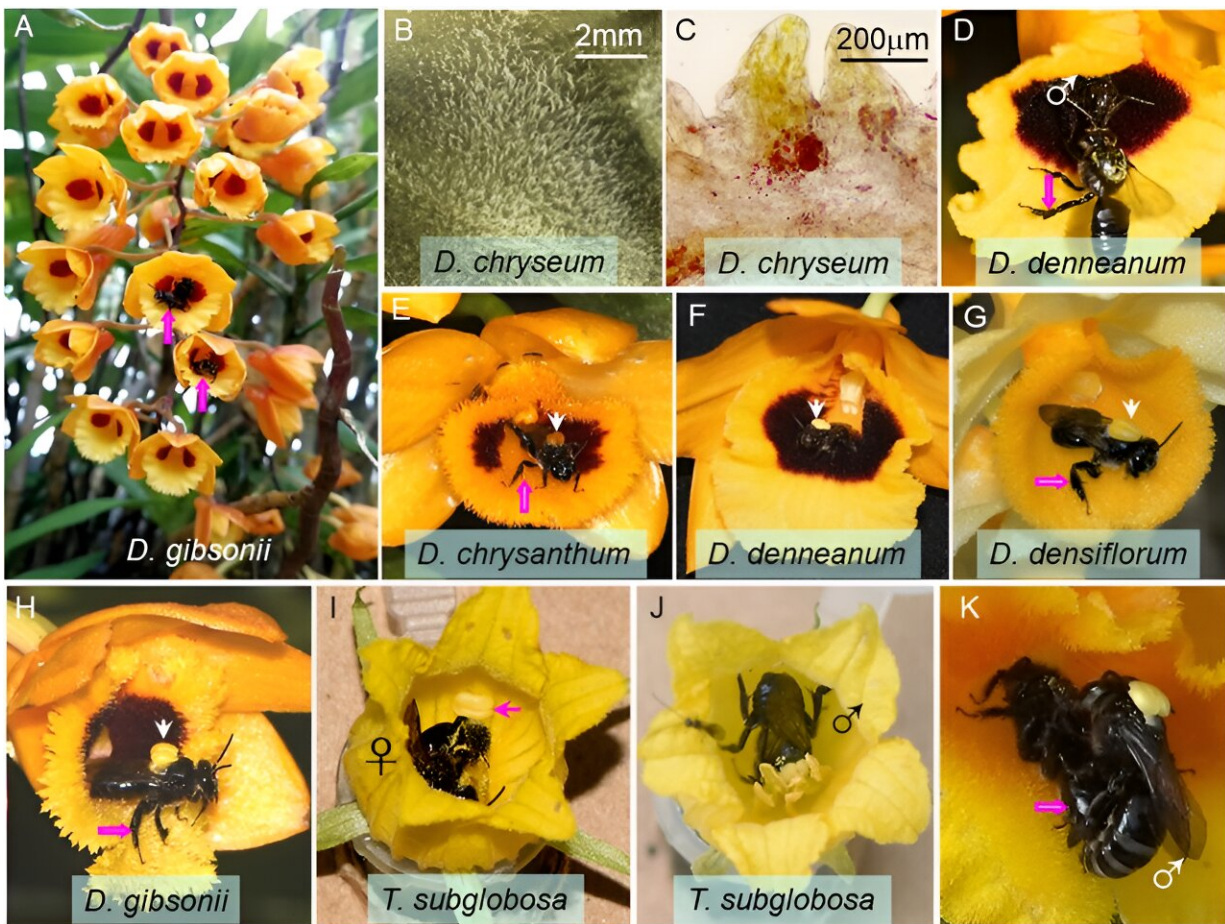


A new oil flower/oil bee pollination mutualism involving male-bee-pollinated orchids discovered in tropical Asia

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(A) Inflorescences of *D. gibsonii*. (B) Glandular hairs covering the labellum in *D. chryseum*. (C) A hand-section of the labellum, with the hairs stained with Sudan IV. (D) A male *Ctenoplectra cornuta* trying to enter a flower of *D. denneanum* that is occupied by another male bee (male symbol marked). (E-H)

Male *C. cornuta* bees leaving the flowers of four *Dendrobium* species, each with pollinaria attached to their thorax (white arrowheads). Note the characterized hind legs of males (purple arrow). (I) A female *C. cornuta* collecting nectar, oil and pollen from *Thladiantha subglobosa*, noting a pollinarium left on the corolla (pink arrow). (J) A male *C. cornuta* collecting nectar from *T. subglobosa*. (K) *Ctenoplectra* mating on *D. chryseum*, the male with a pollinarium on its back is delivering floral secretion (pink arrow) which he collected from *Dendrobium* flowers to the female. Credit: Science China Press

It is well known that animal-pollinated plants usually offer nectar or pollen to reward vectors for pollen transfer. While nectar is a kind of sugar water, pollen is protein-rich, a must-need nutrient for bee babies. The honey humans consume is made by female bee workers. Fifty years ago, German scientist Stefan Vogel first identified that droplets are non-water miscible 'nectar' but lipids in some flowering plants, discovering the so-called oil-flower, which offers oil as a reward for female bees.

The oil bees collect fat droplets with special setae or abdominal hairs and then mix them with pollen as larval food or use the oil for nest lining. Worldwide, oil rewards are offered by about 150 genera in 11 families whose flowers are exploited by 370 species of oil-collecting bees.

To date, our understanding of the ecology and evolution of the oil-bee and oil-flower interactions are mostly from studies in South America and South Africa, although in Asia, since the Early Eocene oil-offering flowers in Cucurbitaceae have coevolved with *Ctenoplectra* bees whose females have unique setae and behaviors for oil mopping.

In research [published](#) in the journal *National Science Review*, a team found that the fatty oil in the minute hairs on the labella, the lower lip of corolla, appeared in 33 of 41 species sampled in *Dendrobium* and *Galeola*, two orchid genera, providing the first document of oil-offering

orchid flowers in Asia. Surprisingly, these orchids are majorly exploited by male bees of *Ctenoplectra*, not females, over a 6-year field study in Xishuangbanna and Malipo, southern Yunnan Province.

As predicted, female bees prefer visiting oil-flowers in Cucurbitaceae to collect oil, nectar, and pollen. The observation of males collecting floral oil from orchids has not been reported before. In this report, male *Ctenoplectra cornuta* was observed as the sole effective pollinator for 12 *Dendrobium* and one *Galeola* orchid species.

The discovery that many [orchid species](#) offer oil and are pollinated by male *Ctenoplectra cornuta*, the females of which depend on Cucurbitaceae oil and [pollen](#), illustrates multipartite oil-flower/oil-bee pollination mutualisms. When *Dendrobium* inflorescences were set out in the field with cucurbit oil flowers nearby, oil-bee visit frequencies (visits per flower per hour) to the orchid flowers increased hundreds of times, suggesting that the orchids' pollination success was greatly attributed to the co-flowering of Cucurbitaceae species.

The *Dendrobium* genus is species-rich (1500 species), but the most economically important orchids have declined in tropical Asia in the last two decades. Given that their [reproductive success](#) extremely depends on the male oil bees, this finding also highlights the challenge of maintaining or restoring natural orchid populations.

More information: Meng Zhang et al, Multipartite oil-flower/oil-bee mutualisms involving male-bee-pollinated orchids in tropical Asia, *National Science Review* (2024). [DOI: 10.1093/nsr/nwae072](https://doi.org/10.1093/nsr/nwae072)

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