Birds: Soaring is better than flapping

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This is a European bee-eater during flight. Credit: Jorge Rodrigues

Large birds, such as storks, save energy on the flight to their wintering grounds by soaring through the air on thermal currents. Until now, however, we knew nothing about the flight patterns of small migrating songbirds, such as whether they flap their wings or soar and whether these styles of flight allow them to save energy.

Now, a team of scientists at the Max Planck Institute for Ornithology in Radolfzell, Ben-Gurion-University of the Negev, and Hebrew University of Jerusalem have tracked the movement of European bee-eaters (Merops apiaster) along the Africa-Eurasia migration flyway with the help of tiny radio transmitters. Analysing measurements of heart rate, flight speed and flying style, they found out that these small birds also soars. Further, they found that the birds fly just as quickly when soaring as when flapping their wings, while using as little energy as it takes to sit

in its nest. (Published in PloS One 11, November 2010)

When we think of birds gliding majestically through the sky without beating their wings, we imagine large species like storks or hawks searching silently for prey. The flight patterns of large birds have been well studied. Ornithologists know how quickly and how far they fly, and how often they flap or soar while in flight. However, much less is known about these patterns in smaller birds. Until recently, it was thought that small birds were not able to glide and save energy in the same way, due to their smaller musculature and wings. Gliding would reduce the flight speed, so it was assumed.

In a recently published study, scientists at the Ben-Gurion University of the Negev and the Hebrew University of Jerusalem, along with Martin Wikelski, director of the Max Planck Institute for Ornithology in Radolfzell, determined for the first time the energy use of small songbirds in the wild. The researchers attached tiny radio transmitters onto the backs of European bee-eaters (Merops apiaster) caught in Israel to record their wing beat frequency, heart rate and flight speed. In order to estimate the birds' energy use, they determined in the laboratory that the birds' heart rate increased with oxygen consumption, and therefore the heart rate measurements indicate the birds' energy use while flying.

"Analysing the data, we were surprised to see that bee-eaters often switch between soaring and flapping, and also that the frequency of heart beats while gliding was only as half what it was while flapping," says Martin Wikelski. "The birds needed the same amount of energy while soaring or gliding as they did when they were resting on a branch or in a nest." In contrast, previous studies with larger birds showed that energy use was at least 30 percent higher when the birds were gliding than when they were resting. Thus, soaring and gliding flight means a considerably higher savings of energy for small migrating birds than for larger species. In addition, the scientists did not find any loss of flight speed

when birds were gliding.

The results of this study not only provide an answer to the question of whether small migrating birds can soar during their long journey, but also show that they travel just as fast while doing so and use less energy.

More information: Nir Sapir, Martin Wikelski, Marshall D. McCue, Berry Pinshow, Ran Nathan, Flight modes in migrating European bee-eaters: Heart rate may indicate low metabolic rate during soaring and gliding, *PloS One* 5(11): e13956. doi:10.1371/journal.phone.0013956

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