

A new method of darting: stepping back in time

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Summary

Ju/'Hoan Bushmen have been hunting with bow and arrow for many thousands of years. The skill is still present among many hunters that live in Namibia. Through the involvement of a local Ju/'Hoan community in a behavioural ecology study a new technique of darting was developed. Ju/'Hoan hunters modified their traditional bow and arrow to deliver a drug dose for the immobilization of large carnivores. Six lions and 17 leopards were darted. The stealth and skill of the Ju/'Hoan hunters on foot led to the darting of four animals that were unapproachable by vehicle. During a test for reliability a grouping of less than 25 cm, from the centre of a target, was maintained, up to a distance of 30 metres.

Key words: bushman, darting, immobilization, leopard, lion, Namibia

Résumé

Les Boshimans Ju/'Hoan chassent au moyen d'arcs et de flèches depuis des milliers d'années. De nombreux chasseurs qui vivent en Namibie possèdent encore cette habileté. On a mis au point une nouvelle technique pour envoyer des fléchettes en impliquant une communauté locale de Ju/'Hoan dans une recherche écologique sur le comportement. Des chasseurs Ju/'Hoan ont modifié leurs arcs et flèches traditionnels pour pouvoir administrer une dose de produit pour l'immobilisation de grands carnivores. On a ainsi traité six lions et 17 léopards. La discrétion et l'habileté des chasseurs Ju/'Hoan à pied a permis l'immobilisation de quatre animaux que l'on n'aurait pas pu approcher en voiture. Lors d'un test de fiabilité, on a pu constater que les flèches lancées vers le centre d'une cible restaient groupées dans un rayon de moins de 25 cm et ce jusqu'à une distance de 30 mètres.

Introduction

The live capture of wild animals is an essential part of most wildlife studies. Most prominent of the various techniques is the use of drugs delivered by projectile mechanisms. These techniques have shown much progress over the past 40 years. Darts and pellets containing solid drugs, delivered by carbon dioxide-powered projectors or crossbows (Taber & Cowan, 1966; Scanlon, 1973) developed into the more reliable use of liquid drug injection syringes, propelled by modified or custom-made projectors (Harthoorn, 1976). Much progress was made in the

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latter group during the 1970s, resulting in the very reliable and flexible techniques in use today (McKenzie, 1993). Present-day darting techniques depend mainly on the use of custom-made projector rifles powered either by means of carbon dioxide, compressed air or .22 blanks. Dart syringes, disposable or re-usable, are generally reliable, accurate and relatively cheap (McKenzie, 1993).

Wild animals live under variable ecological conditions and capture techniques are continuously modified to meet the particular demands of the area or species. During studies on large carnivores in Namibia over the past 15 years, approximately 530 animals were captured, including 445 lions (Van Wyk & Berry, 1986; Stander & Morkel, 1991; K. Venzke & L. Scheepers, pers. comm.). Many modifications of available capture techniques have been made to suit the particular conditions of the region (Stander & Morkel, 1991). The efficient and reliable capture of shy and retiring animals (especially among lions and leopards) remains an unsolved problem.

A 'new' technique for capturing such animals, using a traditional Bushman bow and arrow, is described here. The basis of this technique, though new to modern day science, has been in use for several thousand years. One of the more important developments in the evolution of hominid subsistence is the invention of the bow and arrow for hunting, which occurred approximately 10,000 years ago (Pfeiffer, 1978). There are suggestions that the bow and arrow may initially have been developed as a projector to deliver a dose of poisonous substance (Coon, 1971; Liebenberg, 1990), rather than to inflict a mortal wound (Bicchieri, 1972). Evolutionary developments in hunter-gatherer societies during the Palaeolithic era may well have addressed similar problems faced in present-day wildlife conservation, although for totally different reasons.

