American Honey Producers Association

Check out all the

LATEST NEWS

on our website:

AHPAnet.com

American Honey Producers Association

Annual Conference & Trade Show

December 4 - 7, 2023

Monday - Thursday

Marriott Mission Valley Hotel

PHYS.ORG

New study uses video to show honey bees switch feeding mechanisms as resource conditions vary

by Stephanie Baum
August 21, 2023

Within nature, the compatibility of animals' feeding mechanisms with their food sources determines the breadth of available resources and how successfully the animals will feed. Those who feed on the nectar of flowers, such as honey bees (Apis mellifera), encounter a range of corolla depths and sugar concentrations. The nectar of flowers comprises the prime source of energy and water for honey bees, who are dominant pollinators throughout the world.

Regional climate conditions contribute to plants producing nectar in various volumes and concentrations, and evaporation and pollinator feeding frequently leaves the nectar reservoirs of flowers below capacity. Thus, honey bees' ability to feed "profitably" under naturally varying resource conditions is advantageous.

An international research team has studied the feeding mechanisms of honey bees and has reported on how these bees switch between using suction and lapping to derive maximum benefit from flowers of varied sizes and concentrations of sugar. The team's study, titled "Honey bees switch mechanisms to drink deep nectar efficiently," is published in Proceedings of the National Academy of Sciences(PNAS).

Prior research has studied suction and lapping feeding behaviors in honey bees, but this paper notes that earlier studies have included an "unnatural condition of virtually unlimited nectar supplies. Such large nectar pools are rare in the flowers they visit in the wild."

In this study, the team shows that during feeding, the distance between the honey bees' mouthparts and the nectar, as well as the concentration of sugar within the nectar, are determining factors in whether the bees procure it via suction or lapping.

The feeding mechanism of honey bees consists of a long, thin proboscis that includes a pair of labial palpi inside a pair of elongated galea (lobes). This structure serves as a feeding tube, and the bee's hairy glossa (tongue) is situated inside.

For this study, the researchers pre-starved honey bees, fed them sucrose solutions of 10%, 30%, and 50% w/w contained in capillary tubes, and used high-speed videography to record the bees' feeding behavior with each. Blue dye, which had no nutritional effect, was added to each solution for visual contrast, and the bees tolerated it well.

At the 10% w/w concentration, bees inserted their proboscides deep into the solution and extended their tongues beyond the proboscis tubes to suction the liquid until they could no longer reach the meniscus.

At 30% w/w—an approximate concentration commonly found in nature, according to the research—the bees began by quickly lapping the solution, slowing down as the liquid level receded, and gradually switched to suction until the liquid receded beyond their reach.

At 50% w/w, the bees lapped the solution, beginning rapidly and slowing as the liquid receded, and did not transition to suction at all. Notably, the bees showed a smaller decrease in lapping frequency at 50% w/w than during their transitions to suction at 30% w/w.

The researchers conclude that short-distance lapping helps honey bees most efficiently gather nectar to fill the maximum collection capacity of their tongues, but lapping at longer distances would be less efficient than suction due to more time needed for capillary filling. The decreased lapping frequency observed with the thickest of the tested nectars indicates an allowance for the capillary rise needed for maximum tongue-saturation capacity.

In summary, regardless of nectar depth, lapping is a better strategy for honey bees collecting nectars of high sugar concentrations, and suction is faster for those with lower concentrations of sugar.

The team also believes that the feeding mechanism switching behavior may be a unique ability among this species. Noting a previous study published in Soft Matter in which bumble bees (Bombus terrestris) did not switch between feeding behaviors with nectars of varying viscosities, the team in this study also used a solution of 10% w/w with bumble bees to test whether this would change according to their distance from the liquid, but it did not; the bumble bees only exhibited lapping.

Furthermore, previous research with orchid bees (Euglossini) has shown that they mainly use their long proboscides to procure nectar via suction, but that they have exhibited both suction and lapping with small amounts (films) of nectar. However, there is currently no evidence to show that orchid bees make this switch based on corolla depth or nectar properties.

