BIOLOGICAL SCIENCES

A COMPARISON OF THE AUTUMNAL SOCIETY OF PRAIRIE INVERTEBRATES AND OF COINCIDENT WEATHER CONDITIONS IN 1927 AND 1928

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IN A PAPER entitled "Autumnal Animal Communities of a Prairie,"[1] conditions in 1927 were described for a ten-acre unoccupied field of grassland near the Oklahoma College for Women, Chickasha. Invertebrate samples were obtained from the herbs by sweeping with a net of 14 inches diameter. An estimate of the upper soil population was made on the basis of the results obtained by washing a known cubic content of soil through a soil washer, designed to capture soil invertebrates. Coincident weather records were kept.

The present paper enumerates comparatively the results of an exactly similar study made one year later, using the same field, the same methods, and the same weather-recording instruments.

THE INVERTEBRATE POPULATION

In 1928, the total invertebrate population of the herbs during the autumn was decidedly less than in 1927, averaging about a third as large. The average number per collection of 50 sweeps in 1927 was 164, and in 1928 was 60. Also, without exception, each herb collection in 1928 was smaller than the collection made about the same date in 1927.

No marked decline in total numbers taken in the herbs was noted in 1927 until the first week in November, while in the current year the decrease in numbers indicating the approach of winter was considerable by the middle of October.

The reduction in numbers in 1928 occurred in nearly all the abundant groups of invertebrates represented, so that it was seen to be general rather than a condition applying to a few species only. A total of 350 sweeps was taken during the autumnal period in 1927 and 500 in 1928. When corrections are made for this difference in numbers of samples taken, it was found that there were 39 percent as many spiders in 1928 as in 1927, 28 percent as many leafhoppers, and 25 percent as many Diptera. Of the two most abundant Hemiptera, there were 12 percent of the 1927 total number of *Polymerus basalis* Reut. and 74 percent of the 1927 total for *Harmostes reflexulus* Say taken in 1928.

In contrast to this general reduction in numbers, a few groups were more abundant in 1928 than in 1927. Hemipteran nymphs, especially the nymphs of Pentatomidae, showed an increase in numbers in 1928. Adult Pentatomidae were also more abundant in the current year, there being about 30 percent as many in 1927 as in the past autumn. The presence of two species of *Scalops* spp. (Fulgoridae) was unique for 1928.

In the ground, as in the herbs, a reduction in total population for 1928

[1]Smith, Vera G. and Shackleford, Martha W., 1928, Autumnal Animal Communities of a Prairie. Proc. Okla. Aca. Sci. 8:80-83.

as compared with 1927, was the rule. Two groups, fairly abundant in 1927 and practically absent in 1928, were the ants and the earthworms. However, as in the previous year, the greatest numbers were found in the upper two inches with the population decreasing with depth. The relative numbers in 1928 at the various levels of soil were in the ratio 1:0.41:0.06, 1 being the populous upper two inches, 0.41 the 2 to 4 inch layer, and 0.06 representing the relative numbers in the 4 to 6 inch layer. There were 35 percent as many animals in the surface litter as in the 0 to 2 inch stratum of soil.

WEATHER CONDITIONS

Weather data for the period previous to October 1 were obtained from the U. S. Weather Bureau reports. From a comparison of climographs for 1927, 1928, and the normal, it is apparent that the spring and summer preceding the autumnal collections in 1927 was unusually rainy, while the spring rainfall of 1928 was below normal. The year 1927, characterized by a larger autumnal population, was also the year of greater spring and summer rainfall.

Tables I to IV are based on data obtained in 1928 from recording weather instruments placed in the field where the collections were made. A hygrothermograph and two soil thermographs gave continuous readings and on the basis of conditions at two-hourly intervals the tables were drawn up. The base mean is the average of the nightly temperatures for the week, from 8 p.m. to 6 a.m.—the period of relative stability of temperature and humidity.

It is evident from a comparison of the means of these tables with similar data for the previous year (Smith and Shackleford, 1928) that the mean relative humidity increased as the season advanced in 1928, while it declined during the previous autumn, and that the mean decrease in both air and soil temperatures was more abrupt in 1928 than in 1927.

