Migratory birds burn protein as in-flight water source, researchers find

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(PhysOrg.com) -- Researchers from The University of Western Ontario have discovered that migratory songbirds burn their own muscles and organs to provide a water source during long, non-stop flights, which sometimes cover distances in the thousands of kilometres.

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The new findings, made by doctoral candidate Alexander Gerson and Dr. Christopher Guglielmo from Western's Department of Biology and Advanced Facility for Avian Research (AFAR), were published today in

journal *Science*.

At AFAR, the world's first-ever hypobaric climatic wind tunnel for bird flight, researchers like Gerson and Guglielmo now have a previously unattainable opportunity to study the physiology and aerodynamics of birds in flight.

For this study, the total fat and total lean mass of a bird was measured in a Quantitative Magnetic Resonance (QMR) machine immediately before and after flights under either humid or dry desert-like conditions – sometimes lasting five hours. This innovative non-invasive method gave Gerson and Guglielmo their revolutionary results.

"For years, scientists have studied stop-over areas and resting spots during migration but actually knowing what birds do in flight and being able to study their physiology has always proven tricky, for obvious reasons. But now at AFAR this type of investigation is a possibility," says Gerson, who served as lead investigator on the paper titled, "Flight at Low Ambient Humidity Increases Protein Catabolism in Migratory Birds".

Guglielmo says the ultimate question biologists have regarding flight is how birds evolved to overcome environmental challenges, one of those challenges being water loss. "We've shown that conditions in the atmosphere actually affect fuel metabolism and water balance during flight. How this happens mechanistically, and what happens at simulated altitude remain questions for our future work".

"These animals are exercising extremely hard when they are flying and they are breathing a lot. If you have ever been running or biking on a hot day, you know the first thing that makes you stop is you run out of water. And these birds can't stop," explains Gerson. "So they have evolved this mechanism, which we show in our paper, where they

actually burn their muscles and their organs because they are a good source of water. And in the process, they release a lot of water. So in essence, that process becomes the water source."

More information: Paper: "Flight at Low Ambient Humidity Increases Protein Catabolism in Migratory Birds," by A.R. Gerson; C.G. Guglielmo at University of Western Ontario in London, ON, Canada.

Provided by University of Western Ontario

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