GSM Telemetry, a Quantum Leap – First Results for Long-distance Migrating Lesser Spotted Eagles

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Many questions about the biology of the Lesser Spotted Eagle and other wildlife cannot be clarified without individual marking. As a rule, therefore, field observations alone, for reasons of methodology, do not permit questions such as territory size, distances covered when foraging, etc. to be satisfactorily answered. This is especially true for migration to distant continents. The Lesser Spotted Eagle which breeds mainly in Central and Eastern Europe, is a long-distance migrant that winters in Southern and Central Africa some 10,000 km distant from its breeding grounds.

Photo by Carsten Rohde

Lesser Spotted Eagle equipped with prototype GSM transmitter.

Satellite telemetry (ST) brought about a leap forward in scientific knowledge of the Lesser Spotted Eagle and many other species. With the help of ST it is possible to study changes of location of a number of individual birds worldwide over long periods of time. Until a few years ago the transmitters were located through the Argos system exclusively with the help of the Doppler effect. Shortly after the turn of the century, solar-powered satellite transmitters with the GPS locating system, small and light enough to be fitted to large birds, became available for the first time. Data continued to be transmitted via the Argos system, so that two different satellite systems were involved in this form of telemetry. The advantage of GPS telemetry over the previous form of ST using the Doppler effect is not only the much greater precision of fixes, but also their reliability.

Data transmission via the mobile phone (GSM) network was another quantum leap. The implementation of this technology has enormous advantages for the telemetry of birds, in that the transmission of data is much more secure than via the satellites and the costs are considerably less. In the meantime the global coverage of this system is large, local 'dead zones' are acceptable for land birds, as mobile phones are constructed for use on the move and the transmitter can store a large number of fixes. The prototype GSM transmitter we used was programmed to send as many data as possible. At times this provided fixes every 3-5 minutes. Currently available production-version GSM units can now achieve a position fix every 1-2 minutes, totalling several hundred per day.

Results of the transmitter fitting 2012

In 2012, as part of a long-term research project on the Lesser Spotted Eagle, five individuals were fitted with transmitters in Germany. After being fitted with transmitters, all five adult eagles resumed the breeding process and successfully reared a young eagle. At the usual time in September, they left the breeding area and migrated to their winter quarters in Southern Africa.

An experimental GSM transmitter was fitted to one of the birds, a male, known by the name Panni. This bird was selected for a number of reasons. Panni was ringed as a nestling in 1992 and the rearing of the young bird was recorded by video camera. The bird resettled only a few kilometres from its birthplace. From the day it was fitted with the transmitter on 8 August 2012 to its departure from the breeding area on 13 September a total of 2,665 fixes was received, many more than from the other four birds. The territories of the five birds were very different in size. Panni had by far the largest territory. This information can undoubtedly be ascribed in part to the fact that the GSM transmitter sent many more fixes than the other four Argos GPS transmitters.

On foraging flights Panni travelled the furthest distance from the nest site, up to 17 km. If the bird's transmitter had recorded fixes only on the hour, as was the case with the other eagles, the furthest excursion from the nest by Panni would have appeared some 13.5 km shorter. If a fix had not been received as programmed on the hour in the other PTTs, a further 1 km of the flight would not have been recorded, making a deficit of 14.5 km of distance from the eyrie in all. This case demonstrates that the old transmitters do not record in full the birds' activity and extent of the home ranges.

Figure 1. Map showing full autumn 2012 (red) and spring 2013 (turquoise) migration of Lesser Spotted Eagle 0024 (Panni) fitted with GSM prototype transmitter.

Panni's autumn migration, wintering and spring migration

Panni left the breeding area on 13 September, crossed the Bosporus on 26 September, and the Suez Canal on 4 October. On 10 November the eagle arrived in its wintering area in Southern Zimbabwe after a stop-over period from 25 October to 2 November in south-eastern Congo. During the autumn migration over 4,700 GPS fixes were received. We received 5,374 fixes from the wintering area which included Zambia, Zimbabwe, Botswana and South Africa. On 22 February 2013 the bird left its wintering area again, departed from Africa near Suez on 19 March, flew over the Bosporus on 29 March and arrived back in its old breeding area in Germany on 17 April (Figure1).

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