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Field Report

Determining an effective and safe radio-tracking collar for bush dogs (*Speothos venaticus*)

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Introduction

The bush dog (*Speothos venaticus*), listed as Vulnerable (IUCN 2003), is a small canid from central and South America whose status, distribution, and ecological requirements are poorly understood (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999). Most of what is known about this morphologically distinct canid (Langguth 1975; Berta 1981, 1984) has been gained through captive studies (Bates 1944; Kitchener 1971; Kleiman 1972; Drüwa 1977; Brady 1981; Biben 1982; Porton 1983; Porton et al. 1987; DeMatteo 2004). Opportunistic sightings form the basis of the limited information on bush dogs in the wild (Defler 1986; Strahl et al. 1992; Beccaceci 1994; Silveira et al. 1998; Barnett et al. 2001). In order to develop a species-specific conservation strategy for the bush dog, field research must be focused on gaining insight into its ecology (Ginsberg and Macdonald 1990).

Marking research subjects is a critical first step in any ecological study. However, many researchers have questioned whether the structure of radio collars routinely used with terrestrial mammals would be safe with bush dogs. First, the bush dog's morphology of a short thick neck, flat head, and prominent jaw line are potential challenges in safely and effectively fitting a radio collar. Second, the density of low-lying vegetation in its habitat, its use of burrows for sleeping and hunting, and its high sociality are factors that must be considered when using a collar with this species.

The objective of this study was to determine an effective and safe radio collar design with captive bush dogs. Unlike wild bush dogs, captive animals can be examined and ob-

served daily for any physical and social problems resulting from a radio collar. This controlled situation allows an optimal collar design to be determined prior to their use in the field.

Methods

In a series of trials, three prototype collars were developed and tested. Based on the weight (range:5.5 to 6.5kg) of adult bush dogs at the Saint Louis Zoo (STL), St. Louis MO, USA, which correspond to those reported in the literature (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999), the basic collar used throughout the trials was Advanced Telemetry Systems (Isanti MN, USA) Model M2210 with a 1.9cm wide neoprene collar, weight of 65g, and external antenna. The initial prototype was developed using the neck circumference (range: 28 to 33cm) of adult STL bush dogs. The second and third prototypes were tested sequentially, and had modifications made based on the results from the previous trial. The modifications were aimed at positioning the external antenna between the scapulas, modifying the shape of the transmitter so that rubbing was minimal, and ensuring that the closure on the collar was secure. The latter factor was critical in allowing the collar to be placed sufficiently tight without undue tension at the connection site.

Five adult bush dogs (ages 3 to 7 years) at STL were used in the 8 trials (Table 1). All individuals were housed with an individual of the opposite sex in either an off-exhibit holding that provided no outdoor access or in a holding that provided both indoor and outdoor access (Table 1). With the exception of F100072 who was spayed, the females were reproductively competent (DeMatteo 2004). Collars were placed on anesthetized animals (Anesthetic: 50-60 mcg/kg Medetomidine combined with 5-6mg/kg Ketamine; Reversal Agent: Atipamezole – Dosage is equal to 5X the Medetomidine dose) and excess neoprene strapping was cut off. With the third prototype, the lock-nuts were secured with Quick-Tite® Super Glue Gel (Manco, Inc., Avon OH, USA).

Results

The initial prototype was tested on a single individual male. Despite the fact that one of the two lock-nuts was lost during the first month of the trial, the radio collar remained in place for 127 days. Initially, the male's mate made several attempts to chew on the antenna and neoprene strapping; however, the female's behaviour stopped after a couple of days due to the male actively discouraging her by vocalizing and physically moving away. The collar did not result in changes in behaviour or overall activity, and the pair copulated normally during the female's estrous cycle.

