Preliminary Investigations of Harvester Ants on Southern Idaho Rangelands[1]

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The western harvester ant, *Pogonomyrmex occidentalis* (Cresson), is one of the more common and conspicuous insect pests of the western range. The circular area it clears around its nest results in thousands of acres of rangeland being denuded of vegetation. This causes a reduction in livestock-carrying capacity and an increased potential for soil erosion. The ant is also responsible for the destruction of an inestimable amount of seed which may result in a reduction of vegetation or a change in plant composition in areas where the ant is common.

Numerous studies indicate that many range pest problems are directly related to range condition. Plants and animals that become pests are often present in nominal amounts even under good and excellent range condition. Such potential pests become major problems for the range manager and livestock producer only when range condition declines. These pests are a result rather than a cause of poor range condition and it appears that the harvester ant falls in this category.

The widespread occurrence of harvester ant clearings in southern Idaho led to the initiation of intensive research on this insect in 1956. It is the purpose of this paper to present preliminary findings of one phase of this research involving population studies on harvester ants at three locations in south central Idaho.

Review of Literature

Harvester ants occur over vast areas of rangeland in the western states. This ant is reported to have denuded 90,000 acres of grazing land in the Big Horn Basin of Wyoming (Killough and LeSueur, 1953). These workers found 30 percent of this basin had an average of 32 ant colonies per acre with the cleared areas averaging 18 feet in diameter. In Kansas, Fritz and Vickers (1942) found the clearings to be relatively small with the largest measuring 150 to 200 square feet. Knowlton and Nye (1946) reported a range in diameter of 10 to 43 feet for ant clearings and Bohart and Knowlton (1953) state that individual clearings may occupy 500 square feet or more in Utah. List (1954), working on Colorado rangelands, found 4 to 20 harvester ant clearings per acre ranging from 6 to 30 feet in diameter. Haws and Knowlton (1951) found 733 clearings in a 100-acre dryland alfalfa field in Utah. The number, however, varied with the different sections of the field and ranged from an average of 2.13 per acre on one 30-acre section to 11.75 per acre on a 40-acre section of the same field. Actual measurements showed that 1.9 acres were kept bare of alfalfa by the ant. Weber (1959), observing ant clearings in Utah from the air, calculated that 30,976 clearings per square mile or an average of 48.8 per acre could be present in certain areas. A report on the harvester ant in the Twin Falls area of Idaho by Cole (1932b) lists a range of from 7 to 28 clearings in one-tenth square mile on different soil types found in the area. The number of clearings listed in this study would amount to less than one clearing per two acres of surface area which is far less than found by Haws and Knowlton (1951), Killough and LeSueur (1953), List (1954), or Weber (1959).

The amount and nature of the vegetation is undoubtedly a prime factor in determining the success of harvester ant colonies. Cole (1933) states that the ant is nutritionally dependent upon seeds from vegetation adjoining its nest and that an abundance of annual and perennial grasses with readily available seeds is an inducement to establishment and a factor influencing the continued existence of the granivorous species of ants. Bohart and Knowlton (1953) report that harvester ants may range about 100 feet from their nest and that seeds are their principal diet, but other dry, protein-rich substances such as pollen and dead insects may be taken also. Cole (1932a) found clearings more closely aggregated in peppergrass, *Lepidium perfoliatum*, openings in sagebrush vegetation than in any of the other areas of this community.

Procedure

Three study areas were selected in the Raft River Valley of Cassia County in the fall of 1956. Two of these were located in the saltsage, *Atriplex nuttallii*, type of vegetation. The vegetational

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FIGURE 1. Harvester ant clearing in the depleted saltsage area. Clearing is approximately 13 feet in diameter and completely surrounded by halogeton.

cover of one of these saltsage sites consisted primarily of annuals, with halogeton, *Halogeton glomeratus,* predominating (Figure 1). The annual plant cover in this stand resulted from past misuse of the saltsage vegetation. At the second area the plant cover consisted of a vigorous stand of saltsage (Figure 2). The third area of study was located in a shadscale, *Atriplex confertifolia,* community (Figure 3).

Six adjacent one-acre plots measuring 132 x 330 feet were laid out in the depleted saltsage and the saltsage areas. Twelve plots of the same size were located in the shadscale type.

At the initiation of the study in the fall of 1956, all the ant clearings in one plot of each of the saltsage and depleted saltsage areas were mapped by use of compass bearings and measurements from permanently marked points approximately 15 feet south of the edge of each clearing. Two diameter measurements of each clearing were taken in the other plots, and the position located on a map. Due to the indistinct margins of the clearings in the shadscale type, position only was plotted. It was anticipated that the number and size of the clearings would vary yearly. Consequently, in 1957 and 1958 all clearings in the study areas were located on overlay maps and checked with the previous mappings. In addition, diameter measurements of each clearing were made in the plots at the two saltsage locations.

Results and Discussion

Number of Clearings

The counts of clearings of harvester ant colonies made during this study period at the three locations are presented in Table 1. Only a slight variation in the average number of clearings per acre was found in the two areas with stands of perennial plants. However, a large difference in the number of clearings between the annual and perennial plant areas is evident (Figures 4 and 5). Each year the depleted saltsage plots had approximately three to four times as many clearings per acre as either the shadscale or saltsage plots. These data suggest that a stand of annual plants is more favorable to the establishment of a larger number of colonies than a perennial cover of saltsage or shadscale.

