

# SILVER-STRIPED WEBWORM, CRAMBUS PRAEFECTELLUS ZINCKEN<sup>1</sup>

By GEORGE G. AINSLIE

Entomological Assistant, Cereal and Forage Insect Investigations, Bureau of Entomology,  
United States Department of Agriculture

## INTRODUCTION

Although of less economic importance than many other members of the genus, *Crambus praefectellus* is so widely distributed that it is sure to be met with by anyone interested in these beautiful little moths. It is one of several species with a longitudinal silvery-white stripe in the forewing (fig. 2). It is most likely to be confused with *C. leachellus* Zincken, which, however, is a larger species with the white stripe running much closer to the costal margin of the wing than it does in *praefectellus*. *Crambus quinquareatus* Zeller and *C. unistriatellus* Packard also resemble it in size and general pattern, but in the former the apex of the wing is acuminate and in the latter the white stripe runs the full length of the wing, characters which easily distinguish their possessors from the species under consideration.

## SYSTEMATIC HISTORY

*Crambus praefectellus* was first described by Zincken (9, p. 249)<sup>2</sup> in 1821 from specimens sent him from Georgia. He placed it in the genus *Chilo*, which at that time was synonymous with what we now know as the subfamily Crambinae. Clemens (3, p. 203) redescribed it in 1860 as *Crambus involutellus*. In his revision of the group in 1863, Zeller (8, p. 18) placed Zincken's species in its present genus and incorrectly placed *involutellus* as a synonym of *leachellus* Zincken. In this he was followed, with some hesitation, by Grote (7, p. 77), but Fernald (5, p. 45) corrected the error and first placed *involutellus* Clemens as a synonym of *praefectellus* Zincken, a course approved by all later writers. The synonymy then stands as follows:

*Chilo praefectellus* Zincken, 1821  
*Crambus involutellus* Clemens, 1860  
*Crambus praefectellus* (Zincken) Zeller, 1863

Although the bibliography of this species comprises some 25 titles, the great majority of these are merely references to the occurrence of the moths in various localities. Felt (4, p. 85) figures and discusses the species, but since he did not find it at Ithaca, N. Y., where his work was done, he gives us no biological information. Fernald (6, p. 31) figures and describes the adult and concludes with the comprehensive statement, "Early stages and food plant unknown." Since that time Britton's paper (2, p. 222) is the only publication that adds to our knowledge.

<sup>1</sup> Accepted for publication July 11, 1922. This paper is the fourth in a series of Contributions to a Knowledge of the Crambinae of North America. I, *Crambus hemiochreilus* Zeller, appeared in Annals of the Entomological Society of America for March, 1918, and II, *Crambus laqueatellus* Clemens, appeared in the June, 1922, issue of the same journal. The third paper, entitled, "Striped Sod Webworm, *Crambus mutabilis* Clemens," precedes this paper in the Journal of Agricultural Research.

<sup>2</sup> Reference is made by number (italic) to "Literature cited," p. 424-425.

## GEOGRAPHICAL DISTRIBUTION

*Crambus praefectellus* is a strictly American species and seems to be limited to the eastern half of the United States. It has been taken in practically every State east of the Mississippi River and also in North Dakota, South Dakota, Minnesota, Iowa, Colorado, Missouri, Arkansas, and eastern Texas. It is reported from Cartwright, Manitoba, and also occurs in eastern Canada, at least along the southern edge. The accompanying map (Fig. 1) shows at a glance its present known distribution. The following list gives the States from which records are avail-