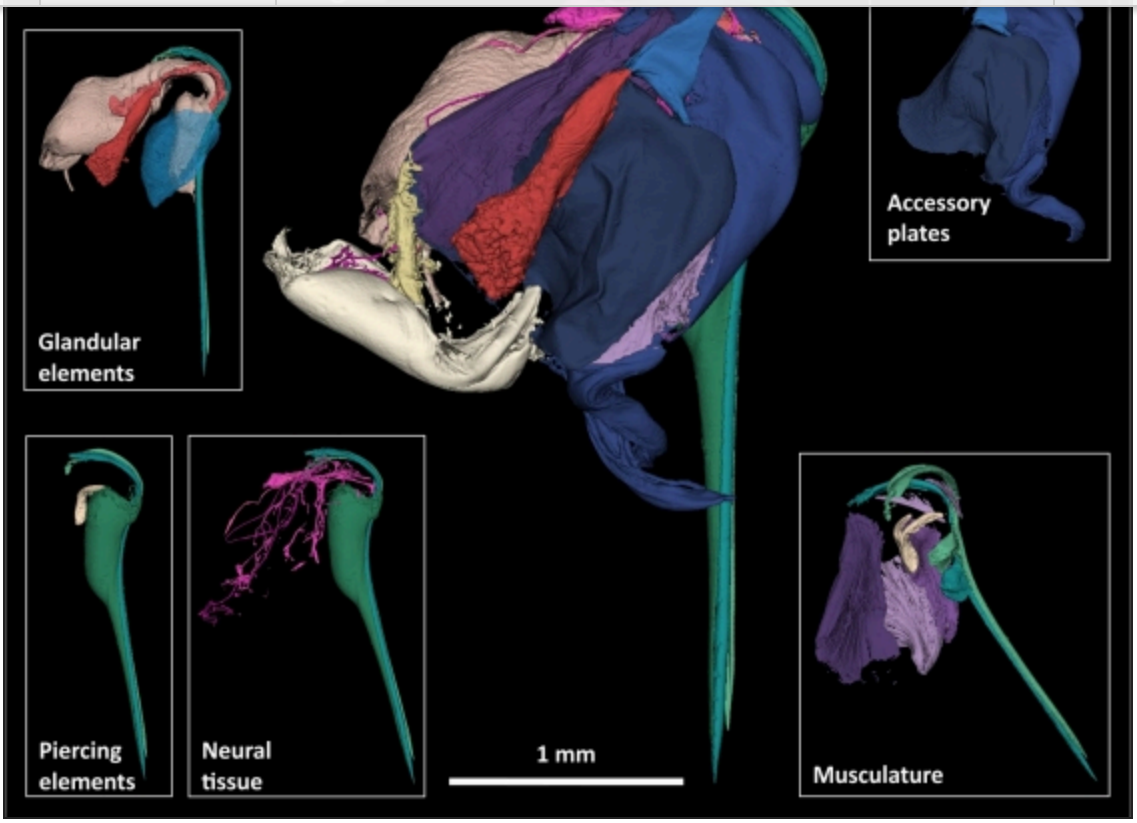
The research team included members from China's Sun Yat-Sen University School of Aeronautics and Astronautics and School of Advanced Manufacturing, The University of Washington Department of Biology and Burke Museum of Natural History and Culture in the U.S., South Africa's University of Pretoria Department of Zoology and Entomology; Belgium's Université libre de Bruxelles, Nonlinear Physical Chemistry Unit and Université de Mons, Laboratoire InFlux; and Kiel University's Department of Zoology in Germany.

To see the videos: https://phys.org/news/2023-08-video-honey-bees-mechanisms-resource.html

---

UNSW SYDNEY

Researchers deconstruct bee stinger to help develop tiny medical devices



17 Aug 2023

The anatomy of bee stingers could help lead to advancements in the emerging field of micro medical devices.

New research deconstructing the anatomy of a honeybee stinger could help pave the way for a future generation of miniaturised medical devices used for drug delivery in humans.

Recently published in the journal iScience, the high-resolution 3D deconstructions produced by UNSW Canberra researchers reveal the unique properties of the bee's powerful defence mechanism, including the numerous barbs responsible for why the stinger is able to work its way deeper into the skin while pumping venom after stinging.

According to lead researcher, Associate Professor Sridhar Ravi, the autonomous delivery mechanism of the bee stinger has numerous characteristics that could help researchers develop small-scale and minimally intrusive medical devices in the future.

"We have never before produced images with this level of detail, and they have given us tremendous new insights into the functions of the bee stinger," A/Prof. Ravi said. "Because of these clearer and more precise images, we have uncovered potential opportunities in medical micro drilling, micro-pumps and much more targeted drug delivery."

