An effective new radio transmitter attachment technique for lizards

Article in Herpetological Review · September 2005

CITATIONS
10

READS
43

2 authors, including:

Charles R. Knapp
Shedd Aquarium

51 PUBLICATIONS 324 CITATIONS

SEE PROFILE
Radio telemetry is a valuable method for acquiring important ecological information such as home range, habitat preference, and dispersal distance for many types of wildlife (White and Garrott 1990). One of the limitations with using telemetry is the difficulty of developing a reliable and safe transmitter attachment technique to facilitate consistent research. Multiple transmitter attachment methods are available for a variety of lizards, with additional approaches being introduced as telemetry becomes increasingly popular and techniques are refined through trial and error (see Richmond 1998; Ussher 1999). Using radio telemetry on saxicolous lizards living among jagged, xeric limestone conditions presents serious challenges for wildlife researchers. West Indian iguanas (genus Cyclura) are particularly difficult because they inhabit areas of sharp limestone and squeeze into small retreat openings, often causing the loss of externally affixed transmitters. Attaching external transmitters to hatchling or subadult iguanas also is problematic because of their small size and potential for rapid growth. Numerous radio transmitter attachment methods have been attempted, with variable results, on adults of this genus (reviewed in Goodman, in press), but none have been successful for hatchlings or juveniles. We devised a technique for attaching radio transmitters to recently hatched Andros Iguanas (Cyclura cychlura cychlura) during a study of natal dispersal, survival, and habitat preferences. Data on these parameters are crucial for developing a science-based management program for this threatened lizard, especially since little ecological information is available for hatchlings of this species or its congeners. We conducted our study from 12 August to 9 October 2003, and 3 August to 14 September 2004 on Andros Island, Bahamas, primarily in pine woodland, scrub, and mangrove habitats. Forty-one hatchlings in 2003 and 36 hatchlings in 2004 were collected for radio tracking directly from nests or from incubated eggs. Hatchlings ranged from 31 to 36 hatchlings in 2004 were collected for radio tracking directly from nests or from incubated eggs. Hatchlings ranged from 31 to 57 g in body mass (mean = 44; S.D. = 5.56), 84–106 mm in snout–vent length (mean = 97; S.D. = 0.41), and 122–171 mm in vent–tail length (mean = 153; S.D. = 0.97). To radio track lizards we used BD-2 (17 x 8.5 x 5.5 mm) and PD-2 (23 x 12 x 5.5 mm) model transmitters (Holohil Systems Ltd., Ontario, Canada). The average battery lifespan for the BD-2 and PD-2 transmitters was 12 and 16 weeks, respectively. The BD-2 (1.9 g) and PD-2 (2.7 g)
transmitters after encapsulation represented between 4.1 and 9.0% (mean = 6.0%; S.D. = 0.7) of hatchling body mass.

To test the efficacy of the attachment technique on another lizard species, we attached transmitters during the 2004 field season to three adult Curlytail Lizards (*Leiocephalus carinatus coryi*) inhabiting the same study sites and tracked them between 16 and 30 days. The lizards ranged from 39 to 45 g in body mass (mean = 42.7), 91–98 mm in SVL (mean = 95), and 127–151 mm in vent–tail length (mean = 139). The transmitters were between 4.9 and 6.0% (mean = 5.7%) of adult body mass.

The transmitters and batteries were encapsulated in an inert waterproof epoxy with tubes attached laterally through the anterior and posterior ventral edges. The antenna was a 20-cm long flexible stainless steel wire covered with a black nylon coating and shrink tubing to reinforce the base. Using a hand-held 3-element Yagi directional antenna and a Wildlife Materials, Inc. (Carbondale, Illinois, USA) TRX-48S receiver, we obtained a signal range of 500 m over open, flat terrain that was reduced to 200 m in closed forest conditions.

To attach a transmitter, two 15-cm pieces of 20 lb test monofilament line were cut (length may vary depending on personal preference and size of animal) and one piece inserted through the anterior and the other through the posterior tube of the transmitter. The transmitter was placed on the dorsal side of the pelvic girdle, the anterior monofilament line was wrapped around the lizard’s body (anterior to the hind limbs) and tied with two square knots in the lateral inguinal region using needle-nose pliers. A dab of ethylcyanoacrylate glue gel was then applied to the knot to prevent it from slipping. The posterior monofilament line was then wrapped loosely around the tail, tied, and glued as above. All extra line was trimmed (Fig. 1). The antenna protruded farther than the tail tip, but appeared to have no effect on the animals. Although antennas can be trimmed, this will limit the maximum signal detection distance.

