

Bird Predation on the European Corn Borer

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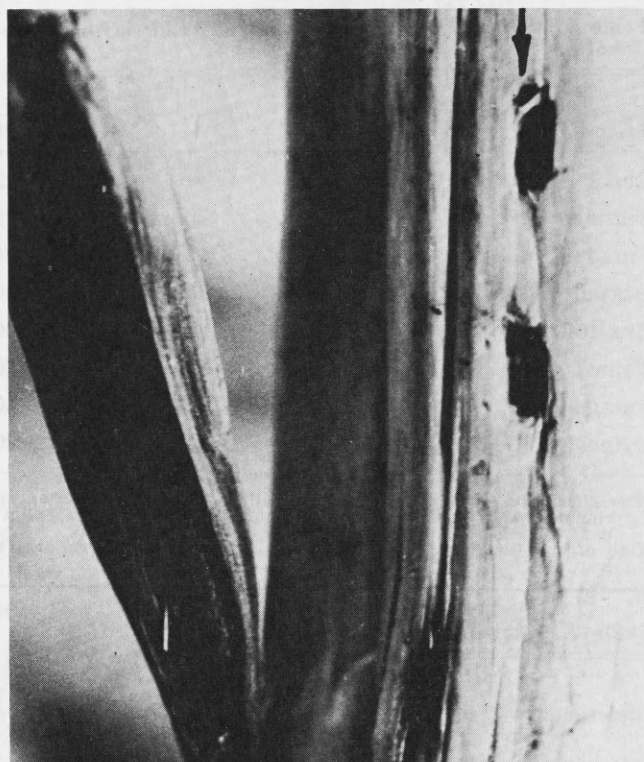
It is well known that insects are an important source of food for many species of birds, and that birds are a factor in the natural control of insect populations. Several species of birds, especially woodpeckers, have been observed feeding on the European corn borer, *Ostrinia nubilalis* (Hbn.). Barber (1925, 1926) reported predation on overwintering larvae by birds; mice were also seen feeding on larvae during the winter. Predation on moths and pupae was also observed.

The most important avian predators (including the woodpeckers) belong to the family Picidae (Barber 1925, Frankhauser 1962). Beal (1911) reported that insects provide more than 65 per cent of the yearly food for members of the Picidae. Stoltenow (1968) found that the most important avian predators in corn fields near Fargo, North Dakota, during the fall, winter and spring of 1967-68 were the downy, *Dendrocopos pubescens* (Swainson), and hairy, *D. villosus* (Linnaeus), woodpeckers. He concluded that birds feed on overwintering borer larvae in quantities that can be estimated. The degree of bird predation appeared to be influenced by the amount and distribution of borer damage, and by the location of the corn field (near or removed from trees). Kaatz (1968) reported that 47 per cent of all corn fields observed showed evidence of bird predation.

Procedures

Bird predation of overwintering corn borer larvae in corn stalks was studied at Northwood, North Dakota, during 1968-69 and 1969-70. A field with a nearby shelterbelt was selected for the study. Eighteen 16x25-foot plots of sweet corn (Morning Sun) were left in the field over the fall, winter and spring. Six of the plots were caged with one-inch wire chicken fencing. The remaining 12 plots were left uncaged; six adjacent to the caged plots, and six 10 feet removed from the uncaged plots adjacent to the caged plots. The cages were

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Bird peck holes in a cornstalk

four feet high and adequate for excluding the downy woodpecker, the principal avian predator observed in the area. There were five rows of corn per plot. The plots were sampled in the spring before farming operations began. Ten plants in each

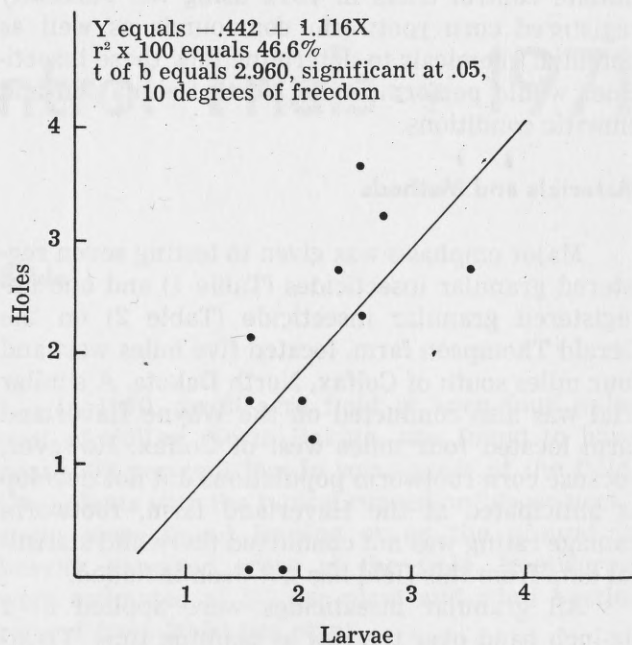


Figure 1. Relationship of the number of bird peck holes in the spring (1969) to the number of corn borer larvae in the fall (1968), Northwood, North Dakota, original data transformed to the square root of X or Y + .5.

