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SOME CONTRIBUTIONS TO THE STUDY OF GRASSLANDS

INSECT POPULATIONS

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GRASSLANDS BIOME

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INTRODUCTION

Preliminary investigations were initiated in September 1969, to evaluate techniques for the study of grasslands insect populations. Three methods of population sampling--the quick trap, the DeVac vacuum insect net, and the sweep net--were evaluated on two dates which spanned the first killing frost; this permitted the evaluation of the effect of the first freeze on range insect populations. The efficiency of Berlese-type extraction funnels was also evaluated.

EVALUATION OF THREE SAMPLING METHODS

An ungrazed buffalo grass-blue grama pasture was subdivided into 20 plots of approximately one-half acre each. Each plot was 72 ft by 300 ft. Each plot was sampled by each of the three techniques: a modification of the quick trap, which is being used in the Canadian Grasslands IBP project; the DeVac vacuum insect net equipped with an eight-inch opening; and a 15-inch diameter beating net.

The quick traps, attached to an eight-foot tripod, were positioned on the afternoon of the day before samples were taken. The one-half square meter traps were dropped by pulling on the end of a 50-ft cord which had been tied in a way that would allow the trap to drop. Insects were removed from the quick trap by a four-inch, flexible hose attached by a cone to the DeVac vacuum insect net. Approximately four minutes were spent in vacuuming the standing plant material and litter layer; this removed about 80% of the litter. The insects and litter were collected in a DeVac net, taken to the laboratory and, within six hours, placed in a modified Berlese funnel.

The DeVac vacuum insect net was carried from one end of the plot to the other and back, sampling a total of 600 linear feet. The collecting cone was tipped backward slightly and carried at a height which just brushed the canopy of the dominant plant material. Specimens and litter in the nets were also placed in Berlese funnels.

With the sweep net, 100 sweeps, each six feet apart, were taken and the contents transferred to DeVac bags for transport to the laboratory and then placed in Berlese funnels. The Berlese funnels were made from 30-lb. lard cans with the bottoms removed and funnels attached to the lower edge. There were 36 funnels in a unit; the top half of the cans were in a chamber heated to 130°F. The lower half of the cans and the funnels were exposed to the ambient air which was approximately 60°F. Samples were heated for 24 hours.

Analysis of the data indicated that there was very poor correlation between the numbers of insects in each taxa counted, and the sampling method employed. The sweep net data appeared to grossly underestimate numbers of every taxa. The DeVac data indicated that this method overestimates the numbers in some groups and underestimates other groups when compared to the quick trap. Small jumping, or weak flying insects--Collembola, leafhopper and plant hopper nymphs, and small flies--apparently are flushed by the DeVac operator and caught in the suction; thus, an area larger than the diameter of the collecting cone is partially sampled. The quick trap, since it encloses an area which is very carefully vacuumed would appear to be the most efficient. In all cases, except those previously described for Collembola, leafhopper and plant hopper nymphs, and small flies, the quick trap gave the highest population estimates.

Analysis of the data from quick trap samples showed that the variation in numbers of total insects per sample and the variation in total standing plant biomass from the same location were within the same order of magnitude. The standard deviation, calculated from 20 samples, varied from 30% to 35% of the mean for insect numbers and vegetative biomass.

A major source of error appeared to be the incomplete extraction of insects from the litter in the Berlese funnels. Preliminary data from the use of washing and flotation methods on the litter following extraction indicate that the efficiency of extraction varied with taxonomic category and was probably poorest in the quick trap samples; within these, extraction appeared to be least efficient for Collembola and leafhopper and plant hopper nymphs.

