine tabulate coenossaces. Lateral processes may be aligned to form intermittent transverse lamellae. Common and well-developed astrosystems of irregularly vermiculate tabulate astrocorrodors, irregularly radial, often bounded by thick vertical lamellae. Tabulae common, may be aligned to form occasional laminae. Skeletal tissue clinooidal or not known.

Family allocation. The genus Dehornella, like so many of the Mesozoic stromatoporoid genera, was founded as a one-species one-specimen genus. Its foundation was the more unfortunate since the type specimen of the species is a thinly encrusting forms and, like all such forms, has a specialized reticulum in the first few millimetres of upward growth. The diagnostic features of the genus, as stated by Lecompte (1952, 1956), are here summarized as follows: (a) stellate astrosystems forming mamelons, (b) continuous vertical pillars and discontinuous transverse lamellae beneath mamelons, and continuous transverse lamellae and discontinuous vertical pillars between mamelons, (c) skeletal tissue possibly originally chitinous. It is now generally accepted that the occurrence of mamelons is specifically but not generally diagnostic. That the pillars were originally chitinous was first tentatively suggested by Dehornoe (1920) who considered that growth stages of the skeletal tissue (Dehornoe 1920, text-fig. 9) showed a similarity to those of the Recent hydroid Hydractinia echinata Fleming in which the skeleton may be in part chitinous. This suggestion was adopted by Lecompte on the grounds that the pigmented core of the pillars seen by transmitted polarized light showed single extinction, a very doubtful assumption that certainly cannot be used as a diagnostic character. The distinction between the vertical structure of astrosystems consisting of astrocorrodors and that of the reticulum occurring between them is mainly expressed by the presence of transverse lamellae continuous in the reticulum but limited to between the vertical lamellae in the astrosystem. This is generally the case in those Parastromatoporoidae which have transverse lamellae though it is most marked in the initial stages of encrust-

EXPLANATION OF PLATE 25

Thin sections (except fig. 6) of Astroporina and Dehornella photographed by transmitted light.
Figs. 1–3. Astroporina cf. orientalis sp. nov., F 1773, ×8. Bihen Limestone (Upper Jurassic), Daghani Section, Bihendula, British Somaliland. 1. Transverse section, F 1773a; note merging of astrocorrodors and coenossaces, and lack of individuality of astrocorroidal systems. 2, Oblique section, F 1773b; in general across astrocorrodors. 3, Radial oblique section, F 1773c; note general alignment of tabulae.

Fig. 4. Astroporina stellata sp. nov., oblique section, F 1774b, from holotype, ×8. Bihen Limestone (Upper Jurassic), Daghani Section, Bihendula, British Somaliland. Note coenostomes within vertical lamellae.

Figs. 5–7. Dehornella crassata sp. nov. Upper part of Shaqra Limestones—With-Mark (Argusian, Maktish Hathrid, Israel. 5, Radial section, H 561Ka, ×45. Encrusting on fine stromatoporoid on coral. 6, Polished tangential surface (photographed reflected light), H 5168, ×7. Note formation of walls of astrocorrodors by closely compacted coenostomal pillars. Large circular openings are subsequent borings. 7, Radial section, H 5170d, ×7 (as Pl. 26,fig. 1), mainly along astrocorrodors and vertical lamellae.

Fig. 8. Dehornella caffartii (Dehornoe). Upper Jurassic (Lusitania—Petrocerian), Ceziama massif, Arabida, Portugal. Tangential section, 25a, ×9-5, of holotype, specimen 25, Stromatoporoid Coll., Geol. Lab., Sorbonne, Paris (as Dehornoe 1917, text-fig. 1; 1920, text-fig. 26 and pl. 13, fig. 2, 1923, pl. 1, fig. 1c).
ing forms where transverse lamellae tend to be more developed than in the rest of the reticulum.

The main features of *Dehornella* such as the abundant astrosystems of radial tabulate astrocorridors, and the dominant vertical pillars or vertical lamellae enclosing irregular, tabulate coenospaces or bounding the astrocorridors are characteristic of certain of the Parastromatoporoidae such as *Stromatopora*, *choffatii* Dehorne and *S. harrarensis* Wells and it is therefore included in that family.