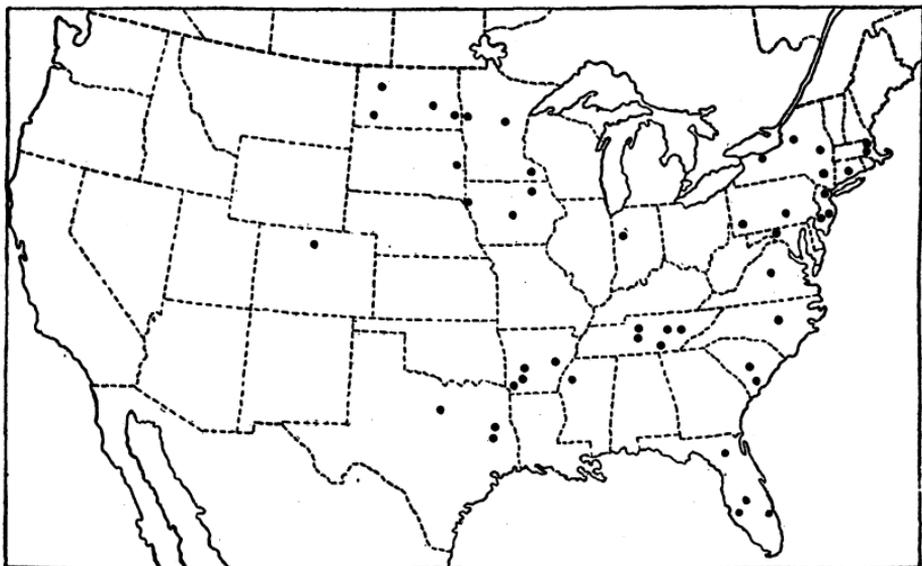


Fig. 1.—Map of the United States showing known distribution of *Crambus praefectellus*.

able and also gives the first and last date and the intervening months when collections have been made:

Arkansas. March 28, June, July 3.	New York. May 21, June, July, August 18.
Colorado. (Date uncertain.)	North Carolina. June —, July, August 23.
Connecticut. May 26, September 1.	North Dakota. June 12, July 21.
Florida. February 7, March, April 30.	Pennsylvania. May 24, June, July, August 19.
Georgia. (Date uncertain.)	South Carolina. April 1 to 7.
Illinois. May 31, June, July, August, September 3.	South Dakota. June 24.
Indiana. August 11, 12.	Tennessee. April 3, May, June, July, August, September, October 20.
Iowa. July 8, August, September 6.	Texas. January 30, March, April, May 22.
Kentucky. August.	Virginia. September 5, 6.
Maryland. August 30.	West Virginia. May 30.
Massachusetts. May 31, June, August 22.	Wisconsin. September 10.
Minnesota. June 19, July —.	Manitoba, Canada. (Date uncertain.)
Mississippi. May 3, June 22.	Ontario, Canada. June 4, July 6.
New Hampshire. August 1 to 7.	
New Jersey. May —, June, July, August, September 11.	

## FOOD PLANTS

Corn, wheat, rye, oats, blue grass (*Poa pratensis*), pigeon grass (*Setaria glauca*), and timothy (*Phleum pratense*) were all used as food plants in the writer's rearing cages and all were accepted readily by the larvæ.

Doubtless this list could be almost indefinitely extended. Judging from the habit of the moths in frequenting weedy waste ground in preference to grassy places, it is very likely that the larvæ also feed on plants other than grasses. The foregoing plants include all on which larvæ have been taken in the field.

#### ECONOMIC HISTORY

While it can not be regarded as a serious pest, *Crambus praelectellus* in one or two instances has shown that it can cause considerable injury under certain conditions. Single larvæ have been taken destroying wheat at La Fayette, Ind., and corn at Lakeland, Fla., Prescott, Brinkley, and Hot Springs, Ark., and Knoxville and Caney Spring, Tenn. Larvæ were received from Advance, Mo., with the report that they had injured 50 acres of a 300-acre cornfield. Britton's (2) recent account is the only published record of injury by these larvæ. In this case a small field of corn in the outskirts of New Haven, Conn., was almost totally ruined. The field had been in grass previously, and was plowed in the spring and planted to corn. The plants were attacked while small, and so numerous were the larvæ that only a very few plants escaped injury and produced grain.

Just what factors in the life economy of this species prevent it from more often becoming destructive can not be stated. Probably parasites, predacious enemies, and disease all play their parts, but nothing is known about these. It is apparent that this insect has not in any special way adapted its life cycle to extremes of climate. It has no definite protective resting period and consequently is overtaken by winter and unfavorable weather in all its different stages, some of them unfitted to resist such conditions. The mortality from such causes must be very great.

If control measures were needed, probably the best would be early fall plowing of land intended for corn the following season. If this were done, and the planting delayed as long as possible in the spring, the ground meanwhile being fallow and free from weeds and grass, there should be very slight possibility of the larvæ surviving until the corn germinated. If the infestation is not discovered until the corn is up, as is usually the case, little can be done but to replant alternately with the old rows, allowing them to stand as long as possible before cultivating them out. This method is described more fully in another paper (1, p. 15).

