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SOME HOLOTHURIAN SCLERITES FROM THE CORALLIAN GROUP OF NORTH DORSET

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Borehole samples of Corallian sediments from East Stour, north Dorset were examined for their microfossil content. Although the main emphasis of the research was concerned with foraminifera, significant numbers of small calcareous platelets of holothuroid echinoderms or Sea Cucumbers were observed. These are known as sclerites and various forms are illustrated and described. They are the first to be recorded from the Corallian Group of this area.

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INTRODUCTION

The mid-Upper Jurassic succession (Oxford Clay, Corallian and Kimmeridge Clay) is poorly exposed in north Dorset and south Somerset. The British Geological Survey has recently remapped this area and drilled three boreholes to augment the limited surface outcrops (Bristow, 1989, 1990; Freshney, 1990). One of these holes [ST 8013 2297], at East Stour, north Dorset penetrates most of the Corallian from the *Clavellata* Beds through to the Hazelbury Bryan Formation. Samples from this borehole have been examined for microfauna, as part of a long-term project. The primary aim of this research is to develop a viable biozonation of the Upper Jurassic succession for the Wessex Basin using microfossils, which when compared with the standard ammonite zonation, will be developed into a fully integrated stratigraphy.

The lithologies covered by the borehole, and the position of the samples with Holothurian sclerites, are shown in Figure 1.

Holothurian sclerites as a group have received little attention in this country. Published works include Hodson *et al.* (1956) who studied specimens from the Oxford Clay of the Dorset Coast; Hampton, (1957, 1958a, 1958b, 1959, 1960) on Upper Bathonian forms from the Dorset Coast; Fletcher (1962) described forms from the Ampthill Clay of Melton, near Hull, and Lord and Senior (1973) redescribed two holothurian species from the Middle Jurassic of South Dorset. Soodan and Whatley (1987, 1988) published a two-part paper titled "Fossil Holothuroidea from the Jurassic of Great Britain". Gilliland (1992) studied in detail the Holothurians from the Blue Lias of southern Britain.

Fossil holothurian sclerites are widely distributed in marine sedimentary strata of moderate to shallow depths, and are found most frequently in clays, marls, shales and sandy shales. They are less common in limestones and marly limestones, and are rare in sandstones. Palaeoenvironments range from tropical to subarctic marine; suggested bathymetry ranges from sublittoral to moderate depths. Although Recent holothurians are abundant and varied in deep seas, fossil sclerites are rare in deep-sea deposits due to dissolution after deposition.

The present study represents a preliminary account of Corallian holothurian sclerites from a continuous lithological succession.

The samples have been prepared using standard micropalaeontological processing techniques, which are not ideal for the preservation of holothurian sclerites. Inherently, they have a far more delicate structure than most foraminifera or ostracods, even the action of separating residues in standard nesting sieves can damage the more fragile specimens. The presence of matrix adhering to the specimens and/or the growth of secondary calcite coupled with the minute size of most specimens, further hampers the identification of forms.

The taxonomy of holothurian sclerites has inherent difficulties as with all groups of fragmental microfossils. Hampton (1959) points out that different forms of sclerites may belong to one species and

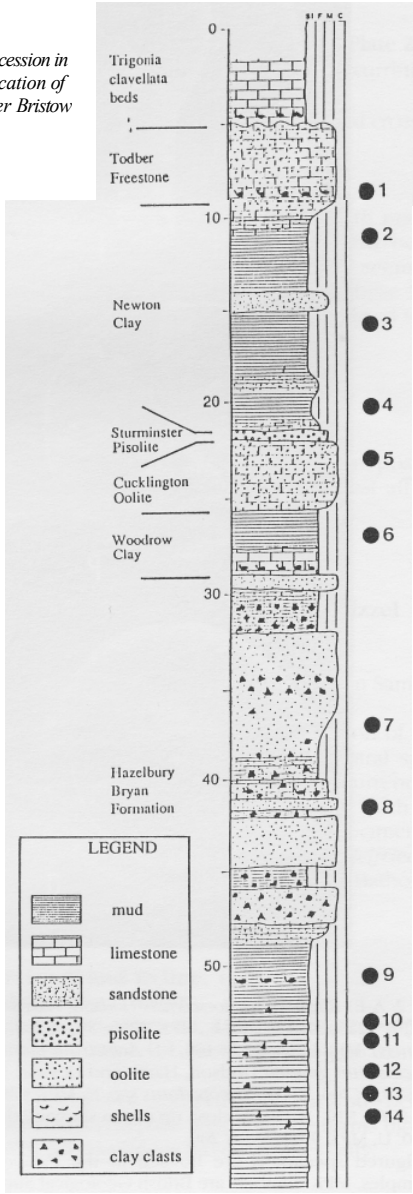

Figure 1: Corallian succession in East Stour borehole, showing location of samples studied (Modified after Bristow 1989).

