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Author(s): Marie de Beaulieu

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# Restoration of a Galapagos tortoise at Norwich Castle Museum and Art Gallery

**Marie de Beaulieu**

Institut national du patrimoine, 150 avenue du Président Wilson,
93210 Saint-Denis la Plaine, France
Email: mar2b@hotmail.com

**Introduction**
This article outlines the conservation of a giant tortoise specimen at Norwich Castle Museum and Art Gallery. The specimen was chosen because this specimen was suitable for two projects of the Norwich Castle Museum: the “Darwin 200” event, organized in collaboration with the Sainsbury Centre for Visual Arts, and the new display planned for the Natural History gallery, at the Castle.

At first sight, this specimen could have discouraged the most audacious, as it appeared to be in a terrible condition (Fig. 1). However, its old age and interesting history make the story behind this specimen all the more interesting, and all the more reason to conserve it for future generations.

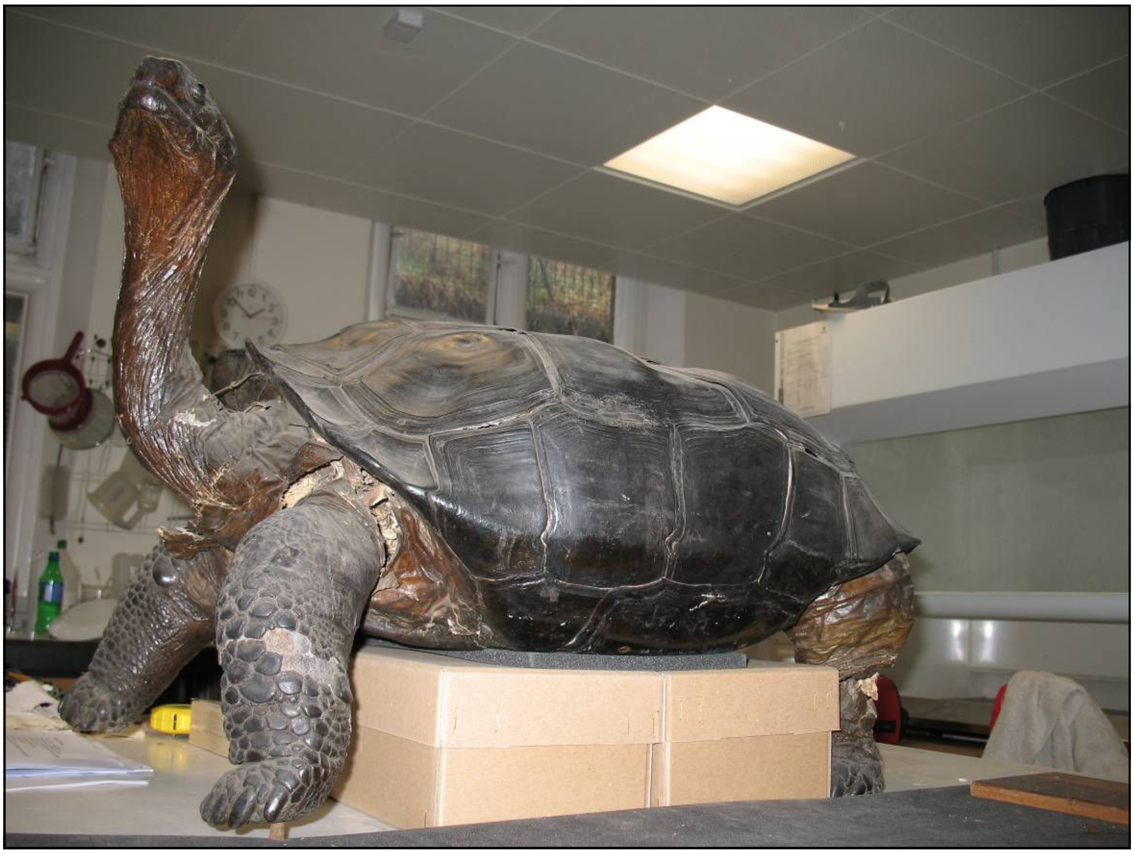

**Fig. 1.** Galapagos tortoise before conservation.

**History of the Tortoise**
This tortoise comes from the Galapagos Islands, where once whaling ships used to stop to stock up with giant tortoises for food. Indeed, they taste good, can feed several men and survive for 6 months without food or water. Stacked on their back, they were unobtrusive guests onboard ships.

