

Preliminary Report on the Relative Attractiveness of Different Heights of Light Traps to Moths

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The use of light traps to determine the presence and abundance of insects, especially moths, has increased in the last few years. These traps are usually placed in barnyards where electricity is readily available rather than in fields of growing crops. Considerable work has been done on the most effective heights to place traps in a cornfield to protect the corn from the European corn borer, but no work has been reported on the best height to place traps to capture insects when the traps are located at some distance from the crops attacked.

The writers started preliminary work on this problem in the summer of 1953. Four one-directional light traps, each illuminated with a 15-watt BL lamp, were placed on the same pole (Figure 1) at heights of 4, 8, 12 and 16 feet above the ground. They were placed in the barnyard at the Purdue Electric Farm and were beamed over a well pastured blue grass pasture. There were no vegetables or field crops for a distance of 40 rods in front of the traps. There was a corn field about 10 rods to the left of the traps but it was not in the direct beam of the lamps. Thus there was no vegetation except the short blue grass to attract the insects to the immediate vicinity of the lights and no cover to harbor the insects during the day. Consequently most of the insects captured must have been ones which had been cruising by.

The traps used in this experiment (Figure 2) were of original design and were constructed in the Purdue Agricultural Engineering shop. They were made of 26 gauge galvanized metal. The overall dimensions were 18" wide, 18" high (excluding the collecting jar), and 11" deep. The top of the trap extended slightly below the top of the opening to aid in excluding rain. The effective opening measured $3\frac{1}{2}$ " by 18". The 15-watt lamp in each trap was mounted so that it was visible approximately 30° above and 30° below the horizontal in the vertical plane and over a total included angle of approximately 165° in the horizontal plane. Below the lamp a flattened funnel with a top opening of 5" by 18" tapered at a 45° angle to a 2" square opening to which was attached a wide-mouthed Mason jar which was charged with calcium cyanide.

These traps were operated continuously from the night of June 16 through that of September 7. The insects were removed from the jars each day.

Species of Moths Included in Study

Of the many insects caught during the season the following 28 species of moths were selected for this study because of the economic importance of their larvae. The sex and the number of individuals of each species caught each night were recorded. In the case of the corn earworm it was determined if the females were gravid.

Family Arctiidae

<i>Diacrisia virginica</i> (F.)	yellow woollybear
<i>Estigmene acrea</i> (Drury)	salt-marsh caterpillar
<i>Isia isabella</i> (A. & S.)	banded woollybear

Family Phalaenidae (Noctuidae)

<i>Agrotis ypsilon</i> Rott.	black cutworm
<i>Amathes c-nigrum</i> (L.)	spotted cutworm
<i>Ceramica picta</i> (Harr.)	zebra caterpillar
<i>Crymodes devastator</i> (Brace)	glassy cutworm
<i>Feltia ducens</i> Walker	"a cutworm" ¹
<i>F. subgothica</i> (Haw.)	dingy cutworm
<i>F. subterranea</i> (F.)	granulate cutworm
<i>Graphiphora bicarnea</i> (Guenee)	"a cutworm" ¹
<i>Heliothis armigera</i> (Hbn.)	bollworm, corn earworm
	tomato fruitworm
<i>Lacinipolia renigera</i> (Steph.)	bristly cutworm
<i>Laphygma frugiperda</i> (A. & S.)	fall armyworm
<i>Peridroma margaritosa</i> (Haw.)	variegated cutworm
<i>Plathypena scabra</i> (F.)	green cloverworm
<i>Polia subjuncta</i> G. & R.	"speckled cutworm" ¹
<i>Prodenia ornithogalli</i> Guenee	yellow-striped armyworm
<i>Protoleucania albilinea</i> (Hbn.)	wheat head armyworm
<i>Pseudaletia phragmatidicola</i> (Guenee)	"yellow armyworm" ¹
<i>P. unipuncta</i> (Haw.)	armyworm
<i>P. ursula</i> (F.)	"an armyworm" ¹
<i>Scotogramma trifolii</i> (Rott.)	clover cutworm
<i>Sideridis rosea</i> (Harvey)	"no common name" ¹

Family Pyralididae

<i>Pyrausta nubilalis</i> (Hbn.)	European corn borer
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Family Sphingidae

<i>Ceratonia catalpae</i> (Bdvl.)	catalpa sphinx
<i>Protoparce quinquemaculata</i> (Haw.)	tomato hornworm
<i>P. sexta</i> (Johan.)	tobacco hornworm

Results: It was observed that insects which were attracted to the 16-foot trap were in many instances captured at one of the lower traps. In general it may be said that if the moths did not immediately enter a trap they would circle and enter a trap at a lower level. Rarely would they enter a higher trap. This means that the number of moths captured at the 16-foot trap is probably smaller than it would have been had the other lights not been present and that the number caught at the 4-foot trap is probably considerably larger than it would have been had the other lights been absent.

