REPORT

On the trail of Lincolnshire plesiosaurs

The search for the Lincolnshire plesiosaurs started with the message 'Geology, not Archaeology', on a Saturday morning telephone call from environmental archaeologist James Rackham. A local builder had just phoned him to report what appeared to be some bones stuck in a stone. Since the discovery had been made in the next village to the author's home in Lincolnshire, he went to have a look.

On the outskirts of Caythorpe, he found Andy Craig, a Derbyshire champion dry stone waller, repairing an old ironstone wall. He had picked up a large stone that had not fitted into the next space, so he had turned it over to see if it fitted better the other way up. There he noticed some dark bone-like patterns. So, well aware that bones of animals or humans found in old walls might be of archaeological significance, he phoned James. A quick inspection and a little gentle washing and brushing to remove some moss and lichen revealed that the stone contained a number of bones, recognisable as the major part of a plesiosaur paddle.

That event started investigations that led back to 1719 and the first known record of what later became known as plesiosaurs. In the process it was revealed that the publications of the Leicester and Cambridge Museums about plesiosaurs contained a number of significant errors concerning their earliest discovery.

The Caythorpe plesiosaur

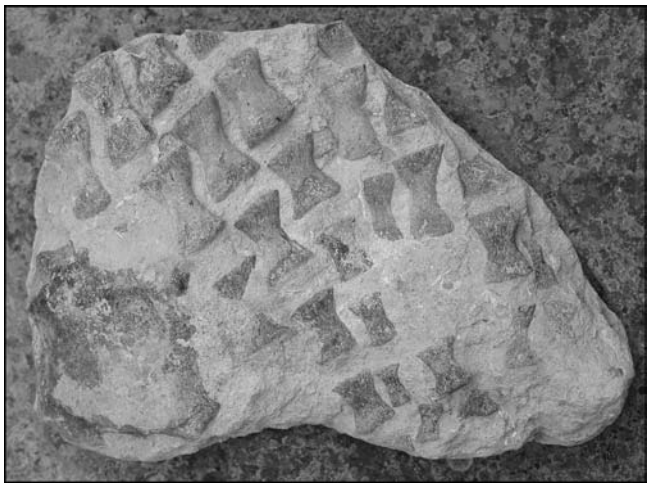
The stone wall under repair was built between 1884 and 1897 by the West Yorkshire Iron and Coal Company when they were extracting iron ore east of Caythorpe village (Squires, 1996). Open-pit quarrying was mainly from an area of over 50 ha acres northwest of the former village railway station on the Lincoln to Grantham line. The Railway Bill for the construction of the line by the Great Northern Railway, was supported by George Hussey Packe of Caythorpe Hall, a local landowner. During construction prior to 1867, a bed of ironstone was encountered for several kilometres along its length near Caythorpe. So, in 1870, George Hussey Packe instigated the mining of ironstone from that part of his land adjacent to the railway. The main purpose of building the original ironstone wall to a height of over 2 m for about a kilometre along the west side of the A607 road towards Fulbeck, was to screen any views of the ironstone workings from his home at Caythorpe Hall.

The Jurassic ironstone bed formed part of the Middle Lias, where the Marlstone Rock is 2.5-4.0 m thick, under a very thin covering of reddish-brown soil (Whitehead, 1952). The beds are believed to have originally been of the minerals chamosite and siderite, later modified by weathering so that they have an average iron content of 20-22%. Production reached a peak of 70,000 tons in 1880 as working proceeded northwards alongside and west of the railway. The Marlstone consisted of two layers that were extracted separately due to their different contents of iron minerals and calcium carbonate.

It seems most likely that the wall was built from the upper layer, a light yellowish-brown, fissile, flaggy limestone that contrasted with the lower, darker, less calcareous beds. Local concentrations of brachiopods occurred in these upper beds, including rhynchonellids (that could be seen in places between the bones on the specimen prior to cleaning). During recent re-mapping of the area the brachiopods were more fully identified and were taken to indicate a Tilton subprovince of the spinatum zone of the Upper Pliensbachian Stage of the Middle Lias, although no zonal ammonites were discovered (Brandon, 1987).

Andy Craig returned to repair the next section of the ironstone wall in 2007. Since making his original find of the paddle bones, he looks more carefully at the stones he handles, even if it slows down his rate of work. This diligence was rewarded by the discovery of an ammonite. Although not well preserved, it was possible to identify the fossil as a *Pleuroceras* species, and probably the zonal fossil *Pleuroceras hawskerense* (Dean, 1961). In this case, the Caythorpe plesiosaur paddle can be attributed with a fair degree of certainty to the top zone of the Upper Pleinsbachian Stage. While the actual species of the Caythorpe plesiosaur remains unknown, there are still many stones to be turned over during the next few years before Andy finishes repairing the wall.