This lucky creature, managed to reach England alive. James Clarke, a man native of Great Yarmouth, presented it to the museum in 1844; but it is not known how he obtained it. The tortoise spent a short time in the museum's garden. Museum records show that the tortoise food bill for 1844 was 11s.1d. and that the animal preserver's bill was £5. In 1845, the tortoise food bills were not mentioned, but the animal preserver's bill was £11.16s.6d. It seems unlikely that this tortoise survived the winter.

The tortoise is undoubtedly a giant tortoise from the Galapagos Islands; unfortunately the specimen is too old, too damaged and too badly stuffed to identify its island of origin precisely. Charles Darwin himself could have studied this very specimen when he visited the archipelago aboard the *Beagle* in September 1835. There, he observed that in wet islands**,** tortoises eat the grass and bushes near the ground, whereas in dry islands they have to reach the high leaves of the trees. As a result from the environmental conditions, dry islands tortoises have developed a special feature; their carapaces are highly bent above the shoulders so their necks can be stretched to their maximum to reach the vital leaves. Using these observations, we can tell that this tortoise comes from a wet island; and the concave plastron (the ventral part of the carapace), it shows that it is a male.

**Inside a Giant Tortoise**

In 1844, a Galapagos tortoise was a rarity in Europe and the museum of Norwich was surely pleased to get one. Few people in the country had ever seen a wild giant tortoise and apparently the taxidermist was not one of them (it is true that accurate references were difficult to find).

Anatomically the specimen is rough: colours are wrong and the rear legs are far too plump. Technically, the mounting is crude: nearly 30% of the skin is missing, which maybe caused by putrefaction, a careless skinning or an aggressive tanning. The internal structure is made of four planks roughly fixed with thick wires and the neck was supported with an external wire fixed to the carapace (Fig. 2).

