Queries for swna-57-04-17

This manuscript/text has been typeset from the submitted material. Please check this proof carefully to make sure there have been no font conversion errors or inadvertent formatting errors. Allen Press.
NOTES

FORCE-FED-RADIOTRANSMITTER TECHNIQUE FOR FINDING REFUGED LIZARDS

ENRIQUE SANTOYO-BRITO* AND STANLEY FOX

Department of Zoology, Oklahoma State University, Stillwater, OK 74078
*Correspondent: enrique.s.brito@okstate.edu

ABSTRACT—We tested the force-fed-radiotransmitter technique on six adult collared lizards \textit{Crotaphytus collaris}. We located lizards within their nocturnal refuges using a hand-held Yagi antenna and a portable radioreceiver, and we verified their exact position with a borescope 17 times in 18 trials. Retention time of radiotransmitters in digestive tracts was 3–4 days. There was no effect on digestion. This technique is best for studies of medium to large lizards that refuge in tight spaces and consequently may rub off externally placed transmitters.

RESUMEN—Probamos la técnica de alimentación forzada de radiotransmisores en seis adultos de lagartijas de collar, \textit{Crotaphytus collaris}. Localizamos a las lagartijas dentro de su refugio nocturno utilizando una antena Yagi y un radioreceptor portátil, y verificamos la posición exacta con un endoscopio 17 veces de 18 intentos. El tiempo de retención de los radiotransmisores en el tracto digestivo fue 3–4 días. No hubo efecto sobre la digestión. Esta técnica es mejor en estudios de radiotelemetría en lagartijas medianas y grandes que se refugian en espacios reducidos, lo que limita el uso de radiotransmisores externos.

Radiotelemetry is a widely used technique that has been applied to many species of animals to acquire information such as use of habitats, movements, migrations, home ranges, and various other behaviors (White and Garrot, 1990). How the radiotransmitter is affixed to an animal depends on physical characteristics of the species of interest (Cochran, 1980). In reptiles, radiotransmitters usually are attached externally (Fisher and Muth, 1995; Boardman et al., 1998; Endriss et al., 2007), implanted in the abdomen (Rodríguez-Robles, 2003), or sometimes force-fed to the animal, a method used primarily on large snakes (Rivas, 2001; Madrid and Valdivia, 2004). For lizards, external attachment using a harness, backpack, glue, or sutures often is employed, but less often, internal implantation via surgery is used (Ferner, 2007). Internal implantation might be a better choice for species of lizards that squeeze into tight crevices (Goodman et al., 2009), but implantation by surgery carries its own complications (e.g., anesthesia, specialized equipment, aseptic conditions, post-operative recovery; Madrid and Valdivia, 2004). Subjects were force-fed radiotransmitters in a study of the endangered rock iguana \textit{Iguana pinguis} (Goodyear and Lazell, 1994).

We tested the procedure of force-feeding radiotransmitters to collared lizards \textit{Crotaphytus collaris}. Subjects were captured by noosing at Sooner Lake Dam, Osage County, Oklahoma, and marked with combinations of toe clips and dots of latex paint on the dorsum. At this site, \textit{C. collaris} used the numerous crevices between and under rocks at the dam for refuge and often squeezed into tight spaces; especially, to spend the night. Radiotransmitters (model BD-2H, 16.7 by 8.0 by 5.5 mm; Holohil Systems, Ltd., Carp, Ontario, Canada) were coated with smooth epoxy and weighed <2 g, satisfying the criterion of \(\leq 5\%\) of mass (Ferner, 2007). Radiotransmitters were force-fed to six adult lizards (two males, four females: mean snout–vent length \(\pm SE = 94.6 \pm 7.5\) mm; mean mass \(\pm SE = 29.3 \pm 7.5\) g). We pushed each radiotransmitter down the esophagus with a probe, while the mouth was held open by hand, and we introduced water to help the lizard swallow the radiotransmitter. Lizards were released at site of capture.

Following release and for the next 4 days, we used a hand-held, three-element Yagi antenna and a radioreceiver (Model R2000; Advanced Telemetry Systems, Inc., Isanti, Minnesota) to locate lizards before dawn, while subjects were inside their nocturnal refuges. We then verified occupancy of each refuge visually with a fiber-optic borescope. During two sessions (21–25 July and 29 July–1 August 2009), we tested the force-fed-radiotransmitter technique and searched for lizards a total of 18 times (one lizard one time, one lizard two times, two lizards three times, one lizard four times, and one lizard five times). Exact position for 17 of the 18
attempts was fixed by radiotelemetry and verified visually with the borescope. The single failure occurred in one of the first trials while we were learning to use the borescope under natural conditions in the dark. Lizards were in crevices 10–28 cm deep (n = 17; mean ± 1SE = 18.0 ± 6.1 cm) and were detected by the radioreceiver as far away as 60–70 m, but more commonly at 30–40 m. Radiotransmitters were defecated and recovered partially embedded in feces on tops of rocks, the usual site of defecation for C. collaris. Retention time (radiotransmitters in digestive tract) was 3–4 days. There was no significant change in mass of lizards during sessions (two lizards were used in both sessions; Wilcoxon signed-rank test: Z = 0.282; n = 8, P = 0.778), but our sample was small.

Based on the lack of a decrease in mass while radiotransmitters were in place, the fact that ejected radiotransmitters were embedded partially in feces, and observations of lizards basking and behaving normally during the day, we conclude that the force-fed-radiotransmitter technique did not affect digestion. In addition, feeding behavior probably was not affected. Goodyear and Lazell (1994) reported that I. pinguis retained fed radiotransmitters ≤7 days before being passed in feces, and they believed that lizards continued to feed normally during that time. Nevertheless, a longer study is needed to conclude that intake of food is not affected while the radiotransmitter is retained internally. We recommend this force-fed technique for short-term studies in medium-to-large lizards that refuge in tight spaces and, consequently, may rub off externally placed radiotransmitters. This technique is less invasive than implantations via surgery and is simple, quick, effective, and easily implemented in the field, but it is of relatively short duration unless the subject is recaptured and made to re-ingest the radiotransmitter.

We thank Oklahoma Gas and Electric Sooner Lake Power Station for permission to work on their property, Consejo Nacional de Ciencia y Tecnología (Beca-Mixta 211488) for financial support of travel and research expenses to ESB, and J. A. Lemos-Espinal, D. Ávila-Nájera, and C. Vargas for advice. This research was conducted with approval of the Oklahoma State University Institutional Animal Care and Use Committee (permit AS09-3).

LITERATURE CITED


Submitted 12 January 2011. Accepted 11 May 2012.

Associate Editor was Rocky Ward.