Zoo Store 1 at the Natural History Museum, London: Meeting National Standards?

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The Natural History Museum (NHM), London is at the forefront of natural history science, and a major player in developing standards for the care of these collections in museums. Around ten years ago, there was a great deal of activity developing policies and standards for the care of the different museum collections. Despite this, the feeling in the museum is that the management of the collections was neglected for some years. Since the Museum Registrar was appointed in 2004, the Museum hosted the International SPNHC Conference and has been working on implementing these policies. This paper examines how the NHM's collections storage compares to the standards and policies to which the museum aspires. Zoo Store 1, one of the NHM's oldest storerooms, is used as a case study. The investigation found that the store falls short of the aspired standards in documentation, security, storage and environmental conditions, but significant progress has been made in the last two years. Reasons range from historical problems inherited from previous generations of museum workers, the attitudes of personnel, and the sheer time that it takes to implement a series of standards across very large collections and numbers of staff.

Keywords
Collection Management Standards, Natural History Museum London, Storeroom survey.

Introduction

Standards for collections management have been developing over a considerable period. There is a growing understanding that collections deteriorate if not kept in appropriate conditions, and that they are largely valueless without associated documentation and information. On the other hand, there is pressure on museums to manage their collections better. This is partly driven by funding bodies insisting that standards are met. Accreditation is another means of encouraging museums to meet professionally accepted standards, and more museums are becoming accredited.

The government's drive to increase access and learning has forced museums to examine the standards of information associated with these collections, as well as their management, and hence accessibility (NMDC 2003: 3). If basic standards for documentation, conservation and so on are not met, then newer initiatives such as digitising collections and creating pan-European and global networks of collection information are hindered.

This is part of a general trend. "The political shift towards restrictions on public spending gave rise to a need for organisations to demonstrate efficiency" (Cox 1999: 1) as a result there has been a drive to establish standards for every aspect of museum activity, from documentation (MDA 1997) to professional ethics (Besterman 2002). The focus on realising standards has meant that an individual museum can no longer set its own standards as an independent institution (Cox 1999: 1). Now, there are more people in-

vestigating what goes on and what has gone on in museums than at any point in history (Saumarez Smith 2005).

This is not to say that collections have necessarily been cared for inappropriately until recently. Previously, these issues were tackled in a variety of ways by different types of museum, sometimes to the detriment of the collections, sometimes to their benefit. Now there is a recognised framework for collections management.

Many museums have a backlog of collection management matters that need addressing to bring collections up to current standards (Davis 1994: 70). Tasks such as the documentation of objects, conservation of materials and safeguarding of collections can seem Herculean for larger and older collections. However, it is the older collections that are most likely to comprise important information and unique objects that are at risk of permanent loss and that are therefore most in need of effective management so as to implement standards.

Over a decade since the importance and need for clear standards and policies for collection management was recognised (MGC 1992) it may be asked whether these standards are being effectively met? There is work that focuses on assessing standards met in some areas and in the USA most museums information is collected via generalised questionnaires and statistics (Institute of Museum and Library Services 2005). In the UK, the situation is bleak, the DCMS being described as an "evidence free zone" in 2003 with relation to how the sector *in general* was collecting, collating and analysing statistical data on visitor numbers and "constructing evidence-based policies" (Selwood 2003: 2; Keene, this volume).

This paper examines the standards of collections management for a large and important collection in of one of the world's leading museums – the Zoology collection of the Natural History Museum, London. In line with the drive for setting standards, in 2000 the museum produced a ten-year plan for collection management standards, aiming to define and implement these standards within the museum, and to encourage their acceptance by other museums of natural history across the UK and internationally (NHM 2003c). Five years after this plan was drafted it is time to see how one of the museums' own storerooms meets the international standards: those that it hopes to roll out worldwide.

The NHM holds approximately 70 million objects including botanical, entomological, mineralogical, palaeontological and zoological specimens as well as substantial works of literature and art (NHM 2003a: 7). As the UK national museum for natural history, with one of the most comprehensive and important natural history collections across the globe, its responsibility is to be the centre of the network of British natural history organisations and to maintain its position as a major player in this important field globally. The museum is well aware of this, and is a major collaborator with numerous governmental, academic and commercial partners within a range of natural science fields (NHM 2003b).