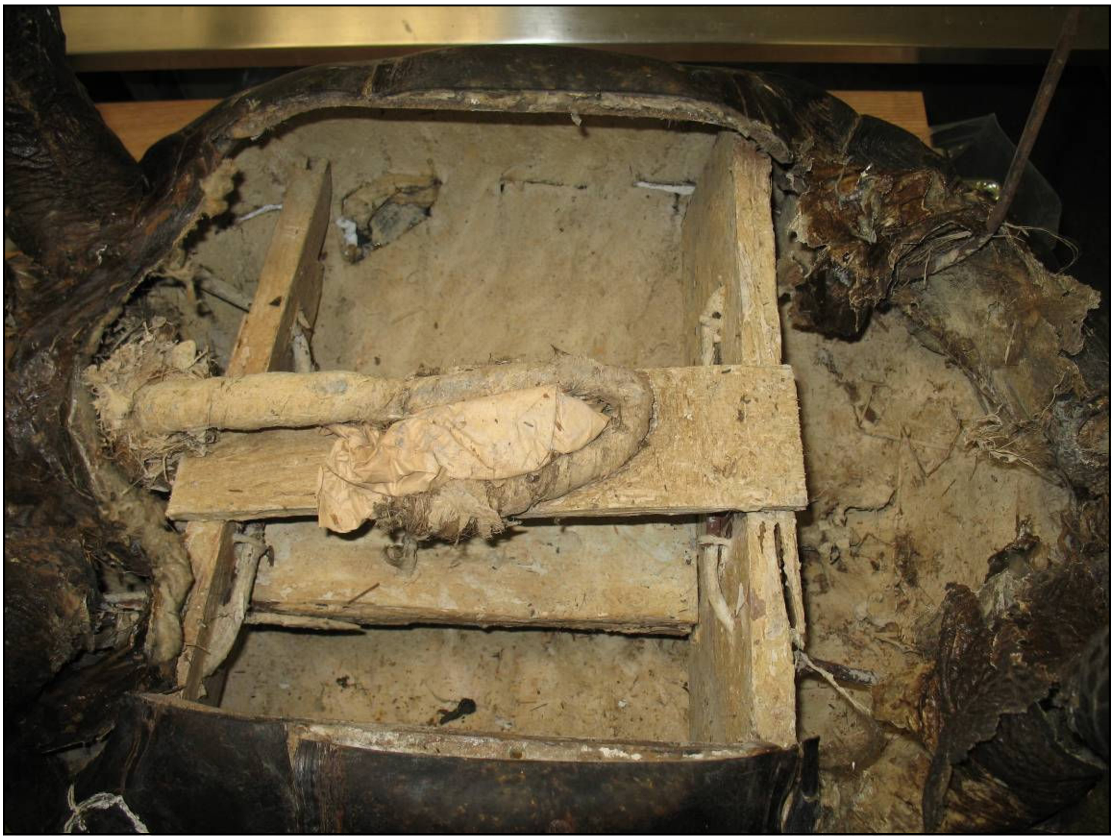

**Fig. 2.** Inside of the carapace.

Even if the taxidermist was not used to this kind of giant reptile, he proceeded traditionally. First, he opened the plastron, and then he detached the skin from the flesh and removed the guts, flesh and bones. The skin could have been chemically treated in order to preserve it; but was more likely simply dried. The taxidermist then "mounted" the specimen by building an internal manikin, sewing the skin, wrapping the wires and packing the legs with a combination of grass, wood shavings, feathers, string. Finally, before closing the plastron with wires, he spread a clay-like paste inside the carapace. This material was tested for arsenic and found to contain more than 3mg p. litre.

The specimens' shell plates were nailed on the bony carapace, cracks and junctions were filled with white putty and concealed the missing pieces of skin by gluing on large patches of paper and fabric. The tortoise would have looked like a coloured patchwork at this stage, so it was completely painted or varnished to make the colour more uniform.

A careful observation and solubilisation tests, helped to identify the glue of the patches and the paint covering the skin as animal glue, the carapace varnish as natural resin and the putty as a traditional mixture of animal glue, whiting (calcium carbonate $CaCO_3$) and cotton wool.

**Identifying areas for conservation**

All the parts of the tortoise were damaged, but to different degrees.

- The internal structure or framework was loose and could not support the weight of the tortoise any longer.
- The stuffing was almost totally missing in the rear legs and loose in the neck and the front left leg.
- The skin was the most damaged part of the specimen. It was very dry and brittle, torn and missing in many places. The patches probably induced most of these tears by pulling on the fragile skin when drying and in responding to humidity changes in a different way.
- The skin itself had also shrunk and the different layers had split causing the loss of scales and hollow areas between the dermis and the epidermis, mainly located on the front legs.
- The shell plates were distorted and torn in some places. They had moved in reaction to the surrounding humidity and temperature; and being irregularly nailed**,** they suffered severe stress and tears in some places.
- The animal glue covering the skin and the natural resin used to varnish the shells had darkened. The thick coat of darkened varnish concealed the shades and the fine design of the shells. It was removed with a commercial basic paint-stripper carefully rinsed after use.

**Remedial conservation**

In order to avoid further damage, the large patches of fabric and paper were taken off with water compresses. This process revealed large pieces of the tortoise's skin which had not been seen for over 150 years.

