A REVIEW OF A NEW SECTION IN THE BEACON LIMESTONE FORMATION (BARRINGTON MEMBER) AND MARLSTONE ROCK BED (PLIENSBACHIAN-TOARCIAN STAGES, LOWER JURASSIC) NEAR SEAVINGTON ST MICHAEL, SOUTH SOMERSET

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Abstract

Excavations during construction of an extension to a commercial potato-processing plant, situated between the villages of Shepton Beauchamp and Seavington St Michael, created a number of new exposures in the Marlstone and suprajacent limestone/clay sequences of the previously termed 'Junction Bed' of the Lower Lias. A general description of these rock-beds is given, together with details of their contained fossil assemblages, primarily ammonites. The ammonites *Porpoceras vortex* (Simpson) and *P. vorticellum* (Simpson) are noted as new records for the Barrington Member, while a possible new species of the rare echinoid genus *Jacquiertia* is recorded. A possible first record in southern England of the ammonite genus *Zugodactylites* is reported. Proposed changes to the established Zonal chronology for the British succession are discussed. Preliminary details are noted relating to the fossil microfauna at Seavington.

INTRODUCTION

The area surrounding Ilminster (South Somerset) has long been known to geologists for the abundant fossil fauna of the rock-beds that were formerly exposed in the numerous small quarries opened for the extraction of the Marlstone for building purposes. Following ploughing, many fields provide numerous ammonite specimens which may be collected from the surface stone brash. Around 1850, Charles Moore, a local resident at Ilminster and well-known geologist, visited many of the then extant quarries and made famous the former quarry named 'Strawberry Bank' from which he collected many superb fossil vertebrates, particularly fishes (Moore 1853; 1865–6).

One of the most important and fossiliferous ammonite successions of the Toarcian in Britain occurs in the area around Barrington and Stocklinch, in South Somerset (Howarth 1992, 19). Between 1920 and 1922, a resurgence of interest in the 'Junction Bed' was generated by the reopening of an old quarry on Windsmoor Hill (ST 385 178) together with excavations near the village of Barrington to provide building stone for new cottages at Barrington Court and for a new local reservoir (Hamlet 1922; Buckman 1922, 449; Spath 1922; Pringle and Templeman 1922). All these exposures, the extensive openings near Atherstone and the well-known quarry on Windsmoor Hill, are now derelict or infilled, but the construction in 1971 of a new reservoir near Windsmoor Hill allowed for a new ammonite collection to be made under modern stratigraphical control (Howarth 1992, 21). An opening in Toarcian sediments remains available for inspection in the roadside banks of Hurcott Lane (ST 398 163), which is protected as a Site of Special Scientific Interest (Constable 1992; Simms *et al.* 2004). In 1987 road improvements for the A303 near Ilminster provided temporary exposures, the fossil macro and micro-faunal content of which has been described in detail (Boomer 1992; Boomer *et al.* 2009).

The site described in the present paper, hereafter referred to as 'Seavington', lies north of the A303 at ST 407 158, adjacent to a potato-processing plant for which the construction of a new cold-store created a number of sections providing an opportunity to review the Toarcian succession in detail. Although opened early in 2009, research on the exposures at Seavington only commenced later that year, by which time many of the sections were graded, thus limiting the recording of stratigraphical and lithological details. However, small, temporary excavations combined with exposures at an ungraded section enabled a general description of the rock/clay sequence to be developed and a list of the fossil fauna, primarily ammonites, to be compiled.

GENERAL DESCRIPTION

The Seavington sections are generally conformable with the typical rock and clay beds of the Barrington Member. As described elsewhere (Wignall *et al.* 2008), deep water, and apparently benign environmental conditions resulting in extremely condensed sedimentary deposition, typify the 'Junction Bed' *sensu stricto* (Fig. 1). The succession at Seavington corresponds well with sections described from Hurcott Lane (Constable 1992; Simms *et al.* 2004) and the Ilminster by-pass (Boomer *et al.* 2009), being alternations of argillaceous (fine-grained, clay-rich) limestones, but with evidence of small-scale intervals of mudstones just above the top of the Marlstone – ie in the lowest part of the Exaratum Subzone – and of marls and clays, the latter often laminated but breaking down into small irregular cubes upon weathering.

The primary section (Fig. 2, A) extended along the western margin of the excavation for 126m, running almost north–south but with a south-easterly dip of about 8° that brings in the Upper Toarcian sediments at the extreme northern end of the section (Fig. 2, C). Sections in the Marlstone extend for 38m from the southern end of the primary section, with a further 8m exposed behind the new cold-store. A considerable quantity of excavated material was deposited on all five sections created by the development, partly obscuring the stratigraphy, and giving a false impression of height to the Toarcian succession, but small-scale hand excavations and limited exposures allowed a general description of the section and its contained macrofauna, principally ammonites.

Measurements from the primary and other sections gave a total height for the Toarcian succession of 4.74m. No attempt is made to introduce finer resolution of the stratigraphy at Seavington, eg 'faunal horizon' *sensu* Callomon (1995) being 'a bed, or series of beds, characterised by an ammonite assemblage that can be distinguishable from those of adjacent strata – distinguished in the sense of evolutionary change in morphology', or 'zonule' *sensu* Page (1995). Condensation of the rock beds, some mixing of the ammonites and much weathering of upper sequences, militated against delimiting the beds to allow such detailed resolution.

From below, with a + symbol indicating measurements for the Toarcian from the top of the Marlstone, the following Zones and Subzones were recognised. Ammonites of particular interest are shown in Figs 3–6.

UPPER PLIENSBACHIAN; Marlstone Rock Member; Spinatum Zone

The topmost bed much fragmented by weathering, with 1–2cm of coarse sand above. Weathering has also produced lenses of sandy marl, an admixture of the sand and the suprajacent clay. The Marlstone seen *in situ* averaged 1.3m thick, a hard, dark-brown to buff coloured limestone with much ferruginous staining and veins throughout, calcareous sandy patches and finely oolitic in clouds. The upper surface was hummocky, suggesting scouring during lithification. Fossil macrofauna was dominated by brachiopods, including the ubiquitous *Lobothyris punctata* (J. Sowerby) and *Tetrarhynchia tetrahedra* (J. Sowerby). There were also abundant belemnite guards, and disarticulated bivalve shells. Ammonites were conspicuous by their rarity, with only the zonal taxon *Pleuroceras spinatum* (Bruguière) collected and a poorly preserved *Lytoceras* sp. seen *in situ*. Epifaunal encrustation observed, mainly on larger bivalves, included minute oysters and some serpulid casts, and a single example of the bryozoan *Berenicea* sp.

