Floral larceny by the stingless bee *Trigona amalthea* on granadilla (*Passiflora ligularis* Juss)

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Flower visitors are considered pollinators when they successfully transfer pollen from anthers to the stigmas. Animals, particularly bees, are the main pollinators of wild and cultivated plants. However, animals may not contribute to the pollination of plants when they act as robbers and thieves while obtaining floral rewards (e.g., pollen and nectar). Robbers extract rewards by making holes in buds, mature flowers or anthers without entering the flower. Thieves, in contrast, collect rewards through the flower opening but transfer little or no pollen, given a mismatch between the morphology or size of the flower and that of the flower visitor. Robbery and thievery of nectar and pollen are collectively referred as floral larceny.

Although some species of stingless bees in the genus *Trigona* have long been reported as floral larcenists, the effects on plant reproduction are unknown for many plant species. Here we studied the behavior of the stingless bee *Trigona amalthea* in relation to flowers of granadilla, and assessed its relation to fruit set.

In buds, we observed *T. amalthea* piercing holes through the corolla and corona to extract mainly pollen. In mature flowers, they collected both nectar and pollen, but the frequency of contacts with floral reproductive structures was extremely low. Thus, *T. amalthea* can be considered both as a robber and thief of granadilla.

In an experimental plot where *T. amalthea* was highly abundant, percentage of flowers that set fruit was significantly lower (16%) as compared to plots free from this bee (45 - 54%). While extracting pollen, *T. amalthea* chewed styles and stigmas of both flower buds and mature flowers. Thus, destruction of floral structures prior to ovule fertilization probably accounts for the significant reduction in fruit set.

Trigona amalthea pierce holes in granadilla buds to primarily extract pollen, destroying styles, anthers and stigmas in the process. Photograph by C. Gutiérrez-Chacón.

Due to the small size of our experimental plots, our findings should be considered with caution. One nearby colony of *T. amalthea* can devastate a small plot, but negative effects can be diluted in large fields. Therefore, the impacts of *Trigona* bees on granadilla production need to be evaluated on commercial plantations, and should include investigation on the main strategies of plants to cope with consumer damages: resistance and tolerance.