Subsequently Andy took his plesiosaur paddle to a Rock and Gem fair at Newark, where it changed hands and was then professionally prepared by Richard and Mark Hawkes at Stone Treasures of Edwinstowe.



The plesiosaur fossil following a gentle washing and removal of lichens after it was discovered by Andy Craig at Caythorpe; note the fragments of rhynchonellid brachiopod between the bones; the slab is 300 mm long.

The 'Lincoln' plesiosaur

Stimulated by the Caythorpe discovery, and familiar with the 'Lincoln' plesiosaur since school days, the author began to seek further information on plesiosaurs in Lincolnshire. The nearly complete Lincoln specimen had recently been cleaned and mounted by Leicester Museum staff, prior to its display in the new Collections Museum in Lincoln. This specimen was originally presented to the Lincoln City and County Museum in 1906, when the details of its discovery in Foster's Brick Pit were recorded. On the western side of the city, east of the old racecourse, that pit had worked the Upper Lias clays for brick-making, and hence the plesiosaur had been given a Toarcian age. During the recent cleaning and preparation for display, blocks containing some of the bones were found to include zonal ammonites of the Pliensbachian Stage of the Middle Lias, rather than the overlying Toarcian Stage. This cleaning also led to the plesiosaur being more correctly identified as a *Microcleidus*, one of a family of plesiosaurs that were in the early stages of developing the distinctive very long necks characteristic of the later plesiosaurs. The Lincoln specimen thus became the oldest representative of this family in Britain (Richard Forrest, *pers. com*.). The pupils of St. Faith's School, Lincoln, which was subsequently built on the former brickworks site, have now adopted the plesiosaur as their official school badge.

The first known record of a plesiosaur was a specimen believed to have come from Fulbeck, the adjacent parish north of Caythorpe (Taylor & Martin, 1990). In 1719, Dr. William Stukely sent a letter to the Royal Society, including an illustration of the major part of a skeleton of what is now recognised to be a plesiosaur. Stukely described the specimen's 16 vertebrae, nine complete or partial ribs, two thigh bones, a foot with four or five toes and 11 joints of a tail, before concluding that it was not a human and might be a crocodile or porpoise. The actual specimen was later presented to the Royal Society, having been discovered in a slab of 'blue Clay Stone', nearly a metre long and 65 cm wide, that was set by the side of a well in Mr. Smith's parsonage at Fulbeck.

The same plesiosaur fossil after professional cleaning and preparation by Stone Treasures; note that the additional bones suggest there may be parts of two paddles represented here (photo: Richard Hawkes, Stone Treasures).

Although Fulbeck village is built on the Marlstone and has numerous wells, local enquiries have failed to locate a well near the old parsonage sites, and neither is there any record of a Mr. Smith being the parson of Fulbeck in the early 18th Century. Doubts were being raised concerning the location of the discovery of the original specimen, and were confirmed by accessing the original Stukely document (1719) through www.plesiosaur.com. It would seem that Stukely had been informed by a friend, Robert Darwin, (probably a relative of Charles Darwin) of the discovery of what was then believed to be a human skeleton impressed in stone, found at the Rev. Mr. John South's, Rector of Elston, near Newark. After describing the stone as a blue Clay Stone, Stukely went on to state that *it is the same stone (and undoubtedly came from) the neighbouring Quarries of Fulbeck, or thereabouts, upon the Western Cliff of the long Tract of Hills extending quite through the adjacent County of Lincoln*.

Even considering that Stukely was a famous archaeologist and not a geologist, the description of the stone had seemed to be inapplicable to any of the Marlstone or limestone being quarried near Fulbeck at that time. The corrected Nottinghamshire locality for its discovery then raised the possibility that the specimen had come from the Lower Lias, possibly from one of the harder, finely laminated limestones that extend south from Newark and east of Elston.

Examination of the original Stukely specimen, on display in the Natural History Museum in London, helped partly resolve this question. The original specimen (R1330) had been presented to the Museum by the Council of the Royal Society in about 1881. Named *Plesiosaurus dolichodeirus* (Conybeare), its age was given as Jurassic, 208-194 Ma, and the locality was stated on the label as Elston, near Newark, Nottinghamshire. The lithology of the block is, as suspected, quite unlike any material from around the Fulbeck or Caythorpe villages. The closest local match for the lithology would be limestones within the upper part of the Lower Lias clays that underlie the Low Fields west of these villages. As seen locally during the construction of the Leadenham by-pass and in the site investigations for a nuclear waste disposal site at Fulbeck Airfield, many of these limestones are quite distinctive and are commonly rich in *Gryphaea* or belemnite fossils, but no vertebrates have been recorded as far as the author is aware.