STAGE	CHRONOSTRATIGRAPHY: ZONE	CHRONOSTRATIGRAPHY: SUBZONE	LITHOSTRATIGRAPHY		LITHOLOGY
UPPER TOARCIAN	***Levesquei***	***aalensis***	**Bridport Sands**		Dorset coast: Blue coloured, sandy clays with harder bands, passing upwards into arenaceous, yellowish coloured, micaceous sands with lenticular bands of blue-centered, calcareous sandstone.
		moorei	**Down Cliff Clay**		South Somerset: Sands, weathering rust-coloured with pale grey coloured patches, some mud and limestone nodules. Often absent or represented by dark brown coloured, loamy sand
		levesquei			
		dispansum	BEACON LIMESTONE FORMATION: **Dorset Coast** ***EYPE MOUTH LIMESTONE MEMBER***	**Junction Bed *sensu lato***	Dorset coast: Pink, yellow and grey coloured, conglomeratic and nodular, sometimes hard and massive, limestones, with marly and ferruginous bands.
	Thouarsense	***fallaciosum***			
		striatulum			
	Variabilis		**Junction Bed** ***sensu stricto***		South Somerset: A series of argillaceous, mainly grey coloured limestones and clays with bands of indurated, ochre coloured marl. Occassional iron-stained intraclasts and limestones nodules. Ferruginous stains and smears common. Basal Yeovil Sands may be present
LOWER TOARCIAN	***Bifrons***	***crassum***			
		fibulatum			
		commune	**South Somerset**		
	Falciferum	***falciferum***	***BARRINGTON MEMBER***		Dorset coast: A grey coloured, argillaceous, nodular, sometimes earthy limestones, with marl bands
		exaratum			South Somerset: A sequence of variably coloured clays and limestones, sometimes marly, with occasional limestone or phosphatic nodules.
	Tenuicostatum	***semicelatum***	**Marlstone** ***sensu Dorset coast***		Dorset coast: A basal conglomeratic, ferruginous, reddish-brown coloured, coarsely oolitic limestone becoming hard, grey or pink coloured with scattered ooliths. Overlain by a brown coloured ,weakly oolitic portion with sandstone pebbles. Portions well cemented but discrete.
		tenuicostatum			
		clevelandicum			
		paltum			South Somerset: Blue-grey coloured, oolitic limestone with sandy marl above or a brown coloured , finely oolitic limestone, much ferruginous staining, calcareous sandy patches. Tenuicostatum Zone often absent or as a grey coloured, marly, sometimes concretionary limestone or a coarse, sandy marl.
UPPER PLIENSBACHIAN	***Spinatum***	***hawskerense***	**Marlstone** ***sensu south Somerset***		
		apyrenum			

Fig. 1 Stratigraphical table incorporating the former term 'Junction Bed' into a current framework of stratigraphy for the Upper Pliensbachian-Toarcian of Dorset and South Somerset

Fig. 2 Seavington site looking northwards. ***A.*** *Primary section with Marlstone descending to ground level at lower foreground;* ***B.*** *Ungraded section with the important exposure of the Fibulatum Subzone at the northern end;* ***C.*** *Point where the Upper Toarcian emerges*

LOWER TOARCIAN; Tenuicostatum Zone

Above the Marlstone were occasional large lenses of calcareous, deep-brown coloured, coarse sand with some admixture of clay material, averaging 0.2m depth, in the absence of which a clay bed of Falciferum Zone age was observed, suggesting a non-sequence. A *Dactylioceras* sp. with thick, involute whorls and fine ribs, which suggests a Tenuicostatum Zone species, was collected *ex situ*, but whilst a single specimen is inconclusive, pockets of sediment of this age may have existed in the area of excavation. However, preliminary data from the clay/sand sampling for micro-fossils has produced results that may allow identification of the Tenuicostatum Zone at Seavington, based on ostracod evidence, but evaluation is ongoing (Dr I. Boomer, pers. comm., March 2011), the outcome of which may be more positive.

Falciferum Zone; Exaratum Subzone

A +1.2m sequence of grey-coloured, occasionally marly, clays with a band of mudstone (lower part only) and three limestone beds. The basal +0.35m of clay contained numerous but flattened examples of *Harpoceras serpentinum* (Schlotheim) and a small *Dactylioceras* sp. At +0.90m a prominent band of argillaceous, dark-grey coloured limestone contained well-preserved specimens of *H. serpentinum*, a species that is common and a notable feature of the Barrington Member (Howarth 1992, 118). Exposures elsewhere demonstrate that the