Natural history museums are unique in that they combine both scientific and educational functions (Stansfield et al. 1994: xi) and the museum is a well-established centre for natural science research and education. The relative priority of the various functions of museums is still a matter of current debate (Wilkinson 2005). However, at the NHM the responsibility for the care and management of the collections not only as resources for research but also as objects held in trust for the public has been accepted (NHM 2003c). Hence, the NHM is very active in developing strategies on museum science and acts as a focus for the development of policies on collections management (NHM 2004a).

The NHM Zoological Collections Storage: Assessment

Zoo Store 1 is contemporary with the building of the museum at the South Kensington site around 1880 (Thakray and Press 2004: 61). It is situated in the basement of the Waterhouse building, directly below the main hall, famed for the *Diplodocus* skeleton. Many of the display cases and individual specimens in the store are also contemporary with the first years of the museum.

The Research Sample

As the main focus for this investigation, Zoo Store 1 is compared and contrasted to another of the main stores for the zoological collections, an external store at Wandsworth. Zoo Store 1 provides an excellent case study for assessment because it contains such a vast array of different zoological specimen types. This diversity of specimens means that a range of different collection management issues can be assessed because the specimens fall under different scientific groups within the museum. The Wandsworth store provides a good contrast, as it was occupied by the museum much more recently and has therefore given the museum the opportunity to establish management arrangements afresh, unencumbered by tradition and the problems inherent to a store in a historic building. Clare Valentine and Richard Sabin of the NHM instigated this study as they acknowledged that they no longer adhere to the old practices - quite the reverse. They wanted this study undertaken to evaluate some of the practical issues involved in assessing such a large and historic storeroom.

Among many other items, Zoo Store 1 holds:

- The large dry fish collection including skeletons, skins and mounted specimens, many of which are holotypic
- The dry reptile collection including many non-wet type specimens
- Approximately 50 large mounted mammals all of which are type specimens (including zebra, giraffe, wallaby and tapir among others)
- Prepared and unprepared mammal skeletons and skins awaiting removal to Wandsworth (See Wandsworth) when funds become available
- The West Orkney zooarchaeological collections belonging to the National Museum of Scotland. (Borrowed by a PhD student - the NHM are waiting for NMS to collect it.)
- Many model and part model specimens
- Turtle eggs, skeletons, mounted specimens and fossil turtle holotypes
- A comparative fish anatomy collection dating from Richard Owen's index museum

- A collection of cetacean otoliths
- A collection of ancient Egyptian mummified cats

To put this store room into context, Zoo Store 1 holds 7000 specimens of the 22 million stored across the department. Many of these specimens are of great historical and scientific importance. If there are problems associated with their care and management it cannot be because the specimens are not significant. It must be due to other factors.

Research Methods

In order to assess, qualitatively, the overall status of the collection a sample of 250 specimens was examined. The specimens surveyed were randomly selected, starting at one end of the room and examining two specimens from each rack/cabinet.

The general layout and security of the storeroom and the Waterhouse building basement were examined before the survey began. Additional observations were made during day-to-day activities around the museum. Individual specimen security was assessed as part of the survey. The figures for environmental conditions were taken from a comprehensive environmental monitoring programme of the Waterhouse building basement, undertaken by the department of Zoology beginning October 2002 (Sabin 2004).

The survey used to assess the condition of specimens in Zoo Store 1 was based on a previous paper format developed by Valentine and Sabin. It was designed by Melissa Gunter, a master's student undertaking the RCA/V&A conservation course, in June 2004 for trial in parts of the collection with a view to rolling it out across other collections (Gunter 2004). The survey was designed to be easy to use and to identify "agents of specimen destruction" that are both descriptive and prescriptive to the causes of specimen damage. It also recorded data about specimen security, documentation and storage. The figures for specimen damage included in this report were calculated by processing the survey forms by hand. The results presented here are an abridged summary of some of the general findings. Photographs taken as part of the survey have been used to produce a Manual of Specimen destruction (Carnall 2005) for use across the zoology collections.

Findings

The collections management functions that are the most significant in meeting proper standards for collections management are set out in the Natural History Museum's own policy report, drawn up in pursuit of its global role (NHM 2003a). They are: disaster avoidance and preparedness; environmental conditions that affect collections preservation; security; storage space and equipment; and the effectiveness of collections management procedures.

