Chapter 10: Wildlife Radiotelemetry and Remote Monitoring

Learning goals

After participating in learning experiences found in this chapter, the reader should be able to:

- Describe potential effects of transmitters on individual animals
- Identify characteristics of receiving antennas or transmitters that affect reception of signal
- Describe how error in bearing contributes to uncertainty in the estimate of animal location
- Compare the proper use of VHF radiotelemetry, GPS collars, PTT systems, and geolocators relative to study objectives

A 1-minute summary

Radiotelemetry has become one of the most effective tools in wildlife biology, because the method allows biologist to understand wildlife behavior, movement and survival. Radio-marked animals can be repeatedly observed or related more consistently, frequently, and systematically than animals marked with any other technique.

Very high frequency (VHF) telemetry is the simplest and most commonly used technique, which includes animal-mounted transmitters that send signals to observers in the VHF portion of the electromagnetic spectrum (20-300MHz). In contrast, Global Positioning System (GPS) tags record animal locations, and the data must be retrieved by the observer. Platform Terminal Transmitters (PTT) use satellite-based receiving equipment that estimate the location of the animal through triangulation among satellites and relay the location to the observer. Geolocators are light-level sensors that estimate the location of an animal from inference of day length and timing of the solar noon.

VHF, GPS, and PTT tags have the potential for accuracy of locations of 20-250 meters, and can be used to assess movements on local scales. Geolocators, in contrast, are accurate to within 150 km, so they are best used to assess large scale movements such as avian migration.

Problem case: designing a radiotelemetry study for striped skunks

Tina, a graduate student at Creighton University, was attending The Wildlife Society's annual conference for the first time. Tina was in the process of writing a proposal for her thesis research to present to her graduate committee. She planned to use VHF radiotelemetry to evaluate movements of striped skunks in Nebraska's Rainwater Basin wetland system.

Two talks at the conference thus far had caught her attention. One, by a graduate student from Virginia, had compared the reception patterns and distances of reception for avian transmitters in a forested system between a 3-element and a 7-element Yagi antenna. Tina only had access to a 3-element, truck-mounted Yagi, and the presentation suggested she needed to buy a larger antenna.

A second presentation had focused on methods of determining error in estimates of radiomarked elk UTM coordinates in Wyoming. Tina would be taking at least 3 bearings on each animal within a short time period from 3 known locations. Although Tina had planned to use her bearings to calculate a coordinate for the animal, this biologist had also estimated the error for his coordinate estimate with triangulation software. The elk research team had decided to throw out some location estimates because the error was too large to be useful, and Tina wondered how she might reduce the uncertainty in her own location estimates.

At the coffee break, Tina struck up a conversation with a well-known mammologist from California who was monitoring mountain lions. He had used a combination of GPS and PPT collars in his study, and he laughed when Tina said she would be using VHF collars. "I'm not sure you can get enough location estimates each day to adequately sample the movements of your skunks with that technique," he said. As the coffee break ended, Tina set off in search of her research advisor. Had she designed her study poorly? Maybe there was enough money in the budget to purchase GPS collars instead?

LEARNING ISSUE IDENTIFICATION

What do you need to learn so that you could serve in the role of Tina's advisor? What terms in this story do you need to have defined?

QUESTIONS TO PONDER AS YOU READ

What criteria should Tina use to determine how many locations she needs for her analyses? How might she reduce the error in her bearings? Is a 3-element Yagi antenna on a truck going to work for her study? Should Tina use VHF or GPS or PTT markers if her budget is limited?