A/Prof. Ravi said there is also the possibility of developing improved 'anchoring' methods that will allow medical devices or adhesive patches to hold onto the skin without the need for chemical adhesives which can cause irritation or be unviable on moist surfaces, like the inside of the body.

“Previous studies have shown that a bee stinger is very good at piercing skin with minimal force, but it is very hard to remove once it is embedded,” A/Prof. Ravi said. “This is a really useful property for medical devices that need to be very precisely inserted without damaging surrounding tissues.”

The 3D deconstructions have also led to the UNSW Canberra research team developing prototype devices that simulate a bee stinger’s unique piercing and pumping actions.

“A bee’s stinger must be able to firstly pierce skin without buckling, and it must safely detach and coordinate the muscular contractions that generate stinging,” said Dr Fiorella Ramirez Esquivel, the project’s other primary researcher. “This means both working itself deeper into tissue and pumping venom quickly and efficiently.”

Dr Ramirez Esquivel said because a bee stinger is so small – just approximately 2mm in length – the research team had to use a combination of techniques to observe the stinger and decode how it works.

“[The 3D de-constructions] have been fantastic because they allowed us to 3D print the whole stinger and blow it up to a scale where we can move all the parts around to figure out how they work together,” Dr Ramirez Esquivel said. “High-speed filming the stinger in action was also a significant challenge, but it has been instrumental in understanding how it functions.”

Dr Ramirez Esquivel said that understanding the evolution of the bee’s stinger is a great example of how we can make progress by learning more about other animal and plant species.

“Bee stingers are incredibly complex structures with numerous moving components that also happen to be incredibly effective and efficient at what they do,” Dr Ramirez Esquivel said. “The more we look into it, the more we find amazing intricacies related to how it does its job.”

The researchers say they are excited by the potential of different bio-inspired designs in medicine.

“As advanced manufacturing makes strides in what it is possible for us to make, natural materials like the insect cuticle will become more and more relevant to the design of soft robots and microdevices,” Dr Ramirez Esquivel said.

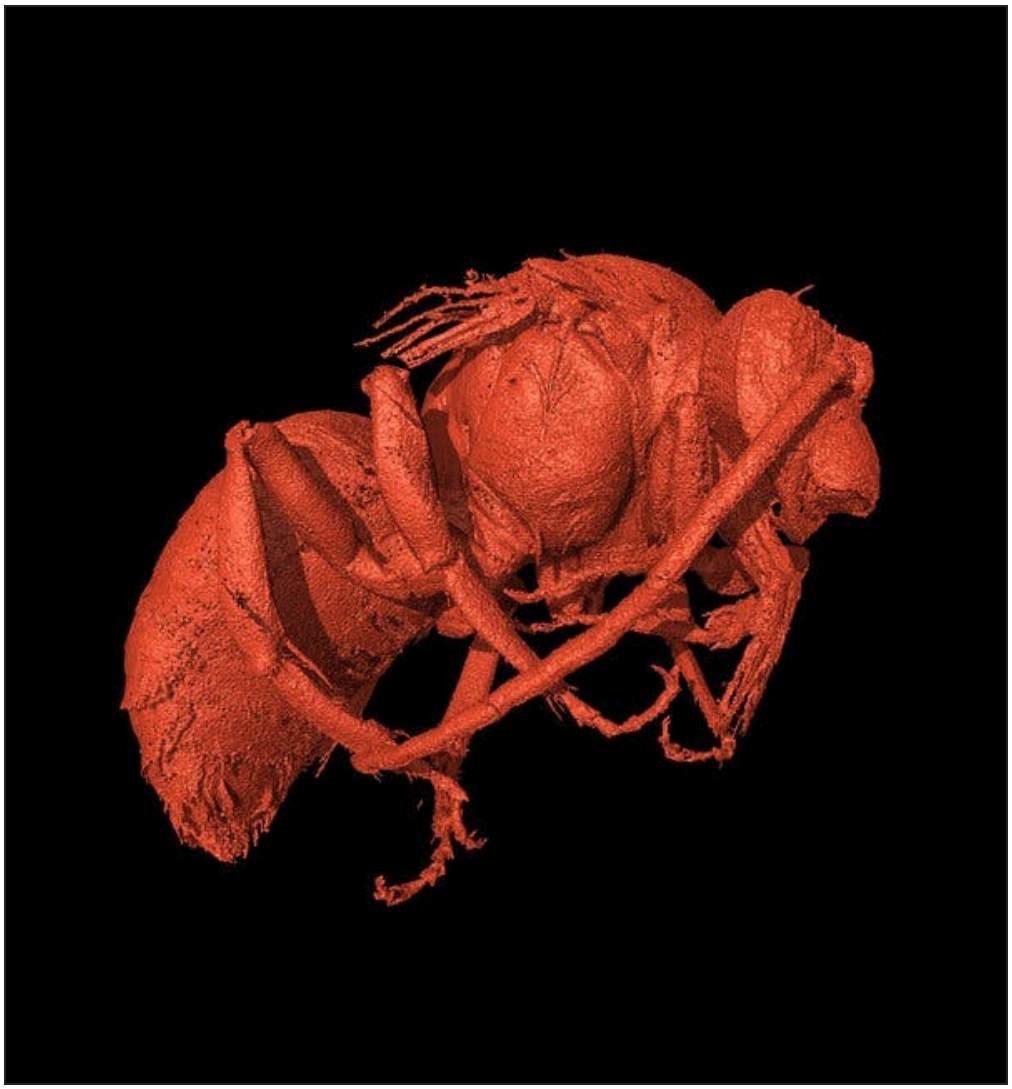
https://newsroom.unsw.edu.au/news/science-tech/researchers-deconstruct-bee-stinger-help-develop-tiny-medical-devices

