The mammalogist's toolkit

The use of tools by mammals is an exceptional phenomenon (van der Grift 2010). By contrast *Homo sapiens* use tools for most of their activities. But what tools do we need for scientific mammal research? A brief historical review will help put this question in perspective. Toolkits contain important equipment, and this is true for mammalogists as well as craftsmen and the evolution of the contents of these kits over time is impressive. We cannot fairly apply the same scientific standards to early Cro-Magnon and to post-modern man. But there are some common traits of 'good science' that were shared by our prehistoric forebears: keen observation and passing acquired knowledge onto the next generation.

Since the dawn of mankind people have had a strong interest in vertebrates, with mammals perhaps triggering most of our curiosity. The numerous depictions from prehistoric caves clearly show this point. The few birds, if present at all, are sketchy and fish, amphibians or reptiles are scarce. The majority of rock art depicts beautifully carved or painted mammals which show that primitive man was keenly observant of anatomical details. The split hoofs in the numerous depictions of Artiodactyla are striking and the long slit of the preorbital gland in Cervidae is shown with a sense of utmost precision, while the variations in antler shape and size are almost as complete as current descriptions.

Alongside spears, bows and arrows, the toolkit in those days contained a range of tools for digging pits and strong nets, all to trap animals. At that time the goal of increasing knowledge about mammals was subordinate to consuming a rich source of protein and of fatty material that was sometimes stored for other purposes. The pictures of different mammals made by early *Homo sapiens* were a form of educational resource for passing on knowledge to future generations.

Nowadays the toolkit of modern mammalogists is much larger. Since the introduction of the metric system in 1799, and the almost worldwide acceptance of it, measurements and weights can unambiguously be identified; tools such as scales and calipers are a standard part of toolkits everywhere. Over time rifles replaced spears, bows and arrows and, since the early 1800s, cartridges and bullets have been used in hunting. These weapons also appeared in mammalogists' toolkits and were used regularly to collect mammals for natural history museums. For instance, Sir Alfred Russel Wallace brought back home a large number of specimens, of which 310 mammals, including 17 orang-utans, had been shot with a rifle (Wallace 1869). As recently as the second half of the last century Husson (1960) described a method - although rather shocking, as he mentions – for collecting bats in the tropics, shooting with the finest shot close to the centre of a bunch of bats, a method that avoided

damaging the skulls of the specimens. In 1897 the British inventor James Henry Atkinson invented the prototype mousetrap, called the "Little Nipper". Since then a wide array of snap traps has been designed. This ultimately led to the development of a specially designed 'museum snap trap' to collect small mammals as specimens for museums. With the growing interest in ecological studies, live traps have been designed, Havaharth(R), Longworth(R) and Sherman(R), being some examples. Today's ecological studies would require up to several hundred small mammal traps, not so easily packed into a portable toolkit.

Electronic equipment, such as bat-detectors, has the great advantage of becoming smaller with the passing years. In the 1940s, Hooper needed a solid transport bike to cross London parks with his four kg Holgate detector to 'listen in the dark', as he described his activities (Boonman 1997). Now 21st century bat-detectors can be easily handheld, with options to listen and store ultrasonic batsounds.

Perhaps the most discrete steps in knowledge and the accompanying tools have been reached on the (sub) cellular and even molecular levels. And a bizarre phenomenon has emerged: the smaller the details, the bigger the instruments needed for proper analysis. Microscopes and electron microscopes can provide enough details to be able to study the numbers of chromosomes and other features within the cellular structures of mammals and other species. In 2011 the most promising equipment, seems to be Eppendorf(R) tubes and related chemicals that open up new opportunities for further DNA studies. Proper DNA analysis in well-equipped laboratories can reveal a wide array of details. These can vary between determining the species of specimens, the family relations between individuals or genetic variation within populations.