In both years, the autumnal period was one of great variability as measured by both the mean range and the mean range above the base. Variability increased in both years until the middle of October, after which the lower daytime temperatures caused the mean range to decline as winter approached. However, the year 1928 showed higher values for variability in all factors, that is, a greater average daily difference between the highest and lowest limits of all climatic factors measured.

SUMMARY

1. The autumnal invertebrate population of a prairie may vary quantitatively from year to year. This is shown by the fact that there were about one-third as many insects captured by similar methods in the same field in 1928 as were taken in 1927.

2. The duration of the autumnal society and the abruptness with which it disappears with the approach of winter differs with different years. In 1927, no marked decline in numbers was noted until the first week in November, while in 1928 the decline was apparent by the middle of October.

3. Quantitative differences in population between years were due in the instance observed to a diminution in numbers of many groups and species, not to a few only.

4. The autumnal invertebrate population of a prairie may vary qualitatively from year to year. Pentatomidae and Fulgoridae (*Scalops* spp) were

TABLE I
Relative Humidity Data, 28 inches above the ground surface.

1928 Week ending at noon	Abs. Max.	Abs. Min.	Mean Max.	Mean Min.	Mean	Base Mean	Abs. range	Mean range	Mean range below base
Oct. 7	100	11	96	30	65	84	89	66	54
Oct 14	100	27	98	35	67	87	73	63	52
Oct. 21	100	8	93	22	64	84	92	71	62
Oct. 28	100	4	90	29	65	82	96	61	53
Nov. 4	94	24	91	51	80	88	70	40	37
Nov. 11	100	35	100	45	84	95	65	55	50
Nov. 18	100	22	100	44	83	92	78	56	48

TABLE II
Air Temperature Data, 28 inches above the ground surface

1928 Week ending at noon	Abs. Max.	Abs. Min.	Mean Max.	Mean Min.	Mean	Base Mean	Abs. range	Mean range	Mean range above base
Oct. 7	95	41	93	60	72	65	54	33	28
Oct. 14	96	55	91	62	75	67	41	29	24
Oct. 21	85	33	82	43	58	49	52	39	33
Oct. 28	85	34	74	47	58	51	51	27	23
Nov. 4	64	25	55	36	43	39	39	19	16
Nov. 11	76	28	68	39	51	45	48	29	23
Nov. 18	75	32	65	47	54	50	43	18	15

TABLE III
Soil Temperature, two inches below surface

1928 Week ending at noon	Abs. Max.	Abs. Min.	Mean Max.	Mean Min.	Mean	Base Mean	Abs. range	Mean range	Mean range above base
Oct. 7	82	57	79	69	71	69	25	10	10
Oct. 14	83	66	81	69	73	71	17	12	10
Oct. 21	78	47	72	54	62	59	31	18	13
Oct. 28	71	46	66	54	59	56	25	12	10
Nov. 4	66	36	54	43	47	45	30	11	9
Nov. 11	60	38	56	45	49	47	22	11	9
Nov. 18	64	39	58	50	54	52	25	8	6

TABLE IV
Soil Temperature, 8 inches below surface

1928 Week ending at noon	Abs. Max.	Abs. Min.	Mean Max.	Mean Min.	Mean	Base Mean	Abs. range	Mean range	Mean range above base
Oct. 14	74	66	73	67	67	70	8	6	3
Oct. 21	71	49	62	53	57	58	22	9	4
Oct. 28	59	43	55	48	52	52	16	7	3
Nov. 4	47	27	41	34	38	37	20	7	4
Nov. 11	47	32	43	36	40	40	15	7	3
Nov. 18	54	33	47	41	44	44	21	6	3

present in much greater numbers in 1928 than in 1927 in the herbs, while earthworms and ants were much less abundant in the current year as compared with the previous year.

5. The smaller total population both in herbs and ground, the rapid decline in the autumnal society, and the qualitative peculiarities observed in 1928 as compared with 1927 were coincident with a drier spring and summer, a more rapid by declining mean autumnal temperature, a greater autumnal relative humidity and greater variability during the period of collections. Moisture was somewhat less than average, previous to collections, and somewhat greater than average during the latter part of the autumn, and temperature conditions in air and soil were rigorous as compared with similar factors in 1927.

It will be impossible definitely to correlate these weather conditions with the characteristics of the autumnal invertebrate societies noted in these two years until nature verifies the experiment by repetition.