#### SEASONAL HISTORY

The earliest seasonal record for a moth of *Crambus praelectellus* is January 30, at New Caney, Tex. It has been taken at several points in Florida during February. In Tennessee, where continuous observations have been made for several years, the first moths make their appearance during April, usually toward the end of the month. It is always the first species of the genus to appear. On one occasion a battered male moth was taken at Knoxville on April 3. This is more than two weeks earlier than the moths have been taken in other years, and the pupa from which it emerged may have been formed in a particularly sheltered location.

After their first appearance the moths do not become abundant but are found singly and scatteringly throughout the greater part of the

summer. The generations are not distinct, although at some times the moths appear to average fresher than at others. It is very evident that they breed continuously and that the larvæ do not have any considerable resting period after completing their growth but pupate at once. Judging from laboratory rearing records, there are probably three generations during the year in Tennessee. Farther north this number may be lessened and at the southern limit of its range there are probably more. With a species such as this, in which the generations follow one another without intermission other than the delays due to unfavorable weather conditions, the number of generations in any given season is directly dependent on the length of the growing season and may vary from year to year.

All the available data as to the seasonal appearance of moths in other regions are so scattered and fragmentary that it seems impossible to draw any definite conclusions from them. In the list given under "Geographical distribution," the seasonal records are arranged by States. In the following list the same data are arranged by months, in order to show very incompletely the seasonal trend of the occurrence of the moths.

January.....	Texas.
February.....	Florida.
March.....	Texas, Florida, Arkansas.
April.....	Texas, Florida, South Carolina, Tennessee.
May.....	Texas, Mississippi, Tennessee, West Virginia, Illinois, New Jersey, Pennsylvania, New York, Massachusetts, Connecticut.
June.....	Mississippi, Arkansas, Tennessee, North Carolina, New Jersey, Illinois, Pennsylvania, New York, Massachusetts, Minnesota, South Dakota, North Dakota, Ontario.
July.....	Arkansas, Tennessee, North Carolina, Illinois, Pennsylvania, New Jersey, New York, Iowa, Minnesota, North Dakota, Ontario.
August.....	Tennessee, North Carolina, Kentucky, Illinois, Maryland, New Jersey, Pennsylvania, New York, New Hampshire, Massachusetts, Indiana, Iowa.
September....	Tennessee, Illinois, Virginia, Connecticut, New Jersey, Iowa, Wisconsin.
October.....	Tennessee.

#### THE MOTH

The writer has never found the moths of this species really abundant. Usually they have been taken very sparingly, one or two at a time and very seldom as many as half a dozen in a day's collecting. They were seen most abundantly at Greenwood, Miss., on the night of June 22, 1915, when 34 were taken at electric street lights between 8 and 11 p. m. In the field the moths seem to prefer more or less open, weedy or waste ground, such as neglected strawberry beds or fallow fields, rather than grassy places.

When the moths are flushed during the day, they usually fly only a short distance and may be readily captured with a small vial, but toward dusk they are much more wary, and when disturbed frequently fly 50 feet or more before settling. They alight, apparently without preference, on any part of an object, leaf, grass stem, or very frequently on the bare ground. They seldom rearrange their position after alighting. In the field, the silvery stripe and the brassy shade of the forewing in fresh specimens make them easy to identify at a considerable distance. Around lights at night they can be distinguished from *Crambus teterrellus* Zincken, the only other species of equal size with which they are apt to be asso-

ciated, by their habit of lying closely parallel with the surface on which they are at rest, quite in contrast with the moths of *teterrellus*, which rest with their heads pressed closely to the surface and their bodies elevated at an angle of 25°.

The data on hand show that these moths are not especially prolific, at least compared with some of the other species of this genus. The average number of eggs laid by the 41 females of which the writer has records was 118. This includes moths taken in the field and confined in dry vials and in tin boxes with water and with honey. The largest number laid by a single individual was 533, and only 9 of the entire 41 laid more than 200 eggs. The moths evidently mate immediately after issuing from the pupa, for not one of those collected in the field, some of them very fresh, laid infertile eggs.

There is nothing to indicate that the adults of either sex ingest anything besides water. They do not seem in the least attracted to flowers or other possible food sources. One moth excitedly waved her antennæ when approached with a droplet of honey and when finally induced to taste it, rapidly sucked it up. An attempt was made to determine if food in the form of dilute honey had any effect on the length of life or the egg production. The following table summarizes the results and leads to the conclusion that food has no pronounced effect above that of plain water, on either longevity or fecundity, but that either water or honey appreciably prolongs the life and increases egg production above that of moths confined in dry vials. As the majority of these moths were taken in the field, the averages as given are rather below than above the normal.