Description and methods

The Ju/'Hoan Bushmen of northeastern Namibia have developed an effective bow and arrow to deliver a lethal poison to a large variety of ungulate species (Lee, 1979). The lightweight bow and arrow combination (Fig. 1) is relatively small and compact, features which are beneficial in the stalking of prey through heavily vegetated terrain used for cover. The bow (Fig. 1a) measures approximately one metre in length and weighs less than 200 grams. It is made from the stem of *Grewia flava* shrubs with the twine constructed from the back muscles (*longissimus dorsi* and *costarum*) of large-sized antelopes. The arrow, a hollow shoot of the grass (*Andropogon gayanus*), weighs 3.3 grams and is 400 mm in length, with no tail feathers or other stabilizing device. A detachable arrowhead shaft, 150 mm long, is covered with glue from the tree *Terminalia sericea* with only the tip of the metal arrowhead exposed (Fig. 1b). The long glue-covered shaft of the arrowhead forms a platform on which the poison, in the form of a paste, is placed. The poison is obtained from the larva of the beetle *Diamphidia simplex*, which feeds exclusively on *Commiphora africana* trees. When an animal has been shot the arrowhead may detach from the main shaft and remain inside the animal allowing further absorption of poison into the blood stream. The arrows are aerodynamic and well-balanced. Ju/'Hoansi hunters are often successful in hitting the target at distances exceeding 50 metres.

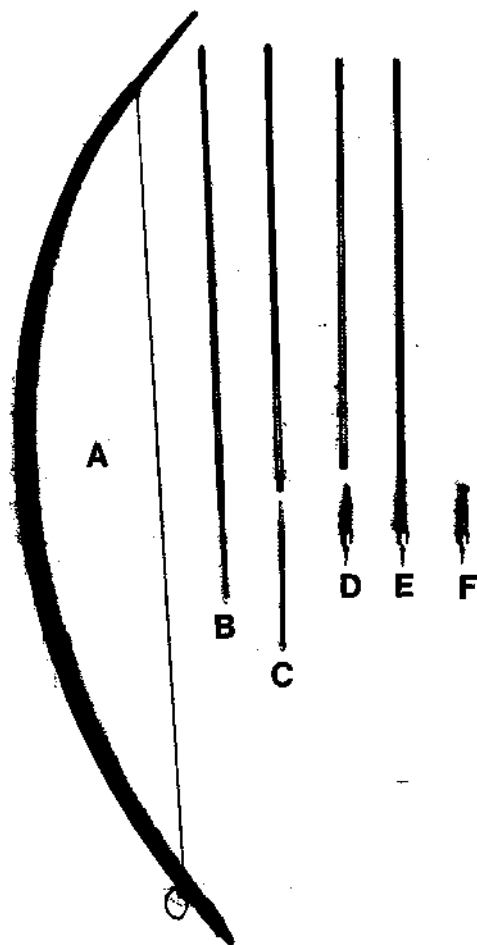


Fig. 1. An outlay of the various components of the Ju/'Hoansi bow and arrow, and disposable Pneu Dart[®] dart-syringe. Illustrated alphabetically are (a) the bow; (b) the complete poison arrow; (c) the arrow with detachable arrowhead removed; (d) the arrow with modified Pneu Dart removed; (e) the arrow with Pneu Dart attached; and (f) a complete Pneu Dart (before modification).

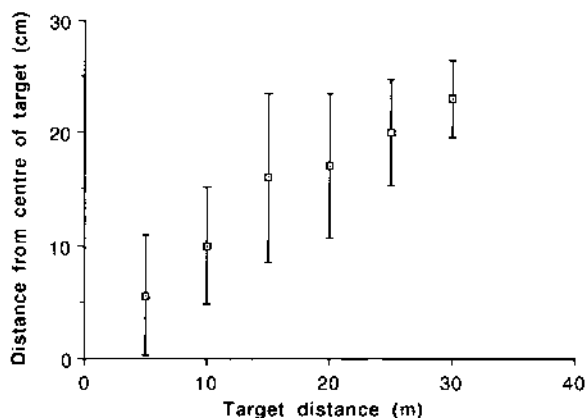
In the present study the Ju/'Hoan arrow was modified by replacing the detachable arrowhead with a conventional and commercially available dart syringe. The tail piece of a disposable 1 ml Pneu Dart (Pneu Dart Inc.) was trimmed (Fig. 1d and f) so that it would tuck into the main arrow shaft (Fig. 1e). The arrow was now somewhat lighter and less balanced as the dart-syringe was shorter and weighed less than the arrowhead.

