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ARMYWORM MOTH (*PSEUDALETIA UNIPUNCTA*) FLIGHT IN DULUTH, MINN.[1]

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Introduction: The populations of the armyworm in Minnesota are in general rather low. But outbreaks have occurred sporadically in places. Two origins of these populations have been emphasized: windborne moths laying eggs, and local overwintering larva population.

The recent outbreak in wide areas of Minnesota in 1954, including areas as far north as Ely and the northshore of Lake Superior, was attributed to strong southwest windstorms which occurred on June 7 and which approached the velocity of 100 miles per hour (Office of State Entomologist, 1955). An outbreak was recorded in that year also in Canada (Seamans, 1956). The possible cause of armyworm infestation in northern states due to windborne populations from southern states is also recognized by entomologists in general.

The overwintering population of armyworm has also been studied in various parts of the country. In New York, Smith (1896) found adults during the entire winter and he believed that the armyworm may overwinter in any stage except the egg stage. Knight (1914), however, stated that pupae did not survive the winter in New York. In the south, Moran and Lyle (1940) reported that they observed all stages of this insect throughout the winter in Mississippi, and Bissell (1944) observed only larvae during the winter in Georgia. In the north central states, David and Satterthwait (1916) stated that only partially grown larvae survived winter in Indiana. Mickel (1932) suggested that partly grown larvae overwinter in southern Minnesota, and that the 1932 outbreak of armyworm in Freeborn, Faribault, Martin, Jackson and Nobles counties arose from a high local overwintering larval population.

In the extreme northern part of Minnesota, the 1954 outbreak strongly suggested the importance of windborne populations. However, a question still remains; is the windborne population the only source of infestation; or conversely, does this insect overwinter in northern Minnesota at all? The present paper deals with attempts to

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answer this question by studying the seasonal history of moth flight. Duluth is a suitable locality for this study since it offers rigorous winter conditions for the survival of this insect.

Methods: A light trap, which is standard for catching the European corn borer moths, was installed on top of a three-story building on the Duluth Campus of the University of Minnesota. The daily catches of the armyworm moths were checked from April 1st to June 12th in 1955, and from June 12th to October 30th in 1956. Moths appeared in the trap in 1955 as early as May 1 and in 1956 as late as October 17. In presenting the results, this annual period is considered as the period of moth flight. More trapping was done with a black light trap from June 16 to September 15 in 1959. In this season, records were taken only on the week days.

The possible effects of daily average direction and velocity of wind and the daily mean temperature were analyzed. These records were taken from the published climatic data for the Duluth Airport.

Results: The moth catches as related to 1. direction of wind, 2. velocity of wind, 3. mean daily temperature are summarized in Tables 1, 2, and 3 respectively. The first two aspects are also graphically presented in Fig. 1 for the 1955-56 records.

Discussion: Although records were kept on fewer days in 1959 than in 1956, the moth flight was higher in 1959 than in 1956. This was reflected both by the percentage of days with moth catch and the average number of moths caught on days with moth catch. The difference in the general level of flight, however, does not affect the analyses of the results, since the comparisons are made mainly on a percentage basis.

The relation of moth flight and wind direction was first analyzed as shown in Table 1. The percentage of days with moth catch varied considerably in the different seasons (22.2 to 50.0 in 1956 and 20.0 to 75.0 in 1959), and did not show consistent correlations with any wind direction. In 1956, it was high on days with S and SE winds, and low on days with SW winds. Conversely, in 1959, it was high on days with S and W winds, and low on days with NW winds. The number of moths caught per night with catch also varied: highest on days with E wind in 1956, but on days with SE and NE winds in 1959. In order to determine if the wind direction of one day might have affected the catch one or two days later, records were examined with this point in mind. It was found that no such correlation existed. The nights with catches of four or more moths were preceded by days with winds from many different directions. Thus, it may be concluded that the moth flight in the two seasons was not correlated with any definite wind direction.

The relation between moth flight and wind velocity is analyzed as presented in Table 2. Two points are shown: 1. The percentage of days with moth catch was relatively stable with winds ranging from 5 to 20 or 25 miles per hour. The fact that the wind velocity within this range had little effect on the flight has been shown in another nocturnal moth, namely *Pyrausta nubilalis*, Hbn., by Stirret (1936).

Table 1. Moth flight in relation to direction of wind.

