SANCTUARI

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Post-Release Tracking and Identification

AT A GLANCE

- Tracking post-release can provide valuable data, but current options for tracking and identification are limited and come with assorted risks and widely varying costs.
- For Virginia opossums, some feasible options include a selection of telemetry collars, PIT implants, and custom-made solutions.

Many rehabilitators know the heartbreak of caring for an animal throughout his or her youth, or over a critical recovery period, only to then lose contact after release. Having the ability to monitor released individuals provides valuable biological and ecological data capable of advancing the entirety of the field of rehabilitation. While wildlife tracking technology is always evolving, the most reliable and readily available current methods for post-release monitoring involve radio and satellite telemetry. Microchips and other forms of identification like PIT (passive integrated transponder) tags can also be useful, but they do not provide location data, instead simply aiding in recognition of a given individual.

Figure 1: radio telemetry equipment

https://scientificservices.eu/item/wildlife-radio-telemetry-equipment-/2010

Tracking Systems

Radio telemetry, a method of tracking via electromagnetic wave transmission, is the oldest and often least expensive mode of tracking currently available. It involves three basic components: a radio antenna, a radio receiver, and a transmitter, the latter of which is attached to the animal of interest. Researchers in search of a given animal use the receiver and antenna, which communicate proximity with a series of beeps that grows more frequent with decreasing distance to the animal. Transmissions can be

customized to the needs of the study, for example to extend battery life. This is a relatively mature method which is still widely used for studying wildlife in the field.

Figure 2: GPS telemetry devices

https://www.telemetrysolutions.com/

Satellite telemetry is a more recent innovation in wildlife tracking. Satellite transmitters provide more precise location information either via GPS technology or Argos satellite tags. Some types of GPS tags store information while others transmit it. The former requires recapture of the animal to collect data. Transmitting tags of both Argos and GPS varieties provide data to receiving stations, where that data can then be accessed and viewed or sent. Some satellite tags are powered by solar cells, with these most often used with birds and marine species. Larger solar-powered tags with higher capacities for wider ranges are often too bulky and cumbersome for smaller terrestrial animals, while smaller options tend to have more limited ranges due to their reduced energy storage capacities. As a general rule, transmitters are often no more than 3-5% of an animal's body weight, though this varies by species, placement of the device, and other factors.

More sophisticated trackers of both radio and satellite varieties can include sensing of vital signs such as heart rate, encounter sensors which recognize and record encounters between multiple tagged individuals, and mortality sensors.

Attachment Methods

Once a specific type of transmitter is chosen for a study, there is the challenge of attaching it to the animal of interest. Several of the most popular techniques include collars, harnesses and backpacks, glue-on attachment, and implantation. Since tracking technology is frequently used in migration studies of birds and even butterflies, there are multiple options designed to be as unobtrusive as possible. Backpacks and harnesses are commonly chosen for various sizes of birds and reptiles, while collars are popular for terrestrial mammals. Glue-on transmitters are used with birds, bats, and some marine

mammals and can also be successful with select terrestrial mammals when deployed with hypoallergenic tapes, neoprene patches, or other innovative solutions.

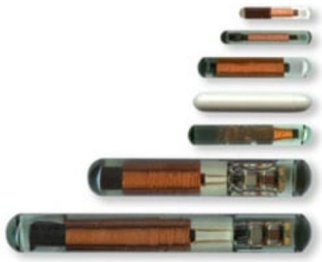
Figure 3: The W500 Wildlink GPS Logger Small Collar by Atstrack

https://atstrack.com/tracking-products/transmitters/W500-wildlink-gps-logger.aspx

Implantable transmitters are commonly used with juvenile animals and in species for which other methods have proved incompatible, such as otters, some snakes, and some fish. Implants are also a viable option for species in which external attachment may be contraindicated due to predation risk, habitat limitations, or behavioral concerns. Some advanced implants can recognize various physiological states, such as stages of estrous, and can also detect disease processes.[1] Use of implantable transmitters in various marine species has been generally successful.[2,3] Though they are considered relatively safe, implants should be thoroughly researched relative to a species of interest prior to implementation. In addition to the usual anesthesia-associated risks of implantation, improper use of this technology can cause harm to animals and can of course then generate compromised data.

