

Muscular head pumps give long-proboscid fly the edge

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Credit: Florian Karolyi

A long-proboscid fly with an extra-long, tongue-like proboscis might seem to take extra-long to feed on a flower, but it actually has an advantage over its counterparts with average sized nectar-sipping mouth parts. It can suck up almost all nectar available in a flower in one go, because it has more efficient suction pumps in its head, says Florian Karolyi of the University of Vienna in Austria, about a study he and his team conducted in South Africa's Namaqualand region. The findings are published in Springer's journal *Naturwissenschaften - The Science of Nature*.

The extremely long, thin proboscis of insects from the genus *Prosoeca* (Nemestrinidae) evolved as an adaptation to feeding from long, tubular flowers. The fly inserts its proboscis into the flower and uses it like a straw to suck up [nectar](#). A suction pump in its head creates a pressure gradient along the proboscis, which allows nectar uptake. The nectar with the highest sugar content offers the greatest energy reward. Biophysical reasoning, however, indicates that the exponential increase of viscosity that goes hand in hand with higher sugar concentrations would make it more difficult to transport sugar-rich liquids through a narrow food canal.

Because proboscis length differs visibly among flies from the same species, Karolyi and his team therefore wondered if flies with longer "tongues" spent more time feeding on a flower because they had more trouble sucking up the nectar. This would mean that they expended more energy in the process of gathering nectar. To study this, the researchers focused on the parasitoid nemestrinid fly genus *Prosoeca* that feeds on nectar of the Iridaceae, *Lapeirousia oreogena*. The team captured the insect's behavior on camera, measured the length of its body and proboscis and used X-ray microtomography for investigations of the head muscles.

They found the reverse to be true. A longer-proboscid fly sports a more

efficient two-part suction pump, while [proboscis](#) length and suction pump muscle volume go hand in hand. The fly is thus able to sip up more nectar in a single visit. This allows the insect to gain a possible advantage over other flies with proboscises of an average length. Analysis of the long-tongued fly's anatomy also suggests that the ancestors of Nemestrinidae might have been blood-sucking insects.

"Flies belong to one of the most important but often underestimated groups of flower-visiting and pollinating insects. Our results indicate that the *Prosoeca* species represents a highly adapted and efficient nectar feeder," says Karolyi.

More information: Karolyi, F. et al. (2013). Time management and nectar flow: flower handling and suction feeding in long-proboscid flies (Nemestrinidae: *Prosoeca*), *Naturwissenschaften - The Science of Nature* DOI: [10.1007/s00114-013-1114-6](https://doi.org/10.1007/s00114-013-1114-6)

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