Some of the nails fixing the shells were removed allowing a general flattening of the carapace. Fish glue was injected under the distorted shell plates and dried with retaining straps. One lateral shell plate, particularly distorted, needed to be immersed several times in hot water (about 40°C for 10 minutes) to be relaxed and gradually put back in shape with clamps. A perfectly shaped carapace would have involved dismantling all the plates, so the junctions, cracks and minor gaps between the shell plates were filled using a mixture of PVA glue, paper pulp (1part) and whiting (1part). This method will allow flexibility to follow the movement of the shell plates without cracking.

The plastron was opened by removing the wires and cracked mastic sealing the junction. The access to the inside of the specimen was very useful in many stages of the restoration and, above all, made the containment of the arsenic possible. It was decided that the arsenic would stay in place but sealed in a resin to prevent the toxic powder from dispersing. The arsenic paste was not cohesive; so to be sure that the resin adhered and that the two layers did not separate, the arsenic paste was consolidated with an acrylic resin (5% Paraloïd® B72 in acetone). Then, an epoxy resin (chosen for its non-reversibility and its dimensional stability) was spread on the paste and the framework. The resin helped to strengthen the framework, and fibreglass soaked with resin was wrapped around the weakest point, the base of the neck.

Access to the inside of the giant tortoise was also extremely useful for the reconstruction of the fleshy parts. In order to avoid stress on the fragile skin, it was decided to build an internal manikin on which the skin would be glued. The structure of the manikin was built with wire mesh on a base of Plastazote® foam and covered with epoxy putty modelled to fit the pieces of skin. In order to remain reversible, the operation set in two stages: first the putty was modelled and hardened, and then the skin was glued on the surface with PVA glue. The epoxy putty showing through holes in the skin was textured and painted to match. The missing scales were replaced using the same epoxy putty, modelled to fill the gaps and then glued with PVA. To fill the hollow areas of the front legs a creamy mixture (5% gelatine and $CaCO_3$), which sets as a gel quickly, was injected. Finally, all the mastics were painted to match the dark-brown colour of the tortoise skin with a mixture of reversible acrylic resin (5% Paraloïd® B72 in acetone) and pigments (Figs. 3-5).