Morphological range. *Dehornella* Lecompte could therefore remain as a genus with an eccentric limited diagnosis which would apply only to the type species. In which case the numerous similar forms such as *Stromatopora choffatii* Dehorne and *S. harrarensis* Wells must be allocated to a new genus since there is no other genus within the Parastromatoporoidae suitable for them. To avoid the creation of only slightly differing genera, *Dehornella* has been more redefined as above and is thus available for many species other than the type.

The various species which can be allocated to *Dehornella* can be mainly grouped into those with a fine reticulum with lamellae about 0.1–0.2 mm across and coenospaces up to about 0.3 mm across, and those with a coarse reticulum with lamellae up to 0.3 mm across and coenospaces up to 0.5 mm across. The former group includes *Stromatopora choffatii* Dehorne, *S. kurtchensis* Wells, *Dehornella hydactoides* (Dehorne), *D. crustrans* sp. nov., and *D. ornatus* sp. nov.; the latter group includes *S. harrarensis* Wells. There are other species, some with an even coarser reticulum and some with a very fine, encrusting reticulum. When these species occur in the same fauna, they are often intergrown or encrust each other. Otherwise many of them encrust echinoderms, corals, or gastropods.
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*Dehornella hydactinoidea* (Dehorne)

**Stromatoporella hydactinoidea** Dehorne 1920, p. 77, text-fig. 9, pl. 6, fig. 2, pl. 17, fig. 3 (not pl. 15, fig. 3); 1923, p. 19, pl. 1, figs. 2a, b.

**Stromatoporella hydactinoidea** Kühn 1928a, p. 550; Kühn 1928b, p. 39.

**Stromatoporella hydactinoidea** Steiner 1932, p. 80.

*Dehornella hydactinoidea* Lecompte 1952, p. 16, pl. 2, figs. 1, 1a; 1956, p. F133, text-fig. 109, 5.

**Holotype** (only recorded specimen). Specimen (Dehorne 1920, pl. 6, fig. 2; 1923, pl. 1, fig. 2a) and thin sections a (Dehorne 1920, text-fig. 9, pl. 17, fig. 3; 1923, pl. 1, fig. 2b), b (Lecompte 1952, pl. 2, fig. 1; 1956, text-fig. 109, 5), and c (Lecompte 1952, pl. 2, fig. 1a). Stromatoporoid coll., Geological Laboratory, Sorbonne, Paris. From Abbudia Maris (upper Lutetianian), 150 meters north-west of Silveiras, Arrábida massif, Portugal.

**Diagnosis.** *Dehornella* with encrusting lamellate coenosteum with conical mamelons about 5-0 mm. across at base and about 7-0 mm. apart. Reticulum with irregularly developed vertical pillars (0-1-0-2 mm. across) and lamellae, and irregular transverse lamellae. Astrostyles common, with well-developed but tortuous astrostyles, about 0-25-0-3 mm. across, often with thick (c. 0-1-0-25 mm. across) bounding vertical lamellae.

*Dehornella choiffi* (Dehorne)

**Plate 25, fig. 8; Plate 26, figs. 7, 8; text-fig. 2.**

**Stromatopora Choiffi** Dehorne 1917, p. 117, text-fig. 1, 2; Dehorne 1920, p. 83, text-figs. 12, 18, 25, 26, pl. 5, fig. 6, pl. 7, fig. 1, pl. 13, figs. 1, 2 (not pl. 6, figs. 3, 4); Dehorne 1923, p. 15, pl. 1, figs. 1a-c, pl. 2, fig. 1; Steiner 1932, p. 82.

**Stromatopora Choiffi** (Dehorne), Kühn 1928a, p. 550; 1928b, p. 90.

**Stromatopora choiffi** (Dehorne), Lecompte 1952, p. 20; Lecompte 1956, text-fig. 109 (3a, b).

Not *Syringostomella choiffi* (Dehorne), Lecompte 1956, text-fig. 109 (4a, b).

