EFFECT OF MALAISE TRAP MODIFICATIONS ON COLLECTIONS OF TABANIDAE[1]

R. H. ROBERTS[2]
Bioenvironmental Insect Control Laboratory, FR, SEA, USDA,
Stoneville, Mississippi 38776

ABSTRACT. The addition of internal horizontal baffles to Malaise traps had no effect on numbers of Tabanidae collected or on species representation. The number of tabanids collected in unbaited malaise traps with an opening that was 4 ft high × 2 ft wide was statistically equivalent to the number collected in a standard 4 ft × 4 opening CO_2 baited trap, but traps with an opening that was 2 ft high × 4 ft wide produced a mixed response depending on whether the top half or the bottom half of the standard opening was closed. When the top half was closed, the number of *Tabanus subsimilis* Bellardi collected was approximately equal to the number collected in the standard CO_2 baited trap. When the bottom half was closed, the number collected was usually significantly less than the number collected in the standard unbaited Malaise trap.

Studies have shown that the design of a trap exerts a strong influence on both the numbers and species of Tabanidae collected. In comparative studies, the Malaise trap of Townes (1962) has been the most effective trap (Roberts 1970; 1972; 1976). However, field observations of the activities of tabanids in and around the Malaise trap revealed that while the flies entered the trap, some flies left the trap through the entrance and departed from the vicinity of the trap. More flies left when the trap was not baited with CO_2. When the trap was baited with CO_2, the flies would remain in the vicinity, flying around the trap, entering and leaving several times before they would fly into the top of the trap and then into the collecting head. Once flies entered the upper portions of the trap, collection was assured since a fly was rarely seen to leave the trap from that location. As a result of these observations a study was made to determine whether changes of the dimensions of the trap opening or the addition of extra internal baffles would increase the retention of the flies within the trap.

MATERIALS AND METHODS

The Malaise trap used in the studies was based on the design of Townes (1962), was constructed with natural saran screen, had a 4 × 4 ft entrance on each of the 4 sides, and had 1-ft wide panels at each corner and corner to corner diagonal partitions extending the full height of the trap.

In the first study, the effect of the addition of 3 internal baffles to the Malaise trap on collections was determined. The baffles were placed as follows: the bottom baffle was 1.3 ft from the bottom edge of the trap; the next was 1.3 ft higher; while the third baffle was 2 ft above the 2nd within the top portion of the trap. The baffles, ca. 1.5 ft wide, were placed at a 45° angle so that the inner edge of one was just above the outer edge of the next higher baffle (Fig. 1). Catches in the modified trap were compared with catches in the standard Malaise trap which was unbaited or baited with CO_2. The modified trap was not baited. The traps used in the study were all new.

In the second study, the 4 trap entrances in standard Malaise traps (not baited with CO_2) were changed as follows: The normal 4 × 4 ft opening was modified with saran screen panels to produce (1) a 2 ft wide × 4 ft high opening or (2) a 4 ft wide × 2 ft high lower opening or (3) a 4 ft wide × 2 ft high upper opening.

[1] In cooperation with the Delta Branch of the Mississippi Agricultural and Forestry Experimental Station, Stoneville, MS 38776.

[2] Present address: Insects Affecting Man and Animals Research Laboratory, USDA, FR, SEA, Gainesville, FL 32604.