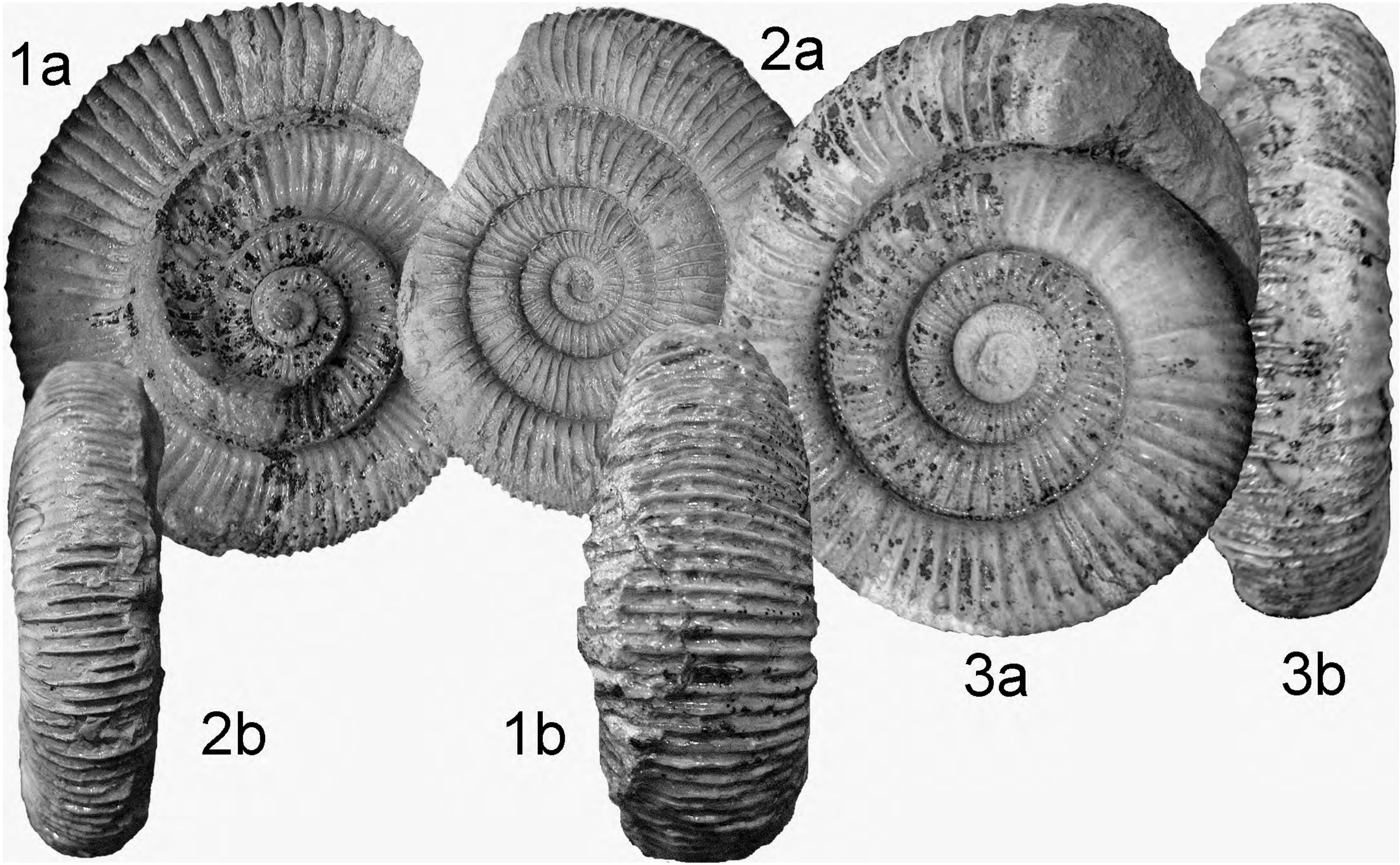

*Fig. 3 Specimens of **Dactylioceratidae** from the Seavington site. 1a, b.* Dactylioceras consimilis*; 2a, b.* Dactylioceras athleticum*; 3a,b.* Dactylioceras toxophorum*; a) = lateral view, b) = ventral view; specimens are shown at natural size*

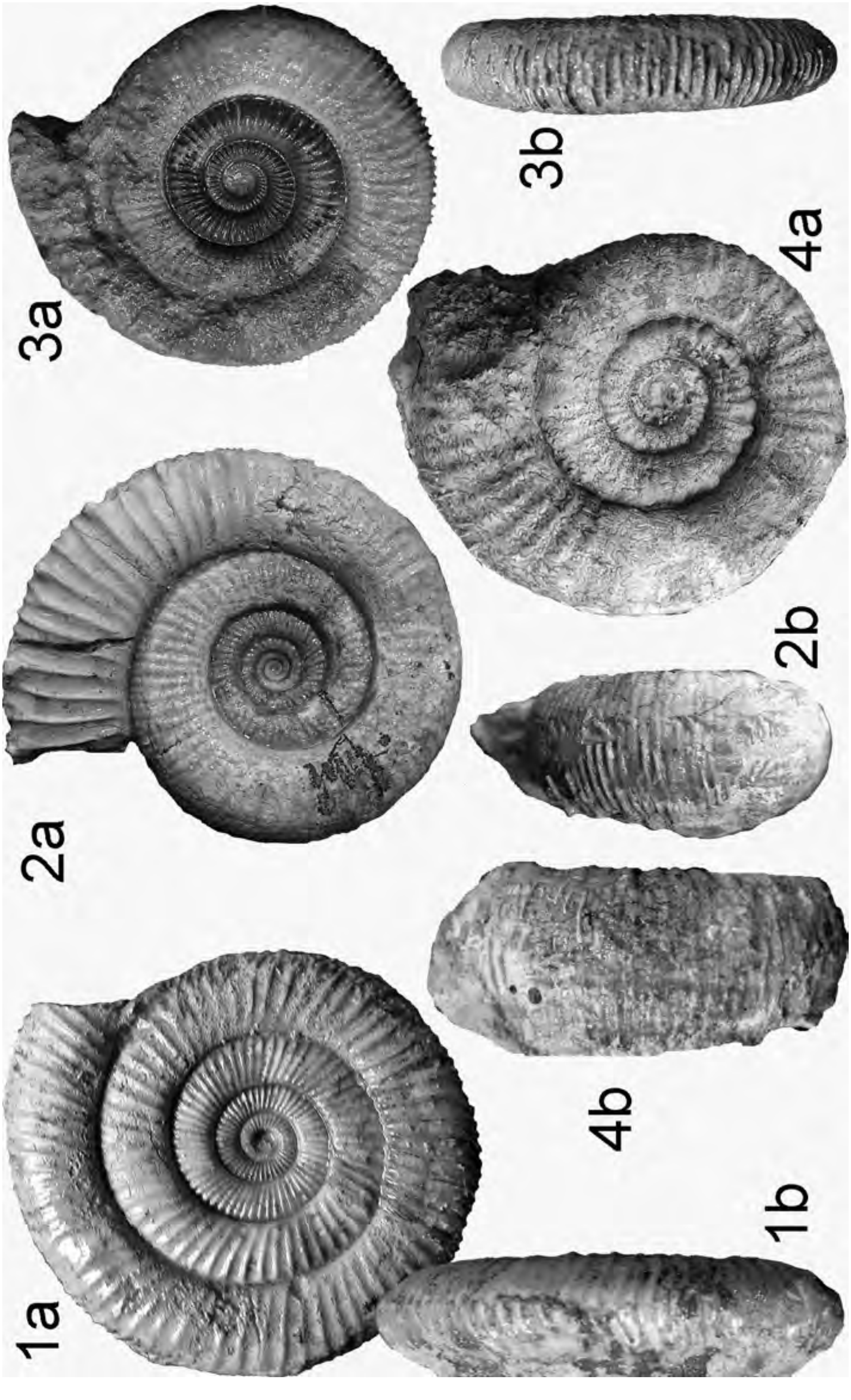

Fig. 4 Specimens of ***Dactylioceratidae*** *from the Seavington site. 1a, b.* Dactylioceras *aff.* commune *(?athleticum); 2a, b.* Dactylioceras *cf.* parvum; *3a, b.* Dactylioceras verme; *4a, b.* Nodicoeloceras spicatum; *a) = lateral view, b) = ventral view; specimens are shown at natural size*