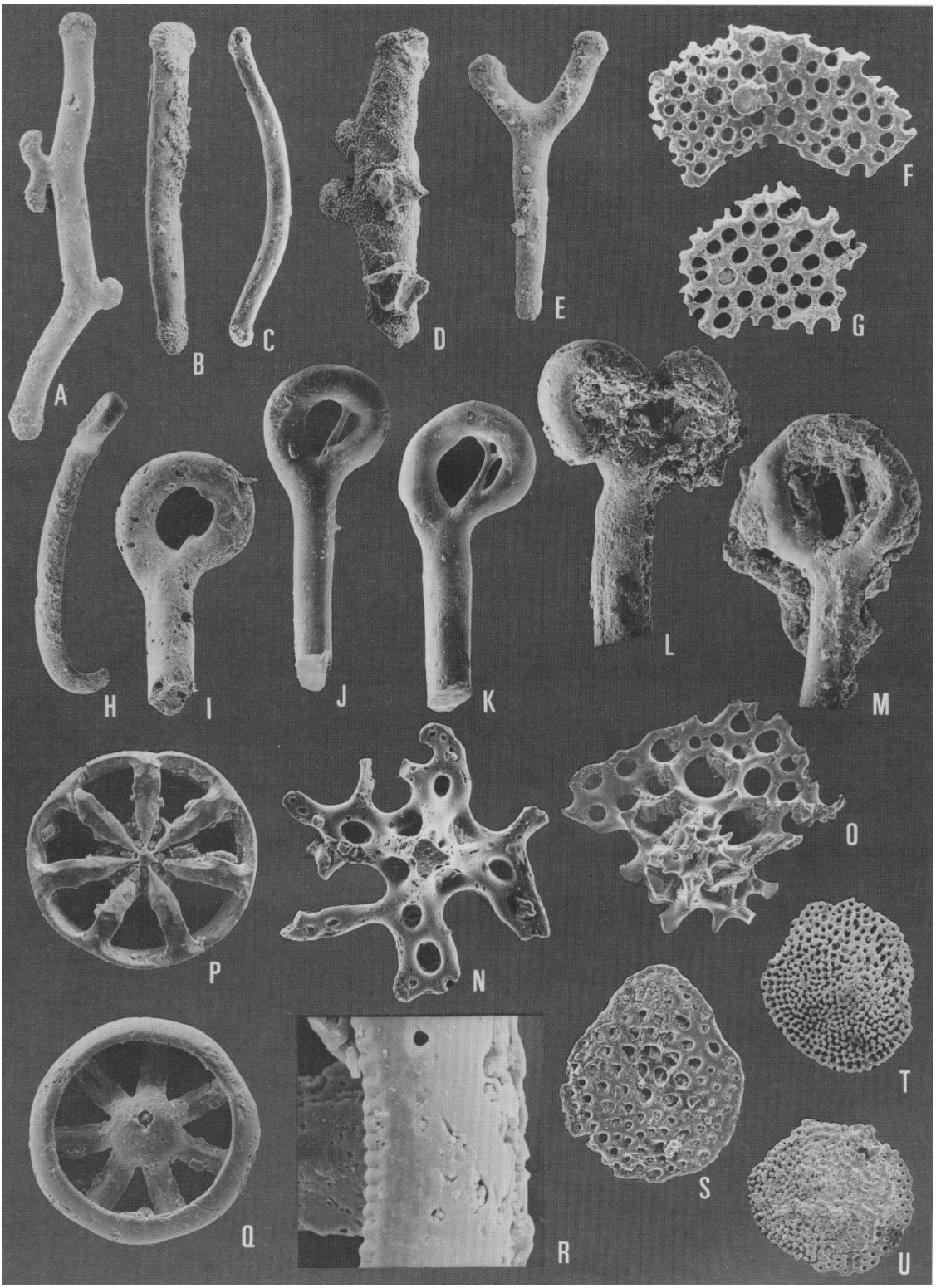

Plate 2: A-E) *Rhabdotites dorsetensis Hodson,* Harris and Lawson, emend. Hampton. A, MPK 9252; S9, x 150. B, MPK 9253; S9, x 150. C, MPK 9254; S9, x 150. D, MPK 9255; S10, x 200. E, MPK 9256; S9, x 200. F-G) *Eocaudina*-type plates. F, MPK 9257; S6, x 200. G, MPK 9258; S2, x 200. *H) Achistrum cf. issleri (Croneis).* MPK 9259; S9, x 100. *I-J) Achistrum monochordata* Hodson, Harris and Lawson. I, MPK 9260; S2, crossbar broken, x 200. J, MPK 9261; S14, x 200. *K) Achistrum gamma* Hodson, Harris and Lawson. MPK 9262; S14, x 150. L) *?Aduncrum sp.* MPK 9263; S9, x 200. *M) Achistrurn bichordata Fletcher.* MPK 9264; S9, x 200. N-O) *Priscopedatus spp.* N, MPK 9265; S10, x 350. O, MPK 9266; S10, x 350. P-R) *Theelia convexa* (Whidborne). P, MPK 9267; S13, x 500. Q, MPK 9268; S10, x 350. R, close up of rim showing dentition, x 2000. *S) Synaptites sp.* MPK 9269; S10, x 200. T-U) *Frizzellus*-type elements. T, MPK 9270; S6, x 200. U, MPK 9271; S9, x 200.

All figured specimens are housed in the Palaeontological Collections of the British Geological Survey, Keyworth, Nottingham. S numbers refer to samples. MPK numbers are British Geological Survey catalogue numbers.

conversely, similar forms may belong to different species. The generally accepted classification is based entirely on disjunct components and is therefore essentially artificial (Frizzell and Exline; 1955) but appears to be valid (Hampton *op. cit.*) and fossil suites can now he described with confidence. Following the proposals of Moore and Sylvester-Bradley (1957), species of fossil holothurian sclerites are here alluded to in terms of parataxa or form species.

SYSTEMATIC DESCRIPTIONS

PHYLUM: Echinodermata

Non-Holothurian 'Holothurian Sclerites'

Following Gilliland (1992), certain species recognised in this study have been placed under this heading. Previous authors have expressed doubts as to whether certain sclerites are holothuroid in origin. Gilliland (*op. cit.*) highlights and discusses this problem and two forms mentioned are encountered in this study.

Frizzellus-type elements (Plate 2, T, U)

The genus *Frizzellus* Hampton, 1958, formally in the Holothurian Family Etheridgellidae Frizzell and Exline, 1955, has remained tentatively within the Holothuroidea. The forms encountered in the borehole are very similar to *F. irregularis* Hampton, 1958, and as Gilliland has shown precludes assigning them to the holothurians.