**Lectotype** (chosen Lecompte 1952, p. 20). Specimen 25 and sections 25a-e cut from it. Stromatoporoid coll., Geological Laboratory, Sorbonne, Paris. Nerinea eghaudei Limestones (Upper Jurassic: Lutetian - Priabonian), Pedreira, Cezimbra massif, Arabida, Portugal. Figured Dehorne 1917, text-fig. 1, 2; 1920, text-figs. 12, 25, 26, pl. 5, fig. 6, pl. 13, figs. 1, 2; 1923, pl. 1, figs. 1a-c, pl. 2, fig. 1; Lecompte 1956, text-figs. 109 (3a, b). Hudson, this paper, Pl. 25, fig. 8, Pl. 26, figs. 7, 8, text-figs. 2a, 2n.

**Explanation of Plate 26.**

Thin sections of *Astrosporina* and *Dehornella*, photographed by transmitted light and showing clinogon microscopic structure of coenostills, all × 100.

**Fig. 1.** *Dehornella cretana* sp. nov. Radial section H 5176g (as PL. 25, fig. 7). Subaqua Limestones-with-Marlis (Argovian), Makkesh Hathara, Israel. Medul pillars with groups of dark-rimmed circles (transverse sections) and elongate tubes (longitudinal sections), both with clear centres.

**Figs. 2, 3.** *Astrosporina cf. orientalis* sp. nov., F. 1773, Bihen Limestone (Upper Jurassic), Daghani Section, Bihendula, British Somaliland. 2, Radial section, F. 1773a. Section does not pass through medial strand. 3, Transverse section, F. 1773b, medial strand present though faintly shown.

**Fig. 4.** *Astrosporina orientalis* sp. nov. Radial thin section H 48506. Glacideoropsis Limestones (Sequanian), near Ain Safra, Yantta, Lebanon.

**Figs. 5, 6.** *Astrosporina stellans* sp. nov., both of holotype, F. 1774, Bihen Limestone (Upper Jurassic), Daghani Section, Bihendula, British Somaliland. 5, Radial section, F. 1774a, showing medial strand. 6, Longitudinal section, F. 1774b, not through medial strand.

**Figs. 7, 8.** *Dehornella choiffi* (Dehorne) Both part of thin section, 25c, of holotype. Note clear tubules at position of origin of clinogon fibres. 7, Radial section. 8, Transverse section. Upper Jurassic. Arabida, Portugal.
The uncut lectotype (Dehorne 1920, pl. 5, fig. 6) was a thin slab about 1.5 cm thick, a fragment from across the centre of a concentric encrusting nodule of about 4 cm diameter. The sections cut from it consist of a, a tangential (Dehorne 1920, pl. 13, fig. 2; Leconpte 1956, text-fig. 109 (5a); this paper, pl. 25, fig. 6), b, an oblique radial (Leconpte 1956, text-fig. 109 (3b); this paper, text-fig. 1a), c, a tangential with outer part radial (this paper, text-fig. 10b), d, a radial (Dehorne 1920, pl. 13, fig. 1) and e, an oblique radial (Dehorne 1920, text-fig. 18). The last two are now missing.

Dehorne (1920) gave the magnifications of her figures of the type specimen as follows: text-fig. 20, × 5; pl. 5, fig. 6, × 12; pl. 13, fig. 2, × 77; they should respectively be × 82, × 15, × 12. In her 1923 paper the magnification of pl. 1, fig. 1c, is × 10.

Diagnosis. *Dehornella* with encrusting nodular coenostome with vertical pillars (c. 0.1 mm thick) joined directly or, at intervals, by transverse pillar-outgrowths to form vertical lamellae (0.1 mm thick). Prominent astrosystems (centres 3–4 mm apart), often conjoined, of irregularly stellate branching astrocorridors (0.2 mm across). Reticulum of irregular and usually narrow elongate coenosparces and irregularly shaped coenotubes (0.12–0.15 mm across) bounded by vertical lamellae, and occasionally crossed, for varying distances, by transverse lamellae formed by aligned transverse pillar-outgrowths. Occasional isolated pillars. Tabulae common in both coenosparces and astrocorridors.

*Dehornella crustans* sp. nov.

*Holotype*. H 5168, two pieces (pl. 25, fig. 6) and section a (pl. 25, fig. 5). *Paratypes*. H 5170, one piece and sections a, c–d (pl. 25, fig. 7), c, f–g (pl. 26, fig. 1). H 5166, one piece and section a. All from the upper part of the Shuqaila Limestones-with-Marl (Upper Jurassic, Algatean), Maktash Hathira, Israel (Hudson 1958).

