A REPORT OF THE EFFECT OF OVERGRAZING ON THE ACRIDIDAE

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The objectives in mind when this study was made were to determine what qualitative and quantitative effects overgrazing had upon insect populations. This report is confined to data concerning the Acrididae. Collections were made weekly beginning September 1, 1936 until the last week in August 1937. Sections I and II were located on a normal vegetation area. Each station was a ten meter quadrat. The sweep net method of collecting was employed, the collections being air dried and stored until the fall of 1937, when they were sorted, identified by experts, and the results analyzed.

Data:

Only species occurring in sufficient numbers to indicate their having an economic importance were identified; those species taken only occasionally were simply grouped and listed as "unidentified."

Ten species were identified from Station I, eight from Station II and nine from Station III. This would not indicate any particular significance. When the qualitative differences are noted, however, the results are more significant. Those species of grasshoppers characteristic of the overgrazed area were:

1. *Phlibostroma quadrimaculatum*

This species was most abundant at both overgrazed stations. From Station I, 146 adults were taken, at II, 76, and at III, only four individuals were collected.

2. *Melanoplus (mexicanus mexicanus, bispinosus and confusus)*

These three species were treated as a unit. In sorting the collections, the numbers taken were as follows: Station I, 68; Station II, 58; and Station III, 22.

3. *M. regalis*

This species was taken only in the overgrazed areas and the numbers collected were, at Station I, 9; and Station II, 14.

4. *Aulocara elliotti*

This hopper also was seemingly partial to the vegetation of the overgrazed areas since none were taken in the heavy growth at Station III, while at Station I, 10 were taken and at Station II, 26.

5. *Ageneotettix deorum deorum*

The above species is the final species to be mentioned as characteristic of the overgrazed habitat. They were taken only in small numbers, 10 from Station I, 9 from Station II, and none from Station III.

In attempting to determine what forms were partial to the normal grass habitat, difficulty was experienced in getting individuals in significant numbers. Only a total of 63 adults were taken in the normal area. Station III, as compared to a total of 258 at Station I, and 168 at Station II. This small number of adults has made it difficult to determine the characteristic

species of the normal area. A few species, however, did seem to prefer this station. Of these the following appear to be most significant.

1. *Syrbula admirabilis*

Eleven specimens were taken at Stations III, none at II, and 6 at I. This might be considered significant, especially since the vegetation at Station I was somewhat more abundant than in II, where no specimens were taken. It might be assumed from this, that the species is especially sensitive to overgrazing and shows a tendency to feed where the conditions approach the normal.

2. *Mermiria neomexicanus and M. maculipennis*

These species were treated as a unit. Six were taken at Station III, two at I and none at II.

3. *Hesperotettix speciosus*

Five specimens of *speciosus* were collected at Station III, only one at Station I, and none at Station II.

The total number of adult grasshoppers taken at each of the three stations provides some interesting information on the influence of overgrazing on the relative populations. Those figures were, Station I, 258; Station II, 186; Station III, 63.

The number of nymphs taken in collection might be considered more reliable as an index to the actual population present. This is due to the fact that the adults, being proficient jumpers and fliers, are difficult to capture in a net, while the nymphs are able to jump only a short distance, and are not capable of flight. The total number of nymphs taken at each station was as follows: I, 1322; II, 1041; III, 163, the total adults and nymphs for each station being: I, 1580; II, 1227; III, 226.

Conclusions:

The data here clearly indicate that the Acrididae are greatly affected as a result of overgrazing. The full explanation of how environmental factors as food material, temperature, and ground cover react to produce these results is not known. The findings of other workers provide a part of the answer. Parker ('30) found that in general grasshoppers favor a barren ground for ovipositing. Severe overgrazing at Station I and II of this study, resulted in great loss of ground cover. It has been further shown by Parker ('30) that with *Melanoplus mexicanus mexicanus* (Saussure) general hatching of the eggs took place (under Montana conditions) during the first warm period of spring when the maximum air temperature was 24°C. or above, for from three to five successive days. Bruner ('26) mentions the high soil temperatures which prevail as a result of plants not shading the ground. This would explain the early hatching of grasshoppers in the overgrazed Stations I and II. The normal area III with the heavy cover of vegetation would discourage ovipositing in the summer and fall and delay the hatching in the spring. This is further substantiated by graphs which cannot be given in this paper. The increase in numbers of grasshoppers in the overgrazed area is further encouraged by the fact that the livestock keep the grass cut off close to the ground and that the fresh growth is always tender and more succulent than the coarse rank stems of the vegetation in the more protected or normal areas.

Thus it is seen that through the combined effects of overgrazing, high soil temperature, and probably other factors of unknown importance, the grasshopper population of overgrazed grasslands is much greater than that of normal areas. This is in agreement with the conclusions of Weese ('35) and the observations of Treherne and Buckell ('24).

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LIST OF SPECIES OF GRASSHOPPERS

	Stations I	II	III
Philbostroma quadrimaculatum	146	72	4
Melanoplus bispinosus, M. confusus, M. mexicanus mexicanus	68	58	22
Aulocara elliotti	10	26	0
Ageneotettix deorum deorum	10	9	0
Melanoplus regalis	9	14	0
Melanoplus packardii, M. angustipennis	5	4	8
Syrbula admirabilis	6	0	11
Mermiria neomexicana, M. maculipennis	2	0	6
Hesperotettix speciosus	1	0	5
Hesperotettix viridis viridis	0	2	4
Pardalophora haldmandii	0	1	2
Schistocerca lineata	1	0	1
Nymphs	1322	1041	163
Total Adults	258	186	63
Total Adults and Nymphs	1580	1227	226