A Preliminary Study of the Effectiveness of Various Traps for the Capture of Non-Formicid Hymenoptera

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Abstract

This is a study to compare techniques of capturing non-Formicidae Hymenoptera. In a trap comparison, the yellow pan trap was more effective than the malaise or flight intercept traps. Sweep netting proved more effective than any of the traps over a short period of time.

Introduction

This study is an attempt to determine the relative effectiveness of sweep netting compared to three types of passive insect traps (yellow pan traps, flight intercept traps, and malaise traps) in capturing non-Formicidae Hymenoptera. Yellow pan traps use the color of the bowl to attract insects to them, where they fall into soapy water and drown. Flight intercept traps, primarily used by coleopterists, work by blocking the flight path of insects; they fly into the screen and fall into a pan of soapy water. Malaise traps work on the principle that some insects fly up when they reach a barrier. Insects hit the vertical mesh of the malaise trap and fly up into a bottle of alcohol.

Materials and Methods

For this study, three kinds of insect traps were employed, yellow pan traps, flight-intercept traps, and malaise traps, as well as sweep netting. The yellow pan traps were plastic cereal bowls 6.7 cm in diameter. Each set of six pan traps had a surface area of 211.44 cm^2. The flight-intercept traps were constructed with screen door mesh tied or stapled between two trees, and aluminum pans 16 cm by 12.5 cm filled with soapy water and preservative were placed under the mesh to collect the insects that hit the net and fall. Each flight intercept trap used three baking pans for a total surface area of 600 cm^2. The Malaise traps were of the standard Townes design. The sweep nets used were standard Bioquip 16” aerial nets.

For this study, two sites out of a series of five were examined (all five trap arrays will be compared in a later, more intensive study). For the trap comparisons, the sites were equipped with one Malaise trap, one flight intercept trap, and six yellow pan traps. The traps were assembled, Site 4 at the Checkhall River on 24 May 2003, and Site 5 at the top of the Mt. Joy trail on 28 May 2003, and emptied periodically until 4 June 2003. For the

trap-sweep comparison, the trap array at the site to be swept was emptied and each trap refilled with alcohol or soapy water. They were let sit while the sweep netting took place. Two people simultaneously swept near, but not right next to the traps for three intervals of ten minutes each. When the thirty minutes of sweeping was over, the traps were again emptied and refilled. This was done for both sites in this study, for Site 4 on 30 May, and for Site 5 on 2 June. Each sweep was conducted in the late afternoon, but before dusk, under intermittent light rain.

Results

The data from the main trap comparison period, i.e. numbers of specimens per trap, are presented in Table 1. The data were then adjusted to compensate for differences in the amounts of time the traps were collecting in Table 2. Tables 3 and 4 give surface area comparisons for the yellow pan and flight intercept traps. Finally, Table 5 gives the results of the sweep net/ trap comparison.

Discussion

Of the three types of traps tested, the yellow pan traps performed best, on average, in the surface area comparisons (Tables 3, 4) with the flight intercept trap, and in the three-way per day comparison with the flight intercept and malaise traps (Table 2). The malaise and flight intercept traps were close in performance, with the flight intercept performing marginally better. This was surprising, as the flight intercept trap was designed primarily with beetles in mind. One possible explanation is that the Hymenopterans were ‘hopping,’ taking short flights low to the ground as many small wasps usually do, and just landed in the pans, instead of hitting the screen and falling. In other words, the flight intercept trap was performing like a pan trap, but without the attractive yellow color.

In the short time it was employed, sweep netting captured more Hymenopterans than any of the traps that were open at the time. If the capture rate were to have stayed the same, three or four man hours of sweeping might have collected more Hymenopterans than the most productive array. However, the main disadvantage of sweep netting is the effort required to perform it; it is not a long term collecting technique. During the sweep

netting time, the only trap to capture any Hymenopterans were the yellow pan traps, which is consistent with the trap-to-trap comparison data.

More study would be necessary to more properly confirm the relative effectivenesses of the capture techniques utilized in this experiment. Further study could also be done to determine if any one collecting method is better at capturing a specific family or species of wasp.

Tables

Table 1. Total numbers of Hymenoptera caught by trap type.

	Site 4	Site 5	Mean
yellow pan traps	50	143	96.5
flight intercept	26	56	41
Malaise traps	41	32	36.5
Total	117	231	--

Table 2. Mean number of Hymenoptera captured per day.

	Site 4	Site 5	Mean
yellow pan trap	4.167	17.875	11.021
flight intercept	2.167	7	4.584
Malaise trap	3.417	4	3.709

Table 3. Effectiveness of yellow pan and flight intercept traps based on surface area of the traps (values in specimens/cm^2).

	Site 4	Site 5	Mean
yellow pan trap	0.236	0.676	0.456
flight intercept	0.043	0.093	0.068

Table 4. Effectiveness of yellow pan traps and flight intercept traps per day based on surface area (values in specimens/cm^2/day).

	Site 4	Site 5	Mean
yellow pan trap	0.0197	0.0845	0.0521
flight intercept	0.0036	0.0116	0.0076

Table 5. Performance of the traps versus sweep netting over a 30 minute period (values indicate number of specimens captured).

	Site 4	Site 5
yellow pan trap	1	1
flight intercept	0	0
Malaise trap	0	0
sweep A	10	27
sweep B	16	8
sweep mean	13	17.5