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Author(s): Yates, G.

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teaching, both for natural sciences and veterinary courses.

Many artists use the specimens; the clean lines provide an ideal model for still lives and our specimens are immortalized in many portfolios. However, the scientific uses of the specimens are paramount and many are prepared with archaeological work in mind. The least fallible way to identify an archaeological bone is by direct comparison with a bone whose provenance is certain; thus the bird osteology collection has been built up over the last ten years to include all common British birds past and present. The collection is used by Chester Museum's Field Archaeology Unit to identify their excavated material, and many other archaeological reports have been based on our material. One of the sources of income for the department has been the contracts undertaken by the Curator of Birds & Mammals on the identification of bird bones from archaeological excavations.

Database Format

All specimens have a unique entry on DBase III and the information is arranged as follows:

Taxonomic classification number.
Family.
Genus & species.
Authority and date of description.
Accession (registration) number.
Sex.
Form of specimen.
Locality where specimen was collected.
Collector's name.
Date of collection.
Donor or seller of specimen.
Date of acquisition by the museum.
Notes.

Acknowledgements

The curation of the Osteology collection would not have been possible without the help of a great many people. The most important of these is Tony Roberts an archaeo-zoologist and natural curatorial ferret, who has, in several periods on contract to the museum, curated the main bulk of the mammal and lower vertebrate specimens. It was he who made the connection between green labels, "Leonardslee" and the Otter collection, and who located the family responsible for the specimens.

I would also like to acknowledge the work that Tony Parker (Assistant Curator, Vertebrates) and Phil Phillips of the Information Technology Department have both done, particularly in using their expertise in computing techniques to help prepare the forthcoming catalogue. Professor Robert Roaf, a retired orthopaedic surgeon, spent several years helping to document and accession the collection. Others have helped greatly with the identification of specimens, notably the Mammal and Bird Sections of the Natural History Museum in London. I would also like to thank Valerie Evans, Malcolm Largen, George McInnes and Ian Wallace of NMGM for their help.

I am very grateful to the Director and Trustees of National Museums & Galleries on Merseyside, for their support over the many years that the osteology collection has benefitted from curatorial time.

This paper is based on the Introduction to the Catalogue of the osteological specimens in the collections of the Zoology Department, Liverpool Museum, which is being presently edited for publication.

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THE PREPARATION OF SMALL MAMMAL SKULLS

Geoff Yates, Bolton Museum, Le Mans Crescent, Bolton BL1 1SA

There are a number of methods available for the preparation of small skulls and it will depend on the facilities available as to which method is used. It may also depend on your disposition and sense of smell. Methods include maceration, burial, insects, boiling, sodium perborate, and enzymes.

Maceration in either cold or warm water is an effective way to clean bones but you will need a laboratory with a good extraction system or you risk becoming very unpopular.

Burial in a sand tray outdoors removes the problem of smell but it does take a bit longer.

Insect preparation is also very good. A *Dermestes* colony will give very good results, but as it has to be sited away from the collections it does present problems. I have never been brave enough to try this, mainly because if ever a Dermestes was found in the collections I would probably have to leave the country under police protection.

Boiling, or rather simmering gently, is a common way to prepare skulls, the meat being scraped off when it is easily removed. If the boiling is overdone, damage can occur, so be careful. This method can also be smelly.

Sodium perborate works very well on small mammal skulls. After simmering and cleaning the skull, add Sodium perborate to the water, approx. 2 tablespoons per litre, and leave to cool overnight, then wash thoroughly.

Enzymes - Papain, Trypsin, Pepsin etc. are a very effective way of cleaning skulls. However, they do have the disadvantage of being very smelly and the staff at Liverpool Museum were warned of a health risk from the scum which forms on the surface when treating the bones.

Enzymes. At Bolton I use enzymes in the form of biological washing powder. I happen to use Persil but I am sure they are all much the same (not always good for getting grease out of your shirts but great on weasel skulls). As with all methods the skull must first be skinned and roughly fleshed. The more flesh you clean off now the quicker the cleaning process will be. The skull is then placed in a suitably sized container of water at approx 400°C and the detergent added. Keep the water at a constant temperature and agitate frequently. Check the skull now and again and scrape off the remaining flesh as it becomes easy to do so. This can be done with a variety of tools - knives, scalpels, brushes and scrapers. Scrapers can be fashioned from wood

or bamboo to suit your own needs and are less likely to do any damage.

