Of water flumes, waxy walls and toilet bowls: Evolution of trapping strategies in *Nepenthes* pitcher plants

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**Nepenthes** pitcher plants:
The genus *Nepenthes* comprises >1000 species of carnivorous plants that are the product of a recent and still ongoing diversification in tropical Southeast Asia. They use specialized mucus-shaped leaves (pitchers) to capture prey, mainly arthropods. This enables them to survive in extremely nutrient-poor habitats.

**Functional trap components:**

- slippery peristome
- wax crystals
- downward-pointing cells
- viscoelastic fluid

Manipulations:
- anti-slip surface coating
- fluid replaced with water

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**Do species/varieties specialise in different trapping strategies?**

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**A**

**Manipulation of individual trap components in 2 varieties of *N. rafflesiana*: implications for prey capture**

- Presence of trapping structures:
  - slippery peristome
  - wax crystals
  - downward-pointing cells
  - viscoelastic fluid

Manipulations:
- anti-slip surface coating
- fluid replaced with water

Do they rely on different trapping structures in the field? **Yes**

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**B**

**Comparative analysis of functional pitcher morphology in 51 *Nepenthes* species**

- Do species without wax have **larger** peristomes? **Yes**
- Do species without wax have peristomes with **longer inward slope**? **Yes**

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**Divergent evolution might be driven by competition for prey.**

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**Evidence from the literature:**

These sympatric species differ in trap morphology and target different prey spectra.

**Evidence from the field:**

A montane species with an extreme strategy for nutrient acquisition.

**The problem:**
Arthropod diversity and abundance decreases with increasing altitude — more competition for prey

**The solution:**
Utilisation of alternative nutrient sources: mammalian faeces

- Upper pitchers of *N. lutea* attract tree shrews (*Tupaia montana*) that feed on a white exudate under the pitcher lid
- Upper pitchers have lost the ability to trap insects
- Mature *N. lutea* plants derive 50-100% of their foliar N from tree shrew faeces

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