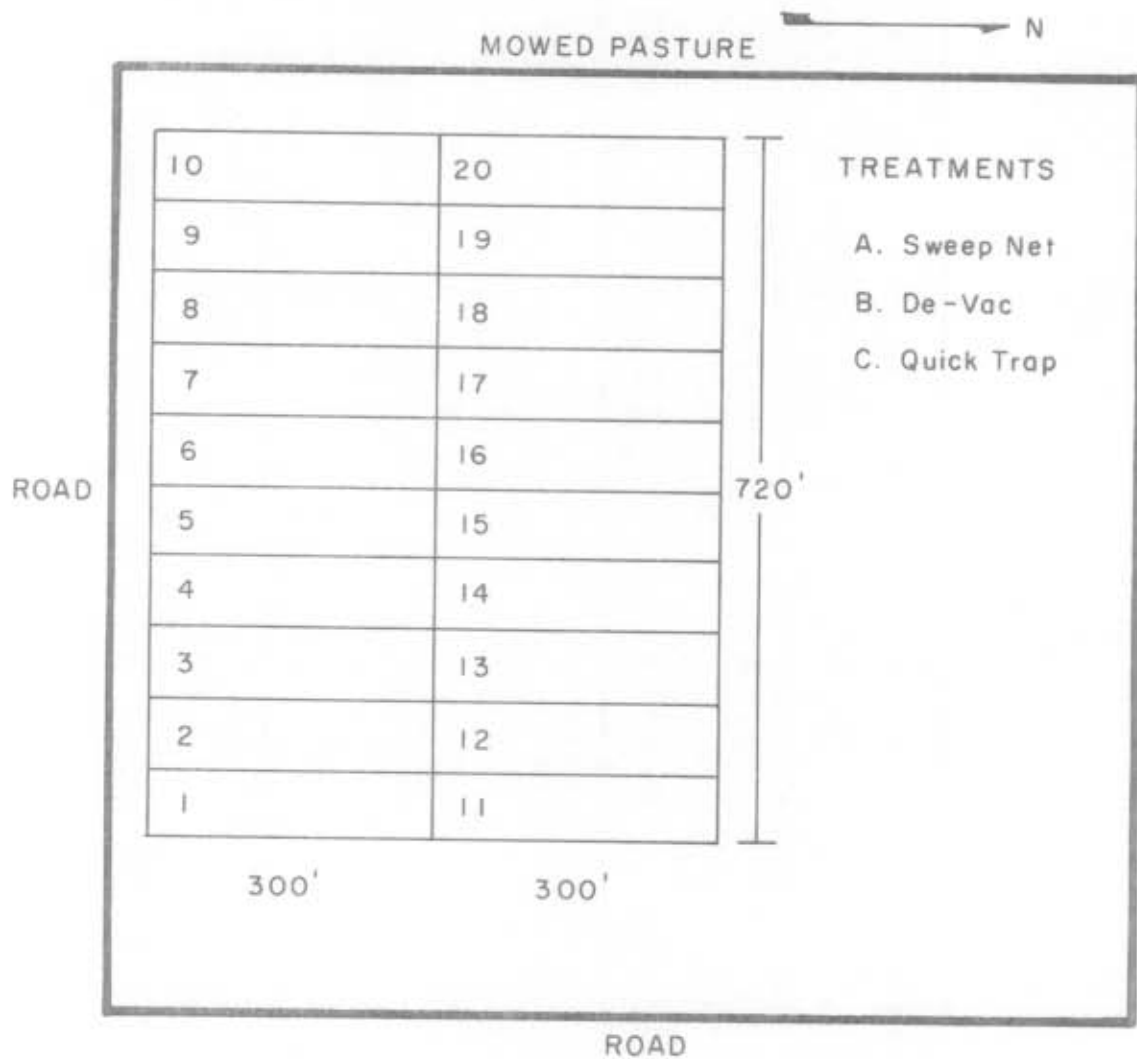
EFFECT OF THE FIRST KILLING FROST ON INSECT NUMBERS