TABLE I.—Relation of feeding to longevity and fecundity of moths of *Crambus praelectellus*

	Male.		Female.			
	Longevity.	Number averaged.	Longevity.	Number averaged.	Eggs produced.	Number averaged.
	<i>Days.</i>		<i>Days.</i>			
Water.....	9.07	15	8.9	8	138	8
Dilute honey.....	7.45	20	11.25	12	134	12
Dry.....	7.75	4	6.72	18	96	21

#### DESCRIPTION OF MOTH (FIG. 2)

Wing expanse, 18–25 millimeters. Head, palpi, and abdomen cinereous, the abdomen lighter. Thorax and forewings golden fuscous, the latter with a silvery white stripe bordered with a fine darker line and tapering toward each end, from base to near subterminal line, a tooth near middle of lower side, and a silvery white dash above the tip and often fused with it; from this dash a dark shade with a light costal triangle above it, a light patch below it, and crossed by the plumbeous subterminal line, runs to the apex of the wing. Costal margin wider than in *leachellus*, being more than one-half the width of the white stripe at the middle of the costa. Subterminal space with 5 blackish venular dashes. Fringes white or slightly tinged with ochreous. Hind wings white or slightly cream-colored, fringes white. (Rewritten from Fernald.) The male antennæ are plainly flattened, each segment bearing a wedge-shaped process, which, in the medium segments, is provided with 8 to 10 sensoria (Pl. 1, E). The female antennæ are filiform and are beautifully banded with narrow alternate rings of brown and white (Pl. 1, F).

**GENITALIA.**—Male: Tegumen (Pl. 1, D) with body very short, about one-third the length of the limbs, which are broad, nearly straight, and almost truncate at the tip. Uncus broad at base but quickly narrowing, slender, and of uniform width for the rest of its length, the distal third dorsad thickly set with short stout spines inclined cephalad, interspersed with a few sparse hairs; gnathos glabrous, its limbs widely separated at their tips but quickly narrowing to the slender body, which considerably exceeds the uncus. Harpes (Pl. 1, B) rather narrow at base, elongate and subfalcate in general shape; costa free except at base but much modified into a short chitinized process, incurved and truncate; cucullus lightly chitinized, strongly concave, widest just above the base and narrowing gradually to the rather obtusely rounded tip, very hairy within, with an especially thick tuft just above the base. Cucullus not sharply separated from the sacculus, which is subquadrate in general outline, with a thickened costal margin and on its disk near the ventral margin a stout, heavily chitinized finger-like spine. The vinculum is much reduced and is merely a band of lightly chitinized tissue connecting the bases of the harpes. Aedoeagus (Pl. 1, C) lightly chitinized, nearly cylindrical, rounded at the base and curved in the shape of an old-fashioned pistol; at the tip truncate and somewhat bell-shaped, the internal lining for half its length roughly tuberculate; just inside the tip is a very short, sharp, chitinized thorn-like cornutus, and about two-thirds toward the base another much larger, acute, oblique spine with a very long narrow base, its tip inclined toward the tip of the aedoeagus. Anellus a mere ventral membrane. Female: Anal plate (Pl. 1, G)

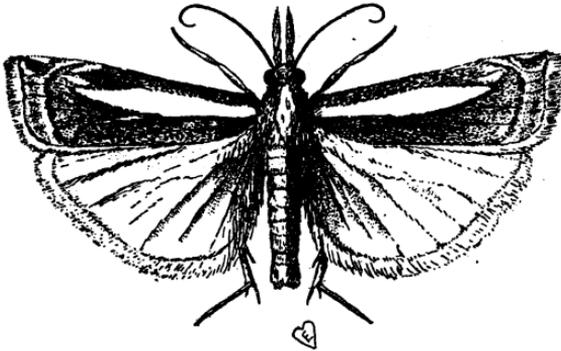


FIG. 2.—*Crambus praelectellus*: Adult. About three times natural size.

two-lobed, the dorsal lobe more feebly chitinized, about one-third the width of the lower, and separated from it by a deep notch, the margins of both lobes thickly set with stout setæ.

