The Biology Curator

Title: Using Mammal Collections

Author(s): Kitchener, A. C.

Source: Kitchener, A. C. (2002). Using Mammal Collections. *The Biology Curator*, *Issue 22*, 24 - 27.

URL: http://www.natsca.org/article/362

Mammal Collections

Curation, Conservation and Uses

Grant Museum of Zoology, University College London, Gower Street
17th December, 2001

Mammals are one of the largest and more visible elements of many museum collections. This meeting at the end of 2001 brough together a wide range of speakers looking at the different uses, issues and opportunities relating to mammal collections.

Using Mammal Collections

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Mammals are among the most important specimens in our museums. They are immensely popular with our visitors, include our closest living relatives, the chimpanzees and other great apes, and are continually exploited in advertising and in symbolising commercial products, ranging from breakfast cereals to fast cars. However, in museums they have their problems. They are often big and, hence, take up a lot of space. Taxidermy is often perceived as out dated, ethically questionable and not as good as TV programmes. Also, the research value of mammal collections is considerably underestimated as it is often assumed that we know all we need to know about mammals.

Over the last 14 years at the National Museums of Scotland, we have been faced with these common assumptions and faced with this paradox of high public popularity, but putative low research need. However, we know more about the basic biology of lions and tigers than our own native species such as wildcats, polecats and red squirrels. As a result of these common misconceptions, we have created new kinds of mammal collection that complement our existing collections and which are more relevant to the research and conservation needs of today. This article is not intended to preach, but provides just a brief outline of the work we have been doing at the National Museums of Scotland using our mammal collections.

Taxonomy and Systematics

This is, of course, one of the traditional mainstays of larger mammal collections. Much of mammalian nomenclature is based on 19th and early 20th century literature, which is mostly non-scientific. As a result the plethora of species and subspecies names used today are based largely on small, unrepresentative, often aberrant samples with a dose of personal vanity. As natural habitats disappear or change and biodiversity is lost, so there is an increasing need to have a better understanding of basic mammalian taxonomy and systematics. At NMS we have been involved in a number of studies to look at geographical variation in endangered species (e.g. clouded leopard, tiger), which have drastically reduced the number of recognised subspecies, which has important implications for conservation in captivity and the wild (Kitchener, 1999; Kitchener & Dugmore, 2000; Kitchener, Richardson & Beaumont, in prep.). Under contact from Scottish Natural Heritage, we have also looked at geographical variation in

European beaver populations to compare with fossil British beavers (Kitchener & Lynch, 2000). From this study we were able to show that the skulls of extinct British beavers are most similar to those of extant Scandinavian ones, and hence recommend these for reintroduction. Scottish Natural Heritage is planning to reintroduce the beaver to Knapdale in Argyll in 2003 (Kitchener, 2001).

Anatomy

Although we carry out little research in comparative anatomy, we have extensive skeletal and wet collections, which are freely available. Despite the lack of interest in comparative anatomy today, there is still much that is unknown, or which has not been looked at since the early 20t^{h} century or before. For example, we have recently published the first anatomical description of the penis of the sperm whale (Bland & Kitchener, 2001), despite the many millions that have been killed in commercial whaling and the thousands that have stranded all over the world. Other anatomical studies carried out at NMS include the preputial gland of the coati (Shannon *et al.,* 1995) and the hindlimb adaptations of arboreal cats (in prep.).

Hybridisation

At NMS we have been collaborating with Scottish Natural Heritage for more than 15 years on the problem of hybridisation between wildcats and domestic cats. Most of this research has been directed to finding reliable morphological characters that can be used to distinguish wildcats from the rest (e.g. Daniels, *et al.*, 1998; Kitchener, 1998; Ward & Kitchener, in press) and correlating these with genetic data (Beaumont *et al.,* 2001). As a result of our expertise in this area we have been approached in recent years to look at similar problems in polecats and feral ferrets (Birks & Kitchener, 1999), Arctic wolves and huskies (Clutton-Brock *et al.,* 1994) and Ethiopian wolves and domestic dogs (in prep.). A most important aspect of research into hybridisation problems is having good time series with large sample sizes so that the progress of hybridisation can be tracked over time.

Comparing Populations

In recent years we have been involved in a number of studies, which have compared populations. These rely mainly on larger sample sizes from discrete areas, in order to examine differences using multivariate statistical analyses mostly of skull measurements. The studies we have carried out fall into two main categories. Firstly geographical variation within species, e.g. otters (Lynch *et al.* 1996), red squirrels (Kitchener, Peacock & Gurnell, in prep.), porpoises (Tolley, Lynch, Lynch and Herman, in prep,), and common dolphins (Murphy, Herman & Kitchener, in prep.). We are also currently involved in comparing the skulls of New Zealand's introduced mustelids (stoats, weasels and feral ferrets) with those of their ancestral populations in Britain (Grimshaw, Kitchener and Macdonald, in prep.)