Aver. wind direction for the day	No. of days with wind from various directions during the period of moth catch			Moth catch	
	Total No. of days	Days with moth catch	% days with moth catch	Total No. of moths caught	No. moths caught per night with catch
1955-56					
N & NNE	3	1	33.3	2	2.0
NE & ENE	19	6	31.6	14	2.3
E & ESE	50	15	30.0	57	3.8
SE & SSE	4	2	50.0	2	1.0
S & SSW	16	8	50.0	22	2.8
SW & WSW	18	4	22.2	12	3.0
W & WNW	33	11	33.3	20	1.8
NW & NNW	29	7	24.1	18	2.8
TOTAL	172	54	31.4	147	2.7
1959					
N & NNE	1	0	...	..	..
NE & ENE	8	3	37.5	33	11.0
E & ESE	15	7	46.6	16	2.3
SE & SSE	6	3	50.0	33	11.0
S & SSW	8	6	75.0	16	2.7
SW & WSW	8	3	37.5	5	1.7
W & WNW	14	9	64.3	27	3.0
NW & NNW	5	1	20.0	5	5.0
TOTAL	65	32	49.2	135	4.2

2. The average number of moths caught per day with moth catch was higher on days with winds of median velocities (10 to 20 mph) than on days with weaker or stronger winds. The above facts were demonstrated consistently in both seasons. It has been observed that the armyworm moths stopped flying and alighted when the wind increased above a certain speed under experimental conditions (author's unpublished data). The field records presented in Table 2 are definitely compatible with the experimental results.

The relation between moth flight and temperature is analyzed in Table 3. Data of both seasons show that there was no moth flight when the daily mean temperature was 47° F. or below. Above 47° F. and up to 78° F., there was an increasing frequency of moth flight. However, the number of moths caught per night with moth catch showed no consistent trend. The lack of moth catch on days when average temperature was below 47° does not confirm the observations of Moran and Lyle (1940). They observed moth activity and oviposition at temperatures considerably below freezing in Mississippi.

The most likely source of windborne populations lies south of Duluth. Yet the results showed no greater moth flight on the days with south winds nor on the days following such winds. This, combined with the fact that the flight was correlated with temperature which is of local nature, seems to suggest that the moths caught in Duluth during the seasons studied were not windborne but of local

Table 2. Moth flight in relation to speed of wind.

Aver. wind speed for the day (mph)	No. of days with wind of various speeds during the period of moth catch			Moth catch	
	Total No. of days	Days with moth catch	% days with moth catch	Total no. of moths caught	No. moths caught per night with catch
1955-56					
0-5	0	0	. .	0	0
5.1-10	36	11	30.6	26	2.4
10.1-15	107	34	31.8	98	2.9
15.1-20	20	7	35.0	21	3.0
20.1-25	7	2	28.6	2	1.0
25.1-30	2	0	0	0	0
TOTAL	172	54		147	
1959					
0-5					
5.1-10	15	6	40.0	15	2.4
10.1-15	36	20	55.5	90	4.5
15.1-20	12	6	50.0	27	4.5
20.1-25	2	1	50.0	3	3.0
25.1-30	0	0		0	
TOTAL	65	33		135	

Table 3. Moth flight in relation to daily mean temperature.

	Daily mean temperature (°F)	No. of days	No. days with moth catch	% days with moth catch	No. moths caught	No. moths per day with catch
1955-56	38-47	24	0	0	0	0
	48-57	67	20	29.8	48	2.4
	58-67	67	26	38.8	79	3.0
	68-78	13	9	69.2	20	2.2
1959	38-47	2	0	0	0	0
	48-57	8	3	37.5	14	4.7
	58-67	33	15	45.4	55	3.7
	68-78	22	15	68.1	66	4.4

origin. This conclusion is further supported by the observations following.

The phenology of moth flight contains an interesting record through a moth caught as early as May 1 in 1955. If the moth caught in Duluth was part of a windborne population from the south, it would be logical to expect that there would be fall-outs in a path south of Duluth on or before May 1. Yet points south of Duluth did not record moth catch until many days later. Furthermore, the moths caught on May 1 as well as on later days were very fresh and showed no wear on the wings. It was therefore concluded that these moths were of local origin. This early record also suggests that armyworms might overwinter in northern Minnesota in an advanced larval stage or even pupal stage.

A number of moths caught in Duluth in the spring of 1958 were examined by Dr. P. S. Callahan of Louisiana State University who is also interested in the dispersal of this insect. He found that the fat bodies of the moths were rather full, indicating that they had not been flying for any distance, and that 90% of the female moths had spermatophores (as many as three spermatophores were found in one of the moths), indicating that they had mated up to as many as three times. The latter phenomenon is seldom found among migrant populations. Based upon the above findings, he suggested that these moths were of local origin.

