With climate change, birds are taking off for migration sooner; not reaching destinations earlier

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Migrating birds can and do keep their travel dates flexible, a new study published online on January 28th in *Current Biology* reveals. But in the case of pied flycatchers, at least, an earlier takeoff hasn't necessarily translated into an earlier arrival at their destination. It appears the problem is travel delays the birds are experiencing as a result of harsh weather conditions on the final leg of their journey through Europe.

The discovery may in a sense be good news as far as birds' potential to cope under climate change, but it also highlights the vulnerability of long-distance migrants to environmental conditions in general.

"We have been claiming for a while that migratory birds have difficulties in adapting to climate change because of their rigid and rather inflexible timing of spring migration; in Africa and South America, they cannot know when spring starts at their northern breeding grounds," said Christiaan Both of the University of Groningen in The Netherlands. "This study shows that timing of spring migration is flexible and that birds do respond to climate change, although in a rather indirect way: breeding dates have become progressively earlier, and birds are thus born earlier in the spring. We now show that the effect of early birth is also that the birds migrate early, and migration time has advanced over the last 25 years. The reason that the birds did not advance their arrival is thus not due to a failure to start migration earlier, but because circumstances at passage in Southern Europe have not

improved."

Pied flycatchers are one of the best-studied migratory bird species in the world. With records going back more than 50 years, researchers have been able to investigate the birds' reaction to climate change over time. Pied flycatchers are also forest-dwelling, which makes them particularly interesting because of the strong seasonality in food dynamics in the forest.

"Forests are characterized by a short burst of insects rather early in spring," Both explained. "If the birds miss this insect peak for raising their chicks, they do not produce enough offspring to keep up their population sizes."

Like many migrants, pied flycatchers must tackle a rather remarkable and grueling trek each spring to reach their breeding sites. They spend their winters in Western Africa, anywhere from 5000 to 9000 kilometers from their breeding grounds across Europe and western Siberia. Their wintering grounds in Africa become progressively drier over the course of the season, and by the end of that dry spell, they somehow have to accumulate enough resources to fly about 2000 kilometers across the Sahara desert. The birds recover in Northern Africa before heading to their final destinations.

"Based on our calculations, they are covering the distance from Northern Africa to The Netherlands in about 6 days, and to central Sweden in about 12 days," Both said. Only a small fraction of birds make it through that harrowing journey. For those that do, "in some of the northern or eastern breeding grounds, the first birds often arrive when the breeding areas are still snow-covered. And these birds are strictly insectivorous—earlier arrival probably means death because there are not enough insects to be found." In The Netherlands, circumstances are better at arrival, he added, but the birds there get little or no chance to

rest before breeding and nest building must begin. In most cases during the warm springs of the past decade, birds in The Netherlands have laid their first eggs 7 to 8 days after completing their journey.

Both's team found that the birds left their wintering grounds and made it all the way to Northern Africa 10 days earlier in the year in 2002 than they did in 1980. Still, they didn't arrive at their European breeding grounds any sooner.

The findings imply that "little should be expected in terms of an evolutionary response [to climate change]: any genetic variation in spring departure is likely to be masked by environmental constraints and not translated into earlier arrival," the researchers conclude. "More generally, because climate change often alters temperatures differently at different periods in the year, adaptation of life cycles in animals with a complex annual cycle is not likely to be solved by simple phenotypic or evolutionary responses toward earlier phenology. An adaptive evolutionary response most likely is needed on a whole suite of different traits simultaneously, and it remains to be seen whether evolution can alter species quickly enough to stop their decline."

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