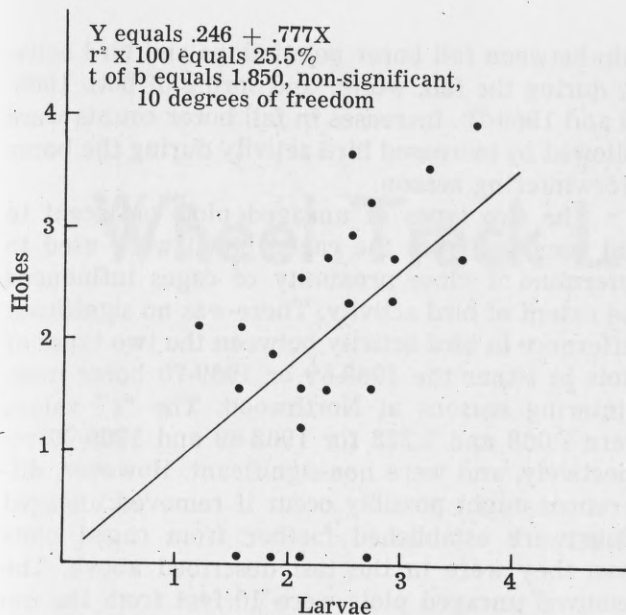


Figure 2. Relationship of the number of bird peck holes in the spring (1970) to the number of corn borer larvae in the fall (1969), Northwood, North Dakota, original data transformed to the square root of X or Y + .5.

plot were examined for evidence of woodpecker activity (typical holes in the stalks) and dissected for borer larvae. The data were transformed to the square root of X or Y + .5.

Results and Discussion

Results are summarized in Table 1 and Figures 1, 2 and 3.

Numbers of borer larvae were reduced from fall to spring during the overwintering period in

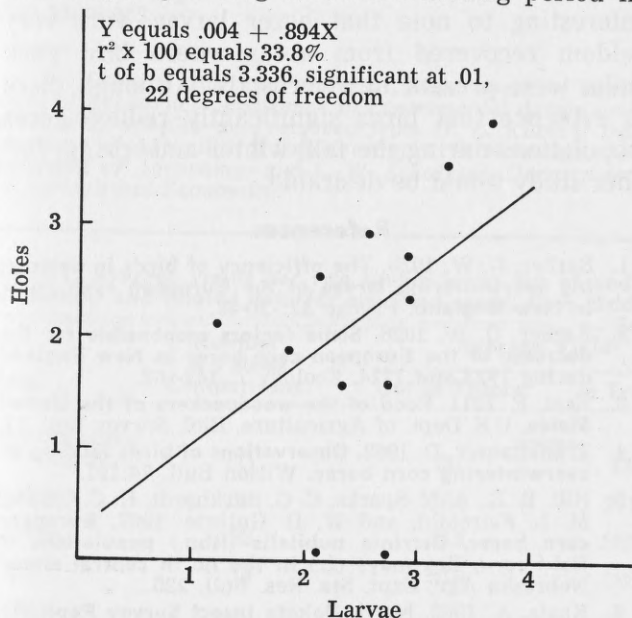


Figure 3. Relationship of the number of bird peck holes in the spring (1969 and 1970 combined) to the number of corn borer larvae in the fall (1968 and 1969 combined), Northwood, North Dakota, original data transformed to the square root of X or Y + .5.

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both 1968-69 and 1969-70. There is evidence that some of the reduction was due to bird activity. Multiple changes (decreases) in borer numbers from fall to spring in caged and uncaged plots averaged -1.73 (approximately 2-fold) and -4.82 (approximately 5-fold) respectively. Reduction in borer numbers averaged 75.61 per cent in uncaged plots and 41.48 per cent in caged plots. Since there was a reduction of 41.48 per cent in caged plots, factors other than bird predation contributed to decreases in borer populations from fall to spring. The average multiple change (increase) of 9.35 (approximately 9-fold) in the number of bird peck holes in the uncaged plots from fall to spring compared to 1.47 (approximately 1.5-fold) in caged plots indicates that birds were active in the corn during the fall, winter and spring of 1968-69 and 1969-70. Procedures used did not provide for determining

Table 1. Summary of bird activity and changes in European corn borer populations from fall to spring; Northwood, North Dakota, averaged over 1968-69 and 1969-70.

