

# Birds' migration genes are conditioned by geography

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The genetic make-up of a willow warbler determines where it will migrate when winter comes. Studies of willow warblers in Sweden, Finland and the Baltic States show that "migration genes" differ - depending on where the birds breed in the summer. The willow warblers that breed in southern Sweden migrate to West Africa, while those in northern Sweden, Finland and the Baltic States fly to southern or eastern Africa.

According to a new study led by biologists at Lund University, the key to the willow warblers' differing [migration patterns](#) probably lies in their genes.

The researchers studied the entire genetic make-up of willow warblers that breed in southern and northern Sweden, Finland and the Baltic States. The comparison shows that the genomes are almost completely identical, but there are significant differences between the birds that breed in southern Sweden and those that breed in the northern parts of the country and east of the Baltic.

The differences are restricted to two regions in the genome, where the comparison shows extensive differences in over 200 genes.

"Of these 200 or so genes, there are several that can be considered to be important for migration-related physiological adaptations and others that, according to our present knowledge, have a poorly characterized or unknown function," says Max Lundberg, researcher at Lund University.

According to him and his colleagues, the genetic differences are probably decisive in determining that willow warblers in southern Sweden migrate to West Africa, whereas the more northerly willow warblers head for the south-east of Africa.

Researchers have previously known that the migration behaviour of many birds is strongly determined by genetics. Inherited information in the [genes](#) determines the direction of migration and a schedule that contains information about when and how far the birds are to migrate. The migration over thousands of kilometres also requires inherited physiological adaptations, for example to store and use fat and energy as efficiently as possible. Up to now, however, very little has been known about the specific changes in the genetic make-up that underlie where birds, in this case [willow](#) warblers, migrate.

"Our results represent an important addition to the understanding of migration-related genetics and will guide future studies in the subject," says Staffan Bensch, a professor at Lund University.

**More information:** Max Lundberg et al. Genetic differences between willow warbler migratory phenotypes are few and cluster in large haplotype blocks, *Evolution Letters* (2017). [DOI: 10.1002/evl3.15](https://doi.org/10.1002/evl3.15)

Provided by Lund University

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