Diagnosis. *Dehornella* with small, nodular, and encrusting coenostome consisting of abundant astrosystems separated by small areas of irregular reticulum. Vertical lamellae (c. 0.1–0.2 mm across) which bound astrocorridors of astrosystems and coenosparces of reticulum, formed of vertical pillars (c. 0.15 mm across) linked by transverse processes which, occasionally, may be aligned. Vertical lamellae, generally vermiculate, may be fenestrate and compound. Coenosparces (c. 0.2–0.3 mm across) irregular and elongate. Astrosystems abundant, about 0.5 mm apart, of irregularly radial astrocorridors (c. 0.2–0.3 mm across). Tabulae abundant, irregularly aligned.

*Dehornella ornatus* sp. nov.

*Holotype*. H 4833 (one piece, text-fig. 3a). *Paratypes*. H 4834 (one piece, pl. 28, fig. 6), H 4835 (two pieces, pl. 28, fig. 6), H 4836, 4838–43, 4845–7 (each one piece), H 4837 (one piece and section a, text-fig. 3a), H 4844 (four pieces, pl. 28, fig. 1, and sections a, pl. 28, fig. 1, b, and c, pl. 28, fig. 7). H 4848 (one piece, pl. 28, fig. 5), and H 4849 (three pieces and sections a–c). All from Ben Zaid Limestone (Oxfordian), Wadi Bih, Ruus al Jihal, Trucial Oman, Arabia.

Description. Coenostome nodular, concentric, often an aggregate of several independent concentric growth nODULES (only fragments known; greatest diameter 80 mm; greatest height, 80 mm.). May be encrusting (as H 4844, pl. 28, figs. 1, 2, grown around a coral). Surface even, no mamelons, ostia-mesh mainly vermiculate. Surface astrosystems, about 0.4 mm across, consist of irregularly radial and irregularly dichotomizing astrocorridors, commonly 0.2 mm wide. Reticulum of dominant vertical lamellae and occasional
transverse lamellae, the former both transversely and longitudinally vermiculate so that the reticulum pattern is loose and irregular. In the vertical lamellae which are commonly 0.12–0.15 mm thick and generally discontinuous, it is possible to recognize the component pillars. The transverse lamellae, formed of joined transverse processes, are widely spaced, and may be continuously aligned across a number of coenosparcs. These are commonly 0.2–0.25 mm wide, vermiculate and generally not completely enclosed; coenotubes are not common. Widely spaced simple tabulae cross the coenosparcs but are not abundant. Latillumellation which is mainly due to variation in thickness of the vertical lamellae and to the varying occurrence of the transverse lamellae is never very strong. Basal holotheca present. Astorhizal systems entirely composed of tabulate astrocorridors of the same width as the coenosparcs and therefore not discernible in vertical section.

Specific differences of Dehornella choffati group. There is so little difference between the members of this group, of which *D. choffati* is the senior species, that their distinction is probably infraspecific. That they were not designated subspecies is due to the author's dislike of departure from the binominal system of nomenclature, a dislike based on the general lack of agreement as to the meaning and function of a subspecies in invertebrate palaeontology.

The type of the genus, *D. hydaticinoides*, is mammellate and its astrosystems are more...
TEXT-FIG. 4. *Dehornella enameolus* sp. nov. Thin sections of H 4844, × 12, from Beni Zaid Limestone, Oman, eastern Arabia. A and B, Transverse section H 4844c, showing astrocytem and vermiculate reticulum. C, Vertical section, H 4844b, slightly oblique. Wide spaces are along astrocorridors. Note fewness of tabulæ.
common and coarser than in *D. choffaiti*; otherwise there is no significant difference between them since in both the vertical lamellae are irregular, transverse lamellae are sporadically developed especially in early growth, and tabulae are common. *D. crustans* differs from them in that transverse lamellae are rare and the reticulum is generally more vertical; it also is not mamillate.

*D. omanensis*, as befits its stratigraphical position, is morphologically simpler than the above species. It is generally finer and much more evenly meshed, has smaller astrosystems with narrower astrocorridors, and, generally, less tabulae. *D. kurtchensis* (Wells) is a mamillate form which is otherwise apparently similar to *D. omanensis*. It may have the same relationship to that species as *D. hydreactinoides* has to *D. choffaiti*.