Changes in the number of clearings occurred within each of the plant stands over the three-year period (Table 1). The number of clearings per acre in the shadscale stand was similar to that found in the saltsage. On the other hand, the net increase in number of ant colonies was similar in the shadscale and depleted saltsage stands. However, the yearly colony mortality was

FIGURE 2. Harvester ant clearing in a vigorous stand of saltsage. Clearing is approximately 16 feet in diameter and bordered by saltsage.

Table 1. Counts of harvester ant colonies per acre at three locations, Raft River Valley, Idaho.

Vegetation Type	Plot	1956 Total Colonies	1957 New Colonies	1957 Dead Colonies	1957 Total Colonies	1958 New Colonies	1958 Dead Colonies	1958 Total Colonies
Depleted Saltsage	1	30	2	3	29	8	4	33
	2	42	2	1	43	4	3	44
	3	38	6	3	41	4	2	43
	Mean	36.7	3.3	2.3	37.7	5.3	3.0	40.0
Saltsage	1	11	0	0	11	0	0	11
	2	10	0	2	8	0	0	8
	3	8	0	0	8	0	0	8
	Mean	9.7	0	0.7	9.0	0	0	9.0
Shadscale	1	9	5	0	14	0	0	14
	2	7	1	0	8	1	0	9
	3	9	4	1	12	3	0	15
	4	5	3	0	8	1	1	8
	5	10	0	1	9	2	0	11
	6	14	3	1	16	0	0	16
	Mean	9.0	2.7	0.5	11.2	1.2	0.2	12.2

greatest in the depleted saltsage. The relatively small loss of clearings in the shadscale vegetation reflects a greater stability than for the depleted saltsage.

The saltsage stand exhibited the greatest stability in number of ant colonies. New clearings did not appear in this area in either 1957 or 1958. Moreover, the average survival of the 1956 colonies in the two following years was high. The number of clearings did not change in two of the three plots over the three-year period. The loss of two colonies in the third plot in 1956 and 1957 was the only change that took place.

Size of Colonies

Measurements of the diameter and area of harvester ant clearings were made in the saltsage and depleted saltsage plots. Such measurements were not made in the shadscale plots. However, it was estimated that the average diameter of the clearings in the shadscale approximated that of depleted saltsage and that the percentage of area cleared was less than 1 percent.

The depleted saltsage generally had smaller clearings than the saltsage. The diameter of clearings in the saltsage averaged approximately one and one-half to nearly two times those in the depleted saltsage (Table 2). Observations indicate that the diameter of clearings in the shadscale are smaller than those in depleted shadscale areas having an annual plant cover. It is not possible to explain the reasons for these differences at this time.

The ant clearings occupied about 3.5 percent of the area in saltsage and approximately 5 to 8 percent of the area in depleted saltsage during the three years of study (Table 2). The size of the clearings in the saltsage area increased slightly each year. Yearly removal of the perennial saltsage plants from the edge of the clearings resulted in a continuous enlargement of the clearings. This results from the slow establishment of the perennial saltsage in comparison with the annual plants that surround the clearings in the depleted saltsage area. Clearings in the depleted saltsage increased and then decreased over the three years of the study.

FIGURE 3. Harvester ant clearing in shadscale vegetation. Tape is stretched to 18 inches.

FIGURE 4. Aerial view of depleted saltsage area. Area shown is approximately 10-15 acres.

FIGURE 5. Aerial view of ant clearings in saltsage stand of vegetation. Area shown is approximately 15-20 acres.

Summary

The western harvester ant is one of the more important insects on the rangelands of the west.

This paper reports results obtained from studies on the number and size of clearings made by the harvester ant at three locations in the Raft River Valley of southern Idaho. One of the three locations had a vegetation cover of saltsage, one a cover of annual plants in a depleted saltsage area and the third a cover of shadscale vegetation.

Plots in the depleted saltsage location had three to four times as many clearings per acre as either the shadscale or saltsage plots. Yearly changes in the number of clearings was greatest in the depleted saltsage and least in the saltsage.

The largest clearings were found in the saltsage community and the smallest in the depleted saltsage community. Measurements were not taken in the shadscale plots. The total area occupied by ant clearings was approximately 3.5 and 5 to 8 percent at the saltsage and depleted saltsage locations respectively.

A greater number of clearings as well as a greater total area cleared was found in the poor condition than in the good condition saltsage. Increased ant activity is thought to be a result rather than a cause of poor range condition.

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Table 2. Measurements of harvester ant clearings at two locations, Raft River Valley, Idaho

		Average Diameter of Clearings			Area Cleared		
	Plot	1956	1957	1958	1956	1957	1958
		(feet)			(percent)		
Depleted	1	9.9	11.3	8.5	5.8	7.3	5.2
Saltsage	2	7.4	10.0	8.4	4.7	8.4	6.3
	3	7.0	9.3	8.3	4.7	7.8	6.4
	average	7.9	10.1	8.4	5.1	7.8	6.0
Saltsage	1	13.0	13.2	13.3	3.6	3.8	3.8
	2	12.8	13.7	14.0	3.1	3.4	3.8
	3	14.7	15.4	15.9	3.2	3.4	3.7
	average	13.5	14.0	14.3	3.3	3.6	3.7