While the first prototype did not result in any physical or social problems, it was necessary to make modifications to optimize the position of the antenna (i.e. between the scapulas), size of the transmitter (i.e. slightly thinner and longer), and decrease the tension at the screw-bracket closure (i.e. adjusting the position from perpendicular to parallel to the transmitter and moving it away from the transmitter). Unfortunately, this latter change resulted in increased tension at the screw-bracket closure and resulted in three of the four prototype 2 collars being lost in <4 days (mean = 2 days; range = 1 to 4 days; Table 1). The fourth prototype 2 collar remained in place for 137 days, with no problems, at which time it was physically removed due to management decisions. This collar did not cause physical harm or impact the pair socially during the female's estrous cycle. Once again attempts were made by the female's mate to chew the antenna and neoprene strapping; however, the female's actions discourage this behaviour.

Table 1. A summary of the captive trials with bush dogs, which tested the 3 radio collar prototypes. The prototype tested, the animal's identification number, his or her mate's identification number, and the type of housing is listed for each animal. In addition, the number of days the radio collar was in place and the details regarding its removal are provided.

Prototype	Animal ID	Mate ID	Type of housing	No. days collar in place	Details regarding radiocollar removal
1	M101469	F100624	Indoor only	127	Lock-nuts on screw-bracket became loose and collar fell off
2	M981127	F100072	Indoor/Outdoor	4	Holes where screw-bracket fastened ripped through
2	M100112	F102078	Indoor only	1	Holes where screw-bracket fastened ripped through
2	F100072	M981127	Indoor/Outdoor	1	Lock-nuts on screw-bracket became loose and collar fell off
2	F102078	M100112	Indoor only	137	Collar removed under anesthesia prior to transfer to another zoo
3	M981127	F100072	Indoor/Outdoor	112	Collar removed under anesthesia at end of study
3	M101469	F100624	Indoor/Outdoor	112	Collar removed under anesthesia at end of study
3	F100072	M981127	Indoor/Outdoor	112	Collar removed under anesthesia at end of study

While the modifications in the second prototype corrected the position of the antenna and the shape of the transmitter (final size=6cmx1.5cmx1.5cm), an additional trial was required to ensure that the connection on the collar was secure. The third and final prototype had modifications that aimed to further decrease the tension between the screw-bracket and the neoprene strapping at the closure. The addition of the QuickTite® Super Glue Gel was important in reliably securing the collars long-term. This final prototype remained in place with no physical or social problems on three individuals for 112 days (Figure 1). Once again, normal mating occurred without problems. In fact, a successful breeding (i.e. pregnancy) occurred with a pair (M101469 and F100624) while the male was wearing a radio collar. Some additional chewing on antennas by mates were seen in this final trial; however, this is believe to be associated with the fact the animals were restricted to a period of indoor-only access and were The collars were removed due to management decisions.

Figure 1. Photographs of Saint Louis Zoo bush dogs with radio collars. ©Karen DeMatteo.

Discussion

These captive trials determined that bush dogs could be safely and effectively fit with radio collars despite their unique morphology and high sociality. The radio collars did not interfere with the bush dog's normal behaviours such as digging, swimming, submissive rolling, urine-marking postures (e.g. female handstand), and playing (e.g. tug-of-war). In fact, one pair (M981127 and F100072) successfully hunted natural wildlife (e.g. birds, opossums, rabbits) that wandered through their outside exhibit. In addition, copulations occurred with no problems (e.g. the male did not suffocate the female with her collar). The results from these trials provide researchers with the assurance that placement of a radio collar on the elusive bush dog is possible without physical or social harm. With this knowledge, researchers will have more confidence in beginning the critical studies aimed at determining the basic ecological requirements of the bush dog.

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Karen DeMatteo has worked with *Speothos* since 1998. Her Ph.D. work on their reproductive physiology provided invaluable insight into their behaviour and opportunities to test field techniques under controlled conditions. She plans to use her knowledge and the developed techniques to study their basic ecological needs in the field.

Christopher (Chris) Kochanny is a wildlife biologist with ATS and a graduate student at the University of Minnesota. He received a BS from Iowa State University in 1991 and has worked for the USGS-Biological Resources Division, the National Biological Survey, and the US Fish and Wildlife Service.