	Caged plots	Adjacent to caged	Removed from caged	Average
Multiple change ¹ in mean number of borers/10 corn plants	-1.73	-3.01	-6.62	-4.82
Per cent decrease in mean number of borers/10 plants	41.48	66.77	84.45	75.61
Multiple change in mean number of bird peck holes/10 plants	1.47	10.48	8.21	9.35

"t" value and sd⁴ of difference (decrease) in number of borers, fall to spring, caged vs. uncaged, 11 degrees of freedom

2.216² 4.396³
 sd=0.176 sd=0.207
 caged vs. average of uncaged 4.191³
 sd=0.167

"t" value and sd of difference (increase) in number of bird peck holes, fall to spring, caged vs. uncaged, 11 degrees of freedom

8.920³ 2.730²
 sd=0.176 sd=.307
 caged vs. average of uncaged 6.231³
 sd=0.207

¹as described by Hill et al. (1967). An increase from 1 to 2 is a multiple change of 2.0. Conversely, a decrease from 2 to 1 is a change of -2.0.

²significant at the 95 per cent level of probability.

³significant at the 99 per cent level of probability.

⁴standard error of the mean difference (d).

when most of the bird activity occurred during the overwintering period.

The "t" value of 4.191 (Table 1) for the difference in decrease in numbers of borer larvae in corn from fall to spring between caged and uncaged plots, averaged over both seasons, was significant at the 99 per cent level. This is interpreted to imply that if it is stated that the calculated confidence interval includes the true population mean, the statement would be true 99 per cent of the time. The standard error of the mean difference was 0.167 borers. There was a significant difference in the reduction in borer populations between caged and uncaged plots of corn. The "t" value (6.231) for the difference in increase in numbers of bird peck holes between caged and uncaged plots averaged over both seasons was significant at the 99 per cent level, and is interpreted as above. The standard error of the mean difference was 0.207 bird peck holes. There was significant bird activity in the corn plots during 1968-69 and 1969-70 overwintering seasons at Northwood. The bird activity was accompanied by a significant reduction in borer populations. Stoltenow (1968) reported that the location of a corn field is a factor which influences the amount of bird activity in corn during the fall, winter and spring. He found that there was more activity in a field that was near trees that provide shelter for birds.

Relationships between fall borer populations and spring bird peck hole counts are presented in Figures 1, 2 and 3. The estimated regression lines for the 1968-69 (Figure 1) and 1969-70 (Figure 2) seasons, and for both seasons combined (Figure 3) show linear relationships. The lines fit the field data fairly well.

The values for $r^2 \times 100$ indicate that 46.6 per cent and 25.5 per cent of the variation in spring bird hole counts in cornstalks was accounted for by the size of fall borer populations during the 1968-69 and 1969-70 seasons respectively. Over both seasons, $r^2 \times 100$ was 33.8 per cent. The "t" value (2.960) computed for the regression coefficient (b) for 1968-69 was significant at the 95 per cent level. The "t" value (1.850) computed for the regression coefficient for 1969-70 was not significant at the 95 per cent level, but was significant at the 90 per cent level. The "t" value (3.336) computed for the regression coefficient for the combined 1968-69 and 1969-70 overwintering season was significant at the 99 per cent level. The "t" values of 2.960, 1.850 and 3.336 are interpreted to imply that the chance that variation in fall borer counts contributed to variation in spring bird peck hole counts was 95 per cent, 90 per cent and 99 per cent respectively. The results indicate that there was a relation-

ship between fall borer populations and bird activity during the fall, winter and spring of both 1968-69 and 1969-70. Increases in fall borer counts were followed by increased bird activity during the borer overwintering season.

The two types of uncaged plots (adjacent to and removed from the caged plots) were used to determine if close proximity of cages influenced the extent of bird activity. There was no significant difference in bird activity between the two types of plots in either the 1968-69 or 1969-70 borer overwintering seasons at Northwood. The "t" values were 1.068 and 2.223 for 1968-69 and 1969-70 respectively, and were non-significant. However, differences might possibly occur if removed uncaged plots were established farther from caged plots than they were in the test described above. The removed uncaged plots were 10 feet from the uncaged plots adjacent to the caged plots, or 35 feet from the caged plots.

Summary and Conclusions

Bird predation on European corn borer, *Ostrinia nubilalis* (Hbn.), was studied at Northwood, North Dakota, during the fall, winter and spring of 1968-69 and 1969-70. The investigation indicated that avian predation reduced corn borer populations during the borer overwintering season. Evidence of bird activity in the spring (peck holes in cornstalks) was more abundant in corn plots with the largest borer populations the previous fall. The downy woodpecker, *Dendrocopos pubescens* (Swainson), was the most common avian predator. It is interesting to note that borer larvae were very seldom recovered from areas where bird peck holes were present in a cornstalk. Although there is evidence that birds significantly reduce borer populations during the fall, winter and spring, further study would be desirable.

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