*Dehornella hararenensis* (Wells)

Plate 28, figs. 3, 4, 9, 10; text-fig. 3a

*Stromatopora hararenensis* Wells 1943, p. 50, pl. 8, figs. 1–5.

*Stromatopora hararenensis* Wells, Hudson 1954, p. 219, pl. 7, fig. 4.


Middle East material. H 4851 (one piece and sections a–c), H 4852–6, 4858–60, 4863, 4867, 4869 (each one piece), H 4861 (one piece and sections a, b), H 4862 (one piece and sections a, Pl. 28, fig. 4, and b), H 4864 (two pieces, Pl. 28, figs. 3, 9, 10), H 4865 (one piece, text-fig. 3a, and section a), H 4866 (one piece and section a), and H 4868 (three pieces and sections a, b). All from Beni Zaid Limestone (Oxfordian), Wadi Bih, Ruus al Jibal, Trucial Oman, Arabia. H 4832 (one piece and section a, text-fig. 6). Oxfordian, Jebel Moghara, Sinai, Egypt.

Description. Nodular (largest specimen, fragmentary, 14 cm. across), usually a confluent aggregate of either concentric coenosten or coenostelial columns, about 8–12 mm. across, each with axial and peripheral reticula; often encrusting or intergrown with other species. Surface undulating with low rounded bosses (not mamellons). Coenostium may be lightly latilamellate due to alternation of layers (c. 40 mm. thick) in which vertical lamellae are thick and closely joined or thinner and separate. Reticulum with dominant vertical lamellae of conjoined pillars, transversely verniculate, and, vertically, tending to be

**EXPLANATION OF PLATE 28**

*Dehornella spp.*, all from Beni Zaid Limestone (Oxfordian s.s.) of Wadi Bih, Jebel Hugab area, Ruus al Jibal, eastern Arabia. All specimens are partly silicified.

Figs. 1, 2, 7. *Dehornella omanensis* sp. nov., H 4844, encrusting coral. 1. Weathered upper surface, × 1:7, showing holobrachia at base of coenostium. 2. Thin section a, × 1:7, across coenostium, showing vertical pattern of reticula. Photographed by reflected light. Note holobrachia at base of coenostium and lamellate pattern of initial reticulum. 7. Tangent thin section c, × 3, photographed by reflected light, showing astrocorridors.

Figs. 3, 9, 10. *Dehornella hararenensis* (Wells) H 4864, 3. Coenostial surface, × 1:1, showing astrocorridors and intervening reticula. 9. Polished surface, × 1:1, across middle of nodular coenostium showing adjoining coenostial columns and latilamellae. 10. Radial polished surface, × 1:7, showing latilamellae.

Figs. 4. *Dehornella hararenensis* (Wells), tangential thin section H 4862a, showing astrocorridors.

Figs. 5, 6, 7. *Dehornella omanensis* sp. nov. 5. Weathered radial surface, H 4848, × 1:5. 6. Polished surface, × 2:7. Radial polished surface, H 4835, × 2.

Compare fineness of texture with that of *D. hararenensis* Wells, fig. 10. Note indefinite latilamellae.
irregular in thickness (generally 0.2-0.3 mm. across) and direction. Lamellae enclose
elongate vermiculate coenospaces, generally 0.4 mm. across, or, less common, smaller
coeotubes. Transverse processes arising laterally from the vertical lamellae may occur
and join to link two lamellae. Aligned transverse lamellae are occasionally present
usually at wide intervals; they show better in weathered specimens than in sections.

TEXT-FIG. 5

TEXT-FIG. 6

TEXT-FIG. 5. Dehornella anomala sp. nov. Vertical thin section, H 4837a from Beni Zaid Limestone,
Oman, eastern Arabia. Wide spaces are along astrocorridors. Thin white lines in vertical lamellae
indicate junction of adjoining pillars. Note slight latilamellation.

TEXT-FIG. 6. Dehornella harzarensis (Wells), H 4832a, from Upper Jurassic (Oxfordian s.s.) of Jebel
Morehara, Sinai. Note plan of astrofibril systems and reticulum as those of Dehornella choleti (De-
hurne). In D. harzarensis the vertical lamellae are thicker and astrocorridors wider.

