

Tracking Pectoral Sandpipers with 5g Solar PTTs

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The Pectoral Sandpiper (*Calidris melanotos*) is a medium-sized migratory shorebird that breeds in the high-Arctic tundra from Hudson Bay in Canada, through Alaska and Siberia all the way to the eastern boundary of Europe. Males weigh on average 100 grams and are noticeably larger than females which are about 30 grams leaner. Males do not provide any parental care and during their short stay on the breeding grounds they are occupied solely with territory defense, competing and displaying to females, which they do in a most peculiar way (see photos). Over the past decade several studies in our group allowed us to understand much about the Pectoral Sandpiper mating system and breeding ecology; for example we discovered that males are unusually active during the breeding season and almost completely forego sleep for many days in a row with no obvious loss in performance (*Science* 337, 1654, 2012). There is also anecdotal evidence that Pectoral Sandpipers are extremely good fliers. In the non-breeding season birdwatchers are often reporting birds far away from their main migration route toward South America, in places like the United Kingdom or even Hawaii or the Micronesian islands. This fact potentially qualifies the Pectoral Sandpiper as an extreme flyer, perhaps in the same league as the Arctic Tern, but no supporting evidence existed before our study.



Photo by Mihai Valcu

A territorial Pectoral Sandpiper male sitting on a tundra elevation (a pingo) and displaying his throat. He carries a 5g PTT.

After a very successful pilot study in 2011 where we tested the 5g solar-powered PTTs on a few males, the following season we captured 60 males at the beginning of the breeding season and equipped them with 5g PTTs. Because we decided to use flexible heavy duty glue (Pattex® Repair Extreme) instead of a harness, the tag weight was in fact 4.7 grams. Tags were programmed to transmit continuously during the birds' stay in the ever-sunny Arctic summer and to switch to a standard duty cycle (10 hours ON followed by 48 hours OFF) afterwards. The tags performed exceptionally well and in order to get the best possible tracks we only had to filter out 5% of the data. We obtained on average 35 locations per male per day.

As an example we show one of our tagged males (102082) caught in Barrow on June 2nd (see map). He stayed in Barrow until the next day when he started to fly over the sea heading toward Siberia. He flew over the Beaufort and Chukchi Seas, crossed the East Siberian Sea and travelled over the pack ice for 1100 miles in about 25 hours. Once he reached land he rested less than a day before continuing his journey. He flew westward for another 2300 miles always keeping close to the coast. At the most westward point in his journey on June 18th he had already crossed the eastern boundary of Europe. After this, without any sign of weariness, 102082 started his way back to South America. While crossing Siberia, he followed roughly the same route as on his journey west. He did not come back to Barrow; instead he crossed the

Brooks Range and stopped for a few days in the Eskimo Lakes area. At this point his tag switched to the standard duty cycle but we could track his route through Saskatchewan, Missouri, Arkansas and Mississippi. The later track suggests he traversed Florida, passed over Cuba and then crossed the Caribbean Sea between Jamaica and Haiti, only a week after the Hurricane Ernesto hit the area. 102082 transmitted the last signal only 360 miles short of South America, when the tag most likely detached and fell to the bottom of the sea.

During his trip from the wintering ground somewhere in the Pampas of South America and back, 102082 travelled roughly a distance equal to the Earth's circumference. This qualifies the Pectoral Sandpiper, by any standards, as an extreme migrant. By using a 4.7 gram tag on a 100 gram bird we reach the boundary of what a bird can carry without impairment. However, the Pectoral Sandpiper story is not complete until females can be tagged. Because females are the only ones caring for eggs and young, they are driven during their spring migration to find a predator-free home with plenty of food. Because they provide care, females are bound to stay at the breeding grounds for much longer than males. Many questions are still to be answered: are males following the females or the other way around? Are females also such extreme wanderers or are they more grounded than the males? Are females as likely to fly over the frozen Arctic Ocean for long hours just to arrive a little earlier to their destination? ... A two gram Solar PTT will help answer those questions as well as open tracking possibilities for another 4000 species. We are looking forward to it!



Journey of male 102082 over four continents and 20,000 miles.



Photo by Mihai Valcu

A Pectoral Sandpiper male displaying over the tundra in Barrow, Alaska. By rhythmically inflating his throat sac and simultaneously producing a hollow sound (a hoot) males are trying to attract females and ward off competitors.