

Battle of the beasts: treatment of a pest infestation of the mounted mammal collection at Liverpool Museum.

Janet Berry

Conservation Centre, National Museums & Galleries on Merseyside, Whitechapel,

Liverpool L1 6HZ

Tel: 0151 478 4827

Fax: 0151 478 4990

E-mail: [jberry@nmgmcc5.demon.co.uk](mailto:jberry@nmgmcc5.demon.co.uk)

#### Abstract

The National Museums and Galleries on Merseyside (NMGM) 2001 project has involved the movement of much of Liverpool Museum's collections to temporary storage facilities whilst parts of the museum are refurbished. It was during this movement of collections that an infestation was discovered in one of the mounted mammal collection stores.

The culprit was identified as *Anthrenus spp.* (carpet beetle). A team of conservators, curators and a taxidermist surveyed the damage and drew up an action plan for a counterattack offensive on the *Anthrenus*. This involved treatment by freezing in the Conservation Centre cold room of 205 mammals ranging in size from a desert rat to a polar bear, as part of a rolling programme.

The paper discusses how the treatment plan was put into action, the practicalities in terms of staff time and resources within the context of the NMGM 2001 project, the rationale behind freezing as a treatment and monitoring after the event.

## Keywords

Mounted mammals, *Anthrenus*, infestation, freezing treatment

## Introduction

Liverpool Museum, National Museums and Galleries on Merseyside, has a natural history collection of international significance. As part of the Heritage Lottery funded NMGM 2001 project, the museum has recently undergone major redevelopment. Before this, much of the natural history collection was stored in spaces which were originally used for display such as the Horseshoe Galleries. This area of Liverpool Museum had suffered from wartime damage and inadequate post-war reconstruction (NMGM, 1997). The 2001 project involves the restoration of these galleries for public displays, and the creation of new storage areas in the basement of the building for much of the natural history and science collections.

The mounted mammals were one of the collections stored in the Horseshoe Galleries. This area was an open-plan space with a mix of collections and curatorial staff offices. Many of the mounted mammals were stored in a temporarily partitioned-off room but the mounted birds in glass display cabinets and the larger specimens, such as the reposing lion and pouncing lioness, were kept in the outer area. Specimens inside the

room were stored on open shelves or on their bases directly on the floor. As the collection grew with new acquisitions, the storeroom became more densely packed, making access to specimens very difficult. With the densely packed store room and open storage of the mammals, the risk of insect infestation was very high, and indeed there had been previous infestation of *Anthrenus*.

With the refurbishment of the galleries, the storage problems for the collection were finally addressed. The smaller mounted mammal specimens were to be housed in a new store in the basement of the main Liverpool Museum building and larger specimens were to be moved to a room in another of NMGM's stores at North Street. All the collection would be in enclosed stores and separated from other collections, thus reducing the risks of infestation.

However, as both the galleries and the basement areas in the museum were to be refurbished at the same time, it was necessary for collections in the Horseshoe Galleries to be decanted either to North Street or to a temporary store in north Liverpool (Bootle). Therefore the smaller mounted mammals would be stored with the bird, entomological and botanical collections for a period of up to 2 years.

As the collections were to be moved out, they had to be physically condition checked and wrapped for the decant. It was during this checking that a new infestation of *Anthrenus* was discovered in the mammal store.

The battle cry is sounded

Parts of the collection had suffered previously from repeated infestations of *Anthrenus sarnicus* (Guernsey carpet beetle), most recently in 1997. After this the room's floor and hessian ceiling had been sprayed with Ficam W<sup>TM</sup> and a programme of monitoring using insect traps had been instigated. However, because of the overcrowded storage of mammal specimens, it had not been possible to check the objects for infestation and a new infestation had taken hold.

