

PACIFIC SOUTHWEST Forest and Range Experiment Station

FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE
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WOOD BORERS ATTRACTED TO TURPENTINE in windthrown timber in northern California

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*U.S.D.A. Forest Service
Research Note PSW-195
1969*

Gardiner¹ has shown that wood-boring insects are attracted to turpentine and smoke. Becker² demonstrated the attractive qualities of several monoterpenes contained in turpentine. In a study made to see what wood borers flew to turpentine under natural conditions, I found that downwind traps caught more wood borers and their predators than did upwind traps. And traps set out to monitor this attraction varied in their efficiency.

METHODS

The study site, near Burney, California at 4,000 feet elevation, was a large log landing, bare of vegetation, and about 200 feet on a side.

A small aluminum pan containing 1 to 2 quarts of turpentine was placed 3 feet above the ground on a table. Fresh turpentine was added as needed, usually 1 to 2 quarts every 3 to 6 days. Twelve stakes were driven into the ground in a circle with an 8-foot radius and the pan as its center. One or two traps were attached to each stake, 3 to 5 feet above the ground. The 12-inch-square traps were generously coated with Tree-Stikem Special. Three materials were tested as trap squares: ¼-inch-mesh hardware cloth; ¼-inch-thick plywood, and single-weight pane glass. The wood and wire traps were arranged vertically as pairs, one 12 inches above the other. The four glass traps were set up singly. This set of traps was checked at midday at 1- to 3-day intervals from June 22 to July 9, 1965.

On July 1, a second circle of 20 stakes, with a 20-foot radius, was set up around the pan (*fig. 1*). Every other stake had a wood or wire trap 4 feet above the ground. The outer circle of traps was also checked at 3-day intervals until July 9. Direct observations were also made on flight behavior during the collection visits.

The prevailing daytime wind in the study area (from about 10 a.m. until sunset) was from the west. Temperatures ranged from 32° to 101° F., and averaged 80° to 90° F. during the day. The weather was clear and sunny during the period.

ABSTRACT: The attraction of turpentine to wood borers under natural conditions was observed by setting up three types of traps in a stand of windthrown timber. The traps were made of hardware cloth, plywood, or pane glass. Several species of wood borers and their predators were caught more consistently in downwind traps than in upwind traps. Circumstantial evidence suggests the attraction of turpentine. The wire-mesh traps proved to be the more efficient type of trap.

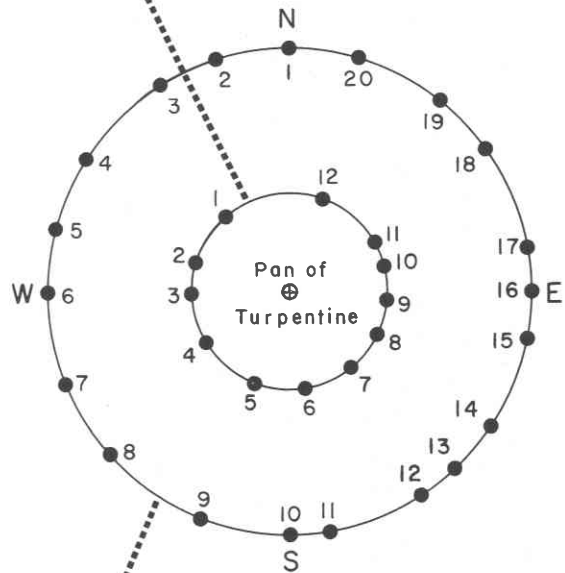
OXFORD: 453-414.11-U668.445:145.7x19.66
Melanophila gentilis.

RETRIEVAL TERMS: attractants (chemical); turpentine; traps (insect); insect control; Buprestidae; *Melanophila gentilis*; Burney, Calif.

INNER CIRCLE

Quadrant	NW					SW			SE						NE					
	1	2A	2B	3A	3B	4	5A	5B	6A	6B	7	8A	8B	9A	9B	10	11A	11B	12A	12B
Trap material *	G	S	S	W	W	G	S	S	W	W	G	S	S	W	W	G	S	S	W	W
<i>Melanophila</i>	1	13	10	4	6	1	21	11	15	26	3	30	17	15	4	1	32	15	16	5
<i>Buprestis</i>				1				1					1							
<i>Chrysobothris</i>			1				1	4	2						1			1		
<i>Cerambycid</i>												1								
<i>Siricids</i>									1		1									
<i>Chrysophana</i>				1																
<i>Temnochila</i>																	4		3	
<i>Thanasimus</i>						1				1						1				
<i>Elaterids</i>														2			1	4	3	

Figure 1. - Schematic arrangement of traps in circles. Tables show insects caught by trap number and quadrant. Insects are identified by genus or family.



