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Short communication

An entrance trap to sample foods of social wasps (Hymenoptera: Vespidae)

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Abstract The design of an entrance trap to enable collection of food from foragers returning to common and German wasps (*Vespula vulgaris* and *V. germanica*) nests is presented.

Keywords entrance trap; wasps; *Vespula*; diet

INTRODUCTION

An accurate method of sampling food, being carried by foragers returning to nests of the social wasps *Vespula vulgaris* and *V. germanica*, is required to investigate diet and foraging patterns. Prey items are often too small to be seen as wasps enter a nest and prey and woodpulp cannot easily be distinguished.

Some information can be obtained by simply netting groups of returning foragers and shaking prey from them (Gambino 1986), but to obtain more precise data, large numbers of foragers need to be sampled regularly and efficiently with minimal disturbance to the colony.

Broekhuizen & Hordijk (1968) designed a device consisting of a perspex channel system to sample returning foragers, but it was ineffective because it failed to separate foragers into ingoing and outgoing streams. Subsequently, Vuillaume et al. (1969; cited in Edwards 1980) used a series of funnels to separate ingoing and outgoing foragers for electronic counting, and Archer (1977) used a similar device which incorporated a trap door to enable wasps to be removed with an aspirator. The trap described in this

paper incorporates features of these two traps. It includes a Y valve to allow foragers to be diverted into a collecting container, and ducting and building paper which allows the trap to be fitted to irregular nest entrances in the field.

TRAP DESIGN AND INSTALLATION

The entrance traps (Fig. 1) I have constructed consist of two plastic funnels (165 mm diam.) connected by PVC tubing (25 mm internal diam.). Between the two funnels (on the entrance tube) is an RC Marine "Marelon" Y valve, normally used with a boat pump. The valve allows returning foragers to enter the nest directly or be diverted into the gassing chamber. The gassing chamber consists of a tube leading to a detachable jar. The tube leading to the jar has a smaller tube leading into it; this allows anaesthetising CO₂ to be administered to trapped wasps.

To install the trap over a nest, the ducting tube (attached to the rest of the trap) is placed over the nest entrance. Building paper is placed around the ducting and over the surrounding ground and covered with soil and stones to hold it in place. This helps to prevent workers digging alternative exits. If the nest entrance is in a bank, the ground in front of the entrance can be built up using soil and logs so the entrance funnel is the same height as the old nest entrance.

The nest should then be left for a week or more before sampling to enable foragers to become familiar with the new entrance and allow the colony to recover from any disturbance caused by installation.

DISCUSSION

The trap is designed to separate incoming and outgoing foragers into two streams. Wasps returning to the nest enter the large external funnel opening and most walk up the walls of the tapering funnel, into the entrance tubing. They then move along its course through the Y valve and into the curved

