Arboreal ants build traps to capture prey

Tiny ants construct an elaborate ambush to immobilize and kill much larger insects.

To meet their need for nitrogen in the restricted foraging environment provided by their host plants, some arboreal ants deploy group ambush tactics in order to capture flying and jumping prey that might otherwise escape[1–4]. Here we show that the ant *Allomerus decemarticulatus* uses hair from the host plant's stem, which it cuts and binds together with a purpose-grown fungal mycelium, to build a spongy 'galleried' platform for trapping much larger insects. Ants beneath the platform reach through the holes and immobilize the prey, which is then stretched, transported and carved up by a swarm of nestmates. To our knowledge, the collective creation of a trap as a predatory strategy has not been described before in ants.

Allomerus decemarticulatus (Myrmicinae) is specifically associated with the Amazonian ant-plant *Hirtella physophora* (Chrysobalanaceae), which houses colonies in leaf pouches. Workers build galleried structures on their host plant's stems in which they pierce numerous holes that are slightly larger in diameter than their heads, allowing them to enter and exit[5] (Fig. 1a). First, they cut plant hairs (trichomes) along the stems, clearing a path. Then, using uncut trichomes as pillars, they build the gallery's vault by binding cut trichomes together with a compound that they regurgitate (for details, see supplementary information). Later, this structure is reinforced by the mycelium of a complex of sooty-mould species that has been manipulated by the ants. Fungal growth starts around the holes and then spreads rapidly to the rest of the structure.

We noted that the stems of 34 young seedlings, which had not yet developed leaf pouches, did not bear fungus; nine saplings raised in a greenhouse in the absence of *Allomerus* developed leaf pouches but never bore fungus. However, 15 saplings raised in the presence of ants bore mycelia, whose development was limited to the galleries. When we eliminated the associated ants from five of the 15, the fungus on the galleries grew into a disorganized structure, and none of the nine new stems that developed bore any fungus at all.

Because prey seemed to be immobilized on the top surface of these galleries, we investigated whether these structures could be acting as a trap. Our observations revealed that *Allomerus* workers hide in the galleries with their heads just under the holes, mandibles wide open, seemingly waiting for an insect to land. To kill the insect, they grasp its free legs, antennae or wings, and move in and out of holes in opposite directions until

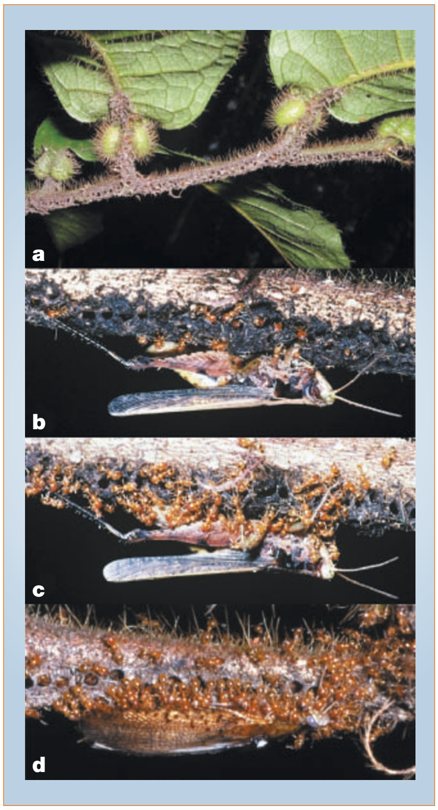

Figure 1 Galleried platforms built by *Allomerus* workers act as traps for prey. **a,** Base of the lamina of two *Hirtella physophora* leaves: the pouches serve as ant nests, which are interconnected by a gallery pierced with numerous holes. **b,** Start of the capture of a locust. **c,** One hour later, recruited workers have left the gallery in order to bite, sting and stretch the prey. **d,** Completion of a cricket capture.

the prey is progressively stretched against the gallery and swarms of workers can sting it (Fig. 1b–d). The ants then slide the prey over the top of the gallery — again moving in and out of holes, but this time in the same direction. They move it slowly towards a leaf pouch, where they carve it up.

Because the requirement for protein is crucial, some arboreal ants consume parts of the Hemiptera that they attend[6], others rely on microsymbionts to recycle nitrogen[7], and some have a thin cuticle and non-proteinaceous venom that economizes on nitrogen use[8]. Nevertheless, most of them must capture prey that land on their host plant[3]. Given this constraint, the tiny *A. decemarticulatus* workers have developed a tripartite association with their host plant and a fungus collectively to ambush their prey.

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Predation

Prey plumage adaptation against falcon attack

Several plumage types are found in feral pigeons (*Columba livia*), but one type imparts a clear survival advantage during attacks by the swiftest of all predators — the peregrine falcon (*Falco peregrinus*)[1,2]. Here we use quantitative field observations and experiments to demonstrate both the selective nature of the falcon's choice of prey and the effect of plumage coloration on the survival of feral pigeons. This plumage colour is an independently heritable trait[3] that is likely to be an antipredator adaptation against high-speed attacks in open air space.

The polymorphic feral pigeon is ideal for investigating the effects of different plumage combinations on predator success. One plumage phenotype — known as the 'wild' variant — is blue-grey but has a white rump between the base of the tail and the lower back, closely resembling the feral pigeon's rock-dove ancestor[3,4] (Fig. 1); all other plumage types lack this contrasting rump patch[3]. We tested whether the wild coloration might impart a selective advantage over other plumage types during high-speed diving attacks by falcons, which often exceed $157\ m\ s^{-1}$ (ref. 2; Fig. 1a).

During a seven-year period, we recorded 1,485 attacks by five adult peregrine falcons on free-ranging flocks of feral pigeons in Davis, California, during their daily linear