An Improved Nonsticky Trap for Field Testing Scolytid Pheromones[1]

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ABSTRACT

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A trap is described for field testing scolytid pheromones that has several advantages including avoidance of sticky materials and less time spent evaluating treatments. The new trap was as effective as a conventional sticky screen trap in catching the pine engraver, *Ips pini* Say.

Field bioassay of scolytid pheromones requires a trapping device to compare numbers of beetles caught by treatments. Such devices have consisted of motor operated olfactometers and rotating nets (Vité and Gara 1961, 1962); window glass barriers (Chapman and Kinghorn 1955); adhesive coated materials such as cardboard (Birch 1979); vinyl coated fiberglass fabric (Browne 1978); wire screen (Furniss and Livingston 1979); and plywood or masonite boards (Vité 1970).

Such traps have disadvantages. Motor operated traps require constant monitoring and a mobile power generator that may be prohibited during periods of high fire danger. Glass barriers pose an obvious hazard, and the liquid-filled trough is cumbersome and apt to be upset and spilled.

Constraint is difficult in enumerating the shortcomings of sticky traps. Experienced trappers know how uncannily the traps catch even cautious workers by their hair or hide. Besides, sticky traps entangle other unintended victims such as birds, bats, and myriads of insects seeking a perch or just passing by. Workers smeared by sticky substances are tempted to use cleaning solvents, odors of which may affect test results.

Specimens must be removed laboriously from sticky traps, then cleaned in solvent before being identified and sexed. Errors creep in when beetles crawl out of sight or are sluffed off as adhesive warms and flows on warm days. After use, the traps are apt to end up as refuse due to the inconvenience and cost of renovating them. If that weren't enough, wallowing beetles may crawl through the adhesive and infest enclosed stem sections that were intended to remain uninfested or infested with only the attractive sex (Furniss and Livingston 1979).

Recently, others have sought to augment the traditional flight traps with better technology (Moser and Browne 1978; Atkinson and Wilkinson 1979; Moeck 1980). Those traps consist of a perforated cylinder on which beetles must land, then crawl through holes into an inner chamber. Such traps have not worked well for *Dendroctonus brevicomus* (Lec.) or *Scolytus multistriatus* Marsham. Stimulated by the effort of those recent trap builders, I sought to make a more universally useful trap.

Description of Trap

The trap (Fig. 1) differs from those mentioned in that flying, rather than walking, beetles are caught as they first strike the target cylinder, then drop through a funnel into a jar containing water. The species caught are not limited by their crawling behavior or physical size. Stem sections may be contained internally in shade and need not be screened because no attracted beetle can gain access to them. This feature is superior to the trap described by Hines and Heikkenen (1977), and the trap is smaller and less cumbersome to use than olfactometers.

Pheromones may be diffused from containers attached to the trap cylinder in the shade of the lid. Stem sections, either uninfested or infested with the attracting sex (female *Dendroctonus*; male *Ips*), can be placed inside the cylinder and attached to the lid and to two supporting rods (Fig. 2A). Thus, the trap may be deployed alone as a check; with pheromones and host tree volatiles; or with a host tree stem section, infested or not.

Trap Construction

The trap (Fig. 1) consists of a cylinder (A), a lid (B), and a funnel (C) containing a glass jar. The trap is suspended 1.5 m above ground from an arm (D) inserted into an upright pipe (E) embedded in the ground.

The 30.5 cm long, 20 cm dia cylinder is constructed from 0.6 mm thick aluminum sheeting joined lengthwise by a "stovepipe seam." The cylinder is not painted or coated with any substance. The lid is a commercially available 33 cm dia aluminum pizza plate. The 21 cm deep funnel (top dia 31 cm, bottom dia 3 cm) is constructed from 0.6 mm thick galvanized sheet iron. A lid is soldered on the outside at the bottom of the funnel, to which the jar is attached.

The vertical support is a 2 m long pipe (inside dia ca. 17 mm). The support arm is constructed from a 1 m piece of 13 mm dia concrete reinforcement iron rod bent at right angle in the middle. A shallow hook is formed at the free end on which the trap is hung.

The funnel is attached to the cylinder by two 35 cm, 3 mm dia iron welding rods inserted at right angle through holes drilled 1.3 cm from the ends of the cylinder and funnel. The lid is fastened to the center of a 15 cm long, 15 cm dia host stem section by a 2.5 cm dia screw eye and a flat washer. The two components thus formed are joined by a 10 cm long, 13 mm OD latex hose, one end of which is attached to the bottom end of the stem section by a 2.5 cm dia screw eye. Inserted in the other end of the latex hose is a threaded metal hook. Hog rings are crimped around the ends of the latex hose to secure them to the screw eye and the hook. The trap is assembled by inserting the stem section, with lid attached, into the aluminum cylinder, and attaching the hooked end of the latex hose over the weld-

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[2] Personal communication, David Cibrian Tovar, Universidad Autonoma Chapingo, Chapingo, Mexico.

