



Motus receiving station on coastal Nova Scotia (David Bell)

New bird tracking initiative will revolutionise migration studies

With transmitters weighing less than 0.3g many species can now be tracked with the groundbreaking Motus Programme

Our knowledge of the movements of migratory birds looks set to be radically increased with the development of one of the world's most ambitious bird tracking initiatives. The Motus Wildlife Tracking System is a pioneering programme of Bird Studies Canada (BSC, one of the two Canadian BirdLife Partners), in partnership with collaborating researchers and organisations.

Motus (which means “movement” in Latin) utilises miniaturised radio transmitters weighing less than 0.3g, which can be unobtrusively fitted onto the backs of birds, including small passerines such as warblers. (Even smaller transmitters have also been developed that can be fitted to insects: for instance, one study already underway is tracking the movements of Monarch butterflies *Danaus plexippus*). The transmitters, or tags, emit a short burst or pulse every 5–30 seconds, each with

a unique numerical pattern. These pulses are then picked up by automated very high frequency (VHF) receivers, which can automatically detect and record signals from the tags at distances of up to 15 km.

Thousands of tags can be simultaneously deployed and tracked within the system, which, as of February 2016 comprised more than 300 receiving stations. At the moment these receivers are located mainly across eastern Canada and the United States. Resembling oversized television aerials, the receivers can be fixed to existing structures such as towers or lighthouses, on trees, or on stand-alone poles that are around 30 feet in height. The receivers can also be located out to sea; some receivers have

already been placed on offshore oil and gas platforms in coastal Nova Scotia.

“What’s new and exciting about Motus is that it harnesses the collective resources and infrastructure of numerous

“Motus offers us access to a new and exciting level of knowledge about the movements of animals and birds—meaning that we can make sure that our scant, ever stretched conservation budgets are utilised in the most effective way.”

researchers into one massive collaborative effort. Indeed, it is the depth of these collaborations that makes the entire system possible”,

explained Stuart Mackenzie, Motus Programme Manager for BSC. As birds—or other animals, such as bats and large insects—pass within range of any receiver in the network, data is recorded automatically into BSC’s central database in Ontario, where it is shared with researchers. “As each tag has a unique signature we can extract a massive level of detail about

movement and behaviour, including learning where and how quickly the bird in question has travelled, and for how long they may have stopped *en route*”, added Stuart.

A large number of individual study projects are currently underway that utilise Motus’ open source technology. These include: studying the stopover and migration ecology of various waders (including Red Knot *Calidris canutus*, Semipalmated Sandpiper *C. pusilla* and White-rumped Sandpiper *C. fuscicollis*); monitoring the migration routes of Grey-cheeked *Catharus minimus* and Swainson’s Thrushes *Catharus ustulatus*; and investigating the post-breeding dispersal of Ipswich Sparrow, the *princeps* sub-species of Savannah Sparrow *Passerculus sandwichensis* that breeds only on Sable Island, Nova Scotia.

One of the big advantages of Motus over other methods

of tracking bird movements—such as ringing (banding) or the use of geolocators or other archival tags—is that Motus-tagged birds don’t have to be recaptured in order for the data to be accessed. Indeed, Stuart estimates that the chances of recovering data from a tagged Motus bird is something like a thousand times greater than with traditional ringing recoveries. “With the 2015 project that studied migratory Grey-cheeked and Swainson’s Thrushes on their Colombian wintering grounds, migration data was obtained from around 30% of the birds involved—19 out of 67 tagged birds—an unprecedented figure compared to previous transcontinental migration studies”, said Stuart.

A striking level of insight is already being gleaned into the movements of thrushes. For instance, a Swainson’s Thrush tagged on 19 March 2015 remained at the Colombia study site, a shade-grown coffee

plantation, until 14 April. On 18 May, it was detected flying past a small array of towers in Canada’s Chaplin Lake in Saskatchewan, an astounding journey of nearly 6,000 km in just 34 days; this equates to flying at least 175 km per day for a month. And one of the study’s Grey-cheeked Thrushes travelled over 3,200 km from Colombia to Indiana in just 3.3 days, meaning it flew an average of 986 km a day.

Motus is poised to expand rapidly over the next few years. “This really is a project with global potential”, explained Stuart. “Perhaps one of the most exciting developments for 2016 will be the deployment—working alongside Audubon Panama [BirdLife Partner]—of receivers across the canal zone of Panama, meaning that most tagged birds that migrate from North to South America will have to cross through and be recorded by the Panama Gateway.”

In addition, Motus now has a foothold in Europe, with the tagging of songbirds taking place on the German island of Heligoland. “The Motus network is starting to expand at a very encouraging rate. Alongside Panama and Germany, 2016 will see an array take shape in Florida, around the Gulf of Mexico. America’s Pacific Flyway will also begin to get receiver coverage, and enquiries have been made from further afield—including Australia—from researchers expressing an interest in using this groundbreaking technology”, said Stuart.



By Edward Parnell

Further reading online Motus, including animations of some of the movement data already obtained, please visit the BSC website www.birdscanada.org/motus



Black-throated Blue Warbler *Dendroica caerulescens* sporting a radio-tag at Long Point, Ontario (Bethany Thurber)



Hermit Thrush *Catharus guttatus* with radio-tag (Stu Mackenzie)