XVIII. AUTUMUNAL ANIMAL COMMUNITIES OF A PRAIRIE.

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A quantitative survey of the animal population of an autumnual prairie community, 1927, with a record of the accompanying climatic condition, was made in a ten-acre field of grassland near Chickasha, Oklahoma, on which was set up a weather shelter containing meterological instruments. A soil washing apparatus made possible a survey of the soil fauna to a depth of one foot.

Tables I to IV, summarizing the conditions of humidity and temperature in the field, are based upon the two-hourly readings of a Friez recording hygrothermograph and two soil thermographs. The base mean is the average nightly temperature for the week, from 8 p. m. to 6 a. m.—the period of relative stability of temperature and humidity. A comparison of means or of base means from week to week indicates the seasonal trend for each factor, while the absolute and mean range and the mean range from the base mean indicates variability.

The percent relative humidity was high during October and showed an increased variability during the period as compared with conditions at the beginning and at the end.

TABLE I

Relative Humidity Data, 28 inches above ground surface.

1927 Week end. at noon	Abs Max	Abs Min	Mean Max	Mean Min	Mean	Base Mean	Abs rng	Mean rng	Mean rang below base
Sept. 26	97	31	95	40	69	85	66	55	45
Oct. 4	97	33	91	44	68	74	64	47	30
Oct. 21	97	8	93	19	60	85	89	74	66
Oct. 31	97	23	89	31	65	82	74	58	51
Nov. 13	72	5	66	29	50	59	67	37	30
Nov. 30	73	18	65	28	51	62	55	37	34

TABLE II.

Air Temperature Data, 28 inches above ground surface.

1927 Week end. at noon	Abs Max	Abs Min	Mean Max	Mean Min	Mean	Base Mean	Abs rng	Mean rng	Mean rng above base
Sept. 26	95	62	94	62	79	70	33	32	24
Oct. 4	94	58	88	67	76	71	36	21	17
Oct. 14	75	34	71	44	56	48	41	27	23
Oct. 21	87	41	81	42	60	49	46	39	32
Oct 31	90	44	83	54	67	59	46	29	24
Nov. 13	79	28	66	45	53	49	51	21	17
Nov. 20	77	26	60	36	46	40	51	24	20

TABLE III.

Soil Temperature two inches below surface.

1927 Week end. at noon	Abs Max	Abs Min	Mean Max	Mean Min	Mean	Base Mean	Abs rng	Mean rng	Mean rng above base
Sept. 25	84	68	66	59	63	61	16	7	5
Oct. 4	89	66	85	72	78	76	23	13	9
Oct. 14	67	47	64	50	56	53	20	14	11
Oct. 21	70	51	68	52	59	55	19	16	13
Oct. 31	72	52	69	57	62	60	20	12	9
Nov. 13	68	41	60	49	53	51	27	11	9
Nov. 20	65	32	50	39	44	42	23	11	8

TABLE IV

Soil Temperature, 12 inches below surface.

1927 Week end. at noon	Abs Max	Abs Min	Mean Max	Mean Min	Mean	Base Mean	Abs rng	Mean rng	Mean rng above base
Oct. 14	65	55	64	58	61	60	10	6	4
Oct. 21	67	58	65	58	62	60	9	7	5
Oct. 31	68	58	67	62	64	64	10	5	3
Nov. 13	61	50	57	53	55	54	11	4	3

The air temperature as represented in the mean and the base mean declined irregularly (Table II). The curve for variability of air temperature rose to a peak, being greatly increased during the middle of the autumnal period.

The soil temperature at two inches (Table III) showed a gradual decline and a fairly constant degree of variation from week to week.

The soil temperature at 12 inches below the surface (Table IV) was declining also and only slight variation differences were recorded between weeks. The variability of the 12 inch temperatuure was always less and the mean always greater than two inches.

A comparison of relations between air and upper soil temperatures (Tables II and III) shows that the mean temperatuure gradient was reversed during the period between September 2 and October 4. The week ending September 26 was characterized by a warmer air temperature than upper soil temparture. In contrast, during the autumnal period beginning September 26, the mean upper soil temperature was warmer than that of the air. The 12-inch soil temperature record does not begin until October 7. However, judging from the gradual weekly change in soil conditions at this depth, probably the upper soil temperature of the previous week would have exceeded the twelve inch temperature mean—thus placing the time of the overturn of the soil temperature gradient early in October also.

The invertebrate collections fell in the period when the temperature gradient as expressed in means was from a warm deep soil to a cold herb stratum, and when the variability of air temperature was much increased in comparison with the preceeding and following seasons.

