practice MAKES perfect

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Bird migration has long fascinated people. Ever since the 'migrate or hibernate' debate was settled, people have wondered how migratory birds navigate between their breeding and wintering grounds, which are often thousands of kilometres apart. Ringing studies show that, in most species, adult birds unerringly locate the same sites year after year. And many young birds undertake their first migration without any guidance from their parents. How do they achieve these amazing feats?

Thanks to a series of elegant experiments, we know that the migratory urge is genetically determined. Indeed, the offspring of migratory Old World cuckoos show that no parental contact at all is required to help guide their first migration. Young birds are 'programmed' to leave their natal grounds and fly in a particular direction until they reach their target latitude. They use a variety of cues to help them orientate during this impressive feat, including the sun, star rotation and the earth's magnetic field.

above *Juvenile Black Kites gradually improve their migratory performance over several years.*

Juvenile birds undertaking their first migration without adult supervision apparently have little ability to compensate for crosswinds. This explains why the majority of vagrants that get blown off course are young birds. The conventional wisdom is that juveniles that successfully reach the wintering area learn the route they followed, adding local landmarks (visual, olfactory and magnetic) to their arsenal of navigation aids, so that on subsequent travels they can offset lateral drift to find their breeding and wintering areas.

This simple, dichotomous model of age-related migratory ability is now being challenged as we can track the routes followed by the same individuals in successive years. Thomas Mueller and colleagues studied the migration of captive-bred Whooping Cranes between their breeding site in Wisconsin and their wintering area in Florida (*Science* 2013, 341: 999–1002). Historically, these cranes travelled in flocks, so juveniles were able to learn the route to follow under the guidance of experienced adults.

This wasn't an option for the hand-reared Wisconsin birds, because their captive parents didn't migrate. Instead, the juvenile cranes were taught to follow an ultralight aeroplane, which led them south to Florida. The cranes were left to their own devices on subsequent trips, and their ability to follow the same route was determined mainly by the age of the oldest bird in the group. The genetic relatedness of all birds in this population was known, allowing the authors to show that genetic similarity played little role in migratory performance in this species. They concluded that spatial learning and the ability to follow a specific migration route develops gradually over several years.

A recent paper by Fabrizio Sergio and colleagues (*Nature* 2014, doi: 10.1038/nature13696) shows a similar pattern in a species that migrates without direct tutelage from more experienced birds. Black Kites from Western Europe funnel through the Straits of Gibraltar and then disperse 3 000 kilometres south across the Sahara to West Africa. Although they often travel in loose groups with other raptors and storks, there is no evidence of close associations between individuals.

Kites of known age from a long-term study population from Doñana National Park in southern Spain were equipped with GPS trackers to record their migration routes over several years. The actual tracks followed varied from year to year, depending on environmental conditions. However, there was selection on the timing of migration because survival and reproduction were correlated with departure date on the northbound migration. As expected, one- to two-year-old juveniles performed the worst, having the most variable departure dates in successive migration events. They also were particularly vulnerable to crosswinds, often being pushed far to the east and necessitating extensive recovery periods en route. Immatures three to six years of age showed considerable improvement over juveniles, but remained inferior to adults aged seven or older.

Migration speed was directly related to age on the southward migration, with adults travelling approximately 280 kilometres per day, immatures 250 kilometres per day, and juveniles 230 kilometres per day. On the northward migration, however, immatures travelled faster than adults. They achieved this by spending more hours flying each day, making fewer stopovers en route, and generally following a more direct track (even though they were less able to compensate for strong crosswinds). But they still arrived later than adults, because they left the wintering grounds later. Their need for speed was probably driven by the desire to try to establish a breeding territory. Immatures were also the last to leave the breeding grounds in autumn, perhaps prospecting likely sites in which to try to establish a territory the following season. However, there were no fitness costs to delaying their departure south in autumn.

Like the Whooping Cranes, the gradual improvement in migratory performance for up to seven years among Black Kites argues for the importance of ongoing learning during successive migrations. Individuals that failed to improve tended to disappear from the population.

These findings are important for assessing the effect of climate change and other human impacts on migrant birds. There are mounting concerns about decreases in migrant bird populations worldwide, especially those undertaking long-distance movements. In order to predict the impacts of global change, we need to focus on the migratory behaviour and survival of young birds, rather than the more easily studied adults.

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The three magazine subscribers who renewed their subscriptions to *African Birdlife* (see September/October 2014 issue) and won Cape Union Mart vouchers are: Paul Rixom, Wilderness, Western Cape (R600 voucher); Barry Caldwell, Port Elizabeth, Eastern Cape (R300 voucher); Scott Patterson, Edenvale, Gauteng (R200 voucher).

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