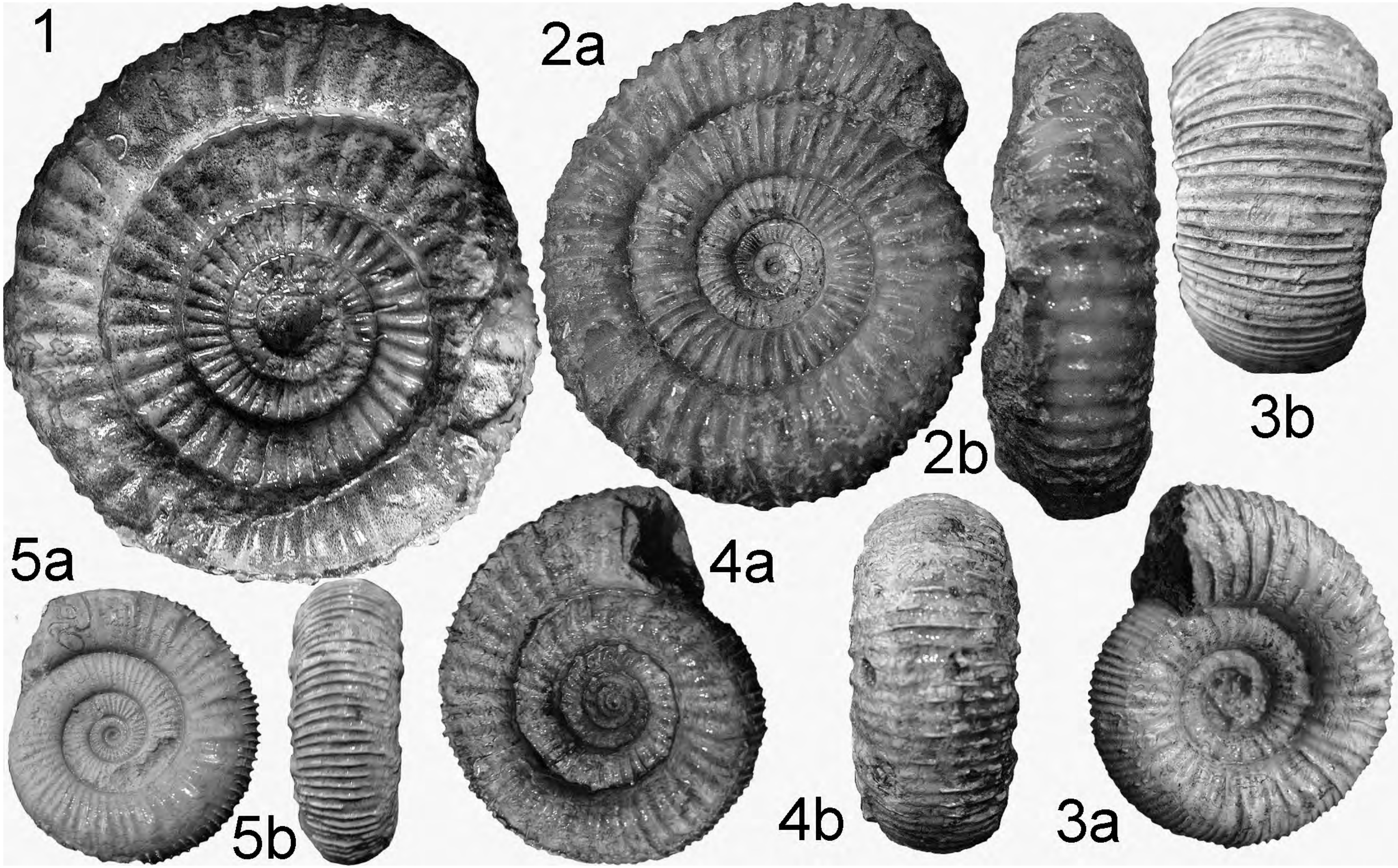

Fig. 5 Specimens of ***Dactylioceratidae*** *from the Seavington site. 1.* Dactylioceras leptum*; 2a, b.* Dactylioceras commune*; 3a, b.* Nodicoeloceras pingue*; 4a, b.* Nodicoeloceras multum*; 5a, b.* Porpoceras vorticellum*; a) = lateral view, b) = ventral view; 1 ventral only; specimens are shown at natural size*