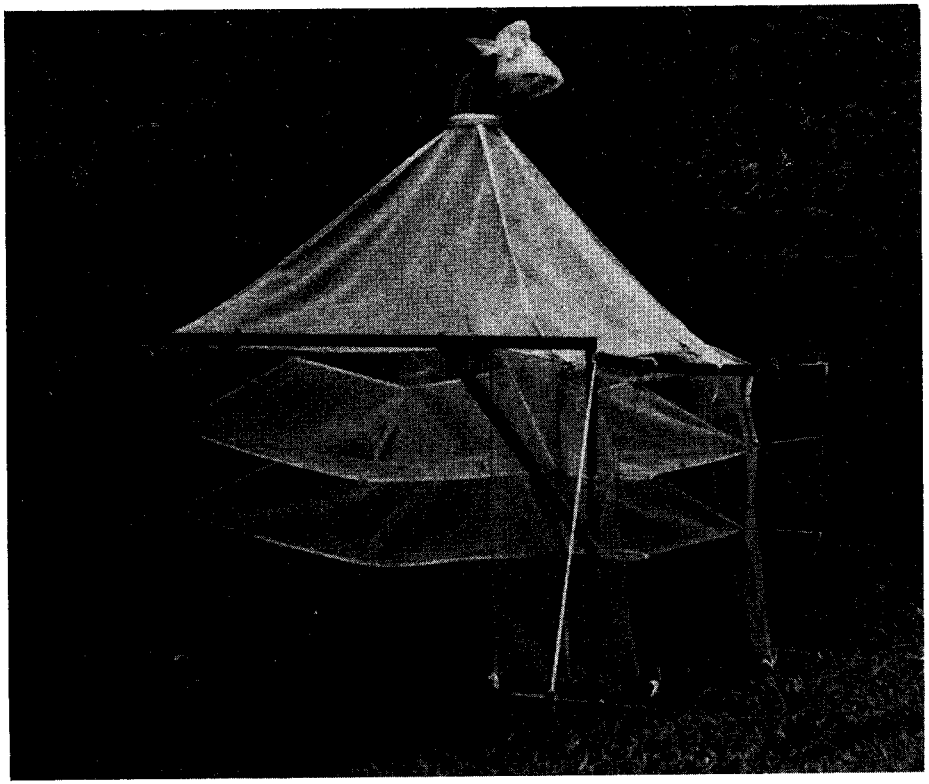

Fig. 1. Malaise trap showing placement of internal baffles.

The panels used to change the width of the opening were tested in 2 positions: 1 set of panels in each opening was attached to the corner panel and extended into the trap at about a 30° angle, while in the other position, the panels extended in a flat plane across the front of the trap opening. In both cases, the width of the opening was the same. The panels used to change the height of the opening were positioned to close off either the upper 2 ft (lower opening) or the lower 2 ft (upper opening) of the trap entrance. Catch in these modified traps was compared with catch in standard Malaise traps, 1 unbaited and 1 baited with CO_2 released at a rate of 100 ml/min. Since the 6 traps used in this study varied in age from new to nearly 2 years old, and since age darkening of the saran screen had been shown to influence trap collections (Roberts 1975), the 6 traps were tested before modification to determine whether a bias existed. There was no significant difference so a weighting factor was not necessary.

These studies were conducted in the Delta Experimental Forest, Stoneville, MS. The traps were located on the shoulders of the roads and were at least 0.5 mile apart. The statistical design was a randomized latin square so that all traps were tested at all trap sites. Collections were started between 1–2 pm (CDT) on 1 day and terminated the next day between 9–10 am. Statistical analysis was based on the transformation of the data to log (X+1). The first study was conducted during the period July 25 to August 10, 1973, and the second study during June 1974. The data for the first study were

taken from a composite study which included 8 other traps and the second study from 1 which included 7 other traps. Thus, the numbers presented in the tables represent 11 collections and 13 collections, respectively.

RESULTS AND DISCUSSION

In the first study, 12 species of Tabanidae were collected, 7 in sufficient numbers for analysis (Table 1). The addition of extra horizontal baffles had no effect on trap efficiency with 1 exception, since there was no significant difference in the catch of tabanids in the modified trap and the unbaited standard trap. The collection of *T. subsimilis* was significantly lower in the modified trap.

In the second study, 17 species of Tabanidae were collected, 6 in sufficient numbers for statistical analysis (Table 2). The effect of the 2 types of vertical panels (flat and V) was to increase the total numbers collected to a level statistically equivalent to catch in the CO_2-baited standard trap. However, the number collected when the top half of the opening was closed was statistically greater than when the bottom half of the opening was closed.