Some of us (X.G., D.T. and X.T.) participated in the testing of this technique for accuracy and precision. Two additional Ju/'Hoan hunters were included in an experiment where five men shot five darts each at targets ranging from five to 30 m at five metre intervals. Accuracy and precision were measured as the distance from the centre, to the nearest centimetre.

Results and discussion

Experiments showed that a radius of 25 cm was consistently hit, up to a distance of 30 m (Fig. 2). Mean accuracy decreased linearly from a 5 cm radius at 5 m to

Fig. 2. Accuracy and precision of arrows shot by five Ju/'Hoan hunters on fixed targets between 5 m and 30 m. Accuracy (squares) depict the mean distance (cm) from the centre of the target, and precision (vertical lines) the standard deviation of the means.



a 23 cm radius at 30 m. Precision, measured in terms of the standard variation, decreased, on average, from 5.3 cm at 5 m to 7.5 cm at 15 m and then increased to 3.4 cm at 30 m (Fig. 2). As a rule Ju/'Hoan hunters shoot at prey from distances exceeding 20 m. During the experiment the five men were uncomfortable shooting their arrows at targets less than 20 metres, which could explain the increase in precision beyond the 15 metre mark.

A total of 6 lions and 17 leopards were darted. Lions were generally shot from a vehicle but on two occasions lions were darted by one hunter (X.G.) after stalking them on foot. Leopards were mostly first captured in a fall-door trap and then immobilized with the bow and arrow. Two leopards were also stalked and darted on foot. Those animals darted on foot were cattle killers that were unapproachable by vehicle and despite several efforts could not be captured by conventional means. Those individuals were induced to eat meat drugged with Midazolam before darting (Stander & Morkel, 1991). The Ju/'Hoan hunters would then track the partly drugged animal and immobilize it, after a careful stalk. The Ju/'Hoansi rely on their stealth and the relative silent flight of the arrow and do not regard this activity as particularly dangerous. No injuries to lions or leopards occurred during the successful dartings. Since an arrow weighs very little the risk of injury from an overpowered shot is minimal. In addition, the Ju/'Hoansi gauge the power of their shot depending on the distance of the target.

The bow and arrow technique operated by an experienced Ju/'Hoan hunter has several advantages over conventional methods. First, it cuts down the costs of operating gas or powder projectors (Woodford, Eltringham & Wyatt, 1972). Secondly, the stealth and skill of the Ju/'Hoan hunter allows for the capture of rogue and generally unapproachable lions and leopards. Thirdly, it supports a sustainable future in wildlife conservation where the local community (in this case the Ju/'Hoansi) are able to employ wildlife management techniques themselves. The Ju/'Hoansi were proficient and reliable in handling drugs, which is not surprising as they regularly work with poison arrows.

The use of bow and arrow in the capture of wild animals has rarely been implemented with success. Hawkins, Autry & Klimstra (1967) described the use of a Browning longbow with cedar arrows to capture white-tailed deer. One live deer was captured per 11.8 man-hours, with a mortality rate of 50%. A major

limitation to the bow and arrow technique is the time involved for the wildlife biologist in acquiring the necessary skill and bow technique (Hawkins *et al.*, 1967). Harthoorn (1976) expressed a preference for a rifle-type projector over crossbows or bow and arrow, as most biologists or managers are already familiar with its use.

In recent years the involvement of local communities in wildlife studies in Africa, and especially southern Africa, has become customary. The future of wildlife and wild areas depend largely on the participation and consent of the local communities in all ecology and conservation projects (Martin, 1984; Owen-Smith & Jacobsohn, 1989). Along with the collaboration with such local communities on conservation projects comes a very valuable, and often underestimated, contribution of local skills and knowledge. A scientist does not have to acquire the skill of operating a bow and arrow, for example, as this skill may already exist among members of the local people. The Bushmen, although known for their tracking skills and knowledge of their environment (Lee, 1979), are possibly only one of the many African people with a major contribution to make towards conserving their wildlife resources. A classic case of collaboration, and combination of skills, has been described here between a western biologist and a local community, resulting in the development of a novel technique for darting lions and leopards, a technique that not only replaced conventional methods but generally improved upon previous wildlife management efforts.

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