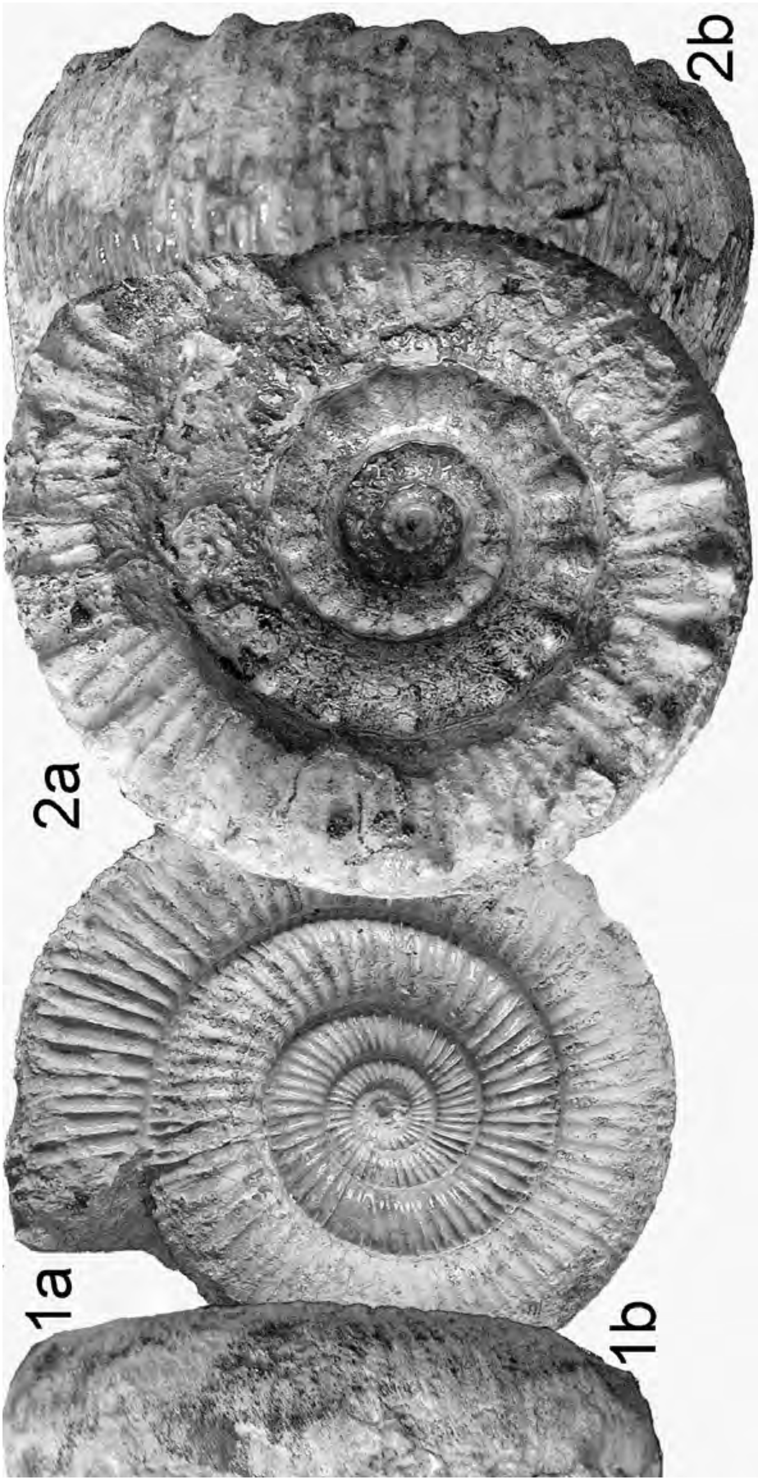

*Fig. 6 Specimens of **Dactylioceratidae** from the Seavington site. 1a, b.* Nodicoeloceras crassoides; *2a, b.* Porpoceras vortex ; *a) = lateral view, b) = ventral view; specimens are shown at natural size*

Subzonal index *Cleviceras exaratum* (Young and Bird) may be absent or extremely rare (Howarth 1991, 98–9) and no specimen to date is known from Seavington, possibly due to collection failure as this ammonite's morphology resembles the very common *Harpoceras falciferum* (J. Sowerby). Although Howarth (1992, 23) recorded the Leptaena Clay (*sensu* Moore 1865–6), this could not be identified at Seavington, nor could the suprajacent Fish Bed (Howarth 1992, 132), although a row of nodules close to the top of the Marlstone, a number of which were examined but with no fossil material observed, might represent the latter (Hamlet 1922; Pringle and Templeman 1922). The form transitional between *H. serpentinum* and *H. falciferum* was also recorded from the uppermost clay band (*c.* +1.1m) of the Subzone. Additional ammonite records were *Hildaites murleyi* (Moxon), *Nodicoeloceras crassoides* (Simpson) and *Phylloceras heterophyllum* (J. de C. Sowerby).

Falciferum Subzone

At *c.* +1.85m, essentially a succession of grey to olive-grey coloured clays and grey or whitish-grey coloured, often ferruginous, argillaceous limestones which are occasionally marly, sub-nodular or with scattered, small nodules. Two prominent marker beds occur which contained examples of the Subzonal ammonite index *Harpoceras falciferum*, the lower a grey-coloured, marly limestone, the upper an ochre-coloured, ferruginous, concretionary limestone, these indicating the position of the middle and upper Falciferum Subzone respectively. An interesting band of extremely irregularly shaped limestone nodules occurs at +2.2m, suggestive of considerable bioturbation with sediments subsequently lithified into small-scale structures cemented to a limestone core. Numerous small *Dactylioceras* cf. *verme* (Simpson) were observed, both within the matrix and cemented to the exterior, which also exhibited much epifaunal encrustation by serpulae, minute oysters, broken echinoid spines, belemnite guard fragments, disarticulated crinoid arms and other organic remains. Photographs of this limestone are given in Christian (2010).

This Subzone comprises the thickest strata of Lower Toarcian sediments seen in the Barrington Member, with ammonites more varied and abundant here than anywhere else in Britain (Howarth 1992, 23). At Seavington, most of the ammonites listed in the distribution table (Fig. 7) were collected, with notable additions to those detailed in the succession description of Howarth (1992, 22). The Subzonal taxon *H. falciferum* was ubiquitous throughout, along with excellent examples of *Dactylioceras toxophorum* (Buckman) and *Nodicoeloceras crassoides* (Buckman). Other ammonites collected were *D. verme, D. anguiforme* (Buckman), *D. consimilis* (Buckman), *D. leptum* (Buckman), *Nodicoeloceras spicatum* (Buckman), *N. lobatum* (Buckman), *N. pingue* (Buckman), *Hildoceras lusitanicum* (Meister), *H. laticosta* (Bellini) and a number of examples of the rare taxon *Orthildaites douvillei* (Haug), of which only four examples were previously known from Britain (Howarth 1992, 175). The latter taxon is not listed in Fig. 7 as it had not previously been recorded from the Barrington Member. The Seavington specimens of *D. toxophorum* and *D. anguiforme* are chorotypes, ie specimens from a section near where the holotypes were collected, and from a comparable stratigraphic horizon. The holotypes were described by Buckman (1927, pls 763, 776), and both these species from the Barrington Member are far better preserved than those from most other exposures in Britain (Howarth 1992, 24).