Zoo Store 1

Disaster and Emergency Provisions

The Zoology department has a comprehensive disaster and contingency plan that outlines the possible disasters that may affect the collections and the action to be taken in the event of a disaster (Valentine and Sabin 2004). Among potential disasters fire, flood

and theft have been emphasised as the largest risks with respect to the likelihood and the extent of damage caused.

Fire

In the disaster plan careless smoking, faulty wiring, faulty electric equipment, maintenance work mishaps and arson are listed as potential causes of fire in a storeroom (Valentine and Sabin 2004: 5).

Although smoking within the museum is prohibited, smoking in the colonnade, the main external staff thoroughfare was not at the time of the survey, even though flammable gas was stored there. Subsequent to this survey, and following recommendations from fire safety officials, smoking was banned across the museum from March 2007.

Flood

> While greatest losses are caused by fire, the most damage requiring the most immediate action and in the long term the most remedial conservation treatment is caused by water
>
> (Valentine and Sabin 2004: 5)

The storeroom is visited about once a week by curatorial staff and researchers, but is not routinely inspected and there are no water detection devices within it. Part of the store is directly beneath a kitchen and numerous water carrying pipes and vents run through it. If there were a localised flood, it could be some time before the flood was discovered by which time specimens may have suffered permanent damage.

Environment and Preservation Conditions

Relative Humidity and Temperature

Zoo Store 1 is a difficult storeroom to control the environment in because it is situated in the basement of a Grade-II listed building and within the Museum Master Plan it is acknowledged that all of the collections in the Waterhouse Basement need to be rehoused in specially built storage. In addition, the Museum is in the process of purchasing a museum-wide environmental monitoring system.

At the time of the survey, there was no equipment in Zoo Store 1 to control directly the environmental conditions within the storeroom. Although maximum and minimum figures for temperature and Relative Humidity (RH) fall within recommended parameters (Sabin 2004: 1-3) the level of fluctuation was cause for concern. For example in August 2004, relative humidity remained at a 70% for several days, fluctuating more than 10% in a 24-hour period (Sabin 2004: 1).

The environmental monitoring project is only in the first stages of development and the data from further periods of environmental monitoring will be used to inform policy on controlling the environment within the basement Zoology store. Although recommended standards were widely published in 1992 (MGC 1992), the current environ-

ment leaves a lot to be desired and Zoo Store 1 is still a part of the museum where these standards are not actively adhered to.

Pest Control

One of the most damaging yet easily preventable causes of specimen damage is pest attack. The NHM pays particular attention to pest management because of the high risks to natural science collections from a range of pest species (NHM 2003a: 11). The museum has run an Integrated Pest Management programme (IPM) since 2003 (NHM 2003c).

As part of the IPM programme all doors on direct routes from outside to storerooms are pest proofed and clearly signposted. In line with the IPM procedures, all specimens coming into Zoo Store 1 from other storerooms or exhibition are required to be frozen for 72 hours at -30º C to prevent the transfer of pests.

In the past, it is clear that Zoo Store 1 has had a pest infection of *Anthrenus* (carpet beetle). Of those examined thirty specimens, 12%, were found with *Anthrenus* skins and 18 specimens, 7.2%, were found with frass. However, none of the specimens examined was found with vermin faeces or urine, and so the infestation is unlikely to be live.

Security and Procedures

> With a common heritage for everyone, security is everybody's business
> (Liston 1993: 3)

Entrance Security

Behind the scenes at the NHM, security is key controlled. Permanent staff, temporary staff and volunteers hold keys to allow them to access only the areas of the museum they need to work in. This is in accordance with standards laid down in the Museums and Galleries Commission guidelines (MGC 1992: 34).

Zoo Store 1 has three entrances. Each door is key controlled and only authorised members of staff can enter the storeroom. Cleaning staff do not enter the storeroom unless requested by collections management staff. This system has worked very well and there have been no major security incidents in the last 20 years. Furthermore, in June 2005, following a security review, this system was updated through the implementation of a programmable swipe-card security system.

Specimen Security

Due to the range of storage solutions in Zoo Store 1 there is also a variety of measures for individual specimen security (see Storage). However, as is often found in museum stores, only 4% of the specimens examined were behind a locked cabinet door. If all the lockable cabinets were locked, this figure would be increased to 40%.

