

# Flapping protective wings increase lift

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New research from Lund University in Sweden reveals the value of carrying two layers of wings around. The researchers studied dung beetles and the way their protective forewings actually function. These wings do not only protect but also help the beetles to lift off from the ground – albeit at a cost.

The forewings of beetles, the elytra, are hardened structures which protect the insect's flying wings and body. The function of the forewings in [flight](#) has been questioned, which is what prompted researchers at Lund University's Department of Biology to study how the forewings and the underlying flying wings work in [dung beetles](#). The researchers studied the air flow created by the wings when the beetles fly in a wind tunnel. The wind tunnel in Lund is one of a few of its kind in the world.

"The results show that the forewings, which are held out and flap during flight, generate lift, helping the beetles to stay airborne", says Christoffer Johansson Westheim, researcher at Lund University.

The study also shows, however, that the beetles are less effective at generating lift than other animals, as a result of their forewings negatively affecting their flying wings. Thus the protection afforded by the hardened forewings comes at a cost in the form of lower efficiency in flight. One conclusion to be drawn from this is that if the flying wings alone could provide enough power to keep the insect in flight, the forewings would fold back over the body while the beetle is flying, which is precisely what happens in some species. The study is the first of its kind on beetles, but the researchers consider that the results could

apply generally to beetles whose flying [wings](#) flap behind forewings – despite the fact that the dung beetles are a fairly extreme case, with a body weight of 5-7 grams and a wingspan of around 15 centimetres.

The beetles used in the current study were captured in South Africa, where they normally fly at night over open terrain, on the hunt for dung. Their flight speed is high and the dung beetles are hardly known for their manoeuvrability. They often miss the dung they are looking for and land some way away from it, but they prefer to walk the last distance rather than attempt a more accurate landing. The research study is part of a project aiming to understand the adaptations of various animals to flight, and how the animals' different origins affect their capacity to fly.

Provided by Lund University

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