

Study explains the unique sound production by Death's head hawkmoths

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A Death's head hawkmoth is pictured. Credit: Gunnar Brehm/FSU Jena

Their arrival used to be perceived as a bad omen: Because of their skull-like markings on their backs the Death's head hawkmoths (*Acherontia atropos*) were dreaded. And yet, the big moth with the dark forewings

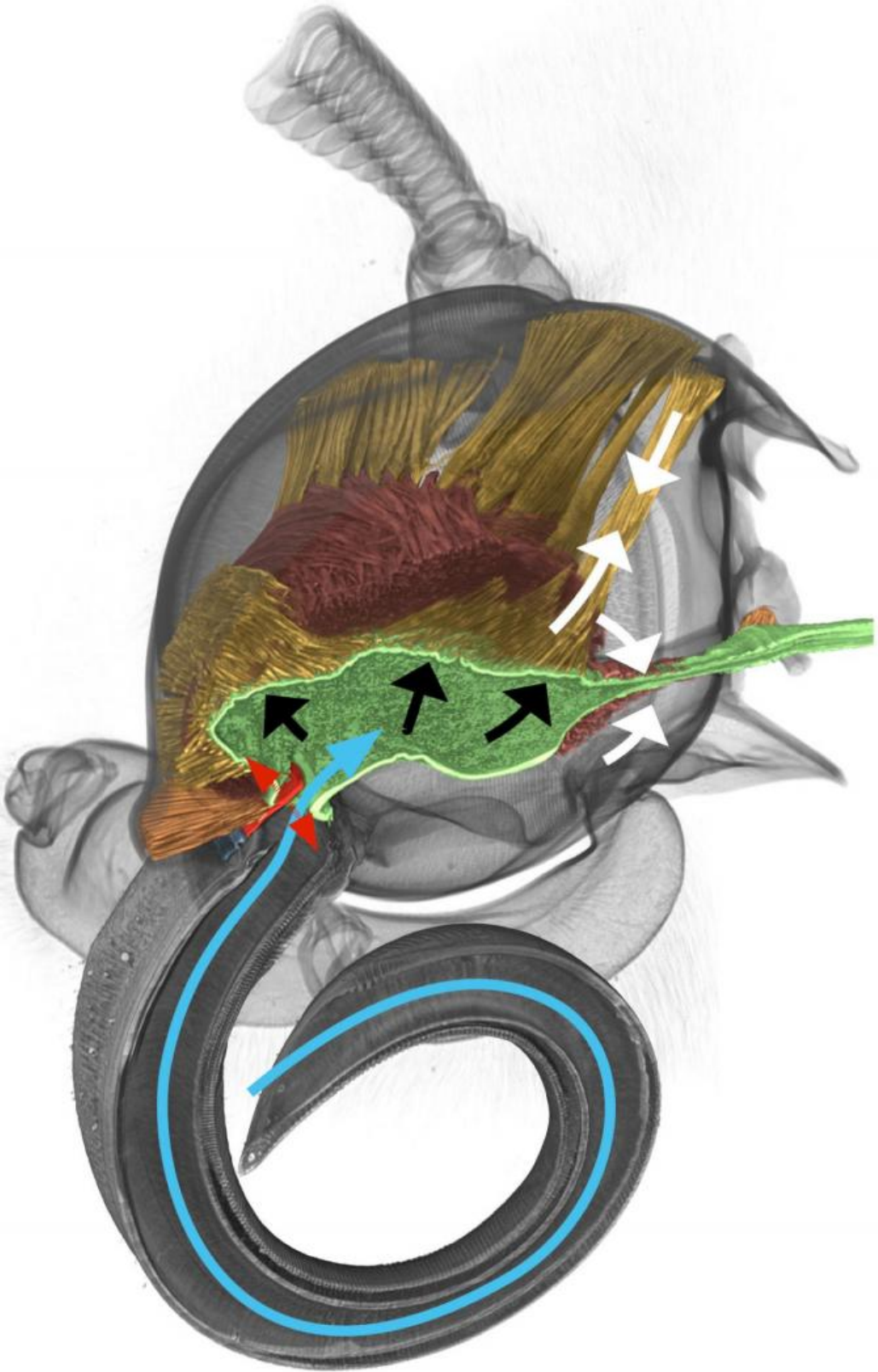
and the beige-yellow marking is unusual for more than one reason: The animals migrate annually from Africa to Europe and visit beehives from which they steal honey with their short proboscides. If the moths are irritated, they produce series of short squeaks. Scientists from the Universities Jena and Kiel, the Ernst-Abbe-Hochschule Jena and the University Hospital Jena (all Germany) looked into their unique way of producing sounds. The results of the joint research have now been published in the science magazine *The Science of Nature*.

"The Death's head hawkmoth produces its sounds in a similar way to an accordion," explains Dr. Gunnar Brehm, who was in charge of the research. The folded top of the moth's pharynx is pulled up by muscles. Thereby a vacuum is created, so that air is drawn in. The air then streams in through the moth's proboscis and mouth and thus triggers the vibration of a small lobe, whereby a sound is produced. Afterwards the air is being expelled, whereby another whistling sound is produced. The inflation and deflation though happens much quicker than in an accordion - it just takes a fifth of a second.

The team of scientists looked into the production of these sounds with the help of computer tomographs, a mammography device and with [high speed cameras](#). The pictures impressively show the inside of the head of the moth, which mainly consists of the pharynx and muscles. In addition, the moths were examined in an acoustics laboratory, where the scientists discovered that the moths create sounds that can be heard by humans as well as in the ultrasound range to over 60 kilohertz. The moth's proboscis thereby serves as the resonating body. With their squeaks, the scientists assume, the moths are trying to scare off predators. This at least works with humans, as the zoologist Brehm notes: Those who unknowingly touch one of the moths, withdraw their hand intuitively once the moth starts to move and squeak. This could be a small, selective evolutionary advantage. "It actually makes you wonder why other [moths](#) and butterflies don't squeak, because anatomically Death's head hawkmoths

are very similar to their non-squeaking relatives," according to Brehm.

The reason for the scientific co-operation was the current special exhibition at the Phyletic Museum of the Jena University which is titled 'Folds in Nature and Technique'. The show also points out parallels between nature and technique using the example of musical instruments. The exhibition will be running until the beginning of September in Jena.



This is the 3-D-reconstruction of a head of a Death's head hawk moth based on computer tomograph data. The white arrows mark the movements of the muscles when air is inhaled. In the process, the front gullet (green) is extended and air (blue arrow) is sucked in through the thereby created vacuum . The air passes a flap, the so-called epipharynx (red). The flap is pressed against the incoming air by muscle power. As a consequence the flap starts to vibrate in the air stream and a sound is produced. Credit: Phyletic Museum/FSU Jena

More information: *The Science of Nature*, [DOI: 10.1007/s00114-015-1292-5](https://doi.org/10.1007/s00114-015-1292-5)

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