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INSIDE JEB

Migrating European nightjars explore altitude to find optimal wind conditions

A European nightjar (*Caprimulgus europaeus*) near Kalmar, Sweden, shortly before release. Photo credit: Gabriel Norevik.

For centuries, the human imagination ran riot creating myths to justify the seasonal appearance of migrating birds. Goldcrests from Scandinavia were believed to hitch lifts on the backs of woodcocks, and barnacle geese were thought to emerge from floating timbers around the UK. The astonishing feats of migration performed by these species would seem even more fantastical to medieval minds. Even though we now understand that birds migrate across great distances, how these animals adjust course to conserve energy was less clear. One possibility was that the aviators may change altitude, taking advantage of winds higher up in the atmosphere to speed them on their way, but no one had tested the theory.

'Up until recently, there were no devices available to measure the flight altitude of small-sized long-distance migrants', says Gabriel Norevik from Lund University, Sweden. However, when Bosch developed a minute pressure sensor that could be integrated with an accelerometer and light sensor in a tiny data logger, Norevik, Susanne Åkesson and Anders Hedenström, also from Lund University, knew they could finally begin to learn more about how European nightjars (*Caprimulgus europaeus*) adjust their altitude during their epic nocturnal migrations between their Swedish breeding grounds and sub-Saharan Africa.

Working with Johan Bäckman and Arne Andersson (also from Lund University), the team built a 2.1 g data logger (3% of the bird's body mass), to track the birds' location and altitude over the 16,000 km migration. Then, Norevik trapped birds with mist nets at night in the forests around Kalmar, Sweden, shortly before their August departure, attaching data loggers to 120 birds over a period of 4 years in the hope that he would be able to retrieve a few when the birds returned 9 months later.

Eventually, the team recovered 26 of the tags, but even then, only 11 had successfully recorded the day length and middle of the day (which the team could use to determine the bird's location) and altitude over the entire course of their migration. 'That some of the retrieved devices had stopped prematurely should be seen as an indication that we have been pushing the boundaries of what is technically possible', says Norevik.

Tracking the data about the birds' altitude over the course of their odyssey, Norevik was impressed to see some of the birds reached hights of almost 5 km as they travelled north across the Sahara Desert in the spring, dropping to altitudes between 1 and 2 km as they approached Europe. The team suspects that the birds were potentially taking advantage of the prevailing northward wind at that time of year. And, when Norevik took a closer look at the birds' manoeuvres, it was clear that instead of reaching an altitude and remaining there, they climbed frequently at a gently rate followed by a descent – especially when travelling north in the spring. 'We interpret this as an indication that the birds are not able to predict flight conditions at other altitudes, but need to update themselves', says Norevik. In addition, the birds continued flapping during their descents, rather than gliding to conserve energy, as had been assumed.

'The birds dynamically and effortlessly alter flight altitude', says Norevik, who suspects that the animals explore the atmosphere to find the most favourable conditions during their awe-inspiring migration. And he is eager to incorporate GPS trackers into the data loggers to learn more about the conditions experienced by the nightjars during their breath-taking voyages.

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