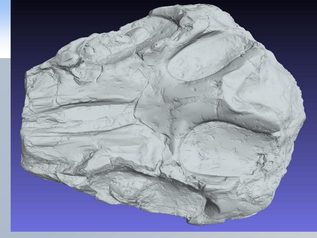
Challenges of The Upside-Down:

Conserving and remounting a huge *Temnodontosaurus* skull found by 14-year-old Mary Anning.

Nigel R. Larkin[1], Steven Dey[2], Dean R. Lomax[3,4] and Deborah Hutchinson[5].

[1] *School of Biological Sciences, University of Reading.* nrlarkin00@googlemail.com @ MrIchthyosaurus

[2]*ThinkSee3D, Eynsham, Oxfordshire;* [3]*Palaeobiology Research Group, School of Earth Sciences, University of Bristol;* [4]*Department of Earth & Environmental Sciences, University of Manchester;* [5]*Bristol Museum & Art Gallery.*



Abstract

A very large ichthyosaur skull (*Temnodontosaurus)* found at Lyme Regis, Dorset, in 1813 by 14-year-old Mary Anning has been in the Bristol Museum & Art Gallery collection since 1845 (Torrens, 2008). This specimen has had deep cracks since its discovery and records show that the lower half has been encased in deep mortar within a wooden frame since at least the 1930s, presumably to give good support so that it did not fall apart under its own weight.

For the new permanent exhibition that opened in January 2024 titled *'Making Waves - Mary Anning and her astonishing ichthyosaur'*, the specimen was carefully removed from the old frame and mortar, and was cleaned, conserved and mounted. However, this necessitated turning the huge skull upside-down temporarily so that the underside could also be cleaned and a new permanent heavy-duty mount could be made. Yet this historically very significant specimen was heavily cracked and weighed a third of a ton! It is a massive understatement to say that this suite of characteristics presented some challenges and consequently a fair amount of trepidation.

The specimen was 3D scanned using photogrammetry before work started and was scanned again with the same technique when the work was complete: scanning the cleaned top half first, and then after the specimen was turned over and the underside cleaned, the lower half was scanned before the mount was made and the specimen turned the right way up again. The detailed digital 3D model of the first scan provides a historical record of the specimen as it was before work commenced. The scan of the cleaned and conserved specimen – without any mount etc in the way – provides a complete record of the specimen. This can be used for research but also provides a benchmark for the condition of the specimen against which its condition can be assessed in the future.

Significantly, the cleaning and conservation work revealed what seem to be several large unhealed toothmarks on both sides of the skull that had been hidden by the mortar and wooden frame for all these years. These marks are currently being assessed by Nigel Larkin, Dean Lomax and Judyth Sassoon to investigate whether it can be said they are evidence of scavenging or predation and if so, who made them. In the meantime, this poster describes the challenging process of turning over the delicate, cracked but historically important specimen that weighs a third of a ton.

Above: the massive skull in its deep wooden frame before work started.

Right: Scan the QR code to see a low-resolution digital 3D model of the conserved skull (e.g. version for online use).

SCAN ME

Cleaning and conservation

Left: Gently cleaning the skull with an airbrasive unit using sodium bicarbonate within a purpose-built plastic tent (with dust extraction). Note the rear (left) half of the orbit has been cleaned and the front half is much darker.

Right: The skull had always suffered from several deep cracks, recorded since the specimen had been collected. However, these needed to be consolidated and filled to make the specimen more robust before turning it over, as well as improving the specimen aesthetically.

Paraloid consolidant was applied to the cracks. After this had set, Japanese tissue paper soaked in consolidant was pushed deep into all the cracks with Paraloid adhesive until the crack was almost full. As Japanese tissue paper applied with Neutral pH PVA gives a much better surface finish, the very tops of the cracks were filled using this adhesive long after the Paraloid had set. All Paraloid used was B48N as this has a glass transition temperature of 50 degrees C and the area where it was to be displayed gets quite warm.

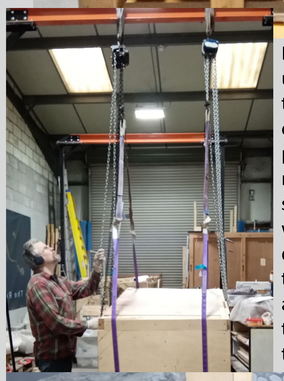
Turning the specimen over….and over!

