

THE INVERTEBRATE POPULATION OF A CENTRAL OKLAHOMA PRAIRIE, NOVEMBER, 1934, TO NOVEMBER, 1935

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In south-central Oklahoma, near Chickasha, the Oklahoma College for Women owns a farm. In a part of this area, fenced off from grazing during the period of this study, quantitative collections were made weekly beginning in November, 1933, and continuing to November, 1935. The area is a flat hill-top characterized by the presence of many buffalo wallows. The collections of the first year were reported in a previous paper.** In this paper, conditions of the second year are reported and compared with those of the previous year.

The period covered two contrasting years; 1934, a drought year, and 1935, a year of heavy spring rainfall. In the drought year, rainfall was below the Chickasha mean from February to August. The average rainfall for Chickasha from March to July is 14.72 in. In 1934, in these normally rainy months, Chickasha received about half the average—7.47 in. Temperatures were much above the mean in June, July, and August. The average July temperature is 82.5°F; in 1934, it was 88°. When the drought broke, rainfall was heavy, being 5.04 in. in excess of the average for September. In contrast to 1934, 1935 was characterized by a rainy May (plus 2.65 in.) and heavier than normal rainfall in June, August and September. From the middle of May until the collection of June 7, a period of three weeks, the ground was covered with water over most of the area. The plant response was the development of a nearly pure stand of *Coreopsis*, which bloomed from June 15 to July 11.

Collections in the two years were made in the same area, always between 10 a. m. and 2 p. m., and by the author except in July and August, 1934, and August, 1935. The sweep net unit was 50 continuous sweeps, with a net of about 14 in. in diameter. The ground unit was a piece of sod 12x6 in., 3 in. deep. All collections were sorted in the laboratory.

Table I compares the totals of collections of the two years. The third and fifth column of Table I gives the ratio of the 1934-5 to the 1933-4 collections, with the earlier year figured as 1. For example, a ratio of 6.6 in the third column means that in the herb collection of November 11, 1934, there were 6.6 times as many forms as in the November 11 collection of 1933. As another example, on December 2, the ratio of 0.2 means that in 1934 the collection was two-tenths as large as that of December 2, 1933. A figure over 1 means that the 1934-5 collection is larger, while a figure less than 1 means that the 1933-4 collection was larger.

In the herbs, collections of 1934-5 were larger than those of 1933-4 in 18 out of the 33 samples compared in Table I and in the estival period the difference was greatly in favor of the wet year. Only during the pre-vernial and autumnal periods did the drought year's collections at times exceed those of the wet year and never by a large amount.

The form of the population curve for the two years was similar in having a low hiemal and a high vernal and autumnal population. A striking difference occurred in the estival period. In the wet year, there were very large numbers in the last fortnight of June and on through

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TABLE I. NUMBER OF ANIMALS PER UNIT COLLECTION

Date	No. per 50 sweeps	Ratio to previous year*	No. per soil sample	Ratio to previous year*
1934				
Nov. 11	243	6.6	14	3.5
23	76	3.4	17	4.3
Dec. 2	27	0.2	49	2.5
9	9	0.1	35	1.5
17	12	0.9	23	1.3
23	3	†	19	0.8
30	0	†	22	4.4
1935				
Jan. 6	60	0.02	31	0.6
13	3	1.5	8	0.1
20	0	†	2	0.3
27	0	†	23	7.7
Feb. 3	6	3.0	32	0.8
10	0	†	43	4.8
17	6	0.6	37	2.9
25	0	†	24	1.3
Mar. 3	0	†	25	0.6
10	2	0.3	40	2.5
17	9	4.5	89	8.9
24	45	0.7	19	0.04
Apr. 1	33	0.5	40	1.1
7	62	0.3	66	0.8
15	56	0.7	36	0.2
21	286	1.7	69	1.6
May 2	367	1.6	62	0.4
7	266	1.2	29	0.1
13	237	.....	37	.....
18	255	1.2	26	0.1
31	207	1.2	3	0.03
June 6	318	1.1	19	0.8
13	264	0.8	1	0.01
21	487	.....	47	.....
27	1144	8.7	5	5.0
July 4	1875	.....	5	.....
11	612	24.5	8	1.3
18	553	.....	0	.....
25	3939	.....	2	.....
Aug. 1	638	37.5	1	†
8	610	.....	3	.....
16	32	10.7	4	0.4
23	107	.....	0	.....
31	21	.....	5	.....
Sept. 6	18	0.5	13	1.4
14	59	2.1	10	2.5
22	40	1.6	12	0.4
29	144	1.2	53	2.5
Oct. 6	208	1.1	196	16.3
13	115	0.8	24	1.1
20	22	0.1	14	1.4
28	94	0.8	8	0.1

*Collections of the previous year (1933-4) made about the same date are taken as unity.