The other main area of study is looking at the effects of captivity on wild mammals in zoos by comparison with wild populations. Owing to lack of activity, population bottlenecks and differences in diet there is a concern that many captive mammals populations may not resemble those in the wild, so that if reintroductions were proposed, the survival of the captive stock would be severely compromised. Also, there is a welfare issue if the lack of activity or inappropriate diet damage the health of captive individuals. Recently, we looked at the effect of captivity on the musculo-skeletal system of Rodrigues fruit bats (Kitchener, *et al.* 1999), which showed that wild-caught and captive-bred fruit bats adapt to captive life in the same way. We have measured gradually increasing amounts of subcutaneous fat throughout life until it reaches about a third of body weight at 20 years old, when the animals can probably no longer fly.

We have also recently begun a collaboration with San Diego Zoological Society and Liverpool University to look at the effect of captive diets and activity levels on the development of the teeth and skeletons of cheetahs.

Pathological studies are also possible to look

at the incidences of diseases. For example, we have also been looking at the incidences of bone and dental diseases in captive bears (Kitchener *et al.*, 2001). The problem is that bears may live for up to 40 years in zoos, and perhaps only half that time in the wild, but many of the old bears donated to NMS had severe skeletal and dental problems. We have found that in bears of all species over 18 years of age there are signs of progressive painful bone disease and severe dental problems including abscesses in more than 93% of animals (Kitchener *et al.*, 2001). Therefore decisions must be made as to how best to manage these long-lived animals given that they may be in severe and increasing pain for up to half their lives in captivity.

There is great potential for carrying out studies on ageing using mammal collections, especially if they contain known-age individuals. One recent study at NMS involved establishing a method for ageing the highly endangered Sumatran rhinoceros using tooth wear (Kitchener, 1997). This established that the captive female at Port Lympne Wild Animal Park, who died in 1994, was probably at least 35 years old and hence was probably too old to breed when she arrived in Britain.

There are also a variety of spin-off studies that become possible from modern samples. For example, we have been able to supply samples for a variety of molecular studies, but also dietary, reproductive, toxicological and pathological research on polecats, wildcats, red squirrels and chimpanzees (see e.g. Alp & Kitchener, 1993; Shore *et al.*, 1996; Davison *et al.*, 1999; Birks & Kitchener, 1999).

Conservation and Legal Relevance

Much of the research that can be carried out on mammal collections may be of direct conservation relevance, such as taxonomic studies to determine subspecific and other geographical variation (Kitchener & Dugmore, 2000), hybridisation studies (see above), and reintroductions (e.g. beavers, Lynch & Kitchener, 2000). Development of reliable methods of identification also assist in the legal protection of endangered species. For example, we have appeared as expert witnesses in the identification of bushmeat items, taxidermy and wildcats, and have identified many items suspected of being illegally imported. Finally, modelling of the tiger's distribution based on museum locality records has allowed a new way of assessing the relationship between putative subspecies and may be of positive benefit in the conservation of some critically endangered populatons of this big cat (Kitchener & Dugmore, 2000).

Exhibitions

Last but not least, we are fortunate in having two excellent and active taxidermists and our exhibition efforts have been directed to preparing new taxidermy where possible. Our new mounts try and show mammals in dynamic poses to show behaviours not often seen in the wild or in zoos, or to show their key adaptations. Therefore mounts are produce to illustrate biological themes in order to facilitate the communication of the exhibitions' key messages.
Collecting policy

Our collecting policy does not allow for the killing of birds and mammals for exhibitions, so that we are totally reliant on the goodwill of our donors. This has required the creation of an extensive network of contacts and transport. methods for getting specimens to Edinburgh.

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The Educational Value Of Natural History Collections In Learning About Biodiversity

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Visitors to natural history museums see museum animals, models or those which have been taxidermically preserved. Do people have to see the 'real thing' in order to learn about animals? If the answer is 'Yes', what do the people who say that they do so mean by 'real'? In a zoo a viewer of animal specimens does indeed see a "real animal", albeit one that usually exists in an artificial setting, without any prey, predators or other natural threats. Hence the zoo animal is yet another type of image, live, but represented in a human constructed frame and constrained by this very design. The design of an exhibit sets a context in which the animal is seen and this artificially created surround helps form the image of the animal in the mind of the onlooker.

Studying images of animals in a natural history museum, of which the majority are mammals, is more effective in terms of what visitors notice and comment upon than looking at animals in zoos. I have focused on