

UPPER CRETACEOUS PINNA AND BELEMNITELLA WITH ASSOCIATED ENDOLITHIC SPONGE CRYPTS AND POLYCHAETE TUNNELS PRESERVED IN FLINT FROM THE ISLE OF WIGHT

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Abstract

Three unusual flint preserved fossils from the Isle of Wight are described. Firstly, a specimen of *Pinna decussata* Goldfuss, 1837 collected from the beach at Thorness, showing extensive endolithic sponge infestation. Secondly, the infilling of the alveoli of two specimens of the belemnite *Belemnitella* sp. from the prolific flint fossil site of High Port, Ventnor. These specimens provide a rare insight into the poorly known phragmocone/alveolus of the genus. They also preserve the tunnels of endolithic polychaete worms in 3D.

Introduction

With flint dominating the beach shingle and soils of the Island, flint preserved fossils are very commonly found. Sponges, echinoids and inoceramid bivalves are frequent finds, less commonly brachiopods and other bivalves. Historically one of the most famous flint collecting beaches on the Island was between Ventnor and Bonchurch. From High Point, Norman (1859) listed a wide range of finds from flints imbedded in clay including sponges, bivalves, brachiopods, and foraminifera. Significantly, Norman also recorded fossils including *Innoceramus lamarcki*, *Micraster* spp., *Marsupites* sp., *Magas pumilus* as well as *Belemnitella* sp. all of which have biostratigraphic signatures. These indicate that the fossils are derived from Chalk ranging from the Turonian to the Campanian, as represented *in situ* on the Island, but only on the north side of the central downs. It is, however, worth noting that both *Belemnitella* sp. and *Magas pumilus* range into the Maastrichtian, which is not present on the Island. However, Curry (1986) recorded that pebbles of Maastrichtian age flint are known from around Southbourne, Dorset, indicating the former presence of Maastrichtian Chalk in the Solent area. Campanian flints were recorded by Curry (1986), based on foraminifera in rotted flint pebbles in Solent Group at Whitecliff Bay.

Unusually the beach around Bonchurch, has many large flint cobbles some measuring up to 50 cm across. Historically it became a focus for collecting fossils and interesting flints. It was a common practice to cut flints containing sponges such as *Siphonia* spp (at the time referred to as *Choanites*), to reveal the sponge structure and associated mineralisation. Norman (1887) recorded that at the time there was an active business selling cut and polished flints to collectors and visitors. Mantell (1854) was the first to record something quite exceptional from the flints near Bonchurch and Ventnor, the flint infill of the alveolus of a belemnite assigned to the genus *Belemnitella*. Herein we revisit these rarities and another unusual flint fossil find from the Island.

Flint in England and much of Europe originates from the White Chalk subgroup, and its lateral equivalents. Flint first occurs in Turonian Chalk then throughout the rest of the Chalk. Fossils in flint are typically preserved as internal or external moulds however, the shell or test can be preserved if collected *in situ* in the Chalk, or near to outcrop. An illustration of the very wide range

of fossils preserved in flint is given by Braasch and Menzel-Harloff (2020) from northern Germany. Other preservations include in flint meal (see Hart *et al.*, 1986) and as flint pebbles, including rotted flints in Paleogene deposits (see Curry, 1986).

Extensive post-Cretaceous erosion of the Chalk has led to huge amounts of flint dominated regolith, which forms terraces linked to Quaternary river channels and beaches. In patches on the Downland are clay-with-flints a weathering product of the Chalk and in-part former overlying Paleogene deposits. Other flint bearing deposits are angular flint gravel in rendzina soils, and coombe rock, a solifluction deposit.

Flint is a precipitation of silica forming concretions which have overgrown the host sediment (Gale and Kennedy, 2011). Often tabular or nodular, it can be found replacing burrow systems and/or body fossils. Typically, originally black, or dark brown/grey, flint is porous therefore readily takes up other minerals changing its colour and forming a patina on the surface. Flint pebbles can show different patinas from repeated transport and burial. A common colour on the Isle of Wight, which is in common with most of southern England, is the light-brown ochre colour associated with terrace gravels (see Gibbard, 1986).

Ichnogenera associated with Cretaceous belemnite guards

Late Cretaceous belemnite guards (or rostra) seem to have been an important habitat for endolithic and encrusting organisms. Seilacher (1968) described slit-like borings which he attributed to cirripeds (barnacles) of the order Acrothoracica. Typical encrusters include 'serpulid' worms and pycnodontine oysters (Jarvis, 1980). Jarvis also noted the prevalence of clinoid sponge borings. Wisshak, *et al.* 2017 used micro-CT scanning to describe a diverse ichno-assemblage in Campanian to Maastrichtian belemnite guards from Norfolk (eastern England), and Höver (Germany). This included *Dendrina dendrina* (Morris, 1851), commonly seen on the surface of belemnite guards, radial traces of *Entobia* isp., and the more extensively, worm-like traces *Trypanites* isp., *Ramosulcichnus bioforans* (Gripp, 1967), and *Lapispecus* ispp. Subsequently, Donovan *et al.* (2019), described abundant, dense, and long tube-like borings tentatively assigned to the ichnogenus *Trypanites* isp. in a flint preserved belemnite specimen from the Maastrichtian of Haccourt, north-east Belgium.