#### THE EGG

As is the case with all other species of this genus so far as known, the eggs are dropped promiscuously by the female during the early evening as she flies about or stands at rest. They are dry and drop down among the grass stems to effectual concealment in the débris beneath.

The incubation period has varied in the writer's experience from 15 days in March in Florida to 5 days in June and July in Tennessee, with all intermediate gradations. During the growing season from 5 to 9 days seems to be about the usual duration.

Almost snow white when first laid, the egg day by day becomes first pink, then flesh color, salmon, and, finally, on about the fourth day, a bright clear coral-red. They remain thus until about 24 hours before hatching, when the head and cervical plate of the contained larva begin to darken, giving the eggs a purplish hue. The larva escapes through a somewhat irregularly cut hole at one side of the larger end of the egg, leaving the empty shell nearly transparent and slightly iridescent.

The eggs of this species are somewhat rounder and with the small end a little more acute than the average for the genus. With this as with

several other species, it is found that the variations among the eggs of different individuals, especially in size, were greater than those existing between this and other species, thus rendering interspecific measurements of very little value. In fact, it holds true throughout the genus that the eggs of the various species are so similar as to render them practically indistinguishable.

To indicate the variation in size of the eggs of this species, the following measurements of two lots of 10 eggs each were made at different times:

TABLE II.—Egg measurements of *Crambus praefectellus*

Lot.	Length.			Width.		
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.
1.....	<i>Mm.</i> o. 5471	<i>Mm.</i> o. 5118	<i>Mm.</i> o. 5207	<i>Mm.</i> o. 3353	<i>Mm.</i> o. 3000	<i>Mm.</i> o. 3106
2.....	. 5736	. 4633	. 5018	. 3442	. 2692	. 3149

The color is of interest because it has been found that the maximum color attained during the incubation period is very similar in the various subgeneric groups of closely related species, and differs between these groups from a pale straw-yellow to a deep coral-red. Thus the egg colors as well as the head colors of the newly hatched larvæ help to indicate the affinities of the various species.

The chorion is ornamented with acute longitudinal ribs, usually 21 in number, which become obsolete before reaching the poles. The polar areas are covered with scattered oval tubercles of variable size (Pl. 1, H). Between the ribs there are also less prominent cross carinae, about 17 of these in the length of the egg. The egg is suboval in outline, one end slightly larger and more flattened than the other.

#### THE LARVA

The writer has never taken larvæ in the field, and the only notes on their normal behavior are those contained in Britton's account (2) of the attack on corn in Connecticut. Even here the conditions were not strictly normal, for the grass sod in which the larvæ were living was plowed under in the spring and the field planted to corn, forcing the larvæ onto the young corn plants as the only available food. The larvæ fed in the manner usual to most of the species under similar conditions, cutting a hole into the tender stalk below the ground level and living in a fragile tube of silk and earth particles attached to the stalk and leading off into the ground. Except when actually at work the larva does not remain in the stalk, but in this tube, so that when the plant is pulled the author of the injury, together with most of its domicile, is likely to be left behind in the earth.

In the cages used the larvæ were reared without especial difficulty. For the most part 1-ounce or 2-ounce tin salve boxes floored with damp blotting paper were used and the food was supplied in the form of short sections of the leaves of various grasses, usually blue grass (*Poa pratensis*). Under these conditions the progress through the instars was easily watched. It was not always easy, however, to be sure that a

molt had occurred. The only sure proof was to find the cast of the head, but in this species the first act of the newly molted larva was in most cases to eat the head cast, often leaving nothing but the mandibles as evidence that ecdysis had really occurred.

The first food of the larva consists of the fragment of eggshell consumed in effecting escape from the egg. This particle becomes bright pink or salmon color in the intestinal tract. As soon as it is free from the egg the tiny caterpillar is ready for green food. When placed on a blue-grass leaf it begins operations by cutting a narrow pit lengthwise of the leaf, at first avoiding the veins. This pit soon becomes large enough to contain the entire body of its maker and then a few threads of silk are spun across above it. The excrement is placed on or among these strands and in a few hours the larva is practically concealed from sight by this filthy roof. After the first day or two the larva eats the small veins as well as the tissue between them down to the lower epidermis of the leaf, but not until it reaches the third instar does it consume the entire leaf blade. By this time it has become too large effectually to conceal itself on a blue-grass leaf, and thenceforth seeks the earth, where, for protection, it constructs a tubular retreat of mingled silk and earth particles. From this vantage ground it comes out, usually at night, to cut off and consume one by one the blue-grass leaves.