†When either collection is zero, † is placed in the ratio column.

the first half of August (Table I). In the previous year, the drought having withered the vegetation, forms were scarce during this period. For example, on August 1 there were 37.5 times as many forms taken in 1935 and in 1934.

In the ground stratum, in opposition to the herbs, numbers were greater in 1934 than in 1935 (Table 1). However, in 23 of the comparable 41 collections the latter year had the larger total. These collections were not much larger. If the compared ground collections were added for 1934-5, the total is 1,241; for 1933-34, 2,179 forms. It appears that when the 1933-4 population exceeded the 1934-5, it did so by a large amount, so that when the two years are compared, the latter year had only 57 per cent as many ground forms as the former drought year. The greater number of ants (mainly *Solenopsis molesta*) was responsible for the large drought total. The population of the second year was more diversified, oftener larger than that of the drought year, but with few big collections. The form of the curve is similar in both years—high in spring and fall, low in summer, and fluctuating irregularly from week to week.

Table II analyzes the group composition of the year's collections, giving in parenthesis the 1933-4 collections for purposes of comparison. In the ground, Coleoptera, Springtails, and Ants were the important groups. In the herbs, Hemiptera were the outstanding forms, making up over 60 per cent of the collection total. Table II is in great contrast to a similar

TABLE II. PERCENTAGE COMPOSITION OF COLLECTIONS, NOV. 1934, TO NOV. 1935

Figures in parentheses are per cents in the drought year collections (1933-4)

Ground Collections		Herb Collections	
	Per cent		Per cent
Coleoptera and larvae	21.5 (8.7)	Hemiptera	60.3 (6.3)
Collembola	20.6 (1.6)	Diptera	10.7 (16.5)
Ants	15.6 (61.3)	Leafhoppers and other Homoptera	8.9 (48.3)
Earthworms	12.0 (17.8)	Arachnida	6.9 (11.8)
Arachnida	8.2 (3.0)	Lepidoptera	4.9 (2.4)
Dipterous larvae	7.6 (2.5)	Hymenoptera	4.7 (2.4)
Orthoptera	6.2 (2.6)	Others*	3.6 (12.3)
Others	8.3 (2.5)		

*This included grasshoppers, 8.4%, and beetles, 3.6%.

analysis for 1933-4, shown in parenthesis. In that year, ants made up 61 per cent of the ground animals, while in the past year, ants made up only 15.6 per cent. In the herbs in the drought year, leaf-hoppers made up almost half of the herb total, in contrast to 8.9 per cent in 1935. Grasshoppers and beetles in the herbs were much larger groups in 1934 than in 1935.

Although great differences existed in totals and in percentage composition by groups (Tables 1 and II), the most abundant forms were present in both years in spite of extreme contrasts of weather and of vegetation. Table III lists the most abundant forms for both years. For example, the