FIG. 1.—Nonsticky trap being installed in field. Lettered components are explained in text.

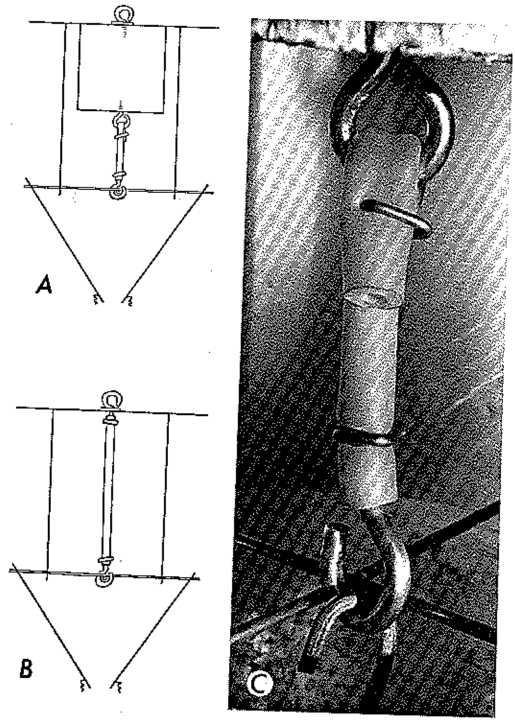

FIG. 2.—Drawings of longitudinal section of nonsticky trap (A) with stem section or (B) with latex tubing in place of stem section. Lower end of tubing is attached to cross wires (C) by use of a wire hook extended through bottom of funnel.

ing rods at the point where they intersect. To do this, a 45 cm long rod, with a hook bent at its end, is inserted through the small end of the funnel to stretch the latex hose (Fig. 2C).

If a stem section is not used, the lid can be attached directly to the cross rods with a 22 cm long piece of latex hose (Fig. 2B) extending from the threaded end of an eye bolt in the lid to the threaded shank of a hook, attached to the 2 cross wires as described.

Results and Discussion

During July 6–10, 1978, the trap was field tested near Plummer, Idaho. Treatments included traps alone and traps with ponderosa pine stem sections infested with either 10 ♂ or 25 ♂ pine engraver, *Ips pini* Say. Each trap was moved to a randomly determined position at a previously unoccupied location for each of 4 replications of 1 day duration. Performance of the new trap is compared in Table 1 to a standard sticky screen trap used in earlier tests (Furniss and Livingston 1979).

Although greatest numbers of *I. pini* were caught by the new trap, the difference between paired means was not statistically significant ($t = 1.13$). The new trap alone (control) was unattractive. Therefore, I believe that beetles were not attracted (or repelled) by the new trap itself and that differences between replicates were due to trap position which is often a significant source of variation in such tests.

We did not keep comparative records of the many taxa of insects caught by the new trap. However, the catch included 11 other species of scolytids, most abundant of which were 67 *Orthotomicus caelatus* (Eichoff); and three species of clerids and one ostomid that are scolytid predators. The trap is in use in Mexico[2] where it has effectively caught scolytids of several genera including *Pseudohylesinus* and *Ips*.

Table 1.—Numbers of *Ips pini* caught by 2 types of traps treated with natural attractant.

Replicate	10 ♂ Log[1]			25 ♂ Log		
	Sticky screen trap	New trap	Control	Sticky screen trap	New trap	Control
1	21	31	0	113	104	0
2	63	125	0	71	235	0
3	64	25	0	64	65	1
4	15	45	0	30	15	1
Total	163	226	0	287	409	2

[1] Stem sections infested with either 10 or 25 male *I. pini* as a natural attractant.

An advantage of the new trap over the sticky screen trap is that it confined all natural attractant (frass) expelled by boring males, whereas frass was sometimes scattered during rapid relocation of sticky screen traps. Such contamination could add to variation in test results.

Field crews were enthusiastic about the trap because they did not get contaminated with adhesive. Avoidance of sticky material also saved time in trap preparation and removal of catch. Specimens retained their appendages and did not require cleaning in solvent prior to examination. The 0.47 liter jar has volume sufficient to contain any rain likely to fall during a test replicate. However, if necessary, the jar could be loosened beforehand to allow water to escape, or drain ports could be provided.

The more positive attitude of workers, savings of time, reduction of fatigue and mistakes, the high quality of specimens and data, and the reusable nature of this trap make it worthy of consideration as a replacement of the much maligned sticky trap.

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