#### Rapid response unit

When the infestation was discovered, the curators alerted relevant Conservation Sections and Taxidermy, and a team was established to deal with the problem. The initial response was to:

- Assess the extent of the infestation
- Assess the damage done to objects
- Isolate infested material
- Arrange treatment
- Alert other staff in the building to the presence of the infestation

The collection in the store was examined, and divided into objects with apparent active infestation and those without. The insect pests were identified by the Entomology section at the museum as *Anthrenus sarnicus*. Different stages in the lifecycle were found on the objects, including different larval instars, cast skins and adults. This indicated that the infestation was well established (Hillyer & Blyth, 1991). Infestation was concentrated on specimens stored near an internal window

between the storeroom and the main gallery, and on small mammals stored on a shelf and within a 0.5m radius on the floor around the bases (concentrating on feet and trailing tails) i.e. within crawling distance for the larvae. Twenty specimens had evidence of heavy and active infestation.

As the infestation was near a window connected to the main gallery area, the collections in the surrounding areas had to be checked for signs of infestation.

The next step was to organise a programme for treatment of the material.

As the work progressed, it became apparent that objects in the mammal store would have to be moved to the temporary store before treatment could be undertaken. As the objects would have to be in the same area as other natural history collections, the risk of spreading the infestation was very high. Therefore it was decided that all the specimens in the area needed to be treated, to ensure that any eggs or larvae missed in the initial search would be killed. This entailed treatment of 125 mounted mammals and 80 mounted game heads - a total of 205 specimens.

The most severe cases could be treated first, whilst the rest would be wrapped to isolate them from the other collections.

The secret weapon

When the Conservation Centre was built, it was designed with a quarantine room containing a walk-in cold room. The cold room is able to treat large objects for pest

disinfestation treatments, and reaches temperatures of  $-29^{\circ}\text{C}$  in 2 to 4 hours. The room is positioned on the ground floor next to the loading bay, to allow potentially infested material to be brought in without risk to other material in the building.

The freezing process has been used as a pest disinfestation technique for centuries (Florian, 1997). The effects of low temperature on insect mortality has been the subject of literature reviews (for example, Strang, 1992; Florian, 1997), in the search for the most effective eradication process for museum insects pests. An important part of the process is to ensure low temperatures are reached quickly, to prevent cold-hardening of insects. Whilst there is little information in the literature that that museum insect pests exhibit a significant degree of freeze-tolerance that would prevent death below  $-20^{\circ}\text{C}$  (Strang, 1992; Brokerhof & Banks, 1993), recommendations are that measures should be taken to prevent cold-hardening occurring during the freezing process (Florian, 1997).

At the Conservation Centre, the procedure is to put material into the cold room at room temperature, set it to  $-29^{\circ}\text{C}$  and maintain this temperature for 72 hours, followed by a slow rise to room temperature over 24-48 hours. Experiments have demonstrated that temperatures at the core of objects reach  $-29^{\circ}\text{C}$  in 9-12 hours (T Seddon, personal communication). For a successful freeze, objects have to be sealed in polythene, to prevent moisture loss and condensation during the freezing process (Florian, 1997) and at NMGM, parcel tape is used to seal the polythene.

It was therefore decided to treat the collection by freezing.

Ideally the objects would have been sealed, transported to the Conservation Centre in batches for freezing, and then sent on to their temporary or permanent stores.

However, the schedule for the movement of the collections from the museum for the start of building works did not allow for any delay in the decant process.

Our immediate priority then became isolation of the specimens that had potentially active infestations before they were moved, which involved ensuring the objects were sealed in polythene before moving.

The decant schedule did allow for some of the worst affected mammals to be wrapped, transported and frozen. Therefore an emergency freezing schedule was arranged for the highest priority material. The rest of the specimens were transported to the temporary stores, awaiting the availability of the Conservation Centre Handling and Transport team.

This Handling and Transport team works to provide in-house transportation of objects. The number of specimens frozen at one time depended not only upon the capacity of the cold room, but also that of the Transport team's van. In general, between 10 and 25 mammals were frozen in one treatment, depending upon the size of specimen. Mixes of small and larger specimens were combined to make optimum use of the racking and floor space in the cold room (figure 1). Larger specimens were placed on pallets to allow air flow around their base and prevent warm pockets occurring. In total, 12 freezing treatments were undertaken. The associated moves (2 moves for each treatment) had to be scheduled in with the Transport and Handling

timetable, including extra staff at times for the movement of the larger items (figure 2).