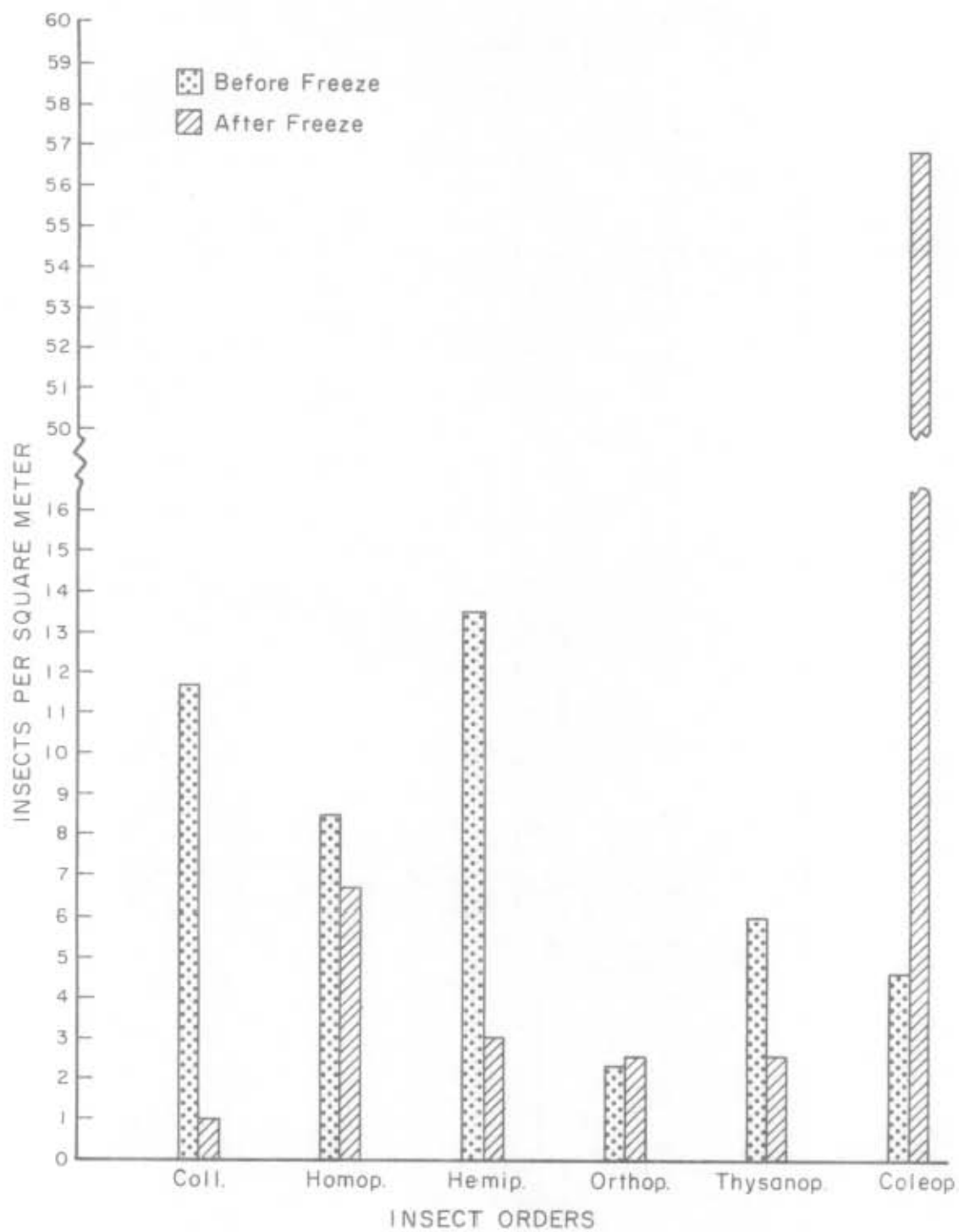
Data from samples taken two weeks prior to the first killing frost (28°F) and two weeks after this frost indicate a general reduction in numbers of most taxa. Noticeable exceptions were in Formicidae, adult Chrysomelidae and Elateridae, and adult Cicadellidae. Weather conditions were almost identical on both sampling dates. The increase in adult beetles and leafhoppers is apparently due to the normal seasonal pattern of development. These data indicate that a fairly large insect biomass may remain after the first killing frost; therefore, sampling should not be terminated at the first killing frost but should be continued throughout the winter.