Bifrons Zone; Commune Subzone

In general, a similar sequence of clays and limestones averaging a total thickness of 0.35m, with the upper portion of the section condensed, becoming more mixed and difficult to differentiate – a feature previously recorded for this part of the Barrington Member (Howarth 1992, text-fig. 6). It also results in ammonite taxa of differing ages being mixed together or apparently out of sequence, so caution must be exercised in identifying specimens, particularly of the Dactylioceratidae. The clays often contained limestone lithoclasts with an irony veneer. The Subzonal index *Dactylioceras commune* (J. Sowerby) was not abundant, with the specimens collected often more finely ribbed than the well-known Yorkshire species. They could be interpreted as *Dactylioceras athleticum* (Simpson), itself possibly a synonym of *D. commune* (M.K. Howarth pers. comm., December 2011). At +3.2m a 6cm bed of whitish-grey coloured limestone contained abundant small (~8mm) specimens of *Dactylioceras* sp. but inextricable due to preservation mode. *Dactyliocera* cf. *parvum* (Buckman) occurred,

Fig. 7 A model section of the Barrington Member compiled from historical records and personal fieldwork by M.K. Howarth (Howarth 1992, text-fig. 6), showing the lithological succession and distribution of ***Hildoceratidae*** *in the Lower Toarcian at Barrington, Somerset. Ammonites of the five successive zones and subzones are mixed in the condensed beds 26 and 27, so clear divisions cannot be drawn. Text-fig. 6 of Howarth 1992 emended (by permission of Dr Howarth) to show the corresponding distribution of the* ***Dactylioceratidae***

with *Hildoceras laticosta*, *H. lusitanicum* and *Harpoceras falciferum* still evident in the lower portion together with rare specimens of *Frechinella subcarinata* (Young and Bird), a diagnostic taxon of this Subzone (Howarth 1992, 138).

Fossil nautiloids are also an element of the fauna of the Barrington Member, although not so abundantly as the ammonites, tending to be ignored by collectors and for the purpose of stratigraphy as they often have a long time-range and species show little change of gross morphology. A recent review of those nautiloids known from the Toarcian of the Ilminster area (King 2011) identified three species from various locations. *Cenoceras astacoides* (Young and

Bird), *C. terebratum* (Dumortier), and *C. jourdani* (Dumortier) are all essentially Bifrons Zone species, with *C. jourdani* being the most abundant and the only one of the three so far collected at Seavington – 18 specimens at the time of writing – and only from the Commune and Fibulatum Subzones. *C. jourdani* is easily identified by its flattened whorls, slightly converging towards a flat venter, and with strongly sinuous almost falcoid septa.

Fibulatum Subzone

This Subzone usually commences with the first appearance of the genus *Peronoceras*, then extends upwards to include beds containing the closely related genus *Porpoceras*. However, these two genera are never mixed, as demonstrated by Howarth (1978), and *Peronoceras* spp are consistently found in stratigraphically older sediments. It is thus noteworthy that *Peronoceras* has not been recognised from the Seavington sections, possibly due to penecontemporaneous erosion, ie occurring at the same time as deposition of younger sediments. A doubtful record of this genus was mentioned in the Geological Survey Memoir (Wilson *et al.* 1958, 54) from an exposure near Ilminster but all associated ammonites mentioned suggest the presence only of the Falciferum Subzone. No mention is made of this genus in relation to the Hurcott Lane SSSI section (contra Page in Boomer *et al.* 2009, 70), although the section developed by Constable (1992) and later re-figured (Simms *et al.* 2004, 96) indicates the Fibulatum Subzone, probably comparable with the nearby Seavington location.

As earlier mentioned, this part of the succession is highly condensed, so only an approximate thickness of 0.30m is proposed. From an 8cm thick, pale-grey coloured, ferruginous limestone above the last clay seam containing *D. commune*, well-preserved specimens of *Porpoceras vortex* (Simpson) were collected, recorded for the first time from the Barrington Member and confirming the upper Fibulatum Subzone age for this part of the Seavington succession. The clays and highly ferruginous nodular limestones yielded a few poorly preserved examples of the Zonal taxon *Hildoceras bifrons* (Bruguière), but relatively abundant examples of *H. lusitanicum*. Additional ammonite records from this part of the Seavington succession are *Nodicoeloceras multum* (Buckman), *Porpoceras vorticellum* (Simpson), *Dactylioceras commune* and *Harpoceras falciferum*.

Crassum Subzone

This Subzone was the most difficult to identify, due to the much weathered and disturbed condition of the beds immediately above those of the Fibulatum Subzone, so without finding any specimens of either *Hildoceras semipolitum* (Buckman) or *Harpoceras subplanatum* (Oppel), diagnostic of this Subzone, it was searched for in higher beds at the far northern end of the primary section (Fig. 2, A). A single almost complete specimen of the Subzonal taxon *Catacoeloceras crassum* (Young and Bird) confirmed the presence of this Subzone but in much disturbed marly clays that also contained numerous specimens of *Hildoceras semipolitum* (Buckman). Immediately below these clays, a dark-grey coloured limestone contained abundant specimens of *Hildoceras bifrons* whilst above the clays a 0.30m thick, nodular, pale-grey coloured limestone with clay seams contained the last observed specimens of *H. bifrons*, together with specimens of *H. semipolitum*. Poorly preserved specimens of *Lytoceras* sp. and *Haugia* sp. also occurred. The presence of *H. semipolitum* together with *Haugia* suggests the point of transition to the Variabilis Zone of the Upper Toarcian.

UPPER TOARCIAN; Variabilis and Thourasense Zones

This upper portion of the section was a sequence of poorly consolidated, somewhat weathered alternations of grey-coloured, soft, marly limestones and bluish-grey coloured clays, with a final topmost bed of ferruginous, reddish-coloured clay which, together with the subjacent marly clay of the Crassum Subzone, totalled 1.05m. Ammonite material from this part of the succession included *Haugia phillipsi* (Simpson), *Haugia* cf. *variabilis* (d'Orbigny) and *Brodeia juncta* (Buckman), of the Variabilis Zone. *Phymatoceras fabale* (Simpson) indicated the presence of the Striatulum Subzone, while *Osperleioceras bicarinatum* (Zeiten) and *Pseudogrammoceras* sp. indicated the Fallaciosum Subzone; both of the Thourasense Zone.