Remarks: This form is the most common, occurring in all the samples. The forms compare well with those described by Hampton (19586), but differ in being perforated towards the outer margin. The surface ornamentation is granular becoming almost reticulate nearer the centre, where the sclerite thickens slightly. The sclerites vary in morphology in accordance with forms (a) to (d), Gilliland, 1992: the majority of specimens being type (a) forms.

Eocaudina-type plates (Plate 2, F, G)

When considered holothurian in origin the genus *Eocaudina* Martin, 1952 belonged to the Family Calclamnidae Frizzell and Exline, 1955, and formally incorporated all perforated plate forms which are discoidal or hexagonal in outline. As noted by Frizzell and Exline and by subsequent authors, *Eocaudina* can not be considered unequivocally as holothurian in origin, since the plates are also found in other echinoderms. The fauna encountered here compares well with that of the Blue Lias (Gilliland, 1992), in that *Eocaudina* co-occurs with holothurian and various echinoderm skeletal elements. The authors agree with Gilliland that it seems preferable not to accept these plates as holothurian.

Remarks: These plates are common, occurring in all samples studied. Unfortunately all the perforated plate forms examined have a tendency to be invariably broken with the perforations filled with matrix and/or secondary calcite. This makes identification difficult.

CLASS: Holothuroidea

FAMILY: Stichopitidae Frizzell and Exline, 1955

GENUS: *Rhabdotites* Deflandre-Rigaud, 1952

SPECIES: *Rhabdotites dorsetensis* Hodson, Harris and Lawson 1956, *emend.* Hampton 1960 (Plate 2, A-E)

Distribution: Samples 9, 10, 12. Very common.

Remarks: This species was revised by Hampton (1960) who concluded that previously separate species are in fact "variational aspects of a single sclerite morphogroup" and are to be included in the single species *Rhabdotites dorsetensis*. The variety of forms encountered in the present study all fall within these "variational aspects". The preservation of all specimens is exceptional.

FAMILY: *Achistridae* Frizzell and Exline, 1955

Remarks: Aside from those belonging to the genus *Frizzellus*, the majority of sclerites encountered in this study belong to this Family (hooks), and all but one of the specimens belongs to the genus *Achistrum*.