Take great care when cleaning bones not to damage the surface or any delicate parts. Also be very careful not to lose any bits down the drain. Always use a fine sieve when disposing of the water and sludge. It is very embarrassing being caught dismantling the sink trap trying to recover lost teeth etc. When cleaning is finished always rinse well.

Degreasing and bleaching is usually unnecessary on small mammal skulls when using this or the sodium perborate methods.

Whichever method is used please take care of yourself as well as the specimens. There are obvious risks attached to this work. Use protective clothing and have good ventilation. There is nothing like the smell of rotting flesh for making you unpopular with workmates so as well as a good extraction system I can also recommend NEUTRADOL room deodorisers. They are very good at counteracting bad smells.

OBSERVATIONS ON THE TREATMENT OF AN INSECT INFESTED OSTEOLOGICAL COLLECTION.

Julian Carter, Conservation Officer, National Museum and Galleries of Wales, Cathays Park, Cardiff, CF1 3NP

ABSTRACT

A large collection of bone material which had been donated to the National Museum of Wales was found to be heavily infested with a number of insect pests and was rapidly falling into serious decay. This paper describes the means of dealing with the collection and the measures taken to prevent further infestation.

Introduction

The Barbara Noddle collection of disarticulated skeletal material was donated to the National Museum and Galleries of Wales, Cardiff (N.M.G.C.) Zoology department in 1988. The collection essentially consists of agricultural animal bone specimens, but does have a component of 'wild' mammal bone material. Much of this material represents endangered or lost agricultural breeds giving the collection an important diagnostic base.

The collection is particularly dominated by various sheep breeds, taking some 63% of the catalogued material. The rest of the collection is of cattle(15%), goat(4%), pig(4%) and the remaining being a miscellaneous cross section of mammalian material.

With the 1988 inventory of the collection it was realised that serious problems existed with the state of conservation of the bone material which had suffered from a combination of poor preparation, inadequate storage conditions and heavy insect infestation. This resulted in 75% of specimens showing some sign of damage which varied from some mild surface insect boring to the complete destruction of some specimens.

Thus in 1992 a complete cleaning and sorting project was initiated on the collection in order to conserve, identify and catalogue the bone material.

History

The bone material in the Noddle Collection was predominantly prepared by hot water maceration (Noddle personal communication) which involved skinning and eviscerating the animal and then dividing up into manageable proportions which were then simmered in a heated water vat until the bones were free. It appears no standards were involved in the method, relying on intuition and experience to determine when the material was prepared. Once cleaned the bone material was simply rinsed in water and allowed to dry before being packed loosely into plastic bags and boxed. In many cases excess animal tissue has remained on the bone material and has become encrusted by the drying process.

Much of the collection later came under storage pressures at the University College of Cardiff. This resulted in the boxes being stored in damp basements causing extensive mould growth and insect invasion affecting the stored bone material, adding to future conservation problems.

A Sample of the collection in its original state.

Observations

Much of the previous treatment of the collection has not been beneficial to the bone material. This relates to both the preparation methods and subsequent storage. From this a number of points have been noted;

- The original bone material has often not been completely devoid of remaining pieces of muscle and tendon.
- Previous storage by loosely packing the bone in open plastic bags and then placing in cardboard boxes has failed to give adequate protection. The boxes have often been over packed, which coupled with acidic attack from the cardboard and insect invasion has resulted in abrasion, crumbling and overall physical deterioration of the material. Improper storage has also opened the material to effects from temperature and humidity fluctuations.
- The preparation methods used may well have affected the long term stability of the bone material (Shelton and Buckley, 1990, William's 1992) especially if over treatment has occurred. Although initial treatment has failed to degrease much of the bone material, this grease content does now appear to be helping to keep some of these specimens intact but does present the problem of grease seepage over the coming years.

Any factor which weakens the bone structure increases the likelihood of insect damage by providing sites of