

Bird migration and conservation clues in robin and Turtle dove genomes

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The European robin and Turtle dove have had their genetic codes sequenced and assembled for the first time by scientists at the Wellcome Sanger Institute and their collaborators. The genomes, completed today (21 December) will enable researchers to explore the genetic switches controlling bird migration and give insight into the magneto receptors that help robins 'see' the Earth's magnetic fields for navigation. The Turtle dove genome will help conservation efforts to save one of the UK's fastest declining bird species.

European robins live throughout Europe, Russia and western Siberia. While most British robins reside in the UK over winter, some birds will migrate to southern Europe to overwinter in warmer climates. Simultaneously in winter, migrant robins from Scandinavia, continental Europe and Russia head to the UK to avoid the harsh weather back home.

Turtle doves also migrate, visiting their breeding grounds in Europe and spending the winter months in Africa. However, since 1995, 94 per cent of Turtle doves have been lost and there are fewer than 5,000 breeding pairs left in the UK. The Turtle dove is the UK's fastest-declining bird [species](#), and as a result, they are listed as vulnerable on the International Union for Conservation of Nature (IUCN) Red List.

Migration patterns and behaviours vary across species, but also within species. Similarly, environmental pressures such as disease and limited food resources affect various bird species differently. To fully

understand the genetic components of complex traits, such as migration and breeding, the whole genetic code must be read and analysed.

The European robin and Turtle dove's genomes were read by the Sanger Institute and its partners, in celebration of Sanger's 25th anniversary.

Collaborators at the University of Lincoln sent robin and Turtle dove samples to the Sanger Institute near Cambridge. The sequencing teams extracted DNA from the samples and used PacBio SMRT Sequencing technology to generate the first reference genomes for robins and Turtle doves.

The European robin [genome](#) will enable researchers to explore the genetic switches underpinning migration, which tell robins when to leave and where to go. The robin's role as a model of bird migration will help in understanding the magneto receptors in birds' eyes that allow them to use the Earth's magnetic fields for navigation and also unpick migratory behaviour in other bird species.

Dr. Miriam Liedvogel from the Max Planck Institute for Evolutionary Biology in Plön, Germany, said: "Birds can use the Earth's magnetic field as a reference for orientation during the migratory journeys, and the magnetic compass in birds was first described in a robin. The European robin genome will allow us to identify what's driving migration in [birds](#), and understand the variability of migration in other bird species as well."

The Turtle dove genome will provide a genetic reference for determining effective population sizes and establishing breeding programmes in efforts to help conserve this threatened bird species.

Dr. Jenny Dunn from the University of Lincoln, said: "To give Turtle doves the best chance of survival in the future, we need to first

understand the pressures that are affecting their population decline. The Turtle dove genome will give insights into how diseases and limited food resources impact on their health and will aid practical [conservation efforts](#) to maximise the genetic diversity of introduced populations."

The European robin and Turtle dove join the Golden Eagle as the first of 25 UK species to have their genetic code sequenced and assembled. The 25 Genomes Project includes species such as grey and red squirrels, blackberry and brown trout.

Dr. Julia Wilson, associate director of the Wellcome Sanger Institute, said: "Genome sequencing has a lot to offer the natural world. Genetic information can bolster the conservation of threatened species and help unravel the tree of evolution in understanding the species we share this planet with."

Provided by Wellcome Trust Sanger Institute

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