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Some New Facts in the Biology of the Box Elder Bug

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THE HOUSEFLY AS A VECTOR OF THE AGENT OF WHITE DIARRHEA AND FOWL TYPHOID OF CHICKENS

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ABSTRACT

Five hundred pupae were processed for each bacterial organism studied. Fifty-one chickens were utilized for each of the bacterium species considered.

Salmonella pullorum (white diarrhea) was disseminated by 40 per cent of the experimental flies. Fifty per cent of the experimental flies harbored *S. pullorum.* The test bacterium was disseminated for nine days. The life span of the flies used in the bacterial-fly-longevity study was 16 days. All of the experimental flies gave evidence of harboring *S. pullorum* prior to the ninth day. Experimental flies infected with *S. pullorum* were fed to chickens, three weeks old, and in three days the test bacterium was recovered from the chicken's excrement. All 50 of the experimental chickens produced *S. pullorum* from their excrement on or before the twelfth day.

Salmonella gallinarum (fowl typhoid) was disseminated by 45 per cent of the experimental flies. The test bacterium was disseminated by one of the flies for nineteen days. The life-span of the flies used in the study was 20 days. Seventy-two percent of the flies studied in the bacterial-fly-longevity phase gave evidence of harboring *S. gallinarum.* Experimental flies infected with the test bacterium were fed to mature chickens and in six days the test bacterium was recovered, first from the excrement, then from the chicken's blood. All of the experimental chickens (50) produced *S. gallinarum* from their excrement and blood on or before the thirteenth day.

SOME NEW FACTS IN THE BIOLOGY OF THE BOX ELDER BUG

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There are a number of questions about the box elder bug (*Leptocoris trivittatus* Say) that have been puzzling. Why is the bug not noticeable during most of the year even though large numbers congregate on buildings in the fall? Why do large fall aggregations occur periodically? For example, outbreaks occurred during the drought years in the thirties and in 1948 and 1949, but not in between. And why are the bugs limited to pistillate box elder trees?

In a field study made of the seasonal behavior and ecology of the box elder bug in the summer of 1950, it was found that the food most frequently utilized by the bug was box elder seeds. This preference would explain the abundance only on pistillate trees.

This food preference also explains a shift in strata observed during the summer. The bugs were found only on the ground during the first part of the summer when the seeds had not started to develop on the trees. During this time they fed on low vegetation and on old seeds lying on the ground. But as the seeds began to form on the box elder trees in the middle of July, the bugs began moving into the tree stratum.

The bug was not distributed at random, but occurred in aggregations. They were in definite areas of concentration determined by food and temperature relations. The concentrations on the ground were always near pistillate trees. That is, they were always in areas where seeds would be lying on the ground. Later in the summer pistillate box elder trees were infested. Both the areas of ground concentration and the infested trees usually had temperatures warmer than the standard air temperature because they both had direct sun all or most of the day. Furthermore, ground concentrations were on substrata with a high heat absorbing capacity, and the tree infestations were on the side of the tree exposed to the sun.

There were several behaviors that were related to temperature. The bugs used the sun in several ways to warm themselves when the air was cool. In the morning they would rest on the upper surfaces of leaves in the sun. Very little feeding was done at this time. Instead, most of it was observed in the afternoon around the time of maximum temperature for the day.

In the laboratory it was determined that the threshold for activity was a relatively high 68°F. This temperature showed a relationship to the temperatures under which the spring and fall migrations took place, as all the days with active migration had a temperature above 68°F. This high threshold temperature suggests a reason for the bugs' choice of warm microhabitats.

A study of the instar composition of the fall population showed that at the end of the season not all the bugs were adults, i.e., the last generation was not complete. This may be an important factor in the natural control of the bug. It was found that nearly all the bugs concentrated on the building in the fall were adults and that the mortality of the bugs that had not migrated to the buildings was very high. The bugs that do not become adults in the fall probably will not survive the winter. Therefore, the fewer the adults, the smaller the population the next spring. The requirements for a more complete second generation, high temperatures and long growing seasons, are reflected in effective heat units using 68°F. as a threshold temperature. A higher value would make possible a more com-

plete second generation. This was demonstrated by the values found for years with low and high populations. A high value went with a large population and a low value with a dropping off of the population.

The food habits and temperature relations suggest an answer to the questions about the box elder bug. The bug is found on the ground and low vegetation during the first part of the summer where he feeds on the seeds lying on the ground. Beginning about the middle of July most of the adults and late instars are found on the pistillate box elder trees where they feed on the developing seeds. The aggregations are found only in areas exposed to the direct sun for most of the day. The size of the population is determined by the degree of completeness of the last generation, which in turn is determined by the number of days during the summer with high temperatures.

THE BIOLOGY AND CONTROL OF THE FOREST TENT CATERPILLAR

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SOME STUDIES OF FACTORS AFFECTING THE LOSS OF TREES

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A VEGETATIONAL ANALYSIS OF THE CARLOS AVERY GAME REFUGE, ANOKA COUNTY, MINNESOTA

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PLANT GEOGRAPHY AND ECOLOGY OF THE ARCTIC SLOPE OF ALASKA

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ABSTRACT

The Arctic slope of Alaska is located between the Alaskan-Canadian border and Cape Lisburne, and from the Brooks Range north