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The Westbury Pliosaur: The Excavation of a Marine Monster

Sue Swansborough[1]

SWANSBOROUGH, S. (1983). The Westbury Pliosaur: The Excavation of a Marine Monster. *Proceedings of the Shropshire Geological Society*, **3**, 9-10. Description of a pliosaur fossil found in a working quarry at Westbury in Wiltshire.

The sequence exposed in the clay pit extends from the *Rasenia cymodoce* Zone to the *Aulacostephanus eudoxus* Zone, Lower Kimmeridge Clay. The pliosaur remains are from the *Aulacostephanus eudoxus* Zone. The horizon from which they were obtained forms a lithologically persistent horizon throughout the English Kimmeridge Clay, from Dorset to North Yorkshire. It is thought that the pliosaur may be a new species, although further work on this aspect is required.

[1]*Shrewsbury, UK. E-mail: editor@shropshiregeology.org.uk*

The aim of the talk, by Sue Swansborough of Bristol City Museum, was to give an appreciation of the problems of finding and retrieving large fossil animals with reference to a particular example.

The example chosen was one with which the speaker had been closely involved: a pliosaur fossil found in a working quarry at Westbury in Wiltshire. Most large fossils are in fact found in working quarries as new faces are continuously exposed, but most are lost because the quarry operators are not interested in their preservation. In this case, the operators (Blue Circle) were very co-operative, even to the extent of loaning transport.

Part of the quarry is in the Kimmeridge Clay, which forms the middle Upper Jurassic in Wiltshire, adjoining a chalk escarpment. The clay is extremely fossiliferous; outcrops on the Dorset coast are noted for their richness although the main fossils are invertebrates, such as ammonites. The clay is also extremely sticky when wet, and brittle when dry.

Pliosaurs developed soon after the Rhaetic, and were totally aquatic. The environment of the time, about 150 m. years ago, was a tropical or sub-tropical shallow sea. They have been found with skulls up to 9 feet (3 metres) in length. They are known to have eaten ammonites; this can be seen from remains in Germany, where very fine limestones have preserved soft body parts including skins and stomach contents.

The Westbury pliosaur was found by a group of Danish students carrying out a project on invertebrates. One of the group in fact tripped over a piece of bone projecting from the clay!

The skull was found to be 5 feet (1.6 metres) long, which indicates an overall body length of 20-25 feet (6.5-8 metres). Once the overburden was removed and the fossil exposed to the atmosphere, the bone started to explode - similar to Cadbury's Flake.

The lower jaws were also present, and these were easier to remove. The traditional method is to make a plaster case. The fossil is covered first with tin foil to protect it, then with plaster, and then the whole structure is dug away underneath. Pillars are left for support at first, and then removed in the final stage. The skull was a more unusual find, but it was found to be possible to use the same technique.

Before removing any items from the site, a plan was drawn on a grid basis showing all the finds. This is helpful in showing what happened to the animal. The site was then excavated systematically in terraces.

Pliosaurs normally fill with gas after death, and then sink. It appears that after this animal died it sank with its jaws pointing upwards; probably a slight current just floated the head away. Vertebrae and ribs were found within several feet of the head. It is not certain whether the rest of the body has been quarried away, or whether it was ever there.

In order to see the outer side of the skull, which was facing downwards, a fibre glass jacket had to be made to strengthen the fossil. It was guessed that the skull was very crushed and therefore not very deep in the clay, and this turned out to be the case. To actually remove the head, a crate was built to fit over the skull. This was placed over the head whilst it was still supported by pillars, packed with polyurethane foam, and then the pillars

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knocked away from under the crate. The whole crate, when packed, weighed half a tonne and required a crane and 4 men to lift it. The process of removing the head took 2½ weeks of continuous work.

It was decided to excavate uphill from the pliosaur, and a bulldozer was lent for this purpose. A systematic search was made, digging an L-shaped trench as a sample of the area. Restricting the search area was made necessary by the time constraint imposed by staff only having a limited leave of absence from their main work at the Museum. Only one tooth of vertebrate material was found in this area.

When the skull was turned over, many more teeth were found than showed originally from the underside. These were up to 10 inches (25 cm) long.

The skull had a very pronounced crest, and a large eye orbit. A lot of restorative work is still needed, especially at the neck end which was badly fragmented. The skull contains a good deal of clay, which continually expands and contracts, and therefore has to be removed if the fossil is to be preserved. To do this, the whole back section of the skull was taken apart at the Museum, piece by piece (about 70 or 80 in all), and reassembled.

Any flaking bone was covered in polyvinylacetate (carpenters' wood glue) used as an emulsion and dripped onto the bone. The advantage of this is that it can be relatively easily removed if it should ever be wished to do any work on the bones in future.

Sophisticated machinery was used to remove the clay. An ultrasonic cleaner, similar to that used by dentists, was able to remove even mineralised clay. Fortunately the skull had not been pyritised, which often occurs in the Kimmeridge Clay, since pyrite oxidises to a powder. The fossil is in fact one of the best preserved skulls of this age anywhere in Britain or Europe.

Cleaning and conservation of the fossil is being carried out over a long period of time, to allow for the gradual drying-out of the specimen. Most of the back part of the skull has now been completed, and work on the front part is awaiting the arrival of a vertebrate palaeontologist in October 1983. There are as yet no firm plans for the fossil after conservation work has been completed (which may take up to 3 years), although reconstruction would be difficult given the extent of lateral crushing which has occurred.

Technical details: The sequence exposed in the clay pit extends from the *Rasenia cymodoce* Zone to the *Aulacostephanus eudoxus* Zone, Lower Kimmeridge Clay. The pliosaur remains are from the *Aulacostephanus eudoxus* Zone. The horizon from which they were obtained forms a lithologically persistent horizon throughout the English Kimmeridge Clay, from Dorset to North Yorkshire. It is thought that the pliosaur may be a new species, although further work on this aspect is required.

A LECTURE BY SUE SWANSBOROUGH GIVEN TO THE SOCIETY IN 1983.

Anne Dugdale

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