Due to weathering, ammonites from higher in the succession were difficult to obtain as most were in an extremely poor condition, most badly eroded. Specimens that could be determined were considered as possibly *Phlyseogrammoceras dispansum* (Lycett) which would suggest the presence of the Dispansum Subzone, Levesquei Zone. These could be relict specimens from the suprajacent Bridport Sands, which here are possibly represented by a bed of extremely earthy, rust-coloured sand seen at the northernmost point of the site. An excavation below these sands showed a mixture of very rubbly, ferruginous limestone and blackish-coloured clay, from which were collected specimens of the zonal taxon *Grammoceras thourasense* (d'Orbigny), also numerous fragments of *Grammoceras* sp. indet.

DISCUSSION

The term 'Junction Bed' was introduced by Woodward (1887, 272) as an all-inclusive lithological 'label' for the succession of rock-beds comprising the conglomeratic, red-brown coloured, often oolitic lower limestones (the Marlstone) of Upper Pliensbachian age and the following succession of limestones/clays of the Toarcian. This term became entrenched in the literature and applied to that sequence whenever it was exposed in Dorset or Somerset. The Marlstone Rock Bed on the Dorset coast is a highly condensed, lithologically diverse limestone with some marl partings, never more than 0.6m thick (Howarth 1957, 192–3) but which increases considerably northwards to reach *c.* 6m (Cope *et al*., 1980, 48, PL. 2), once seen at the quarry at Moolham Farm, Ilminster. Traditionally, the top of the Marlstone was considered to be the junction between the Spinatum and Tenuicostatum Zones (Howarth 1980, 637), ie the boundary between the Middle and Upper Lias, the bed itself being described as the basal part of the formation termed the Upper Lias Junction Bed. However, Howarth (1992, 5) demonstrated that the three-fold division of the Lias into Lower, Middle and Upper Lias was unhelpful to interpreting the biostratigraphy of the Lias, with 'Middle' relevant only to its type area (Somerset). To rationalise both that situation and the use of the term 'Junction Bed', as relevant to Dorset and Somerset, all were consolidated into a single unit, the Beacon Limestone Formation (Cox *et al*. 1999, 4) (Fig. 1), the type locality designated as Thorncombe Beacon on the Dorset coast, with two subordinate units, the Eype Mouth Member (Dorset coast only) and the Marlstone Rock Member (Cox *et al*. 1999). However, by detailed investigation elsewhere of the upper part of the Marlstone and collection of the contained ammonites, Howarth (1980) demonstrated that the junction of the Upper Pliensbachian and the Lower Toarcian – the traditional commencement of the Tenuicostatum Zone – could be placed within the upper portion of the Marlstone Rock Bed. At its type locality, this portion of the Marlstone within the Beacon Limestone Formation contains specimens of *Pleuroceras* and *Dactylioceras* cf. *tenuicostatum*, with *Dactylioceras semicelatum* (Simpson) above, and a similar assemblage was recorded from the Barrington locality but in differing sediments, ie sandy marls and grey-coloured, oolitic limestone, indicating a local lithological variation of the Marlstone below the commencement of the Exaratum Subzone (Howarth 1980, 641) that has not been found at Seavington.

Due to distinctively different lithologies of the rock-beds overlying the Marlstone at the Dorset coast and at inland exposures in Somerset, the term 'Barrington Beds' was used by Donovan *et al.* (1989) for the Toarcian part of the previously termed 'Junction Bed'. This was then used to describe the upper part of the 'Junction Bed' by Bristow *et al.* (1993) and to a wider area of Somerset than the Barrington area. The term 'Barrington Member' was then formalised by Cox *et al.* (1999, 7) (Fig. 1) to describe the Lower and Upper (pars.) Toarcian of South Somerset. The term was derived from 'Barrington Beds' (Buckman 1927, 45–6), named after the former exposures nearby to the village of Barrington.

The abundant ammonite fauna of the Lower Jurassic provides the index names for the zonal/subzonal chronostratigraphy. The most comprehensive photographic record remains that of Buckman (1909–28), of which the earlier volumes illustrate many of the type species, collected mainly from the Yorkshire coast. Those ammonites from Seavington described in the present paper are nominal morphospecies, typical of their relative stratigraphical position and assigned following the standard ammonite zonation of Howarth (in Dean *et al.* 1961) with modifications by Howarth (in Cope *et al.* 1980; Howarth 1992) (Fig. 7).

The Seavington site provided most of the ammonite fauna associated with the Barrington Member, with notable additions, and reaffirmed the zonal/subzonal indices which have been used for the British Toarcian for more than a century. The Lower Toarcian ammonite fauna at Seavington, as elsewhere in the British succession, is dominated by the families **Hildoceratidae** and **Dactylioceratidae** (Howarth 1992, 1). However, at Seavington the Upper Toarcian faunas are less evident.

As above mentioned, the zonal indices applied herein are those traditionally used for the British Toarcian, although more recent research in Europe has introduced a number of changes applicable to the European Toarcian successions (Elmi *et al*. 1997). In addition, a detailed review of the Lower Jurassic of Europe discusses a redefined ammonite provincialism (Page 2003) for the North-West European Province (Dean *et al*. 1961). A detailed commentary on these proposals is outside the scope of the present review, but whilst accepting that a number of discrete ammonite provinces can be recognised with similarities of fauna to the British Toarcian, the following observations are pertinent to maintaining the *status quo* herein. It is proposed by Page (2003) that northern Britain should be included in a restricted Subboreal Province whilst southern England should be lumped with north-west Europe in a Submediterranean Province, resulting in a number of changes to the long established British stratigraphy. These are here discussed in relation to the zonal stratigraphy for the Seavington location which, as for the Barrington Member (Figs. 1 and 7), has been described using the established British stratigraphy. Whilst new evidence may require change, Holland *et al.* (1978) advocated that existing names be stabilised and changed only where the originals are inappropriate; a position subsequently supported in the Geological Society's Introduction to their Correlation Charts (Torrens in Cope *et al.* 1980, 3), and in a revision by the Geological Society Stratigraphy Committee (Whittaker *et al.* 1991) which recommended that stability in stratigraphical nomenclature, whilst recognising new concepts, is best served by continuity with well-established names preserved.

