Scent-Trail Diversion, a Novel Defense Against Ants by Tropical Social Wasps

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Ants are mong the most important ptedators of the brood of tropical social wasps (Jeanne 1979). The wasps' defences include "pecking" attacks with the mandibles accompanied by wing-fanning (West-Eberhard 1969), protective nest architecture (reviewed in Jeanne 1975), application of sticky and repellent substances to the nest support or pedicel (Jeanne 1975, Post & Jeanne 1981), rapid nest abandonment by swarms (Chadab 1979a), and nesting on trees inhabited by *Azteca* ants (known to afford protection against army ants—Chadab, 1979b).

Chadab (1979b) noted that wotkers of *Occipitalia sulcata* sctaped their mandibles on the nest envelope after incursions by *Azteca* ants, sometimes removing bits of carton and discarding them. Few ants approached the nests of these wasps, even though the wasps were always located on trees occupied by *Azteca*. When Chadab crushed parts of ants in forceps and rubbed the forceps on or near nests, the wasps scraped the spot with their mandibles. She hypothesized that "by removing any chemical substance left by the *Azteca,* the wasps probably prevent the ants from forming an active or permanent trail to the wasp nest and thus prevent an increase in ant activity near the nest." The following observations of *Metapolybia aztecoides* in Colombia (near Santandet, Departamento de Cauca, and near Cali, Departamento del Valle) confirm Chadab's interpretation and provide evidence that *Metapolybia* wasps detect and remove trail pheromone of ants, and that a repellent substance is not responsible for deterting the ants (a possibility reviewed by Post & Jeanne 1981, that must be considered given the use of ant tepellents by sevetal genera of social wasps).

Initial observations indicated deterrence of ants by *Metapolybia* wasps. In one case, an otherwise straight trail of small red ants (unidentified species) diverged from its course to skirt a *Metapolybia* nest, keeping at all points about 1 cm from the nest perimeter. In another case, *Azteca* ants from a large carton nest on a tree only 30 cm from a *Metapolybia* nest usually avoided the nest, even though one small extension of the *Azteca* nest was only 1 cm away. During 30 min of observation, 32 approaching ants hesitated, antennated the substrate, and retreated from the vicinity of the wasps' nest without being chased by the wasps. Three times during the same period, wasps leaned off the periphery of the nest and mouthed or bit at the surface of the branch nearby, as if either applying or removing something from the substrate.

At a third nest, also on a tree containing a large *Azteca* colony, *Metapolybia* wasps pecked with their mandibles at large numbers of ants approaching their nest after the ants' nest was deliberately disturbed. They also leaned out and bit the surface of the tree near the nest as if trying to remove pieces of the surface.

In order to test the hypothesis that the wasps were applying an ant-repellent substance near the edge of their nest, I removed a piece of bark of about 1 cm diameter from the region directly adjacent to the wasps' nest, and placed it in a heavily travelled ant trail nearby. I took care to place it in a small depression in the bark so that the ants would contact the top surface rather than the raw (possibly sappy or odiferous) edge. As a control, I placed in the path of the ants a piece of bark taken from an area away from the wasps' nest. A third piece of bark was transplanted from one part of an ant trail to another. The ants avoided both transplants not traversed by ant trails, whether from near a wasps' nest or away from it. However, after brief antennation, they walked across the transplant taken from an active ant ttail. This suggests that they avoid absense of ant trail substance, not presence of some "repellent" substance near the nest. The area where bark was removed from near the wasps' nest did not serve as an "ant bridge" as one would expect if it represented a break in a repellent ring around the nest. Nor did the wasps treat the area in any special way (*e.g.,* mouthing it as they might if replacing removed repellent).

Three sections of bark from heavily travelled ant trails were placed near the wasps' nest. Alert wasps sitting on the nest envelope reacted initially with alarmed rearing back, sometimes buzzing their wings aggressively, and the pieces were repeatedly bitten by the wasps. Control pieces of bark from the same tree but away from ant trails did not provoke such aggressiveness.

These observations suggest that wasps are able to detect the trail pheromone of ants, and that by biting at substrate marked by ants they are able to maintain a ring of trail-substance-free surface around the nest. By direct wing-buzzing and pecking attacks on ants approaching the nest, they may be able to keep trail-making ants at a distance, thus diverting or "training" away from the nest the path usually taken by the ants. None of the observations supported the hypothesis that a repellent substance is applied by wasps to area surrounding their nest.

Scent-trail diversion, by removal of marked substrate and re-direction of potential attackers, adds a new device to the multitude of ways in which tropical social wasps defend themselves against invasions by predatory ants. *Metapolybia* and *Occipitalia* are among a small group of related genera (see Carpenter, in press) that build an enveloped comb directly against a substrate. It will be of interest to see if telated wasps having the same nest structute (e.g., in the genera *Clypearia, Synoeca,* and *Asteloeca*) react in the same way to the scent ttails of ants.

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Announcement: Educational Materials for Tropical Conservation

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