At the Museum, a cabinet adjacent to the Stukely specimen held a more complete plesiosaur (14435), from Granby, Nottinghamshire, presented by the Duke

of Rutland. Now named *Eretmosaurus rugosus* (Owen) and dated as Lower Jurassic, 208-203 Ma, this specimen is almost certainly the one referred to by Stukely in his original 1719 letter to the Royal Society - *Sir Hans Sloan has a Fish-sceleton amongst his immense Treasure of Curiosities, found near this place, given by the Duke of Rutland*. The matrix of this specimen appears to be similar to that of the Stukely plesiosaur. This raises the possibility that, since both Elston and Granby lie on the western edge of what were formerly known as the Hydraulic Limestones, at the base of the Jurassic, both specimens were from limestone beds close to the base of the Lower Lias.

These beds now form part of the Barnstone Member, at the base of the Hettangian Stage of the Lower Jurassic. In the past, they have been extensively quarried in North Leicestershire and South Nottinghamshire for cement and lime. The Hydraulic Limestones are described as containing a number of limestones and shales that are finely laminated and bituminous, indicating their deposition in anaerobic sea bottom conditions, where benthonic fossils are very rare, but they contain the best preserved vertebrates (Hallam, 1968). This description fits the lithologies of the large, finely laminated slabs containing the Elston and Granby plesiosaurs better than it does the limestones from the higher part of the Lower Lias clays nearer to Fulbeck and Caythorpe. Prior to closure in the 1970s, the Barnstone Cement Works quarries were well known as a source of vertebrate fossils, particularly ichthyosaurs from the lowest beds, and Peter Kent recorded the remains of plesiosaurs from the overlying zones of the Hettangian (Hallam 1968). This seems to further increase the likelihood that the two specimens in the Natural History Museum in London could both have come from these same beds about 300 years ago.

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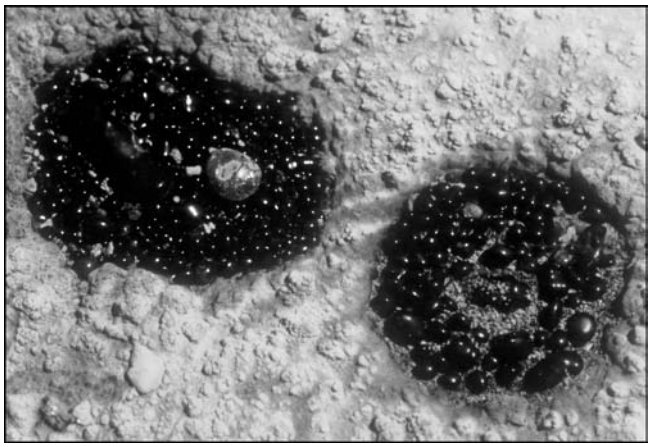
REPORT

Black cave pearls in Derbyshire

Black cave pearls have been found in the Bage Mine, in the eastern part of the Carboniferous Limestone at Bolehill, near Wirksworth. This mine was worked for galena from the 16th century or earlier, until closing in 1908. Its shaft was re-discovered and re-opened in November 1980 by the Wirksworth Mines Research Group. Most of the workings are in the Bage, Butler, Wallclose and Bloodworth Veins, which have been worked on three levels each 17 m apart.

About 200 m north of Hardend shaft, in Bolehill, at the intersection of the Butler and Wallclose Veins on the 200 ft level, the miners worked through a natural cave that rises vertically for 6 m, to grey/black shales exposed in the roof. Meteoric water coming through these iron-rich shales runs down the walls to forms a stalactitic flowstone of hard goethite/limestone, varying in colour from yellow and brown to black. Below these wall deposits, the mine floor is covered in a soft, red, hematitic ochre, which has spread over a large area of the floor on Butler Vein. This part of the mine is generally known as Red Ochre Junction. The miners followed the Butler Vein through the cave by removing a small section of the natural wall.



Water now drips from the exposed mine limestone walls on to the red ochre floor, where several nests of black cave pearls have formed in water that is 8 mm deep. The pearls vary in size up to 6 mm in diameter. Some have been cut to reveal cores of yellow-orange limonite with a honeycomb structure inside a hard, black, shiny, outer shell that is 1 mm thick. This structure appears to originate from a reduction process, whereby a red ochre of soft hematite alters to the lustrous black shell of hard hematite. The drips of water that land in the pearls' pool splash out to form a crust of nearly white calcite on the surrounding red ochre floor. Some pearls have tiny crystalline calcite overgrowths on their black hematite.

(Thanks to Bob King for useful comment on the mineralogy)

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