Pitcher plant uses power of the rain to trap prey (w/ Video)

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This is an *N. gracilis* pitcher with a visiting *Polyrhachis pruinosa* ant. Credit: From: Bauer U, Di Giusto B, Skepper J, Grafe TU, Federle W (2012) With a Flick of the Lid: A Novel Trapping Mechanism in Nepenthes gracilis Pitcher Plants. PLoS ONE 7(6): e38951. doi:10.1371/journal.pone.0038951

During heavy rain, the lid of *Nepenthes gracilis* pitchers acts like a springboard, catapulting insects that seek shelter on its underside directly into the fluid-filled pitcher, new research has found. The findings were published today, Wednesday 13 June, in the journal *PLoS ONE*.

Pitcher plants (Nepenthes) rely on insects as a source of nutrients, enabling them to colonise nutrient-poor habitats where other plants struggle to grow. Prey is captured in specialised pitcher-shaped leaves with slippery surfaces on the upper rim and inner wall, and drowns in the digestive fluid at the bottom. Under humid conditions, the wettable pitcher rim is covered by a very thin, continuous film of water. If an insect tries to walk on the wet surface, its adhesive pads (the 'soles' of its feet) are prevented from making contact with the surface and instead slip on the water layer, similar to the 'aquaplaning' effect of a car tire on a wet road.

However, researchers have now discovered a new, unique method of capturing insects by the pitcher plant *Nepenthes gracilis*.

The lead author of the paper, Dr Ulrike Bauer from the University of Cambridge's Department of Plant Sciences, said: "It all started with the observation of a beetle seeking shelter under a *N. gracilis* lid during a tropical rainstorm. Instead of finding a safe - and dry - place to rest, the beetle ended up in the pitcher fluid, captured by the plant. We had observed ants crawling under the lid without difficulty many times before, so we assumed that the rain played a role, maybe causing the lid to vibrate and 'catapulting' the beetle into the trap, similar to the springboard at a swimming pool."

To test their hypothesis, the scientists simulated 'rain' with a hospital drip and recorded its effect on a captive colony of ants that was foraging on the nectar under the lid. They counted the number of ants that fell from the lid in relation to the total number of visitors. They found that ants were safe before and directly after the 'rain', but when the drip was switched on about 40% of the ants got trapped.

Further research revealed that the lower lid surface of the *N. gracilis* pitcher is covered with highly specialised wax crystals. This structure

seems to provide just the right level of slipperiness to enable insects to walk on the surface under 'calm' conditions but lose their footing when the lid is disturbed (in most cases, by rain drops). The scientists also found that the lid of *N. gracilis* secretes larger amounts of attractive nectar than that of other pitcher plants, presumably to take advantage of this unique mechanism.

Dr Bauer added: "Scientists have tried to unravel the mysteries of these plants since the days of Charles Darwin. The fact that we keep discovering new trapping mechanisms in the 21st century makes me curious what other surprises these amazing plants might still have in store!"

More information: Bauer U, Di Giusto B, Skepper J, Grafe TU, Federle W (2012) With a Flick of the Lid: A Novel Trapping Mechanism in Nepenthes gracilis Pitcher Plants. PLoS ONE 7(6): e38951. doi:10.1371/journal.pone.0038951

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