An assumption of radio tracking investigations is that animal movements are not affected by researcher techniques (White and Garrott 1990). Although not quantified, our method appears to have no significant effect on iguana behavior or movement. All hatchling iguanas ran, jumped, swam, and climbed trees without apparent difficulty. Lizards were found in pine trees 10 m above the ground, in underground (and at times underwater) limestone retreats, and within mangrove islands which required overwater movement. The Curlytail Lizards also appeared unaffected by the transmitters. The inert waterproof epoxy was gray in color and was relatively cryptic in our study environment. The epoxy can be painted to either facilitate detection by the researcher or to offer additional camouflage for the lizard.

Although no transmitters detached from the animals during the study, this technique does have limitations. Abrasions developed after two weeks in the inguinal region of five (12%) iguana hatchlings in 2003. When this occurred, we recaptured the lizard and reattached the transmitter on the ventral surface directly posterior to the cloaca using the method described above. Repositioning the transmitter removed pressure from the ventral inguinal region where the abrasions were occurring. Abrasions healed after one week and the new ventral transmitter placement appeared to have no effect on the movements, activity, or defecation ability of the hatchlings.

During the 2003 study, we noted that the posterior (tail) monofilament line often snagged on jagged limestone surfaces or tree bark as the lizards moved, thereby increasing cutting pressure on the inguinal region. Therefore, we attached the last ten transmitters in 2003 and all the transmitters in 2004 without using the posterior

![Fig. 1. Lateral view of PD-2 transmitter attachment method with both the anterior and posterior monofilaments lines tied.](image1)

![Fig. 2. Dorsal view of PD-2 transmitter attachment method with only the anterior monofilament line tied.](image2)
monofilament line and secured the anterior (inguinal region) line more loosely (Fig. 2). This method also was effective, and in our opinion, the better of the two options, as it allowed the transmitter to move slightly as the lizard moved, thereby reducing pressure on the inguinal region. The transmitter rotated on the body at times and occasionally flipped back and forth as the animals moved backwards then forwards in enclosed spaces. However, no abrasions were found during the remaining four weeks of the project in 2003 or throughout most of 2004. All surviving hatchlings in 2003 (N = 2) and 2004 (N = 8), as well as the three Leiocephalus in 2004, were recaptured at the end of this study and transmitters were removed. All recaptured iguanas had maintained, or gained body mass, were free of abrasions, and appeared healthy. One curlytail lizard, which was not recaptured until 30 days after initial attachment, exhibited slight cutting abrasions in the inguinal region.

No lizards died during this study directly as a result of the attachment method. Because very little material is required for this convenient and easy procedure, lizards can be harnessed in the field within minutes using only minimal equipment. However, we encourage using this technique only if lizards can be reliably recaptured. The monofilament line may not present a significant problem for adult lizards of equivalent size, but long-term survival of growing hatchlings will be affected if the line is not removed. Additionally, 83% and 61% of radio-tagged hatchlings were visually confirmed to be eaten by snakes in 2003 and 2004, respectively. Although we feel time of release after hatching may have influenced the higher than expected predation rates in 2003, we cannot exclude the possibility that the transmitter attachment played a role. The potential benefits of using this technique warrants further study with results being disseminated in the literature. A future modification could include inserting the monofilament line through low-diameter Tygon® tubing so that the potential for long-term cutting into the inguinal region of adult lizards is further reduced. In conclusion, use of this method allowed us to elucidate many previously unknown aspects of the behavior and ecology of Cyclura hatchlings (Knapp and Owens 2004), and should be applicable to other lizards of similar size.

Acknowledgments.—We thank C. Kenneth Dodd, Jr. and Allison Alberts for comments on early versions of the manuscript. We also thank Glenn Gerber and Bryon Wilson for critically reviewing the manuscript and offering welcomed suggestions. Coleman Sheehy III assisted with radio tracking during the 2004 field season. Funding for transmitters was made possible through the Chicago Zoological Society Board of Trade Endangered Species Fund, the International Iguana Foundation, and the Chicago Herpetological Society. Tiamo Resorts of South Andros provided logistical support during the study.

Literature Cited