Documentation

The documentation associated with natural history specimens is arguably more important than the physical specimen itself. Among other uses, geographical location data for specimens can provide valuable evidence for population biology and for studying the historical ranges of species now extinct. This is extremely important to genetic studies and evolutionary sequencing, in recent and fossil specimens respectively.

Within the sample of specimens, there was a great variation in the type, content, location, style and completeness of the labels. Some specimens had complete labels as well as the original paperwork. Other labels consisted of a single number in NHM registration number format. Overall, 35% of the specimen labels sampled including one holotype did not have a number of any kind.

Labels

- 52% of the labels were found to be in good condition i.e. the paper was in good condition and the label was readable.
- 32% of the labels were found to be in fair condition i.e. there is some minor damage to the label or some of the information may be hard to read.
- 8% of the labels were found to be in poor condition i.e. the label is severely damaged and the information is very hard to read.
- 8% of the specimens surveyed did not have a label of any form.
- No labels were in a Secol sleeve™ or separate bag.

It is important to note that although the quality of the labels directly attached to specimens was highly variable, the museum does keep comprehensive registration details, catalogues, card indexes, databases and other associated documentation elsewhere.

Storage Space and Equipment

General Storage

Almost every square inch of the storeroom is used as specimen storage. In addition, Zoo Store 1 is regularly used as an overspill store for the zoology department. There were also a variety of miscellaneous non-collection objects that have been 'permanently' left in the storeroom. Most of the skeletal fish collection within Zoo Store 1 is stored on open racks along the left hand side of the room. This offers little or no protection from environmental fluctuations in the storeroom (Figs. 3a and b). Many of the large mammal specimens are stored in the original display cabinets that date from the 19th century (Thakray and Press: 73). The fish skin type collection and most of the reptile collection are stored in old gallery cabinets and in large cupboards that also date from the museums' opening. These cabinets are not conservation grade and many are in a state of disrepair.

The survey determined that damage due to physical forces was by far the largest cause of damage to the specimens sampled and hence to the collections in Zoo Store 1. 67.6 % of specimens had abrasion damage, 37% had breaks and 22% were fractured. Rehousing specimens in appropriate sized conservation grade boxes on more suitable racking

or in cupboards would significantly decrease the damage the collections are suffering from physical causes (MGC 1992: 39). Much of the material in Zoo Store 1 is awaiting provision to transfer to the significantly better conditions at the Wandsworth store.

Extraneous Items

Zoo Store 1 is difficult to manage because of the diversity of types of specimen and storage, and because specimens fall under a number of curatorial departments. However, while surveying the store it became apparent that there was not only a mix of specimen types but also a great deal of material that did not belong in the store or even in a museum. Such items included office contents, disused laboratory equipment, and other even less appropriate material, including a collection stored in flammable spirit.

Some of these objects were removed upon discovery but no doubt there are other objects like these amongst the collection. As a direct result of this survey, most of these extraneous items were identified and removed.

Collections Management Procedures

Whatever the policies set for the standard of collections management, they can only be as effective as their management. Collections management includes setting policies for the standards to be achieved and maintained; establishing the procedures for staff to follow that will ensure that standards are maintained; keeping comprehensive records of every action that affects an object or a collection; and, finally, taking steps to ensure that staff understand and follow procedures. Judging the implementation of procedures in Zoo Store 1 was difficult, because only the outcome could be assessed, not the processes and events that led to it. However, one of the specimens examined highlighted attitudes towards the acquisition of specimens that has helped to bring about an ever-increasing need for more space. This example is especially pertinent with the current climate of using collections to engage with the public and not "clinging on to everything unthinkingly" (Wilkinson 2005: 9). Alongside the specimens in one of the many cupboards in Zoo Store 1, was a letter from the donor dated 1998, saying that if the specimens are of no use he would like to collect them.

Wandsworth Vertebrate Store

It is already apparent that Zoo Store 1 is in a rather poor state and does not satisfy basic standards of collection care. However, the NHM Wandsworth off site store, another zoological storeroom, has in the last 15 years become a textbook example of a good natural history collection dry store. Examining the set-up at Wandsworth may help to understand some of the root issues that affect the care of the NHM collections and how these can be overcome or prevented.

The NHM purchased the buildings in south London in 1990 in order to rehouse most of the large mounted vertebrate collection from an old store in Ruislip. The store holds thousands of large specimens.

