Initial Deployment Tests of Tiny PTTs on the Red Knot *(Calidris canutus rufa)*

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The Western Atlantic population of the red knot (*Calidris canutus rufa*) has declined by 67-88% since the 1980's. This subspecies undertakes a phenomenal annual migration from wintering grounds in Tierra Del Fuego, Argentina, to breeding grounds in the Arctic and sub-Arctic tundra. Most of the journey is believed to be accomplished in long stretches, including a nonstop journey of over 3,000 miles from the north coast of Brazil to Delaware Bay in the United States, where at least half of the known population stops to refuel by gorging on abundant horseshoe crab (*Limulus polyphemus*) eggs.

There currently is no research linking specific breeding populations to specific stopover populations, and little information on ecology at alternate stopover sites and food sources outside of the Delaware Bay. Coastal Virginia, for instance, hosts nearly 6,000 migrating red knots each year, but the relationship of birds stopping in Virginia to birds stopping in the Delaware Bay is poorly understood.

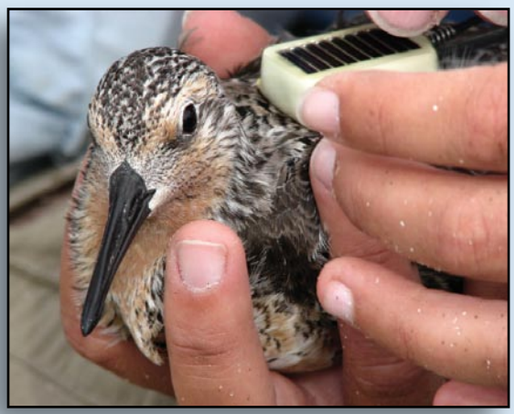
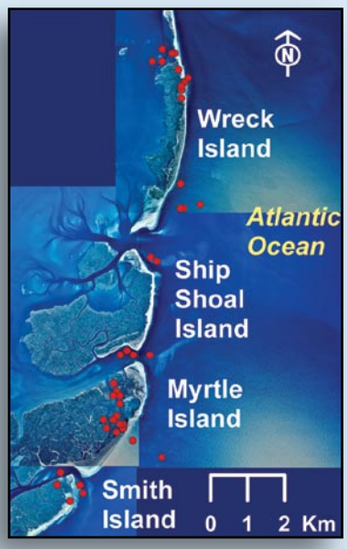


Photo by Brian Gerber

Red Knot outfitted with raised height prototype tiny PTT.

Microwave Telemetry provided researchers at Virginia Tech and The Nature Conservancy's Virginia Coast Reserve with an opportunity to fill in these information gaps by tracking red knots throughout their annual cycle. To do this required a PTT light enough in weight that red knots could carry it safely and with a height that keeps the solar cells above the feathers, and a durable attachment method that nevertheless allows for the substantial weight changes the red knot undergoes during migration. In our first field trial, we attached four prototype Microwave Telemetry PTTs to four red knots wintering in Florida in January 2007, using a leg loop harness that held the transmitter just anterior to the tail. This attachment method had been successfully used on sora rails. These prototype PTTs ranged in weight from 5.2 to 6.6 grams. We expected these birds to begin migrating in mid April, and we intended to track their winter movements until that time, then to learn their migratory stopover and breeding sites. Unfortunately, we encountered two problems. The first was that the transmitter height was apparently too low, presumably leading to feathers preened over the solar panel. As a result, the batteries were at approximately 50-67% of full charge at the start of each transmission cycle, and the starting charge dropped with successive cycles. We lost track of all four birds between 1-26 days. The second problem was slipping of the leg loop harness, as it seems at least one bird freed itself from one side of the attachment. This resulted in the transmitter hanging from one flank with the antenna trailing on the ground or in the water, and very slow recharging of the battery such that we received one day of signaling after nearly two months without any.

To study the charging and attachment issues, we created styrofoam transmitter mounts with the same dimensions as the original PTTs and attached them to 14 red knots in Virginia during spring migration 2007 with a backpack harness instead of a leg loop harness. We glued conventional VHF radios to each mount, and tracked the birds by air and land for two weeks during the stopover period. We relocated many of these birds several times, and managed to view a small number through a spotting scope. It was clear that the simulated transmitters were being preened almost completely under the feathers. We did not note any slipping or breaking of the backpack harness. Thus, Microwave Telemetry supplied two more PTTs with double the height of the ones used in Florida in the hope of raising them above the feathers, and we attached them to red knots in Virginia in the second week of June. Unfortunately, the activity counter of one of the red knots ceased incrementing after two days, after which time the battery charge began to decline in successive transmission cycles, and we lost the signal entirely after nine days. Lack of movement, and subsequent lack of recharge is suggestive of a detached PTT or bird mortality, as a solar PTT on the ground is rarely in an ideal positions for recharging. However, we successfully tracked the second red knot for three months in the coastal Virginia barrier islands. This red knot did not migrate. We believe that this bird, tagged late in the migratory stopover period, was a nonbreeding bird, as it was resighted in late June in the company of a small number of conspecifics. The activity counter sensed a lack of activity and ceased to increment in late August, we lost the signal soon thereafter. However, the bird had ranged over 36 miles of shoreline during the time we tracked it, and the battery appeared to be fully charged at the start of each cycle. The map shows only the LC3 grade fixes obtained over the approximately 3 month period that the bird was tracked. This appears to be a successful step in the development of a method to satellite track small long distance migrant birds. We intend to attach more tiny PTTs to some red knots in mid-May of 2008 in Virginia, since red knots tagged at that time should migrate to their breeding grounds within two weeks. We hope in this way to obtain unbiased locations of red knot breeding sites in the North American Arctic and sub-Arctic.



Tagged Red Knot locations over a three month period, June to August 2007. Only LC3 locations shown.

We are normally very secretive about out future products, but here we make an exception. Our goal has always been to reduce the weight of our PTTs, making them suitable for smaller species. We have recently had many enquires for PTTs in the 5 gram range.

Jonathan and Jim's preceding article details their experiences with a few handmade prototypes of such a PTT, proving its feasibility. To put these very tiny PTTs into production is going to be a major undertaking, requiring investment not only in development time but also expensive new equipment to handle the very tiny components.

Please be patient, we will make these new units available at the first opportunity.

Paul Howey Nov. 2007

Actual size