OUTER CIRCLE

Quadrant	NW					SW					SE					NE				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Trap material *	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
<i>Melanophila</i>	7	4			1	1	2	2	4	6	7	4	2	2	1		3	4	4	2
<i>Buprestis</i>	1					1	1								3		1	1		
<i>Chrysobothris</i>	3	1		1	1		2		1				1	2		2	1	1		
<i>Cerambycid</i>												1								
<i>Siricids</i>									1		1									
<i>Chrysophana</i>	2	1			1	1	1						1		1					
<i>Temnochila</i>		1		2										1	1			3	3	2
<i>Thanasimus</i>		1									2				1	1		1	1	
<i>Elaterids</i>	6	1		1		2	1	1	2		3	1	1	3	4	4	1	1	2	2

* G = glass, S = hardware cloth, W = wood

RESULTS

Insects

The variety of wood borers trapped was limited to those in flight during the study period and no doubt included some accidental catches as well as attracted insects. The species trapped generally agreed with what life history studies in the area had shown would be flying that time of year.³ Buprestids, especially *Melanophila gentilis* were most commonly trapped, mainly because this group was at the peak of their flight during the study. In his field test, Gardiner¹ collected mostly cerambycids at his turpentine trap. Wood borer predators (clerids and ostomatids) were trapped. Elaterids, whose association with wood borers or windthrown timber is unknown, were also caught.

The numbers and kind of insects caught near Burney were:

Woodborers:

<i>Melanophila gentilis</i> Lec.	286
<i>M. drummondi</i> Kby. & <i>M. californica</i> Van D.	16
<i>Buprestis maculiventris rusticorum</i> (Kby.)	11
<i>B. subornata</i> (Lec.) & <i>B. aurulenta</i> L.	26
<i>Chrysobothris</i> sp.	4
<i>Xeris morrisoni</i> (Cress.)	2
Cerambycids	2
Total	345

Predators:

<i>Temnochila virescens</i> (Fabr.)	20
<i>Thanasimus lecontei</i>	10
Total	30

Associates:

Elaterids	46
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Flight Behavior

Four species of wood borers—*M. gentilis* (about 24 insects), *Buprestis maculiventris rusticorum* (2), *B. aurulenta* (1), *Chrysobothris* sp. (3)—and one predator—*Temnochila virescens* (3)—were observed in flight during plot visits.

The insects were flying upwind (west) toward the turpentine pan. They flew 3 to 6 feet above the ground, quickly and directly (some individuals occasionally zig-zagged). They could be seen approaching 20 to 40 feet beyond the outer trap circle. Several of the *M. gentilis* and one *Chrysobothris* sp. missed all traps and flew within a foot or two of the pan. As they approached the pan they veered

off sharply, possibly repelled, and hit either the back side of a trap or more often the ground. In a laboratory study, Becker¹ noticed that monoterpenes had a repellent effect on wood borers when they were overdosed. And Gardiner² noticed insects landed 2 to 10 feet away rather than immediately around the turpentine.

When borer flights were observed, the wind was from the west at 5 to 10 m.p.h., and flights were from the east. No borer flights were seen when the wind was calm, although flying diptera and hymenoptera were common.

The downwind traps caught almost twice as many wood borers and almost four times as many predators as did the upwind traps (table 1).

Trap Efficiency

Traps varied in their efficiency. Wire traps had 33 percent more insects than wood traps. The glass traps contained only a few insects (table 2). The glass panes were also hard to fasten to the stakes, and the Stikem tended to slide off, carrying the insects with it. (The insects were found on the stakes or on the ground underneath.) This problem was not encountered with wood or wire. Wire is probably superior because it does not obstruct or change the flow of attractant laden air. And it is easier to brush Stikem on wire.

DISCUSSION AND CONCLUSIONS

This work was designed as a first stage in planned investigations of the attractiveness of turpentine and its components to wood borers. No check area was set up mainly because no comparable clearing in the vicinity could be found. I considered removing the turpentine for several days at a time as a check, but decided against it because the wood borer emergence and flight were sporadic during the short period of the test, and different species of wood borers were in flight as the summer progressed.

From my observations, I concluded that turpentine appears to attract several species of wood borers. These observations seem to complement the findings of other workers. This attraction of turpentine was also suggested by circumstantial evidence: more insects were trapped downwind than upwind. The insects trapped on the west half of the circle were either a product of random (nonattracted) flights, or wind shifts, or both that occurred when no observers were present.

Turpentine or its volatile components could be a valuable tool for making survey collections or possibly for controlling wood borers.

Table 1. - Effect of wind direction on the numbers of insects caught

Insect	Number	Number per upwind trap	Number per downwind trap
Wood borers	345	6.8	10.1
Predators	30	.3	1.1
Elaterids	46	.8	1.4

Table 2. - Insects caught in three types of 12- by 12-inch traps surrounding turpentine pan

Trap location	Wood Trap		Wire Trap		Glass Trap	
	Traps	Insects (mean) per trap	Traps	Insects (mean) per trap	Traps	Insects (mean) per trap
	Number					
Inner circle	8	13.2	8	21.0	4	2.0
Outer Circle	10	6.2	10	8.5	0	-
Total	18	9.3	18	14.1	4	2.0

Acknowledgments: I am indebted to B. H. Startt and Serge Seminoff for assisting in the field phases of this work.

Notes

¹Becker, Gunther. *Nahrungsfinding und chemotoxien bei holzbewohnenden Kafern.* (Food finding and chemotactic behavior of wood-inhabiting beetles.) *Z. Angew Entomol.* 50:88-93. 1962.

²Gardiner, L. M. *Collecting wood-boring adults by turpentine and smoke.* *Can. Dep. Agr. Div. Forest Biol. Bimo. Rep.* 13(1):2. 1957.

³Wickman, Boyd E. *Insect-caused deterioration of windthrown timber in northern California, 1963-1964.* U.S. Forest Serv. Res. Paper PSW-20, Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 14 p., illus. 1965.

The Author

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