Disaster Planning

Wandsworth is more than adequately equipped to deal with storms, fire, flooding and theft highlighted in the disaster plan.

In case of a storm, the store is equipped with earthing rods fitted to earth lightning strikes. There are no windows in the storeroom, which prevents possible damage from flying debris.

To prevent fire, the whole site is designated a no-smoking site, unlike the main site until recently (See Disaster and Emergency). The storeroom is also fitted with area specific water sprinklers to respond to localised fires. There is an automated smoke venting system as well as an automated roller shutter that prevents the spread of fire between areas.

Flooding has been highlighted as potentially the most serious risk to collections becuase of the range of possible sources of water flooding and the difficulty in detecting it until after significant damage has been done. The Wandsworth storeroom is regularly patrolled by security staff in normal working hours but infrequently outside them (Valentine and Sabin 2004: 5). Therefore, a number of portable flood detectors ('waterbugs') have been deployed that emit a loud, shrill alarm when water is present. Except for extremely large specimens, all specimens are stored above ground height. The size of the storeroom and the presence of drains (Valentine and Sabin 2004: 5) is enough to prevent more than a few inches of water ever accumulating in the store even in a major flood.

Environmental Conditions and Collections Preservation

Relative Humidity and Temperature

The environmental conditions at Wandsworth are monitored and maintained by a Building Management System (BMS). It will shortly be networked so that curators and conservators will be able to remotely monitor conditions. The new system will alert staff of critical conditions by email and SMS (Tilleard 2005). Relative humidity is centred at 45% +10 and -5% and temperature is set at 16°C with a tolerance of + or -1°C (Ryder 2005: 1). These figures were decided upon between departments that hold collections at Wandsworth.

Pest Management

The integrated pest management (IPM) procedures set up for the NHM were developed and implemented at the Wandsworth site (NHM 2003c). A programme of trap monitoring has been maintained since collections were moved into the storeroom.

The IPM procedures are viewed so seriously that any party moving material to Wandsworth is required to sign an integrated pest management declaration to prevent re-infestation of the collections (IPM Declaration for Wandsworth 2003).

Atmospheric Contaminants

Atmospheric contaminates including dust and other particulate matter can often be impossible to control and over long periods can cause significant damage. At Wandsworth, the air is filtered twice through carbon filters before entering the storeroom. Filters are changed every six months. A negative pressure gradient is maintained so that air is led out of the storeroom whenever doors are opened, thus preventing particulate pollution from entering.

Documentation

Every specimen at Wandsworth is labelled and held on the collections database. The labelling style and content is consistent across the collection in line with the documentation standards set by SPECTRUM (MDA 1997).

Storage Space and Equipment

Due to the large size and numbers of specimens, many of those in the Wandsworth store are kept in customised open storage. Although a few of the older cabinets are still in use, most of the specimens are stored on customised open shelving. The specimens are arranged using the space economically and curators have been careful to avoid the specimens touching each other. The extensive trophy antler and head collection is stored on compactor storage specifically designed for the NHM (Figure 1).

Figure 1. Ranks of the customised racking designed to suspend one of the world's largest collections of trophy antlers and heads. This storage not only uses the space efficiently but is also easily accessible. Photograph: author.

Collections Management Procedures

The storage facilities, including security and maintenance, are run by an out-sourced facilities management company, which has worked with the museum to provide security and maintenance specifically tailored to the needs of the collection. Members of staff visiting the storeroom are required to sign keys in and out of the security office. Visiting researchers are permitted on site by appointment only and for a predefined period, supervised by a member of museum staff at all times. The storerooms are routinely patrolled around the clock, and museum staff working alone are required to radio in every half an hour in line with the museum's lone working policy.

Through dialogue between the NHM and the facilities management personnel it was recognised that the effective management of the store required continuity of NHM collections management staff. It was necessary for the same individuals to work at Wandsworth over a long period of time, rather than staff being periodically rotated. This is so that the staff are familiar with the security, maintenance and access procedures that require attention on daily, weekly, monthly and yearly cycles. As a result, the facilities management staff and the scientific staff have developed a good working relationship, and both groups understand the need to work together to effectively manage the site. Richard Sabin, mammal curator, has been instrumental in organising and developing the Wandsworth mammal storeroom as well as creating working dialogue with facilities staff to maintain the high standard of collection care.