An additional point of significance is that moths were caught not only in the year which immediately followed the 1954 outbreak but also in later years. This fact would indicate that the presence of local

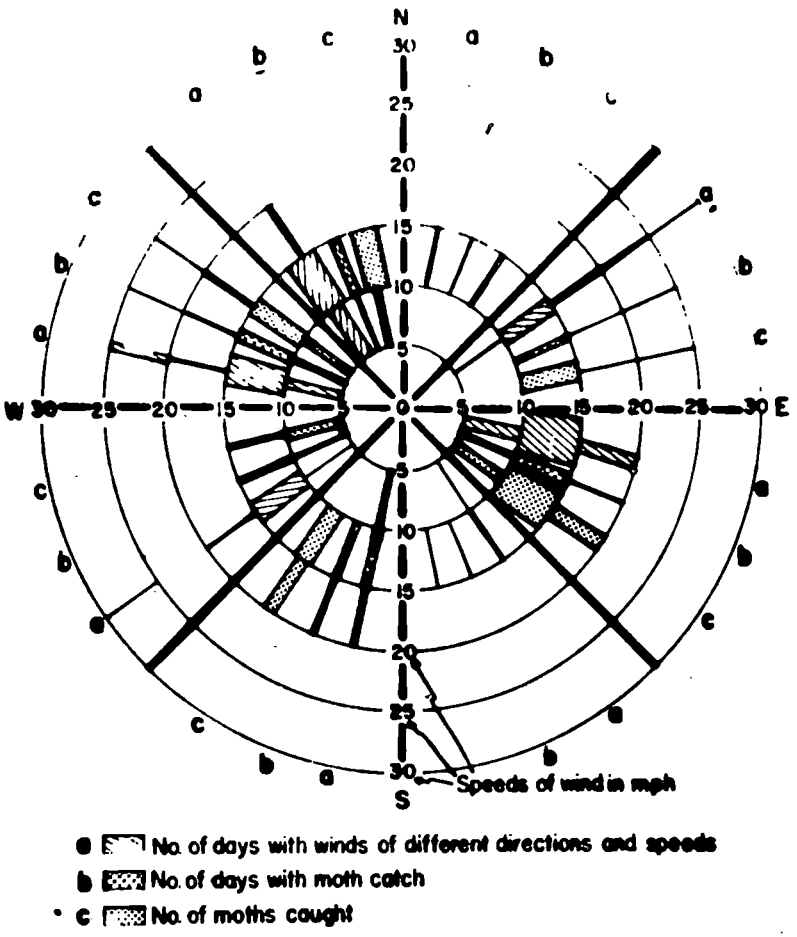

Fig. 1. Moth catch in light trap in relation to the direction and velocity of wind.

overwintering populations is a normal situation rather than a residual effect of population outbreaks.

Summary and Conclusions: The flight of the armyworm moths in Duluth, Minnesota, in 1955, 1956, and 1959 were correlated with the wind and temperature conditions. It was found that, in general, the frequency of flight was independent of the direction of wind, but was correlated with the average wind velocity and the daily mean temperature. Phenological interpretation of the flight records, as well as anatomical examination of the specimens collected, suggest that the moths caught were of local origin, and that the insect might overwinter in northern Minnesota in an advanced larval stage or even the pupal stage. A suggestion was also made that the presence of overwintering populations in northern Minnesota is a normal situation rather than a residual effect of population outbreaks.

LITERATURE CITED

BISSELL, THEODORE L. 1944. Armyworms in Georgia. *Jour. Econ. Ent.* 37:112-3.

DAVIS, J. J. and SATTERTHWAIT, A. F. 1916. Life history of *Cirphis unipuncta*, the true army worm. *Jour. Agr. Res.* 6:799-812.

KNIGHT, H. H. 1916. The armyworm in New York in 1914. *Cornell University Agr. Exp. Sta., Ithaca, Bull.* 376:16-8.

MICKEL, C. E. 1932. Armyworms in southern Minnesota. *Jour. Econ. Ent.* 25:1123-8.

State of Minnesota, Office of State Entomologist, Minnesota Department of Agriculture, Dairy and Foods 1955. *Circular No. 274-N.*

SEAMANS, H. L. 1956. Field crop and vegetable insects. *Can. Ent.* 88:322-31.

STIRRETT, G. M. 1938. A field study of the flight, oviposition and establishment periods in the life cycle of the European corn borer, *Pyrausta nubilalis* Hbn., and the physical factors affecting them. IV. *Scientific Agriculture* (Canada) 18:568-85.