Also, collections of *T. abdominalis* in the trap with both vertical type panels and

Table 1. Collections of Tabanidae in the Stoneville Malaise trap with and without internal baffles (total of 11 collections, female tabanids only).[a]

Species	Trap type[b] 1	2	3
Tabanus			
abdominalis F.	44a	11a	10a
fuscicostatus Hine	377a	91b	127b
lineola F.	102a	19b	22b
proximus Walker	102a	17b	17b
subsimilis Bellardi	907a	276b	130c
sulcifrons Macquart	1591a	343b	391b
Chrysops			
flavidus Wiedemann	118a	31b	23b
Total tabanids	3270a	787b	724b

[a] Comparative values followed by the same letter are not significantly different at the 5% level.

[b] 1. Stoneville Malaise trap bait with CO_2 at 100 ml min.
2. Stoneville Malaise trap without CO_2.
3. Stoneville Malaise trap with internal baffles.

Table 2. Collections of Tabanidae in the standard Stoneville Malaise trap and traps with modified openings (total of 13 collections, female tabanids only).[a]

Species	Trap type[b] 1	2	3	4	5	6
Tabanus						
abdominalis F.	2059a	771b	810b	269c	465b	609b
fuscicostatus Hine	1475b	2830a	2270a	2412a	765b	584c
lineola F.	303a	166b	201b	191ab	123bc	109c
proximus Walker	524a	345bc	371b	204bc	176bc	199c
subsimilis Bellardi	1510a	750c	992bc	1314ab	620cd	585d
Chrysops						
flavidus Wiedemann	2019a	634b	665b	206c	782b	619b
Total tabanids	8093a	5607ab	5440ab	4714bc	3009cd	2783d

[a] Comparative values followed by the same letter are not significantly different at the 5% level.

[b] 1. Stoneville Malaise trap baited with CO_2 at 100 ml/min.
2. Stoneville Malaise trap with vertical "V" panels.
3. Stoneville Malaise trap with vertical flat panels.
4. Stoneville Malaise trap with lower half open.
5. Stoneville Malaise trap not baited with CO_2.
6. Stoneville Malaise trap with upper half open.

with the bottom half of the opening closed were equivalent to those in the unbaited standard trap. When the top half of the opening was closed, collections were significantly lower than in the unbaited standard trap.

Collections of *T. fuscicostatus* were greatly improved by both types of vertical panels and the closure of the top half of the opening and were significantly greater than those in the CO_2-baited standard trap. Closure of the bottom half of the trap opening significantly decreased collections below those in the unbaited standard trap.

Collections of *T. lineola, T. proximus* and *C. flavidus* were not increased by the modified trap openings. In fact, catch of *C. flavidus* in the trap with the top half of the opening closed was significantly less than the catch in the unbaited standard trap.

The catch of *T. subsimilis* when the top half of the opening was closed was statistically equivalent to the catch in CO_2-baited standard trap. Collections in the other modified traps were statistically equivalent to those in the unbaited standard trap.

The results of the studies therefore indicated the importance of the size and shape of the trap opening to both the numbers of Tabanidae collected and the relative representation of species in the collections. Theoretically, the greater the numbers of a species that can be retained in the trap, the better the estimate that can be made of the population. However, certain modifications favored some species more than others. Additional study of the optimum width of the baffles and combinations of the vertical and horizontal baffles is needed to arrive at a practical dimension that will permit adequate representation of all species.

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SPECIAL PROGRAMME FOR RESEARCH AND TRAINING IN TROPICAL DISEASES

Scientists are invited to submit proposals for research grants for participation in the World Health Organization Programme planned particularly for the prevention of tropical diseases including vector control. Some details of this program appear in *Mosquito News* 38 (1): 159. Enquiries should be addressed to Dr. Adetokumbo O. Lucas, Special Programme for Research and Training in Tropical Diseases, WHO 1211, Geneva 27, Switzerland.