Coenotabulae not uncommon. Abundant astrosystems, about 5-6 mm. across, occasion-
ally contiguous, but centres usually about 7-9 mm. apart, consist of irregularly
radial, long, dichotomizing, tabulate astrocorridors, generally 0.4 mm. across, and
bounded by vertical lamellae joining at or near the astrosystem axis.

Many of the Oman specimens, such as H 4852, 4854, 4858, 4869 are encrusted on or
by a form with much coarser skeletal elements than D. harzarensis: others as H 4859,
4866, 4867 are encrusted on or by D. anomala.
Dehornella aff. harraensis (Wells)

Material. H 5159, H 5169 (each one piece and a thin section), H 5160–2, H 5165, H 5167 (each one piece), and H 5164 (two pieces and a thin section). All from Shaqraa Limestone-Marl (Upper Jurassic, Argovian). Maktesh Hithira, Israel (Hudson 1958).

Description. Dehornella with small nodular coenosteum (up to 6 cm. across) encrusting (usually small phaceloid corallites) and with irregularly slightly nodose surface. Coarse reticulum with thick vertical lamellae (c. 0·2-0·5 mm. across) of pillars joined directly or by short lateral processes, and enclosing irregular coenospaces (c. 0·2–0·3 mm. across), often irregularly vermiculate and joining each other. Astrosystems of coarse irregular astrocorridors (0·2-0·3 mm. across) joining coenospaces. Tabulac fairly common. Skeletal tissue largely replaced by silica and hence specimens not preserved well enough for illustration or definite identification.

The skeletal elements of these forms have generally the same dimensions as D. harraensis. They differ in that their lamellae are generally more vertical and perhaps thicker (more compound) and there are few or no transverse lamellae.

ASTROPORINA gen. nov.

Type species Astroporinastellifera sp. nov.

Diagnosis. Parastromatoporoidae with coenosteum of abundant conjoined or interlaced astrosystems of well-developed tabulate astrocorridors, variously radial or irregular and indefinite, bounded by vertical lamellae, often composite with cells. Reticulum of coenospaces and coenotubules, if present, very subordinate. Tabulac abundant and irregularly aligned.

Astroporina stellifera sp. nov.

Plate 24, figs. 1–5; Plate 27, figs. 1, 2

Holotype. F 1775, one piece and sections a (PL 24, fig. 5), b (PL 24, figs. 1, 3), and c (PL 24, figs. 2, 4) and H 3657, two pieces (PL 27, figs. 1, 2) and sections H 3658–9 (cut from H 3657). Upper Jurassic, Ahankon Tog (11° 01’ N., 48° 26’ E.), Inda District, British Somaliland.

Diagnosis. Astroporina with nodular coenosteum of conjoined distinct astrosystems (centres 3·5–5· mm. apart) consisting of astrocorridors (0·25–0·30 mm. wide), irregularly stellate and well branched, bounded by vertical lamellae (pillars 0·15 mm. across) enclosing abundant coenotubules (0·12 mm. across).

Astroporina orientalis sp. nov.

Plate 26, figs. 1, 2; Plate 27, figs. 6, 7

Holotype. H 4850, one piece and thin sections a (PL 26, fig. 1; PL 27, fig. 7) and b (PL 27, fig. 6; PL 26, fig. 2). Coladocoropsis Limestones (Sequanian), near Ain Saffa, Yanta, Lebanon.

Diagnosis. Astroporina with coenosteum of vertical pillars, occasionally isolated but mainly joined laterally to form extensive vertical lamellae (c. 0·15–2·0 mm. across), vertically fairly straight, occasionally enclosing coenotubules. Interlaced astrosystems of astrocorridors (c. 0·3–0·4 mm. across) bounded by vertical lamellae joining at or near the axis. In parts of the coenosteum the corridors are intermingled and lose their identity as astrocorridors. Tabulac abundant, close (about 7 to 2 mm.), and irregularly aligned.
Astroporina cf. orientalis sp. nov.

Material: F 773, three pieces and sections a (Pl. 25, fig. 2; Pl. 26, fig. 2), b (Pl. 25, fig. 1; Pl. 26, fig. 3), and c (Pl. 25, fig. 3; Pl. 3, fig. 3). Upper Jurassic, Biben Limestone, Daghan Section (10° 09' N., 45° 10' E.), Bibendula, British Somailand.