As shown in Table 1 approximately equal numbers of individuals were captured at the 4-foot and the 16-foot traps and that more were

1. No common name has been approved by the Entomological Society of America.

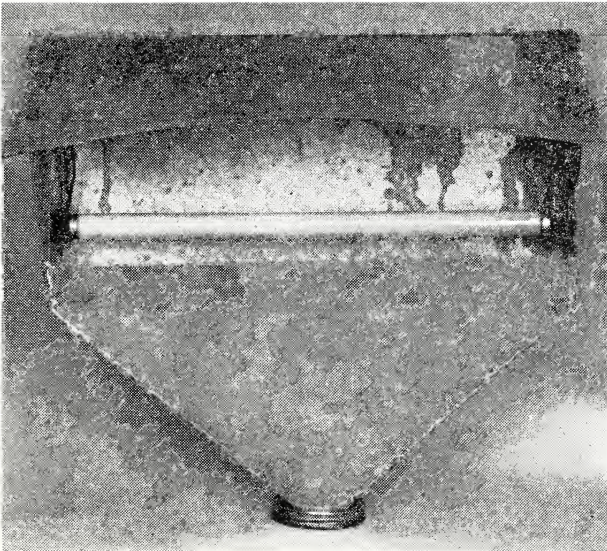
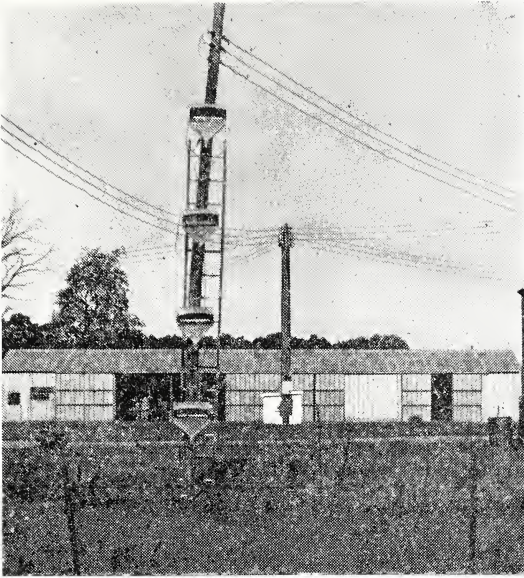


Figure 1. The light traps were placed at heights of 4, 8, 12 and 16 feet above the ground.

Figure 2. Close-up of light traps used in the experiments.

caught at each of these than at either the 8-foot or the 12-foot trap. The most females were caught at the 16-foot trap and the most males at the 4-foot one. Of the 28 species included in this study representatives of both sexes of all species except *C. picta*, where no females, and *S. rosae*, where no males, were captured. Representatives of all but two of the species (*G. bicarnea* and *S. rosae*) were caught by the 4-foot and 8-foot traps, of all but *C. picta* at the 12-foot, and of all but *C. picta* and *S. rosae* at the 16-foot.

The three species of Arctiidae studied showed a decided preference for the 4 and 8-foot traps. The paucity of females captured may be explained by the fact that they are weak fliers and stay close to the ground.

Of the cutworms *A. ypsilon*, *A. c-nigrum*, *F. subterranea*, *L. renigera* and *P. margaritosa* showed a decided preference for the 16-foot trap. Over 50 per cent of *F. ducens* and *F. subgothica* were caught by the 4-foot trap. *P. ornithogalli* came in about equal numbers to all the traps, but tended to favor the 16-foot one.

The armyworm, *P. unipuncta*, showed a decided preference for the 16-foot trap. The fall armyworm, *L. frugiperda*, preferred the 16-foot with a secondary preference for the 8-foot.

The tobacco and tomato hornworm moths have been observed to cruise at heights of 15 to 35 feet, but about equal numbers of males were caught at all four traps, and about 50 per cent of the females at the 4-foot one.

The highest number of moths of the corn borer (*P. nubilalis*) and the corn earworm (*H. armigera*) were caught at the 12-foot trap and the next highest at the 4-foot one. Ninety-one per cent of the female corn earworm moths caught at the 4-foot trap, ninety-six per cent of those at the 8 and 12-foot traps, and 100 per cent of those at the 16-foot trap were gravid.

In examining the data to determine the length of time the various species were active, it was found that of the 25 species taken at all four traps, eight were present the first night the traps were operated and came to all four traps. Of the other 17 species nine made their first appearance at either the 4 or 8-foot trap (usually the 4-foot one) and eight at either the 12 or 16-foot trap (usually the 16-foot). This preference for high or low traps was followed in general throughout the period of flight.

Judging from the results obtained in this preliminary study it appears that when light traps are placed near the barnyard in order to determine the kinds and numbers of insects present and the period of their activity, at least two light traps should be placed on the same pole—one near the ground and the other at a height of 12 or 16 feet.