As stated above, the larvæ of this species do not spend any time in a resting period, but pupate as soon as fully fed, weather conditions permitting. Of course during the cool weather of spring and fall, and in the winter, their activities are much retarded or cease altogether, but as soon as warmer temperatures prevail feeding is resumed and the transformations completed.

The following tables give figures showing the maximum, minimum, and average periods required for the various instars and for the complete life history.

TABLE III.—Length in days of various stages and instars of *Crambus praelectellus*

A. EGGS HATCHING MAY 13

	Eggs.	I.	II.	III.	IV.	V.	VI normal.	VI pre-pupal.	VII pre-pupal.	Pupa.
Maximum . . . . .	9	5	5	4	6	6	6	15	8	12
Minimum . . . . .	9	3	2	2	3	4	4	7	8	9
Average . . . . .	9	3.46	3.83	3.00	3.92	5.20	5.00	9.30	8.00	9.87
Number of records averaged . . . . .		26	29	27	27	25	2	19	1	15

B. EGGS HATCHING JUNE 25

Maximum . . . . .	5	2	4	4	4	5	5	18	12	11
Minimum . . . . .	5	2	3	3	3	2	5	11	12	10
Average . . . . .	5	2	3.50	3.17	3.82	4.25	5.00	13.14	12	10.33
Number of records averaged . . . . .		14	12	12	11	8	1	7	1	6

TABLE III.—Length in days of various stages and instars of *Crambus praefectellus*—Con.

C. MISCELLANEOUS RECORDS. EGGS HATCHING APRIL 21 TO AUGUST 8

	Eggs.	Larva.	Larva-pupa.	Pupa.	Entire developmental period.
Maximum.....	15	38	85	18	71
Minimum.....	5	27	33	9	41
Average.....	7.73	31.5	51	11.3	51.5
Number of records averaged.....	22 lots.	14	65	21	.....

In addition to those included in the tables, the writer has records of a few individuals hatching on September 18, which emerged as adults between January 23 and February 26 of the following year, after having been kept in the cool room of the insectary all winter.

It will be noted that most of these larvæ pass through six instars before pupation, but occasionally there is a seventh instar. The last instar before pupation is always much longer than those preceding, so that in order to make the averages correct these records are separated as normal and prepupal.

Through an oversight, detailed color descriptions of the various larval instars except the first were not made. The molted head casts were preserved, however, and the following list of characters is drawn up from them:

TABLE IV.—Head width of larvæ of *Crambus praefectellus*

Instar.	Minimum.	Maximum.	Average.	Number of heads measured.
	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i> (a)
I.....	0.229	0.229	0.229	
II.....	.335	.300	.325	8
III.....	.529	.459	.512	7
IV.....	.882	.759	.826	10
V.....	1.306	.933	1.219	15
VI.....	1.493	1.306	1.399	2

a Large number measured, but exact number not known.

In the first instar the head is shining black, paling somewhat but still fuscous in II. In III the ground color is still paler, with faintly darker areas indicating the later color pattern. In IV these markings have become much darker and more distinct, and the ground color of the head has become pale yellow. In the next two instars the colors remain the same, but become more intense. The color of the body of the larva through most of its growing period is a dull brown with a greenish tinge from the contents. The arrangement of the pinacula and setæ is shown in Plate 1, A.

#### THE PUPA

The cocoon is a little case about the size and shape of a peanut meat, lined and stiffened with gray silk inside and outwardly covered with particles of earth. It generally lies so near the surface that no "neck" or emergence tube is necessary.

The pupa itself is very similar to others of this genus. Bright yellow when first formed, it soon darkens to a mahogany brown. A day or two before emergence the silvery stripe in the forewing becomes plainly visible through the covering. The

pupa is 9.0 millimeters long and 2.0 millimeters wide. The caudal process is flattened into a broadly triangular plate with sharp margins, its acute tip bent slightly ventrad. Close to the tip of this plate below are two slender bristles with upturned ends, while above, more widely spaced and standing about halfway from the tip to the basal angles of the plate, are two shorter, smaller bristles with down-turned ends. Beneath, the process is flattened but not excavated.