Both the Subboreal and Submediterranean Provinces, as proposed by Page (2003), introduce a Serpentinum Zone as a replacement for the Falciferum Zone, with the latter retained as Subzone. *Harpoceras falciferum* (J. Sowerby) is the phylogenetic successor of *H. serpentinum* (Schlotheim), but the latter was the subject of vague or mis-identifications, fully discussed elsewhere (Howarth 1992, 114–15), although used as a zonal index by Oppel (1856–58) as *Ammonites serpentinum*. It was Haug (1885) who introduced the Falciferum Zone. While under the relevant rules of the International Code for Zoological Nomenclature age priority confirms a fossil name and authorship, this is not the procedure under the International Stratigraphic Guide. Thus there seems no reason that justifies the major change being proposed, and so in the present paper the Falciferum Zone has been retained.

Similarly, introducing an Elegantulum Subzone (index *Eleganticeras elegantulum* (Young and Bird)) to replace the Exaratum Subzone for the proposed application of the Submediterranean Province to southern England (Page 2003) is questionable, as in Britain this index is an ammonite of northern England only, ie Subboreal (Howarth 1992, 88). In addition, within the Submediterranean Province, Page (2003) introduces a Sublevisoni Subzone (index *Hildoceras sublevisoni* (Fucini)) to replace the Commune Subzone, for which the index *Dactylioceras commune* (J. Sowerby) is one of the oldest stratigraphic indexes of the British succession and a most recognisable form. Howarth (1992, 176–7) demonstrated that *H. sublevisoni* is a junior synonym of *Hildoceras laticosta* (Bellini) and thus is here considered an unacceptable substitute for the Commune Subzone in England.

Affinities of ammonoid genera within the north-western European provinces is well proven (Dean *et al*. 1961), with subsequent European research refining the Toarcian stratigraphy and associated ammonite faunas as determined for western Europe. However, having regard to the comments above, it is proposed by the present author to introduce a 'Britannia Province' to reflect the overall nature and distribution of British ammonite faunas which support maintaining the established British chronostratigraphy.

Micro-faunal evaluation

At the invitation of this author, visits were made to the Seavington site by Prof Alan Lord (Senckenberg Research Institute, Frankfurt am Main, Germany) and Dr Ian Boomer (Manager, Stable Isotope Laboratory, University of Birmingham), to further their ongoing research of the microfauna of the Upper Pliensbachian/Lower Toarcian boundary. In addition to evaluating the microfauna (ostracods and foraminifera), the research is providing more evidence of the extinction event caused by oxygen deprivation that occurred in early Lower Toarcian time (Toarcian Oceanic Anoxia Event) – a bed at Seavington being possibly one of the first records of this event in relatively shallow water conditions – as well as providing new foraminifera records for the region (Dr Ian Boomer, pers. comm., March 2011). Overall, however, the Seavington site displays sediments conformable with deposition in well-oxygenated, deep-water conditions, with episodic erosion evidenced by numerous lithoclasts and redeposited, worn ammonites.

Palaeontological notes

During the course of collecting fossil material at Seavington, an *ex situ* echinoid was found on one of the irregularly shaped nodules (Falciferum Subzone) described above. Identified as a specimen of the poorly known genus *Jacquiertia* , it might be *J. minuta* (Mortensen and Mercier) but the type material was destroyed during World War II and no topotype (ie an example from the original locality and Zone) material is known. It is the first recorded occurrence of this genus in Britain and possibly a new species (Dr Andrew Smith, pers. comm., January 2011).

The ammonite genus *Zugodactylites* has not previously been identified south of the East Midlands. It is an element of the Fibulatum Subzone and during the excavation of this Subzone as described above, a wholly septate fragment of this genus was discovered. Whilst not conclusive evidence that this ammonite had populated south-west England, further collecting at Seavington or elsewhere in the Ilminster area may add to this record.

Since completing this manuscript, Dr Mike Howarth (pers. comm., March 2012) has confirmed that an ammonite collected at Seavington *ex situ* is positively identified as *Dactylioceras (Orthodactylites) tenuicostatum* (Young and Bird) (Howarth 1980, pl. 82, figs. 4 and 9). This suggests that the observation above is correct and that the Tenuicostatum Zone probably was present within the area of excavation.

CONCLUSION

The Seavington site has provided an opportunity to review the general stratigraphy of the South Somerset Toarcian and its contained macro and microfauna in a classic area where new exposures are rare. The results obtained encourage further fieldwork in the Ilminster area that may provide additional evidence to the new records obtained at the described location. This author has commenced a report of the extant exposures, also of sub-crops of Toarcian rock-beds as evidenced by surface brash and the abundant *ex situ* fossil material. As Charles Moore wrote (1865–6, 169): ‘Perhaps at no other place can the great stone book be thus more readily read than in the thin bands of clay and stone, which compose the few feet forming the Upper Lias of the neighbourhood of Ilminster’.

ACKNOWLEDGEMENTS

I am pleased to thank the landowners Mr John Hallett, also Mr Mathew Hallett, both of Shepton Beauchamp, for their permission to access the site, support for the field work and the collection of fossil material. I appreciated the permission of Mr N. Brake, Operations Manager of Branston Ltd, to cross the grounds of the processing plant to access the site.

Without the support of Dr M.K. Howarth, Natural History Museum, London (retired), for identifying most of the ammonite fauna mentioned herein, for his guidance, agreement to reproduce extracts from his mnograph and especially for critically reviewing the first draft of this paper, which would otherwise have been deficient, I am most grateful and thank Mike for all his help.

I thank Dr Andrew Smith, Department of Palaeontology, Natural History Museum, London, for identifying and providing information on the echinoid *Jacquiertia* and his permission to reproduce this herein. The information on the results of the microfaunal investigations with additional comments by Dr Ian Boomer, University of Birmingham, and permission to quote these, is gratefully acknowledged. I appreciated discussions with Bob Christian, Dorset Geological Group, and Mark Varar (Stroud). My thanks to Stuart Derrick (Taunton) and Robert Chandler (Whyteleaf, Surrey) for help with the digital reproduction of this paper and the photographs for Figs 3-6. I appreciated the help of Simon Leach, Derek Briggs and Graham Rix (SANHS) for their comments on the text.

Author’s address and location of fossil material:

[redacted].
The fossil material will in due course be donated to the Natural History Museum, London.

Dedication

This paper is dedicated to the memory of Prof John H. Callomon, one of the foremost authorities on Jurassic ammonite phylogeny, and related chrono- and biostratigraphy. As both mentor and friend, always willing to guide, to advise and to help with fieldwork and written works, he is sorely missed by this author and all with whom he collaborated.

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