TABLE III. COMPARISON OF THE ABUNDANCE OF SOME INVERTEBRATE PREDOMINANTS IN 1934 AND 1935.*

Societies—	Autumnal		Hiemal		Number per unit collection				Estival		Autumnal		
	GHOUND STRATUM Unit Is	12x6 In: 3 In. deep.	34	34	34	35	34	35	34	35	34	35	
Number of Collections	33	4	34	11	34	8	8	34	7	34	6	34	35
Solenopsis molesta (ant)	2.6	0	2.7	1.2	73.3	0	0	79.0	0.4	0.3	0	7.0	29.8
Spiridulae (Aptera)	1.6	1.7	0.2	8.0	0.4	19.7	0	1.9	3.0	0.2	0.1	0	0
Encyrtidae	3.6	0.8	3.9	1.6	15.5	3.1	10.0	9.0	8.0	0.3	0.1	8.1	6.6
Beetle larvae	1.0	2.3	3.3	3.2	3.9	2.9	4.3	3.3	0.7	2.1	2.3	2.3	6.0
Proctomera nodosa Say	1.0	0	0.4	0.3	0.3	0	0.1	0.1	0	0	0	0	0
HERB STRATUM Unit Is													
50 sweeps													
Leathoppers—													
Exaltans obscurinervis Stal.	2.8	13.0	0	1.0	0.8	1.5	0.3	0	2.2	0.1	38.7	0.3	
Agallia sanguinolenta Prov.	1.0	33.3	0.2	2.9	2.5	11.8	26.3	41.7	2.5	0.8	17.0	0.2	
Carneccephala flaviceps Riley	5.2	4.8	0	0.1	0.8	0	0	0	0	0	5.2	0	
Cleadus divisa Dhl	0	0	0	0	1.1	0	1.1	10.1	0	1.2	1.0	20.7	
Beetles—													
Hippodamia convergens Guer.	0	0	0	0	0.1	0	0.7	2.4	0	1.4	0	0.2	
Zygogramma disrupta Rog.	0	0	0	0	0	0	0.3	0.1	0.7	0.4	0	0.2	
Collops 4-maculatus F.	0	0	0	0	0	0	2.4	0.9	0	0.2	0	0	
Melanocephala spp.	0	0	0	0	0	0	0.7	0	0	4.5	0	3.7	
Hemiptera—													
Mytus californicus Stal & nymphs	0	0	0	0	0	0	0.9	2.9	0	560.0	0	11.3	
Tyranta curvator Fab.	0.2	0.3	0	0.1	0	0.1	0.8	0.1	0.8	0.2	0	0.3	
Harmotus reflexus Say	0	0	0	0	0	0	0.5	0.4	0	2.3	0	0.1	
Lygus pratensis oblineatus Say	0	0.3	0	0.1	0	0	3.4	2.4	0	2.0	0	1.0	
Polymerus basalis Reut.	0.6	0.2	0	0	0	0	0.4	29.5	0	14.2	1.1	3.2	
Sinea diademata Fab.	0	0	0	0	0	0	0.1	0.1	0	1.4	0	0.3	
Corizus lateralis Say	0	0	0	0	0	0	3.9	0.4	0	0	0	0	
Orizus laticollis Say	0.4	0	0	0	0.4	0	0	0	0	0	0	0	
Diptera—													
Meoegramma marginata Say	0	1.0	0	0	0	0	0.4	1.0	0	4.6	1.0	2.5	
Spider—													
Mutinus rosea Keys	0.4	0.8	0	0	0	1.3	3.3	14.0	0.2	17.6	0	1.2	
Neuroptera—													
Chrysopa sp & larvae	0	0	0	0	0	0.1	0.3	5.4	0	2.9	0	0	
Grasshoppers—													
Short-horned nymphs	0	0	0	0.1	4.9	3.9	13.2	5.4	4.7	1.1	0	0	

*Collections begin Nov. 1, 1933 and continue to Nov. 1, 1936. The duration of societies is: Autumnal, Sept. 16 to Dec. 10; Hiemal, Dec. 11 to Feb. 25; Prevernal, Feb. 26 to Apr. 25; Vernal, Apr. 26 to June 17; Estival, June 18 to Sept. 15.

three leaf-hoppers may be analyzed. *Extanus obscurinervis* Stal, was present in both years in about equal numbers until the autumnal society when it became abundant in the drought year. *Agallia sanguinolenta* Prov. was important in both years, showing a greater increase in the autumnal society of the drought year than in 1935. *Cicadula divisa* Uhl. was present in 1934, but was abundant only in 1935. One may examine the remainder of Table III and find only one form, *Sinea diadema* Fab., as taken in one year only. The list is incomplete, lacking a proper analysis of Diptera.

Great differences in the numbers of most species were evident in these two years of climatic extremes. For example, *Corizus lateralis* Say was more numerous in the drought year and *Nysius californicus* Stal experienced a storm of breeding in the estival period of 1935. This was the most striking event of the year 1935 for this area.

If one had made a study in 1934, an erroneous ranking would have been given to many forms; if one had made a study in 1935 only, more importance would have been attributed to other animals than perhaps they deserve. But the whole list of predominant invertebrates would have been largely the same in both years.

SUMMARY

1. In 1935 the ground population was low as compared with the population in the drought year, 1934. Ants were few and Collembola more abundant in 1935. The form of the curve for the year was similar to the 1934 curve.

2. The herb population was much higher in 1935 than in the previous drought year. In the summer, the herb population reached its maximum, which contrasts with 1934 when few forms survived the dry summer. In 1935, Hemiptera were abundant, while in 1934 leaf-hoppers were the most numerous group. In 1935, *Nysius californicus* Stal was present in enormous numbers in the estival period.

3. Although totals and percentage groups differed widely in the years 1934 and 1935, the specific composition of these years of extreme weather contrasts was similar. With few exceptions, forms present in one year were also recorded in the other.