The cold room was fitted with a ramp, which made movement of larger objects into and out of the room easier (figure 3). Although the internal dimensions of the cold room are large (3.82m wide x 2.80m long x 2.30m high), the limiting factor is the door size, at 1.00m wide x 1.99m high. Although animals such as gazelles were themselves quite slender, their bases had to be taken into consideration. For some mammals with bases wider than the door, extra help had to be sought to carefully manoeuvre objects into the room.

## Resources

As already stated, the mammals were due to be packed and moved as part of the 2001 project. However, this temporary wrapping was not sealed to the standards needed for freezing, so more time and expense had to be spent on wrapping. Additional time was also required for the initial assessment, freezing treatments and movement of the specimens. Table 1 gives a breakdown of the amount of time spent by staff dealing with the infestation, with figure 4 presenting the times as percentages. The total of 491 person hours represents approximately 2.4 hours per specimen treated.

The main staff involved in the process were 2 conservators, 3 curators, 1 taxidermist, and 6 members of the Handling and Transport team, plus administration and security staff.



It can be seen from table 1 and figure 4 that a large proportion of time was necessary for wrapping the collections prior to treatment. This figure would have been larger if the mammals had not already been wrapped for decant. Transport and handling took the second largest proportion of time. This is high due to a number of the specimens which required 6 people to move them, making the moves labour intensive. Therefore, although each move took on average 2 hours, this involved a total of 12 person hours per move for 8 of the moves (4 treatments). The percentage of time spent on organisation of the stores is under-represented, as the collection in temporary storage has not yet been moved back to the main museum. More time will be spent by curators and conservators ensuring that the collections are organised for better protection against reinfestation than under previous conditions.

Each freezing treatment takes approximately five and a half days (12 hours to reach temperature, 72 hours at temperature, 48 hours to return to room temperature). For the twelve processes undertaken, this makes a total of 66 days for the entire freezing process. The cost of electricity for the running of the cold room for 72 hours at -30C is approximately £50 (based on UK business rate electricity tariffs). Therefore the total electricity cost for the treatment of 205 objects was £600 (excluding labour and packing materials).

#### Aftermath

After the freezing treatment, the objects taken to the temporary store in Bootle are being kept wrapped in polythene until they are moved to their permanent store in the

newly refurbished museum, with a trap monitoring programme to check for signs of new infestations.

The large mammals and mounted game heads have been placed permanently in a separate store and 4 curators, 1 taxidermist, and 1 conservator, spent a day there unwrapping, removing old evidence of infestation and mounting the game heads on the wall. The larger mammals have been kept wrapped to inhibit reinfestation from any external sources. The room has insect monitoring traps, and the objects are spaced out to allow access for regular checks.

Much of the movement of the collection would have occurred during decant, but the extra time and resources needed for the freezing process were a significant addition to our work load. With the schedules of staff involved, the process took 9 months to complete. New, better-designed stores will vastly reduce the chances of reinfestation and with better object access, checking for infestations will be much easier.

NMGM now has an IPM policy document, which clearly defines roles relating to monitoring and treatment of pests. This paper shows the amount of time and resources needed to treat infestations. This was one battle won in the war against insect pests in museums.

## Endnotes

[1] All times are based on an average 8 hour day with 1 hour lunch and 2 half-hour teabreaks, giving a working time of 6 hours.

[2] Some of the specimens were wrapped for transport by an external contractor. This figure is for additional wrapping required to prepare specimens for freezing.

## References

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## Materials and Equipment

Ficam W<sup>TM</sup> is a non-repellent odourless water dispersible powder containing 80% w/w 2,2-dimethyl-1,3-benzodioxol-4-yl methylcarbamate (Bendiocarb). It was applied as a spray in water following relevant health and safety procedures.

### Acknowledgements

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Procedure	Hours spent [1]
Initial assessment/ emergency measures	72
Additional wrapping/ sealing of objects for freezing [2]	144
Transport + handling to/from Conservation Centre cold room	134
Rearrangement of specimens in store	27
Associated paperwork by conservation staff	24
<b>Total</b>	<b>491</b>

Table 1: Number of hours spent treating infestation in addition to packing of collection for decant.