Once the upper surfaces of the skull had been cleaned and conserved and all cracks robustly filled to improve the strength of the specimen, it was prepared for turning so that the underside could be cleaned and a sturdy bespoke mount made for display.

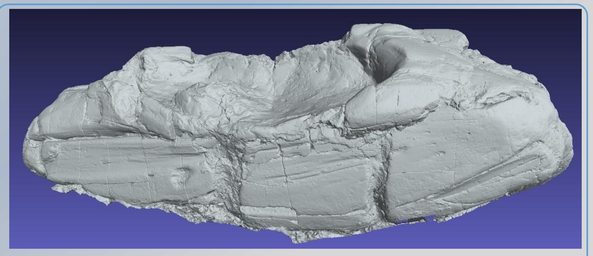
A protective jacket had to be made that would hold the specimen firmly together whilst being turned over twice. A 'flashline' was decided upon half-way up the specimen. The lower half of the skull was still sitting on a bed of mortar and broken bricks on a pallet. Bone surfaces of this half were protected with Japanese tissue and several layers of foil, then expanding foam was applied to the desired height and a wooden retaining wall screwed together (see top of next column).

The upper half of the skull was also protected with Japanese tissue paper and foil, and all undercuts then filled with Plasticine. A couple of layers of Silicone wacker moulding rubbing was applied, then Jesmonite acrylic resin and fibreglass to make a two-part jacket, bolted together. This would securely hold the upper half of the specimen together. A wooden pallet was placed on top, and wooden wedges screwed to the underside of this to hold the protective jacket in place. The pallet above the specimen and the pallet below the specimen were screwed together with vertical sheets of thick plywood to make a rigid cube within which nothing could move.

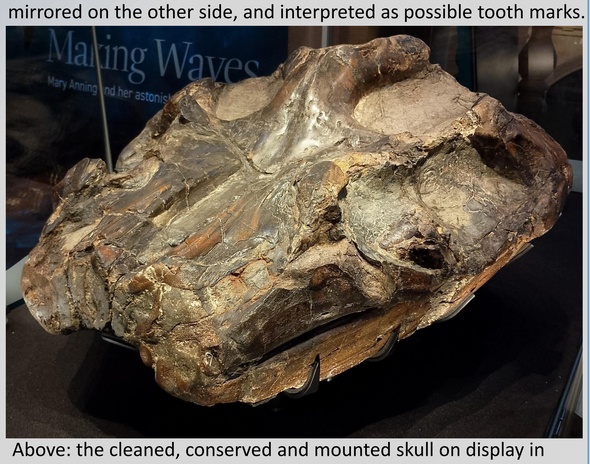
Above: The rigid protective jacket. Right: Wedges to hold the jacket securely in place. Below: Making the rigid wooden box.



Left: Chain hoists and slings were used to slowly turn the box over so that the underside could be worked on. Below: Making the new permanent heavy-duty fiam-lined mount for the underside (the specimen was protected from the welding). The permanent bespoke display pallet was placed on top of this, a new wooden box was made around it all, and the specimen was turned the right way up again with the chain hoists and slings.



Above, and either side of the title: Screenshots of the digital 3D model of the skull, with and without colour. Made by Steven Dey of ThinkSee3D. Note the deep vertical grooves in the image above, mirrored on the other side, and interpreted as possible tooth marks.



Above: the cleaned, conserved and mounted skull on display in Bristol.

Conclusions

This method – jacketing the specimen securely and making a rigid wooden box around it so that nothing could shift during turning – worked perfectly. Despite turning over the deeply cracked 330 kg specimen twice, there was absolutely no damage to the skull at all.

Some people are very reluctant to allow work to be undertaken on specimens relateing to Mary Anning and other important historical figures. When the tender was announced for this project, some people contacted Bristol museum to say this specimen should be left as it was and not be interfered with. But such specimens cannot be treated like religious relics. Before work started, only the top third of this specimen was visible to researchers and members of the public. The rest was obscured by mortar and wood. For it to be cleaned and conserved properly, the skull had to be removed from the wooden box. Now it has been cleaned, conserved and mounted, it looks exactly as it did when Mary Anning last saw it, aged 14. Importantly, the work has also revealed the possible tooth marks that otherwise wouldhave remained hidden. What Mary thought about these we will never know.

References

Torrens, H. 2008. A saw For A Jaw: Mary Anning's ichthyosaur. Geoscientist 18.12, December, 18-21.

Acknowledgements

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