The autumnal plant subdominants of the gently rolling, well-drained field in the order of their abundance, were the broomweed (*Amphiachyris dracunculodies* D. C. Nutt.), *Aster multiflorus* Ait.,

buffalo bur (*Solanum rostratum* Dunal.) and hoary spurge (*Chamaesyce lata* Engelm.) . Near the small permanent pond, which crossed the field diagonally, *Euphorbia marginata* Pursh. was plentiful.

Numerous burrows of the common pocket gopher, *Geomys bursariuus* (Shaw), indicated that it was the most abundant mammal. The common jack rabbit, *Lepus campestris* Bachman, and the cottontail *Lepus sylvaticuus,* were flushed. The abundant birds were the scissor-tailed fly-catcher in flocks of seven to ten, and the meadowlarks.

Nests of the large, red, harvester ant, *Pogonomyrex barbatus* var. *molefaciens* Buckley, within cleared spaces often a yard in diameter, occurred thruout the area. The nest and is radiating pathway were alive with ants during the warm part of the day, an average of 194 ants passing a point of a main ant highway in five minutes early in an afternoon. The smaller crater of *Dorymyrex pyramicus* var. *flavus* Pergande, sometimes occurring in the clearings of *P. molefciens,* were next in abundance. *Lasius niger* var. *neoniger* Emery and a very small *Pheidole* sp. also nested abundantly in the area.

The turretted holes of two species of Lycosidae (wolf-spiders) were encountered. Moulds, made by pouring plaster of paris down the burrows, showed the holes to be perpendicular, slightly spiral, and about one-half inch in diameter. The hole of the less abundant species, averaged 30 inches in depth and had a slanting entrance, while the more abundant was taken from burrows 10.5 to 11.5 inches deep with a bulbous enlargement at the bottom. Beetle remains, especially carabid elytra, sticking to the casts, gave evidence of their food. Young live crickets climbed out of the top of occupied holes on several occasions when water was poured in to drown out the spiders.

Quantitative samples of the herb stratal population consisted of forms obtained in fifty strokes thru the herbs with a sweep net of fourteen inches diameter. The autumnal population of the herb was predominantly hemipteran, the abundant forms being *Lygus pratensis oblineatus* Say, *Polymerus basalis* Reut., *Harmostes reflexulus* Say, and *Lygus apicalis* Fieb. Cicadellidae were taken abundantly in all and snowy tree crickets in most of the collections. The population of the herbs declined as winter approached, the average total for October being 177 as compared with 130 for the first two weeks of November. The lowest number, 91 individuals, was recorded for the last collection of November 9.

Of the animals seen on one-half square foot of ground surface, collected as representative of a ground surface stratum, the ants were the most abundant.

The sub-surface ground sample was taken in four stratal units. One-half square foot to a depth of 2 inches constituted the first layer, from 2 inches to 4 inches a second, the third from 4 to 8 inches, and the last from 8 to 12 inches. These soil samples carried to the laboratory in large paper bags, were placed in the soil-washer[1] under running water. The washer contains three removable trays with perforated bottoms which are set one above the other. The soil is washed from a coarse-bottomed, upper tray thru lower trays with much finer screening, the bottom one being floored with 50-to-the

inch mesh. The dirt is removed by the running water, leaving the animals of the soil within the trays. The soil washer is set up in a small field laboratory behind the power-house of the Oklahoma College for Women.

The number of sub-surface animals taken in the autumn collection were as follows:

0 to 2 inches depth—117 individuals.
2 to 4 inches depth— 40 individuals
4 to 8 inches depth— 85 individuals.
8 to 12 inches depth— 16 individuals.

When it is recalled that the two bottom stratal samples are twice as large as the top samples, it appears that the largest population occurred in the top two inches and the numbers decreased with increasing depth. Ants, beetles, especially Carabidae and larvae, and earthworms were the abundant sub-surface forms. An unidentified minute Crustacean occurred abundantly in depths of from two to eight inches.

In the description of the entire annual cycle of the community, more complete identifications of this autumnal society will be included. The authors wish to thank the administration of the Oklahoma College for Women for cooperation in obtaining the field and the meteorological instruments, and in providing for the making of the soil-washer. Dr. M. R. Smith, A. and M. College, Mississippi, identified the ants and Dr. C. R. Crosby, Cornell University, determined the spiders mentioned.

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[1]The soil-washer was made in accordance with a plan described in Bull. Ent. Res. 1922, Vol. 13, pp. 197-200, "On a Method of Separating Insects and other Arthropods from Soil," Hubert M. Morris.