Figure 1: Wrapped game heads are placed in the cold room on open metal shelving in preparation for the freezing treatment.



Figure 2: Six people were required to move the pouncing lioness into the new mammal store at North Street after the freezing treatment.



Figure 3: A ramp on the door into the cold room allowed the reposing lion to be wheeled directly into the room from the loading bay by 2 people.

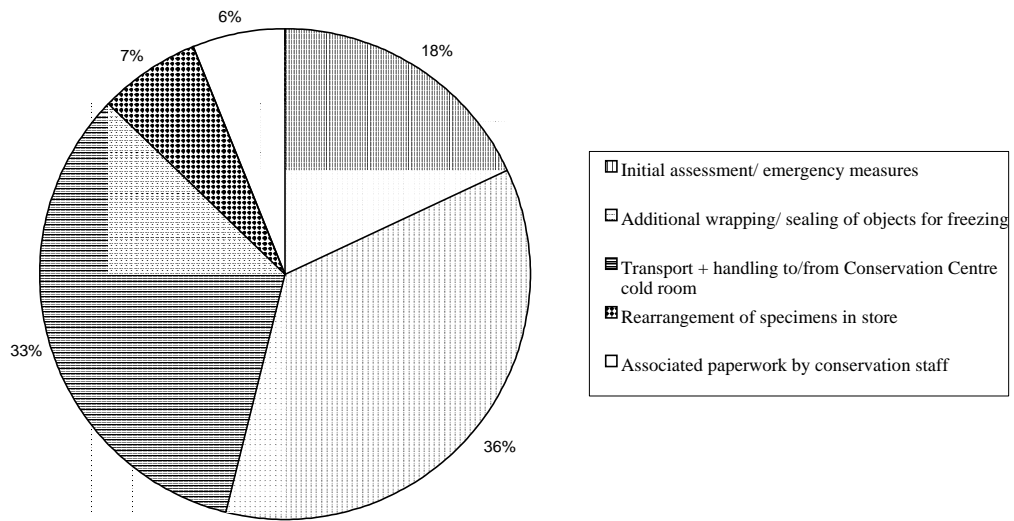


Figure 4 Proportion of time spent by staff on infestation

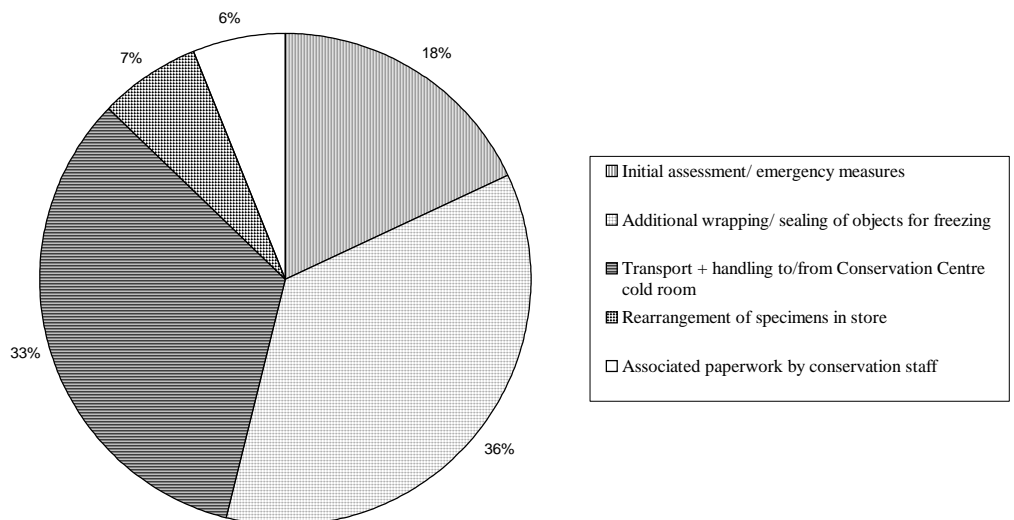


Figure 4 Proportion of time spent by staff on infestation

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