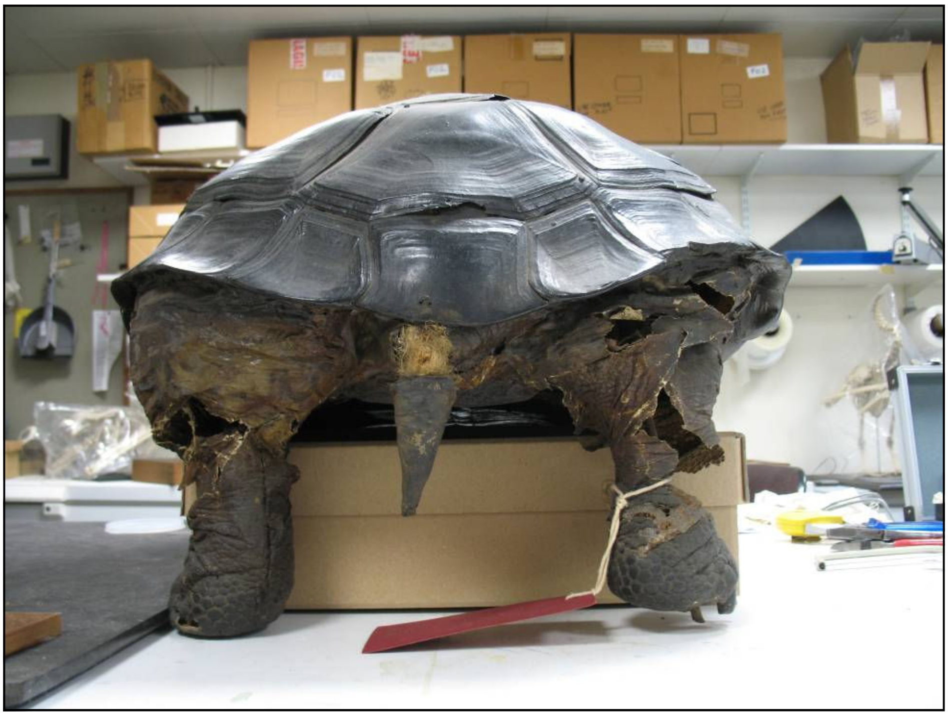

**Fig. 3.** The rear legs before an conservation work on the specimen.

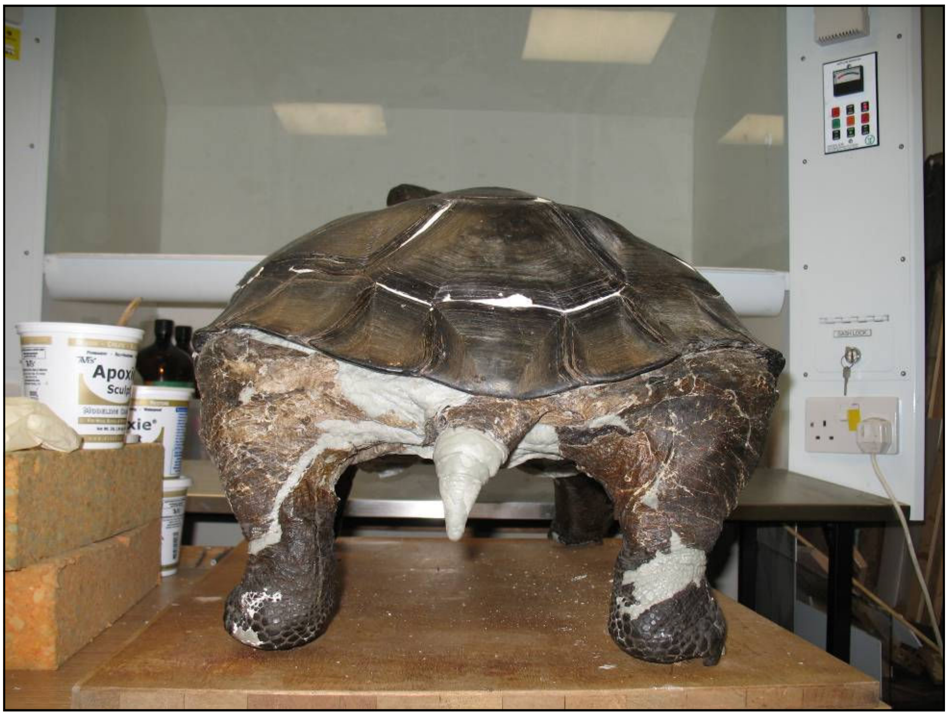

**Fig. 4.** Remedial conservation on the specimen in progress.

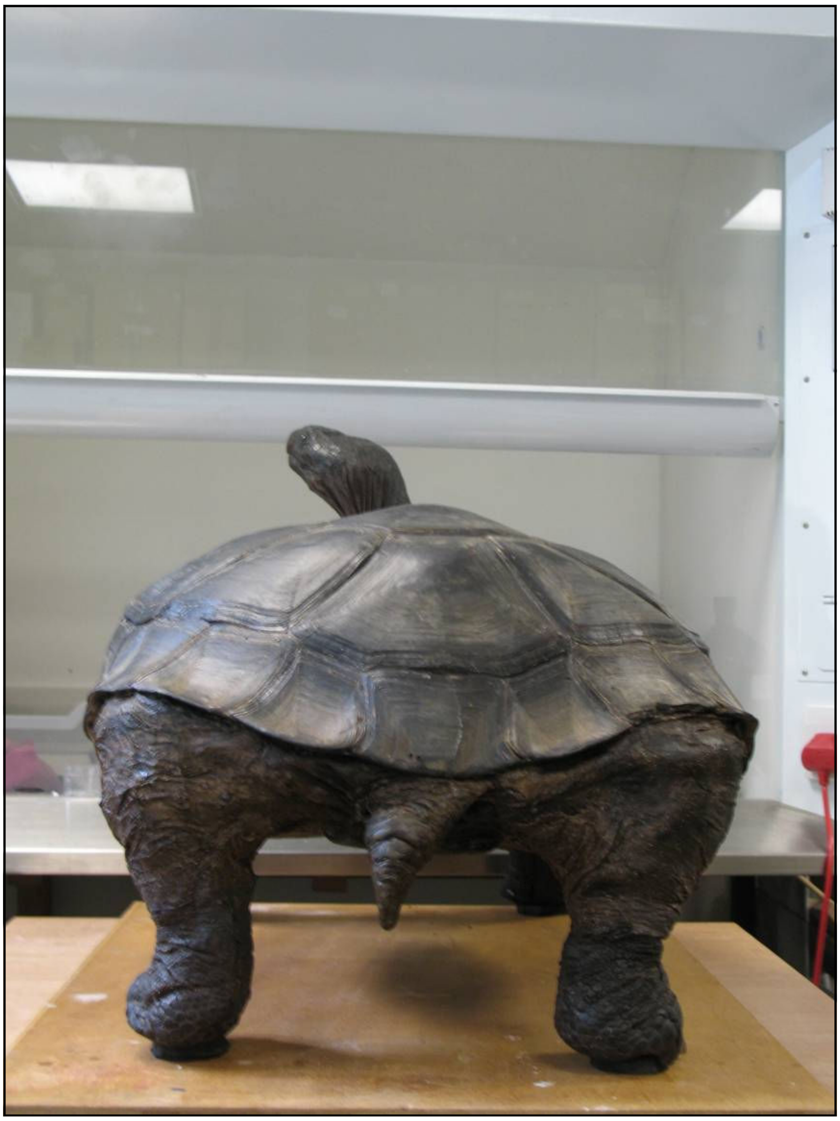

**Fig. 4.** Remedial conservation on the specimen complete.

### Future Research

During the conservation project, we retained a sample of the specimen's muscle, with the aim to send it for analysis and thereby establish exactly which island the tortoise came from. No attempt was made to correct the overstuffing because it is historical. Sealing the arsenic, strengthening the structure of the specimen and documenting all the procedures along the way, have vastly improved the safety of this specimen for future research and display.

**Acknowledgments**

I am a fourth-year student at the Institut national du patrimoine (National Institute of Heritage), and I worked on this specimen during my six-month internship at the Norwich Castle Museum and Art Gallery. I would like to thank Vanessa Trevelyan, Head of Museums, for giving me the opportunity to work as an intern in the Natural History department of the Norwich Castle Museum and Art Gallery. I thank Dr Tony Irwin, Natural History curator, for his attentive management and the team of the Natural History department for its help.

**UK Suppliers**

Arsenic test - Merckoquant®, Arsenic test kit, 0,02 to 3mg p. litre, Merck®.
Paint stripper - peel-off Ronstrip® by Ronseal®.
Epoxy resin - Resin research – epoxy system – 2000 epoxy resin/2100F fast hardener by Seabase®.
Epoxy putty - Apoxie® sculpt by Aves®.
PVA glue - PVA M218 reversible, bookbinding quality by Charwood books®.
Gelatine - 100% pork skin gelatine, platinium grade by Super cook select®.
Acrylic resin - Acrylic adhesive B72 by HMG product®.

**References**

Masschhelein Kleiner, L.; Bridgland, J.; Watson, S. & Werner, A.E., 1995, *Ancient binding media, varnishes and adhesives*, Rome: ICCROM.
Masschhelein Kleiner, L., 1994, *Les solvants*, Bruxelles: Institut royal du patrimoine artistique (IRPA).
Odegaard, N.; Carroll, S. & Zimmt, W. S., 2005, *Material characterization tests for objects of art and archaeology*, London: Archetype publications.