Flying without wings: Losing feathers has a detrimental effect on migrating birds

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The researchers used a trained jackdaw in a wind tunnel to study flight. Credit: Aron Hejdström

Birds that moult at the wrong time of the year could be disadvantaged, according to a study by scientists at Lund University, Sweden. Birds

depend on a full set of feathers for maximum efficiency when flying long distances, but the study shows that moulting has a detrimental effect on their flight performance.

The researchers trained a jackdaw to fly in a wind tunnel and measured different types of drag experienced by the bird. "We expected the bird not to be able to glide at the lowest speeds that it could glide at before moult and our results confirmed this", says Marco Klein Heerenbrink, who is involved in the research.

The results imply the bird could not fully compensate for the missing feathers during moult. This suggests that if a migratory bird departs prematurely before it has fully moulted, it is likely it will need more energy to make the journey and may need more stopovers too.

The annual loss of flight feathers poses a potential challenge to birds due to the resulting reduced wing area and altered wing shape. However, birds have extraordinary flexibility in wing shape, which is thought to help maximise the efficiency of their wings and may compensate for missing flight feathers. "Understanding how moult affects the flight of a bird, can tell us something about the different moulting strategies birds use," says Klein Heerenbrink.

"In the wind tunnel, we can set a flight speed for the bird to fly at", he says. "The bird will try to stay in place relative to the walls of the wind tunnel. This means we can vary the speed, and the bird will attempt to adjust to this. For gliding flight we tilt the wind tunnel. This gives a vertical component to the airflow, simulating descending flight. If the bird can hold its position, this means that its weight is balanced by the aerodynamic forces (lift and drag)."

To compensate for the missing feathers, the bird needs to either move the wings forward or unload weight from the tail. There is a limit to how

far the bird can move the wings forward and unloading from the tail requires increasing the loading on the main wings, which are already struggling due to the moult gaps. "So the bird has a difficult time finding the right balance," says Klein Heerenbrink.

Long distance migrants benefit from having a complete set of high quality flight feathers on their departure and this study implies it would be particularly bad to start migrating while certain feathers (called the outer primaries) are missing.

More information: This work will be presented by Marco Klein Heerenbrink (Lund University, Sweden) at the annual meeting of the Society for Experimental Biology (SEB) in Prague on Thursday 2nd July 2015.

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