Discussion

From Policy to Practice

Griffin (1987: 391) highlights that few museum workers see themselves as part of an organisation, and this problem increases exponentially with the size of the museum. Staff may therefore find it difficult to accept the need for standards and the discipline and inconvenience of procedures necessary to maintain them.

Staff indifference may be exacerbated because policies and standards may have been drafted over a long period, but are instigated overnight. It is unreasonable to assume that they can be realised in a similarly short space of time, especially when dealing with collections of 70m specimens and items (NHM 2003a: 7). This argument could be used to defend the state of the collections in Zoo Store 1. However, it can be seen from the stores assessments that these standards can and have been met in this same timeframe in a storeroom holding similar collections (Table 1). The differences between Zoo Store 1 and Wandsworth may help to explain why standards have not been realised in Zoo Store 1, while in Wandsworth they have all been met.

Source of standard	Year NHM Instigated	Zoo Store 1: Standard met?
Museum Documentation Association documentation standards	1997	Not met 10 years later.
Basic security provisions outlined in Museum and Galleries Commission Standards	1992	Met 15 years later.
Vapona ban	2003. Deadline 1/04/2004	Met 3 years later.
Basic level care of collections outlined in Museum and Galleries Commission Standards	1992	Not met 15 years later.
Integrated Pest Management policy	2003	Met
Disaster and emergency provisions	2004	Met 3 years later.

Table 1. Standards compliance in Zoo Store 1.

Entrenched Practices

The collections at Wandsworth were moved in 1992, whereas some of the collections in Zoo Store 1 have resided in the storeroom since the museum's opening. This means that at Wandsworth some aspects of collection care were planned and installed before moving the collections into the storeroom, while in Zoo Store 1 the same provisions have been in place since the room was first used as a specimen store.

Until this year, the mammal section has had the largest amount of material at Wandsworth. In Zoo Store 1 the mammal section and the fish, reptile and amphibian section as well as other departments which have temporarily stored material in Zoo Store 1, have all been responsible for parts of the collections in the storeroom. The management of the storeroom has been complicated because good communication and coordination between the groups has not been maintained and the storeroom has ended up as a veritable 'dumping ground' of specimens and other material. This could be due to the lack of a single person with the responsibility to enforce procedures and to compel people to remove extraneous materials. The conditions of the Wandsworth store have been brought about by the very hard work of one individual (NHM 2003c) and facilitated by excellent communication between estates management and scientific staff working to bring the collections up to the current standards.

Scientific Use of Collections

The collections stored in Zoo Store 1 are of less scientific research value compared to the spirit collections in the Darwin Centre (cover illustration). The laboratories and offices of staff at the Darwin Centre deal with the constant flow of specimens in use in research, awaiting processing for outgoing and incoming loans or in the process of

conservation or documentation. The majority of current biological research occurs at tissue or cell level; genetics has all but superseded anatomy and biodynamics as the prime source of zoological research (Behe 1998: 4). The odd large mounted specimen is used more often than not as corridor decoration or as part of a display rather than in active scientific research.

Osteological material is still used in research. The large vertebrate specimens at the Wandsworth storeroom are frequently used because cetacean specimens and other large mammals are not easily stored in spirits and many of the organisms are now protected in the wild because of big game hunting.

In contrast, a large section of the specimens in Zoo Store 1 can be viewed as skilfully created art objects rather than specimens for scientific use. A large proportion is not on a searchable database and information pertaining to them has deteriorated or been misplaced over time. Many items are mounted fish specimens. This is now practised mostly to preserve fish trophies, because of the many disadvantages to their value for scientific study (Carnall 2005: 27). Attempts at painting and conserving them in the past have resulted in further loss of utility of this material for scientific study. Specimens with greater scientific value have until recently been the priority for conservation, and so those in Zoo Store 1 have been allowed to deteriorate.

However, some published guidelines acknowledge that attitudes to natural history specimens may evolve. They emphasise that collections should be managed not only for active research, but with "respect for the scientific, historic, physical, cultural and aesthetic integrity of the specimen or artefact and its associated data" (SPNHC 1994: 1). Members of staff at the NHM play an active role in the work of the Society for the Preservation of Natural History Collections and one assumes that these guidelines have been adopted. Yet policy has failed to filter down to staff practices in Zoo Store 1.