The data as to the duration of the pupa stage are included in Table III. It varies somewhat, depending on the temperature, in the writer's records ranging from 9 to 18 days. The last, however, is very unusual, and the average of all the records puts it at 10.65 days, which is much more nearly correct. Ten days may be taken as the usual duration of this stage during the growing season.

#### SYSTEMATIC RELATIONSHIPS

*Crambus praelectellus* is closely similar to *C. leachellus* in structure as in wing markings. The male genitalia differ in that in the former species the cucullus of the harpe is narrower and somewhat more falcate, the free costal margin is shorter and more highly chitinized, and the cornutus of the aedoeagus is smaller. *C. unistriatellus* also undoubtedly belongs to this group. Its harpes and uncus are very similar, but the aedoeagus differs somewhat in its armament. Another species, as yet not definitely determined but externally very similar to *C. leachellus*, has genitalia which place it in this group, though it is certainly specifically distinct from any of the other members. *C. quinquareatus* (considered by Felt as *C. hastiferellus* Walk.) is placed in this group by Felt (4, p. 85), but for want of more certain synonymy its position is not discussed.

#### SUMMARY

*Crambus praelectellus* is an American species widely distributed throughout the eastern half of the United States. While not often injurious, it has shown itself capable of causing serious damage.

It breeds continuously throughout the growing season. The generations are not distinct, but rearing records indicate that three generations per year is the usual number.

The moths are not often abundant. They prefer waste or weedy land and are seldom found in clean grasslands. The larvæ are readily reared on grasses. Winter is passed by the partly grown or mature larvæ. The moths from the mature larvæ emerge early in the spring and are the first *Crambus* moths to appear.

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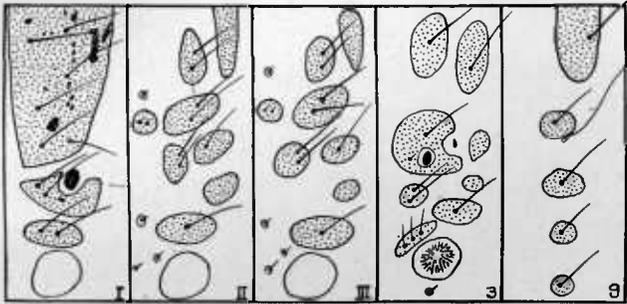
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PLATE I

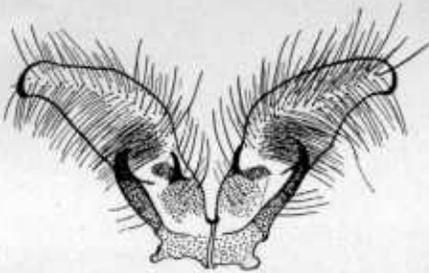
*Crambus praelectellus*:

- A.—Setal map of larva showing arrangement of pinacula and setæ on the three thoracic and third and ninth abdominal segments.
- B.—Male genitalia: Harpes.
- C.—Male genitalia: Aedoeagus.
- D.—Male genitalia: Tegumen and uncus.
- E.—Male antennal segment (twenty-fifth). Greatly enlarged.
- F.—Female antennal segment (twenty-fifth). Greatly enlarged.
- G.—Female genitalia: Valve.
- H.—Polar area of egg. Greatly enlarged.

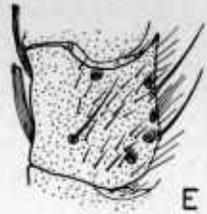
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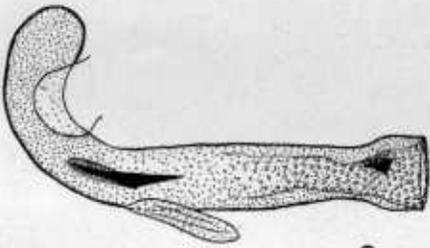
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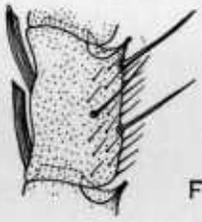
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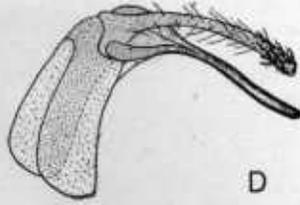
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C



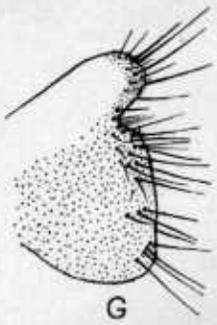
F



D



H



G