Specimen Descriptions

Pinna decussata

Class BIVALVIA Linnaeus, 1758 in 1758–1759

Suborder MALLEIDINA J. Gray, 1854

Superfamily PINNOIDEA Leach, 1819

Family PINNIDAE Leach, 1819

Genus PINNA Linnaeus, 1758

Pinna decussata Goldfuss, 1837

Range: Lower Cenomanian to Upper Campanian.

Material: IWCMS: 2022.1009 Sticeletts, Thorness Bay, Andy Yule Collection.



Fig. 1: *Pinna decussata* Goldfuss, 1837 with extensive crypts of *Entobia* isp., Sticeletts, Thorness Bay, Isle of Wight. IWCMS.2022.1009. Scale bar in centimetres.

Description: A single valve preserved in a light brown coloured flint cobble measuring approximately 120mm x 100mm x 60mm. The specimen comprises an internal mould of a single right valve original size estimated at c. 150mm height by 80mm width. The shell margins are not preserved and comprises a section of the middle of the flank, possibly including the posterior adductor scar. Posteriorly, eight moderate to strong rounded radiating ribs are preserved. The ventral area of the flank is less ornamented.

Remarks: As the ribs are rounded, derivation from the Upper Campanian *Belemnitella mucronata* Biozone is probable, as recorded by Cleeveley and Morris (2002) who noted that Campanian forms tend to have more rounded ribs, than earlier forms. *Pinna* spp. are typically very thin shelled, and the specimen shows no evidence of the shell. The *Entobia* isp (see below) may have occupied the full thickness of the shell at 2-3mm.

Associated Sponge Ichnogenus

Entobia isp.

Range: Upper Turonian to Maastrichtian.

Description: Numerous sub-spheroidal, depressed bodies, 2-3mm in diameter/length/depth, some with thin inter-linking stolons. The borings are concentrated in the posterior area of the valve, increasing in density ventrally where they spread into the middle of the flank of the valve.

Belemnitella sp.

Class CEPHALOPODA Cuvier, 1797

Subclass COLEOIDEA Bather, 1888

Order BELEMNITIDA Zittel, 1895

Suborder BELEMNOPSEINA Jeletzky, 1965

Family BELEMNITELLIDAE Pavlow, 1914

Genus BELEMNITELLA d'Orbigny, 1840

Belemnitella sp.

Range: Santonian to Maastrichtian, locally Campanian.

Material: MIWG.510 a High Port, Ventnor, ex Ventnor Museum Collection; MIWG. 3846 High Port, Ventnor, G.T. Woods Collection.

Description: MIWG.510 is a flint infill of the alveolus of a belemnite, contained in a small block of light-brown and grey coloured flint, preserving a deeply patinated piece of cortex, 42 mm in length, 40mm in depth. The alveolus infill is 20mm in length, and 6mm in diameter, there is sufficient encasing flint preserved to indicate that the belemnite guard was c 9mm in diameter. The angle of the alveolus cavity was c. 20 degrees.

MIWG.3846 is a flint infill of the alveolus of a belemnite, contained in a small block of light-grey coloured flint 42 mm long by 10mm wide. The alveolus infill is approximately 35 mm long by 10mm in diameter, it is conical in shape, the angle of the alveolar cavity is between 19 and 20 degrees. and has a strong dorsal keel running its full length. The guard has been completely lost.

Remarks: Mantell (1854, p.316-318, LIGN.38), first recorded these from the collection of Samuel Beckles who had four specimens. The late Cretaceous belemnite genera *Goniot euthis*, *Belemnitella*, and *Belemnella* have a distinct ventral alveolar fissure. Of these *Belemnella* is Maastrichtian, which is not exposed on the Isle of Wight, having been eroded away before deposition of the overlying Palaeogene strata. The zonal belemnite *Goniot euthis quadrata* is locally rare, whereas *Goniot euthis granulata* is common in a narrow band of green-nodule beds and hardgrounds in the Newhaven Chalk Formation at Culver Cliff. However, this part of the Chalk lacks flint bands (the Flintless Chalk of Rowe, 1908). It is therefore highly probable that the alveolar infills relate to *Belemnitella* spp. The zonal belemnite *Belemnitella mucronata* is very common at outcrop at Whitecliff Bay and Alum Bay.

