



Red Knot with Satellite Transmitter. Photo: Arie Manchen

Lesson Three: Making Tracks with Shorebirds

Shorebird Research and Technology

Discovering more about shorebirds through research

Scientists are still searching for answers to many questions about shorebirds. To understand the birds that live in a habitat, we can explore the area throughout the year and note the different species. With a good field guide, binoculars, and lots of practice, we could identify all of the species in an area. But how do we answer questions dealing with age, survivorship, mortality, or behavior? For conservation to be effective we need to understand their habitat needs.

Often, in order to focus management efforts, researchers need to know where a specific bird population is throughout the year. Individual shorebirds, because of their migratory patterns, are difficult to track throughout the year. There is often a need to link birds breeding in the Arctic with those migrating through Missouri and wintering in Argentina. Because of this need, ornithologists use several methods such as banding, radio and satellite telemetry, DNA testing, and stable isotope analysis.

Bird Banding

Bird Banding helps to answer many of these questions. Marking birds for study has been done for more than 100 years—ever since John James Audubon captured an Eastern Phoebe in the 1850s, wrapped a small piece of silver wire around its leg, and determined that the same bird returned the following year. Today, bird banding involves attaching a loose-fitting aluminum band

around the bird's leg that is coded ahead of time with a unique identification number. Often there is a series of colored bracelets and flags that represent the country where the bird was banded, the banding year, and perhaps the age of the bird.

There are several ways to capture birds for banding:

1. Researchers can stretch a fine net called a mist net across an area where birds are likely to fly. Once caught in the net, the bird is quickly and carefully untangled by the researcher, who bands it, collects data on the species such as age, weight, and sex, then releases it.
2. Chicks can be banded before they leave the nest. By banding birds in the year they hatch and recording their annual return, researchers can see how long they live and if they are being replaced by a sufficient number of young. Shorebirds, unlike other bird species, are tolerant of humans handling their chicks.
3. *Cannon netting* involves using an electrical charge to catapult a net into the air over feeding shorebirds. This method is usually used in coastal areas where many birds can be captured quickly.



Because learning to handle birds properly requires special training, and to ensure that valuable information is not wasted or lost if birds are banded incorrectly, a special permit from the U.S. Fish and Wildlife Service is required for all bird banding in the United States. Trained biologists handle birds carefully and keep stress to the birds to a minimum, ensuring that they are rarely injured.

Many birds that have been banded disappear and die without the researchers knowing where, when, or why. If you find a dead bird with a band, please report it to the appropriate agency.

To Report a Color-Banded or Flagged Bird

If you and or your students are lucky enough to see a bird with a band this information can be reported at www.bandedbirds.org:

- Describe each band: type (metal, color band, flag); colors (as exactly as possible-light green, dark blue); and location on bird (left or right leg, upper or lower leg, above or below other bands).
- Report if you are unsure of any bands or if you did not see all parts of both legs clearly.
- Please also report species, location of sighting, date, and any other information about behavior or other birds.

Motus Wildlife Tracking

Motus Radio Telemetry: The Motus Wildlife Tracking System (Motus) is an international collaborative research network that uses coordinated automated radio telemetry to facilitate research and education on the ecology and conservation of migratory animals

Another technology that is used to understand migratory routes is the Motus Wildlife Tracking System (Motus). Motus is an international collaborative research network that uses coordinated automated radio telemetry to facilitate research and education on the ecology and conservation of migratory animals. This tracking system consists of stations installed in a variety of habitats. Each station is composed of several antennae that can detect the movements of birds with tiny radio-transmitters attached to them. After antenna detects a bird with a transmitter, a computer on the tower records it and sends signals to a central database where users can access the data, seeing a list of all the stations where a particular bird has been detected.

Motus is not just useful for understand migration at the flyway scale, but it can also help biologists understand the use of a particular site by tracking movements within the site. The automated recordings of Motus provide real time of data such as survival, and arrival and departure dates of marked birds. This all provides important data for the design of more effective conservation action plans at the site.

There are over 500 Motus stations installed throughout the Americas, stations are shared across the network and can be used for tracking the movements of a variety of wildlife, not just shorebirds. This tracking system has had extensive adoption by biologists across the Americas, but the presence of stations is still one of the limiting factors for the success of this tracking method. Motus stations will be needed in many more places to fully map the migration or use of a site by certain species.

Satellite Telemetry

Sometimes biologists will clip the feathers between a shorebird's shoulder blades and attach a small satellite transmitter with glue. The transmitter does not injure the bird and eventually falls off. The feathers will grow back without affecting the bird's ability to fly. This technique allows scientists to study shorebird behavior in real-time without the need for Motus radio towers. They can learn what habitat the birds are using, how long they stay there, where they fly to next, and much more. Satellite technology is more expensive than Motus tags and this type of transmitter can not be used on the smaller birds, but it is a reliable way to get location data in remote places.

Stable Isotopes

New technology is allowing biologists to isolate stable isotopes in shorebird feathers and to trace what location the bird was in when it grew those feathers during its molt. Stable isotopes are different forms of the same elements that have similar chemical properties but vary in their atomic mass due to differences in the number of neutrons. Isotopes vary by location, and can be linked to that region when analyzed in the tissue of an organism.

Carbon, nitrogen, and hydrogen are among the most useful for studying migratory connectivity since they are naturally abundant. Shorebirds consume prey in a particular location, if they are molting and growing new feathers the isotopes of that region will be incorporated into the tissue of the feather.

Additional Resources:

MOTUS Introduction:

<https://www.youtube.com/watch?v=kqx85gL2Dek>

Migratory Connectivity Project:

<https://bit.ly/migratoryconnectivityproject>

World Migratory Bird Day:

<https://www.migratorybirdday.org/tracking-technologies/>