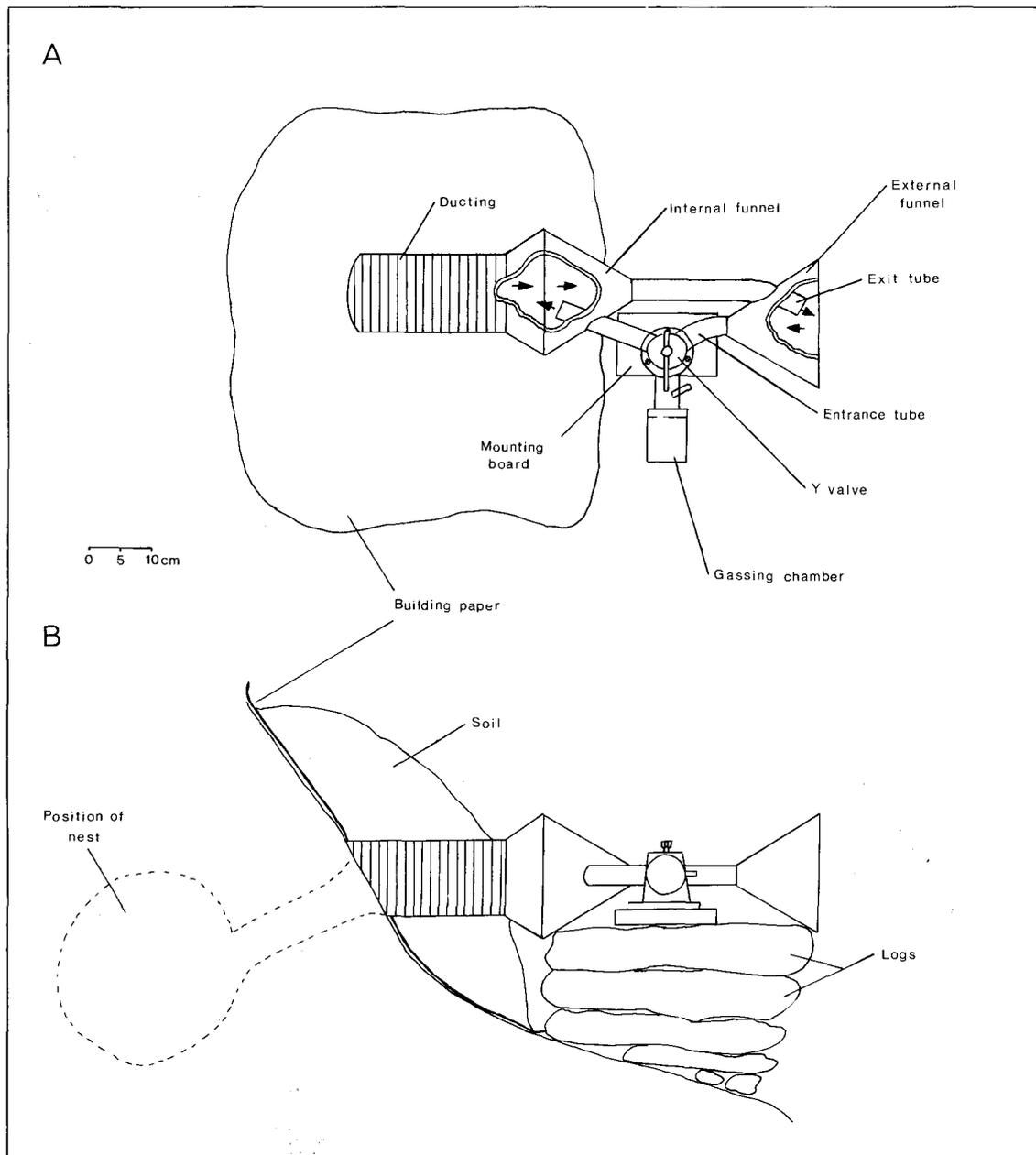


Fig. 1 (A) Birds eye view of entrance trap with the sides of the funnels partially removed. Arrows show the direction of wasp movement; (B) Side view of entrance trap showing position over a nest in a bank.

ducting tube. The outlet tube is missed because it protrudes 30 mm from the external funnel and entry may also be prevented by the presence of a stream of foragers leaving the nest. Exiting foragers leave the nest via the ducting which leads to the internal funnel and from there to the exit tubing. The entrance tube is missed as it projects 30 mm from the surface of the internal funnel.

In February 1988, I installed traps on two *V. vulgaris* nests in the Trass Valley, 35 km west of Nelson. In January and February 1989 an additional 14 traps were installed on nests in the Spooners Range Scenic Reserve (35 km west of Nelson) and along the Nile River, inland from Charleston (28 km south of Westport).

Foragers returning to the nest immediately after installation of the trap were slow to enter the new entrance (however, more than 50% entered the exit tube). Seven, one minute counts of wasps entering and exiting five of these nests, 1–2 days after installation, revealed that about 80% (235 out of 290) of returning foragers used the entrance tube when entering the nest. After 10–14 days, about 90% (512 out of 550) used the correct entrance and a similar percentage did so throughout the remainder of the season.

When leaving the nest, 98% (140 out of 143) exited via the correct tube, and none of those leaving via the entrance tube were observed to be carrying soil particles. This indicates that wasps exiting incorrectly may actually have been returning foragers that had become confused and turned around before reaching the nest. My observations indicate that most of these wasps fly less than a metre from the entrance and then enter the nest again. This demonstrates that almost all wasps that are being sampled are returning foragers.

Foragers from some nests managed to establish alternative ways in and out and so bypassed the trap; however, blocking the new exits with soil usually solved the problem.

In March 1988, and from February to May 1989, foragers were sampled regularly throughout the day with minimal disturbance to the colony. To obtain a sample the Y valve tap was turned so that wasps entered the gassing chamber. After initial hesitation (up to a minute) wasps began to move into it. The moment any wasps entering the trap turned around

and began to move back towards the Y valve the chamber was shut off by turning the tap back to its initial position. This meant the chamber was open for variable amounts of time (from 1–2 s to 2–3 min) during which 1–20 wasps were trapped. They were then anaesthetised with a blast of CO₂ through the gas entry tube and any individuals in the tube itself were blown into the detachable end jar. The jar was then removed and each wasp was inspected individually for the presence of prey or woodpulp. Time, number of wasps sampled, and number carry-ing loads were then recorded, and collected items were transferred to vials for later identification. Finally, wasps (still anaesthetised) were released onto the forest floor beside the nest entrance, the jar was reattached to the trap, and another sample was taken. On a regular basis I sampled 30–60 wasps per hour in this way and made six one minute counts of foragers entering and exiting the nest during the same period. Sampling of this intensity represents only a small proportion (< 1/50) of the wasps entering the nest. It is large enough to obtain reasonable sample sizes but not large enough to affect nest activity and disrupt the colony.

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