---

The New York Times

These Bees Have Been Mummified in Their Cocoons for 3,000 Years

Insects rarely survive in fossilized form, but a strange series of events somehow killed and preserved these brooding bees for millenniums.



Using X-ray microcomputed tomography, scientists could look inside the brood cells and see the bees' long antennae, indicating that they were male.Credit...Federico Bernardini/ICTP

The eyes and head of a bee extracted from the sediment.Credit...Andrea Baucon

“The exoskeleton of bees (and insects in general) is made of chitin, a cellulose-like biopolymer that quickly is decomposed after the animal dies,” Mr. Neto de Carvalho wrote in an email.

What bees typically leave are trace fossils or ichnofossils — imprints frozen in time of bodies, abandoned or active nests, or old burrows.

The cocoons that the team discovered were lined and sealed with a silk-like thread produced by the mother bee. This thread was a waterproof, organic polymer — a mixture of material and structural engineering — that had fostered the preservation of the bees inside. Mr. Neto de Carvalho said that this “organic mortar” had protected the cells from the environment, shielding the delicate chitin from bacterial activity and decomposition.

Sealed in their cocoons, the bees mummified, preserving their body shape and distinctive features. The team used X-ray microcomputed tomography — a type of CT scanning that captures detailed images of small things like insects — to examine the mummified bees without destroying the protective cocoons.

"I think what makes this study so cool is that you do have the bee in there and you can see that it's in the tribe Eucerini, which are the long-horned bees," said Bryan Danforth, an entomologist at Cornell University who was not involved in the study. "If you look at the CT image, you can see the long antennae, so you know it's a male."

Usually, determining what created a fossilized brood cell is tricky. "There are other animals that burrow into the soil that might create a thing that looks like a bee nest," Dr. Danforth said.

The discovery, he added, is "the first ichnofossil that actually contains the bee inside of it."

As for what killed the bees, the researchers considered flooding or a prolonged drought that might have limited food supplies. But the pollen stored inside the cells told the team that the bees had plenty of food (meaning they didn't die by starvation).

Read the rest of the article here: https://www.nytimes.com/2023/08/20/science/mummified-bees-cocoons.html

---

Raw Honey from Argentina, Brazil, India, and Vietnam Injures U.S. Industry, Says USITC

May 11, 2022
News Release 22-058
Inv. No. 731-TA-1560-1562 and 731-TA-1564 (Final)
Contact: Jennifer Andberg, 202-205-1819

Raw Honey from Argentina, Brazil, India, and Vietnam Injures U.S. Industry, Says USITC

The United States International Trade Commission (USITC) today determined that a U.S. industry is materially injured by reason of imports of raw honey from Argentina, Brazil, India, and Vietnam that the U.S. Department of Commerce (Commerce) has determined are sold in the United States at less than fair value.

Chair Jason E. Kearns, Vice Chair Randolph J. Stayin, and Commissioners David S. Johanson, Rhonda K. Schmidtlein, and Amy A. Karpel voted in the affirmative.