Description. Astroporina with nodular coenestum of vertical lamellae (constituent pillars 0.13–0.19 mm. across), vertically and transversely irregular, occasionally enclosing coenotubes, and bounding interacing corridors (0.22–0.38 mm. across). The general plan of this specimen is that of Astroporina orientalis. The vertical lamellae are, however, more irregular and the astrocorridors are more indefinitely radial: the overall transverse plan is that of the more indefinite parts of A. orientalis.

Astroporina stellans sp. nov.

Material: 774, one piece and sections a (Pl. 24, fig. 7; Pl. 26, fig. 5), b (Pl. 25, fig. 4; Pl. 26, fig. 6), and c (Pl. 24, fig. 6). Upper Jurassic, Biben Limestone, Daghan Section (10° 09' N., 45° 10' E.), Bibendula, British Somailand.

Diagnosis. Astroporina with nodular coenestum. Reticulum of thick irregular vertical lamellae (c. 0.2–0.5 mm. across) formed of joined pillars (c. 0.2 mm. across). Lateral processes not common. Lamellae occasionally enclose coenotubes (c. 0.125–0.2 mm. across) but generally bound irregular vermiculid conjoined coenosparcs (c. 0.2–0.3 mm. across). Astrocorridors, centres about 2.5–4.5 mm. apart, of irregularly branching astrocorridors (c. 0.25–0.35 mm. across) bounded by irregular vertical lamellae. Tabulare common (about 0.4–0.6 mm. apart).

Astroporina sp.

Material: F 4857, four pieces and sections a–d. Beni Zaid Limestone (Oxfordian s.s.), Wadi Bih Jebel Hagar area, Ras al Khaima, Trucial Oman, Arabia.

Description. Astroporina with nodular coenestum of intergrown coenosteal columns forming low bosses at surface. Astrocorridors dominant, of long radial astrocorridors (c. 0.4 mm. across), bounded by irregular but continuous vertical lamellae (c. 0.25 mm. across). Reticulum between astrocorridors not extensive, of isolated vertical lamellae and pillars, and wide joined coenosparcs similar to astrocorridors. Occasionally transverse lamellae. Tabulare not common, mainly aligned.

Specific distinction in Astroporina

Species of Astroporina, as species of Dehornella and Parastrocorina, include those with fine structural elements as A. stellifer and A. orientalis (compare D. chalati and D. omanensis) and those with coarse structural elements as A. stellans and Astroporina sp. (compare D. barreraensis): it seems probable that fine and coarse structural forms are independent lineages. The difference between Astroporina and Dehornella and the distinction between the species of Astroporina is based on the progressive elimination of the normal reticulum within the coenestum. In A. stellifer the astrocorridors remain about
the same size (c. 5 mm. across) but so increase in number and completely occupy the coenostome, the reticulum being represented by the cellular skeletal blocks between the astrocorridors. The coenostome is therefore a complex of short corridors.

In A. orientalis the astrocorridors increase in width up to 12 mm. across, the astrocorridors widening, lengthening, and increasing in number. The single tubes enclosed by the lamellae and usually in an astrocorridor wall have as far as is known no special significance; they appear to be normal coenotubes. Otherwise there is no remnant of the reticulum. The general pattern is therefore a mesh of wide and comparatively straight radial astrocorridors. Occasionally the walls of the astrocorridors break up into pillars or small lamellae and the astropattern is lost. This is especially the case in A. C. orientalis.

The coenostome of A. stellans consists of a mesh of close short branching corridors, many of which have a radial arrangement and all of which are considered to be astrocorridors. The astrocorridors are small, with few astrocorridors and closely intermingled. The astrocorridors are separated by thick short vertical lamellae and columns enclosing coenotubes. A. stellans is thus more closely similar to Dehorneella.

Astroportana sp. occurs with and has the dimensions of Dehorneella hararensis. It differs from that species in that astrocorridors are more numerous, have long astrocorridors, and occupy a much greater part of the coenostome.

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Manuscript received 3 February 1959

R. G. S. HUDSON
HUDSON, Jurassic stromatoporoids
HUDSON, Pillar clinogonal structure, Astroporina and Dehiscella, x100.