Study finds bumblebees able to fly as high as Mount Everest

5 February 2014, by Bob Yirka

Image credit: Wikipedia.

(Phys.org) —A pair of researchers has found that alpine bumblebees are able to fly at altitudes in excess of twenty nine thousand simulated feet—higher than Mount Everest. In their paper published in the journal *Biology Letters*, Michael Dillon and Robert Dudley, of the University of California and the Smithsonian Tropical Research Institute, respectively, describe experiments they conducted with alpine bumblebees in pressure chambers and their theories as to why the bees have such high flying skills.

Bees aren't the best flyers, of course, they can zig-zag around and hop from flower to flower, but they could never compete with most birds or many other insects for that matter. But they are able to do something remarkable nonetheless—fly at extremely high altitude. To discover this remarkable ability, Dillon and Dudley traveled to the mountains of Sichuan, China; once there they captured several specimens of alpine bumblebees who normally live and fly at altitudes of over 10,000 feet. They put the bees (one at a time) into a pressure chamber and then pumper air out to simulate various altitudes. In so doing they found that two of the bees were able to fly around in the chamber in conditions that simulated 29,527 feet.

To better understand how it was that the bees were able to fly under such conditions, each was filmed with a high speed camera and audio recorded (to measure wing beats). In studying the sound and video, the researchers found that the bees did not increase the speed of wing flapping but instead moved them in much deeper arcs, allowing for more scooping of air with each beat.

The research duo suggest the bees high-flying technique is more likely put to a different use in the their natural environment—it would help in moving faster to escape being eaten, and even more perhaps in carrying heavy loads of nectar.

Still a mystery is how the bees were able to maintain their wing flapping with far less oxygen to breathe—their metabolisms normally run much faster than most creatures—with less oxygen in the pressure tank, they should have literally run out of breath. Dillon and Dudley plan to conduct more experiments with the bees to answer that question.

More information: Surpassing Mt. Everest: extreme flight performance of alpine bumble-bees, Published 5 February 2014. DOI: 10.1098/rsbl.2013.0922

Abstract

Animal flight at altitude involves substantial aerodynamic and physiological challenges. Hovering at high elevations is particularly demanding from the dual perspectives of lift and power output; nevertheless, some volant insects reside and fly at elevations in excess of 4000 m. Here, we demonstrate that alpine bumble-bees possess substantial aerodynamic reserves, and can sustain hovering flight under hypobaria at effective elevations in excess of 9000 m, i.e. higher than Mt. Everest. Modulation of stroke amplitude and not wingbeat frequency is the primary means of compensation for overcoming the aerodynamic challenge. The presence of such excess capacity in a high-altitude bumble-bee is surprising and

suggests intermittent behavioural demands for extreme flight performance supplemental to routine foraging.

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