SUMMARY

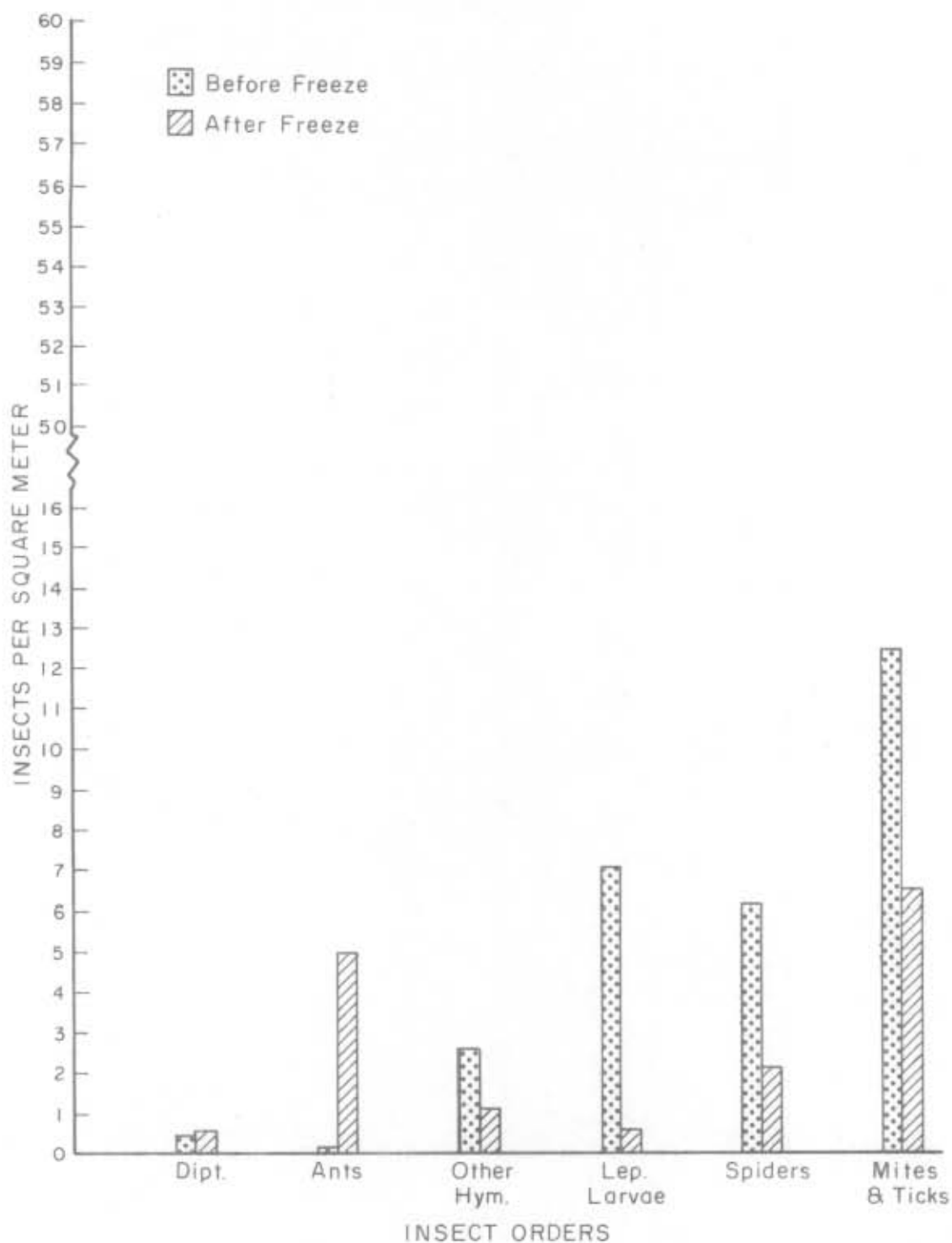
Based on these data and data from other investigators, insect sampling in the first year of the Comprehensive Network studies of the Grassland Biome

project will utilize the quick trap. Samples will be taken biweekly during periods of active plant growth and monthly during the remainder of the year. Tentative plans call for 20 samples per replicate per treatment. Specimens will be classified only to functional groups except in cases where further subdivision can be easily accomplished. All specimens will be preserved for species determination as interested specialists become available.





Insects Per Square Meter Before and After Freeze
By Quick Trap Method



Insects Per Square Meter Before and After Freeze
By Quick Trap Method