Conclusions

Wandsworth was an empty building before the collections were moved in. Zoo Store 1 has been part of the museum since it first opened and this is why the miscellany found during this survey has accumulated. Many of the problems discussed above have been inherited from previous generations' activity. But access to Wandsworth is strictly controlled and recorded, and so visiting researchers and staff are less likely to use the collection space as a temporary storage facility for extraneous material. When, during the survey, the extraneous items noted above were discovered in Zoo Store 1 staff members had no idea that the items were in the storeroom or who had seen fit to deposit those items there.

The spirit collection and other miscellany highlight possible problems with personnel who do not see how such items can bring the management of collections in a national museum into serious question. This attitude was representative of the outdated perspective often found in museums. The policies and standards set at trustee, directorate and heads of collections level were not filtering down to the staff who have the most contact with specimens, and the conclusion must be that the appropriate management

structures to implement and maintain them were not been effectively implemented. This problem has subsequently been addressed. All staff members, regardless of section or position, should be well informed of policies for managing the collections to maintain high standards, and of their own responsibilities. Staff should be informed, as they are in health and safety practice, where full support is required at every level of management from trustees down, with full provision for training. There is an insistence that every member of staff understands their moral and legal responsibilities.

A problem that faces those aspiring to meet set standards for collections management is that there is still a great deal of ambiguity on the detailed parameters, especially for standards relating to environmental conditions. The NHM has adopted the standards for environmental factors laid out in the Museums and Galleries Commission, *Standards in the Care of Biological Collections Guidelines* (MGC 1992: 52). However, closer examination of these guidelines and of other relevant literature reveals that the figures given are approximate and based on recommendations rather than scientifically established optimum values. For example, 50-55% RH is recommended as an optimum range for a mixed collection of specimens in the MGC guidelines (MGC 1992: 52) but 45-60% is suggested as acceptable by Thomson (1986: 86). Indeed, the MGC guidelines note that "there is a great deal of debate about acceptable levels, further research may reappraise the values given in this table" (1992: 52). Although the difference seems minimal, complications arise when museums lending to museums in other climates demand that specimens are kept in the conditions specified by the standard scheme they are using (for further discussion of this issue, see Thomson 1986: 112-121). The original parameters represented a consensus based on best knowledge at the time, and either there has been no further research, or else the guidelines have not been updated.

Nonetheless, these 13-year-old guidelines are still the prime source of reference for environmental standards (NHM 2003a: 5). It is surely time for these standards to be revisited and updated, with further research undertaken as required. Meeting current standards is only the beginning of a much longer process of establishing proven, cost effective benchmarks for the long-term preservation of collections held in trust by public museums. Since the survey was undertaken and as part of the development of the next OC phases, the NHM is now actively working on developing and experimenting with environmental conditions using the example of Wandsworth as a benchmark for collections management.

Collections For All?

10 to 20 years ago, when standards were being benchmarked and made widely available through publication, (Griffin 1987; MGC 1992 etc.) marked the acknowledgement of the need for standards to define the required levels of care for museum collections. The Natural History Museum only exemplifies a widespread problem in museums. I suspect that the majority of museums have storerooms comparable to Zoo Store 1. The Natural History Museum, however, has a particular national and international role in upholding of standards. If the storeroom doors are to be opened to all, then professional standards do need to be established and met. Until that time it is best that some remain

tightly shut. However, this survey and others like it are being used to inform the setting of standards as well as changing the way collections are assessed at a manageable level.

Acknowledgements
I would like to thank both Clare Valentine and Richard Sabin at the NHM for allowing me access to the wonderful collections held at the NHM and their support, expertise and openness. I would also like to thank them for the opportunity to assess one of the oldest, largest and potentially problematic storerooms to highlight some of the difficulties in dealing with the inherited problems of the old practices and to inform the difficult process of meeting and developing new standards.

I would also like to thank Melissa Gunter for her hard work and research in developing the survey and for allowing me to use the survey. Her work, help and enthusiasm were instrumental in understanding exactly how collections deteriorate and how we can quickly assess museum storerooms.

References
Abbreviations
SPNHC - Society for the Preservation of Natural History Collections
MA – Museums Association
MDA- Museum Documentation Association
MGC- Museums and Galleries Commission
MLA- Council for Museums Libraries and Archives, formerly Re:source

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