Identification

Figure 4: PIT tags of various sizes



https://www.oregonrfid.com/new-to-rfid/

Passive integrated transponder (PIT) tags are commonly used as implanted identification tools by researchers looking to distinguish individual animals. PIT tags can feasibly be used for the lifetime of a given animal, with an operable lifespan often spanning decades. They are usually highly economical but

have similar drawbacks to radio transmitters since they contain microchips that must be read from a very short distance away. This often then requires recapture of a subject animal.[4]

Limitations

There are several disadvantages to each available tracking and identification option. In the case of telemetry, battery life of transmitters is a major limiting factor, especially for long-term studies. While battery longevity depends partially on transmission programming, finding trackers with batteries that last longer than a few months or so is currently a challenge, with the longest-lasting options' maximum operational lifespans being 1-2 years. Radio telemetry also requires researchers to go out into the field to track down the animal. Another option involves placement of VHF receiver equipment near an area frequented by the subject animal and retrieving it at a later time, as opposed to needing to locate a known individual at any given point to gather data. This option represents a compromise between true "soft release" and live tracking, but it may prove difficult for species such as Virginia opossums due to the ground covered while foraging and their tendencies toward more nomadic behaviors.

GPS transmitters, though versatile, are often heavy and may present an added burden to animals versus radio transmitters. They also usually cost very much more per device. Transmitters of either type pose injury and predation risk to the animal in the event the devices become caught on objects in the environment, which is especially a concern for predator-vulnerable species such as the opossum. To mitigate such risks, there are breakaway collars, designed to degrade and fall off after a given amount of time, and anti-snare collars, first used in African painted dogs and designed to prevent the animal from becoming caught in poachers' wire snares. Expandable collars, designed to grow with a juvenile animal, can also be problematic. Made from flexible material, these collars pose an additional injury risk, as a stretched collar is more likely to become snared in the environment or to allow an animal to inadvertently step into it and constrain themselves.

Telemetry implants and PIT tags are invasive, requiring specialized skill to implement and close proximity to the animal for data to be read.

Applications

Sanctuari's investigations of such technologies currently center on post-release tracking and identification of wildlife as an alternative to "soft release" when the latter is impractical or unfeasible. Relatively recent studies have used both GPS collars and PIT tags to track and identify Virginia opossums for research purposes,[5] implying usefulness for such frequently rehabilitated species. Some sources that offer relevant equipment include:

- **Sigma Eight** (https://sigmaeight.ca/products/transmitters/pisces-catalog/)
  This company offers a diverse catalog of radio telemetry transmitters.

- **Advanced Telemetry Systems** (https://atstrack.com/tracking-products.html)
  Products sold by ATS include transmitter implants and collars of various materials and sizes.

- **Telemetry Solutions** (https://www.telemetrysolutions.com/category/small-mammals/)
  Telemetry solutions offers GPS collars for a variety of small mammals, including racoons, skunks, South American possum, feral cats, and squirrels. Many of these include both GPS and a VHF beacon for versatility. This company also offers tracking implants and backpacks. All products are custom ordered.

- **Microwave Telemetry** (https://www.microwavetelemetry.com/solar_5g_ptt)
  This company provides a solar-powered transmitter option, able to be attached via glue or as a backpack, with a two-year lifespan.

- **Lotek Wireless** (https://www.lotek.com/products/ultimate-anti-snare-collars/)
  Lotek Wireless offers implants, glue-on transmitters, and collars, including an anti-snare option.

- **Biomark** (https://www.biomark.com/all-products)
  This company offers PIT tags made of biocompatible glass in a variety of sizes and options as well as readers, impanters, and associated software.

The evolving and convergent nature of various aspects of these technologies is noteworthy. Also, additive manufacture of custom transmitters, tags, and attachment systems is becoming more common and cost-effective.[6] Customizing equipment for a given species, and even for specific individuals, minimizes injury risk and overall burden to animals carrying transmitters. It also stands to reduce total research cost while giving studies better chances of success versus use of standard equipment at suitability limits for a given species. We expect the near future to hold significant further advances in terms of lighter, smaller, more precise, and longer-lasting tracking equipment suitable for wider varieties of species. Useful findings will be reported in revisions to this advisory.

Sanctuari is always striving to keep its content current. If you have questions or additions you would like to ask or offer, contact us at sanctuari.org@gmail.com and reference the title of this piece.

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