Since prehistoric times, our way of depicting mammals has also evolved and developed. Between 1566 and 1598, whales were regularly depicted in paintings which had obviously been correctly identified (Barthelmess 1992). Since the eightheenth century realistic watercolour drawings and other paintings familiarized people around the world with local and distant mammal species. The unprecedented boom of photography and film since the end of the nineteenth century has also greatly contributed to our knowledge of mammalian life. Despite these technological advances we should not underestimate the work of modern artists, such as Paul Barruel, Helmuth Diller and Peter Twisk (figure 1). Their fine watercolours of mammals in typical postures add an extra dimension to written descriptions and can instantly provide details in a more direct way.

Mammalogy was initially a side product of humanity's main goal of acquiring proteins. Nowadays mammalogists do not need to be vegetarian, but they will only rarely consume discarded parts of objects of their study. Yet one can also overemphasize the importance of the toolkit. However, no matter how much equipment there is available (or how large it becomes), the most important point in science remains the amazement at the phenomena one encounters. This provides the basis for posing pertinent questions, undertaking good research and publishing the obtained results.

In this issue of Lutra, van den Brink et al. study isolated root vole (*Microtus oeconomus*) populations in the Netherlands. They used a wide array of tools to apply geometric morphometrics to vole skulls obtained from owl pellets. Their study also illustrates the increasing importance of applied DNA analysis, nowadays a standard tool in the mammalogist's toolkit. Cornelis, in his search for *Pipistrellus pygmaeus* flying around in a forest lane, couldn't have written his paper that records the addition of this species to the Dutch list without his bat-detector, an indispensable tool in modern research into

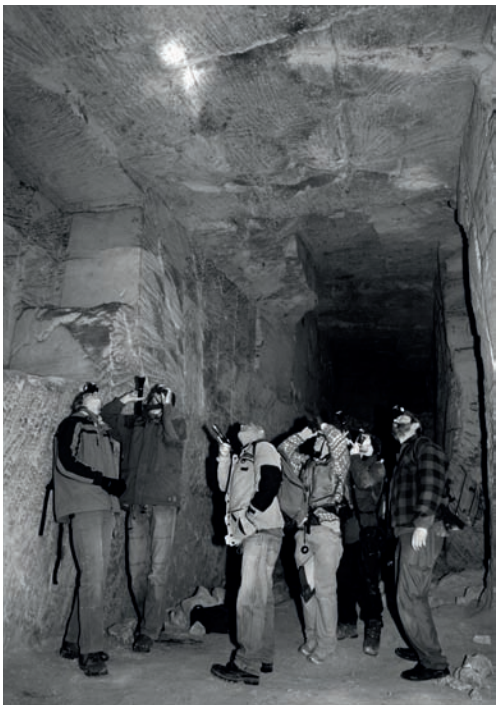

Photo 1. A torch and a pair of good eyes usually suffice to count hibernating bats. But to identify a bat hidden high up in a crack, a pair of binoculars may be required. *Photograph: B. Verboom.*

bats and their summer habitats. By contrast, hibernating bats can be investigated with simple tools: a torch and a pair of good eyes should do, as illustrated by Grol et al. in their study of the effects of a Christmas market on hibernating bats (photo 1). More sophisticated tools were used by Van Den Berge & Gouwy to reveal the activities of the obscure pine marten (*Martes martes*) in a small and isolated forest complex. Numerous encounters with cetaceans have been described by sailors from their vessels at sea. Camphuysen & Krop describe the interactions between a female harbour porpoise and her calf, based on keen observations of the second author and his colleagues from a non-sailing object; however, an offshore gas production platform in this case can hardly be described as a tool.

In the second half of 2011 two new editors joined the board of *Lutra*, Jan Haelters and Eric Thomassen. Jan has dedicated most of his work to marine mammals along the Belgian coast and the Delta. Eric is a more general biologist with extensive field experience in almost all of Europe's countries, as well as on several other continents. Undoubtedly *Lutra* will benefit from their knowledge and skills in the years to come.

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Figure 1. Edible dormouse (*Glis glis*) in a typical posture; watercolour drawing by Peter Twisk, also depicted (slightly adapted) in "Zoogdieren van de Benelux. Herkenning en onderzoek" by R. Lange et al. (1986).