As a result of the Commission's affirmative determinations, Commerce will issue antidumping duty orders on imports of this product from Argentina, Brazil, India, and Vietnam.

The Commission made a negative critical circumstances finding with regard to imports of this product from Argentina. The Commission made an affirmative critical circumstances finding with regard to imports of this product from Vietnam.

The Commission's public report *Raw Honey from Argentina, Brazil, India, and Vietnam* (Inv. Nos. 731-TA-1560-1562 and 731-TA-1564 (Final), USITC Publication 5327, May 2022) will contain the views of the Commission and information developed during the investigations.

The report will be available by June 20, 2022; when available, it may be accessed on the USITC website at: *http://pubapps.usitc.gov/applications/publogs/qry_publication_loglist.asp*.

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, DC 20436

FACTUAL HIGHLIGHTS
Raw Honey from Argentina, Brazil, India, and Vietnam
Investigation Nos.: 731-TA-1560-1562, 1564 (Final)

Product Description: Honey is a sweet, viscous fluid produced from the nectar of plants and flowers which is collected by honeybees, transformed, and combined with substances of their own, and stored and left in honeycombs to mature and ripen. Raw honey is honey as it exists in the beehive or as obtained by extraction, settling and skimming, or straining.

Status of Proceedings:

1. Type of investigation: Final antidumping duty investigations.

2. Petitioners: American Honey Producers Association ("AHPA"), Bruce, South Dakota; and Sioux Honey Association ("SHA"), Sioux City, Iowa.
3. USITC Institution Date: Wednesday, April 21, 2021.
4. USITC Hearing Date: Tuesday, April 12, 2022.
5. USITC Vote Date: Wednesday, May 11, 2022.
6. USITC Notification to Commerce Date: Tuesday, May 31, 2022.

U.S. Industry in 2020:

1. Number of U.S. producers: approximately 30,000 to 60,000.
2. Location of producers' plants: North Dakota, South Dakota, California, Texas, Montana, Florida, Minnesota, and Michigan
3. Production and related workers: 1,360.
4. U.S. producers' U.S. shipments: $302 million.
5. Apparent U.S. consumption: $690 million.
6. Ratio of subject imports to apparent U.S. consumption: 42.8 percent.

U.S. Imports in 2020:

1. Subject imports: $296 million.
2. Nonsubject imports: $93 million.
3. Leading import sources: Argentina, Brazil, India, Vietnam.

https://www.usitc.gov/press_room/news_release/2022/er0511ll1935.htm

---

What does this mean for beekeepers?

The decision will be transmitted to the Commerce Department, which will issue antidumping duty orders shortly. In addition, the Commission reached an affirmative critical circumstances determination against Vietnam. This means that U.S. Customs will collect antidumping duties on entries going back an additional 90 days prior to the preliminary antidumping duty determination —from August 28, 2020, forward. This is an important additional finding, and one that the Commission rarely makes.

These results should continue to ensure that the American honey producer gets the fair prices they deserve.

We truly appreciate all of the donations that we have received to cover legal fees.

The good fight isn't over yet, however, and we still need your support.

To donate to the Antidumping Fund, please contact

Or donate on our secure website: https://www.ahpanet.com/donations-1

American Honey Producers Association

AHPA App

As AHPA continues to work on behalf of all beekeepers, one of our initiatives is advocating with the FDA in Washington D.C. to update honey labeling guidelines. As part of this effort, we need your help to collect pictures of honey labels from around the United States. Our goal is primarily to find honey that is mislabeled according to current FDA guidelines. Secondarily, we need examples of any labels which misrepresent country of origin or are purposefully confusing to consumers so that we can advocate for positive changes and updates.

Search the App Store or Google Play for "AHPA app". We need to collect as many pictures from honey on the store shelf as possible. Please take a few minutes to help collect this data.

Please do not respond to this message.
This email is sent from an unattended mailbox

The materials and information included in this electronic newsletter are provided as a service to you and do not reflect endorsement by the American Honey Producers Association (AHPA). The content and opinions expressed within the newsletter are those of the authors and are not necessarily shared by AHPA. AHPA is not responsible for the accuracy of information provided from outside sources.

This email was sent to <<Email Address>>
why did I get this? unsubscribe from this list update subscription preferences
American Honey Producers Association · PO Box 435 · Mendon, Ut 84325 · USA