GENUS: *Achistrum* Etheridge, 1881, *emend*. Frizzell and Exline, 1955

Remarks: The authors do not follow Hampton (1958) in splitting the genus *Achistrum* into the subgenera *Achistrum* s.s., *Spinrum*, *Cancellrum* and *Aduncrum*, but follow Frizzell and Exline, 1966. The preservation of the specimens is generally very good, but some forms have the eye wholly or partially filled with matrix and/or secondary calcite. In the latter case it becomes difficult to assign forms to any distinct species, and they are lumped under the genus *Achistrum*. Almost all of the specimens are incomplete, in that the spear of each is lacking.

SPECIES: *Achistrum* spp

Remarks: There are a moderate number of indeterminable species of *Achistrum* in the study, occurring in Samples 8, 9, 11, 12.

SPECIES: *Achistrum* cf *issleri* (Croneis and McCormack, 1932) (Plate 2, H)

Distribution: The second most common *Achistrum* species in the East Stour Borehole; occurring in Samples 6, 9, 10, 12, 13.

Remarks: Almost all specimens are incomplete (lacking a spear), but otherwise agree closely with those figured by Hodson *et al.* 1956, as A. sp. cf. *issleri*.

SPECIES: A. *monochordata* Hodson, Harris and Lawson, 1956 (Plate 2, 1, J)

Distribution: This form is very common in the samples studied occurring in Samples 2, 4, 6, 7, 8. 9, 10, 12, 13, 14.

Remarks: This is the most common species of this genus and aside from *F. irregularis* is the single most common species encountered in this study. The crossbar varies in its position within the eye, and in many cases is broken, resulting in two small protrusions which have been interpreted as spine-like processes by previous authors and recorded as the distinct species A. *bartensteini* Frizzell and Exline, 1955. This is synonymized here following Rioult (1961). All specimens are lacking the spear.

SPECIES: *A. gamma* Hodson, Harris and Lawson, 1956 (Plate 2, K)

Distribution: Relatively rare in the samples studied. Occurring in Samples 6, 12, 14.

Remarks: The majority of the specimens have the `Y'-shaped crossbar intact. All specimens are lacking the spear.

SPECIES: *A. bichordata* Fletcher, 1962 (Plate 2, M)

Distribution: Only one specimen occurring in Sample 9.

Remarks: As the eye of this form is partially infilled with matrix, the nature of the crossbar is difficult to ascertain and hence assigning it to this species is uncertain. The specimen seems to have only two crossbars but a bifurcation of one of these bars could easily be obscured. The form would then be assigned to *A. trichordata*.

GENUS: *Adencrum* Hapton, 1958

SPECIES: *?Adundcrum* sp. (Plate 2, L)

Distribution: One specimen only. Sample 9.

Remarks: Due to the Specimen's relatively bad preservation, positive identification is difficult, however the form shows greatest affinity with this genus

FAMILY: Priscopedatidae Frizzel and Exline, 1955

GENUS: *Priscopedatus* Schlumberger, emend. Frizzel and Exline, 1955

SPECIES: *Priscopedatus spp* (Plate 2, N, O)

Distribution: Common in the samples studied. Occurring in Samples 8, 9, 10.

Remarks: One of the major characteristics for identification of taxa within this Family is the position and nature of the central spire, lattice cross and primary pore(s). Due to the common occurrence of secondary calcite on perforated plate forms, coupled with the invariable damaged outline it is difficult to assign these specimens to an individual taxon. Some forms bare an affinity to *Helfriedella mesojurassica* Kozur and Sadeddin (1990) from the Upper Bathonian and Callovian of Jordan.

FAMILY: Theeliidae Frizzell and Exline, 1955

GENUS: *Theelia* Schlumberger, 1890

SPECIES: *Theelia convexa* (Whidborne, 1883) (Plate 2, P-R)

Distribution: Frequent in the samples studied. Occurring in Samples 7, 9, 10, 12, 13.

Remarks: Specimens of Theeliidae found in the present study belong to this species. The specimens compare well with the forms figured by Lord and Senior, 1973. All specimens have 7 spokes only.

FAMILY: Synaptitidae Frizzel and Exline, *1955*

GENUS: *Synaptites* Deflandre-Rigaud, *1959 emend.* Frizzel and Exline, *1955*

SPECIES: *Synaptites* sp. (Plate 2, S)

Distribution: Only one specimen. Sample 10.

Remarks: Due to poor preservation it is only possible to classify this specimen to generic level. The genus *Synaptites* has not been previously reported from the Jurassic of Britain.

CONCLUSIONS

It can be seen that the species represented here have no real stratigraphic value within the interval studied. Sclerite species in general are long ranging. A notable exception is *Rhabdotites dorsetensis* which is restricted to the Oxfordian. It is hoped that with future study sclerites may prove to be useful when utilized alongside foraminifera and other microfossils in establishing a biozonation for the west Wessex Basin.

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