Whittlesea (1991) described the phragmocone of *Belemnitella* cf. *langei* from the Beeston Chalk near Caiston St Edmund, Norfolk. Subsequently (Whittlesea, 2004) described the phragmocone and alveolar cavity of *Goniot euthis* sp. in a flint cobble from near Norwich. In the latter paper Whittlesea records that

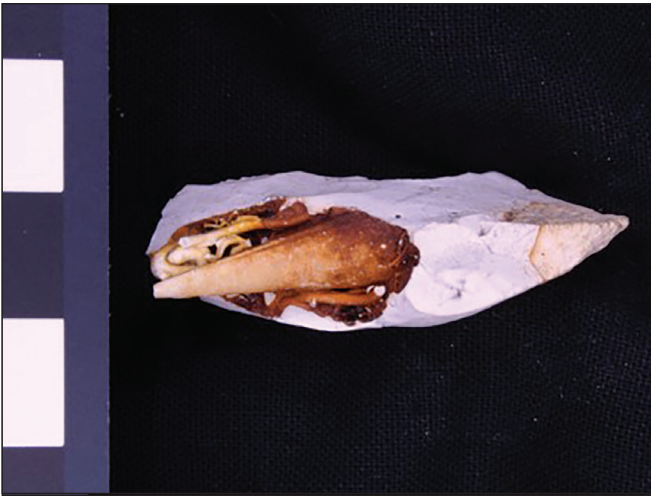


Fig. 2: Infilled alveolar cavity of *Belemnitella* sp. with *Lapispecus* isp.; b. *Trypanites* isp.
High Port, Ventnor, Isle of Wight. MIWG. 3846.



Fig. 3: Infilled alveolar cavity of *Belemnitella* sp. a. colonies of *Dendrina* isp. on the inside of the cavity, left by the dissolution of the belemnite guard. Scale bar in centimetres. MIWG.510 a High Port, Ventnor, ex Ventnor Museum Collection.

the angle of the alveolar cavity of *Gonoteuthis* is just six degrees as opposed to 19 degrees in *Belemnitella*. Christensen (1995) regarded *Belmnitella mucronata* as a group of about ten similar species. *Belemnitella mucronata sensu stricto* is restricted to the basal *Belemnitella mucronata* biozone as seen at Culver Cliff, in the Portsdown Formation. However, at Alum Bay the Chalk possibly correlates to the middle part of the stratigraphically younger Norwich Chalk (Gale, 2019), which has a wider range of species. Based upon the field evidence, and the angle of the alveolar cavity we can with some confidence assign MIWG. 3846 to the genus *Belemnitella*, but not to any given species.

Associated Ichnogenera

Lapispecus isp.

Range. Campanian.

Material. MIWG.3846 High Port, Ventnor, G.T. Woods Collection, and MIWG.510 a High Port, Ventnor, ex Ventnor Museum Collection

Description. Fairly constant 2-3 mm diameter, circular and winding tunnels with thin, but wide vanes, forming a keyhole like cross-section. The tunnels run subparallel to the guard.

Remarks. Unlike the belemnite alveolus first described by Mantell (1854), and subsequently figured by Doyle (2002, Plate 45, fig.5), MIWG.3846, shows infilled, extensive worm-tube like borings originating from the belemnite's alveolar cavity. The vanes are diagnostic of *Lapispecus* isp, and closely resemble *Lapispecus cuniculus* Voigt, 1970, previously recorded in derived cobbles within a Santonian conglomerate. Also, *Lapispecus hastatus* Wisshak et al. 2017 in guards of *Gonoteuthis quadrata*, Lower Campanian, Höver, Germany. *Lapispecus* isp. is considered to be a boring of a polychaete worm (Wisshak et al. 2017).

Trypanites isp.

Range. Campanian-Maastrichtian.

Material. MIWG.3846 High Port, Ventnor, G.T. Woods Collection.

Description. Thin circular, infilled, winding tunnels, up to 2mm in diameter. The tunnels show tight bends, including direction of growth reversal.

Remarks. Previously recorded in *Belemnella* sp, Lower Maastrichtian of Norfolk Wisshak et al. 2017 and Donovan et al. (2019) from the Maastrichtian of Haccourt, north-east Belgium.

Dendrina isp.

Range: Upper Turonian to Maastrichtian.

Material. MIWG.510 a High Port, Ventnor, ex Ventnor Museum Collection.

Description: Numerous groups of radiating irregular diameter stolons located near to the surface impression of the belemnite guard. Less than 1mm in diameter, forming patches up to 4 mm across.

Conclusion

The Isle of Wight is a rich source for fossils preserved in flint, and interesting discoveries can be made almost anywhere. Past collecting in the Bonchurch- Ventnor area, focused on Quaternary deposits at High Port have yielded a wide range of fossils from Turonian to Campanian Chalk. The examination of a rare *Belemnitella* sp alveolus infill has led to new records of endolithic polychaetes from the Campanian of the Island.

Abbreviations

MIWG = Museum of Isle of Wight Geology, prefix for Isle of Wight Council Museum Service, geological specimens accessioned before 1993; IWCMS = Isle of Wight County Museum Service; isp. = Ichnospecies (ispp. = plural).

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