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# ARACHNIDS AS ECOLOGICAL INDICATORS

Dorald M. Allred<sup>1</sup>

**ABSTRACT.**— In three ecological studies in the southern parts of Nevada, Idaho, and Utah, spiders of 138 species, scorpions of 10, solpugids of 29, and phalangids of 2 species were obtained by pitfall capture. Significant differences in species occurrence were noted between the three geographic and ecologically distinct areas. Within each geographic area, arachnids differed in species occurrence and abundance in different plant communities. Only three species of spiders and four species of scorpions were common to all three geographic areas.

This paper summarizes species distribution of arachnids captured in can pit traps in the major plant communities of three geographic areas—southern Nevada, southern Idaho, and southern Utah—during the periods of 1959 to 1966, 1966 and 1967, and 1971 to 1973, respectively. Details of the equipment and techniques used and specific results of the studies in each area are discussed in published articles listed in the references section of this paper. The comparative results of these three studies are summarized in Tables 1 to 4.

### Summary Discussion

Only three spiders—*Calilena restricta*, *Euryopis scriptipes*, and *Haplodrassus eunis*—were common to all three areas. Fifteen other species were common to Nevada and Utah, seven to Nevada and Idaho, and six to Idaho and Utah. *Paruroctonus boreus* was the only scorpion found in all three study areas. Four other

species were common to Nevada and Utah, one to Nevada and Idaho, and one to Idaho and Utah. None of the 29 species of solpugids was found in all three areas. Two species were common to Nevada and Utah, and two to Nevada and Idaho.

Apparently the habitat preferences of most species of these arachnids are so unique that even at similar latitudes and in similar vegetative types the environmental factors are sufficiently different to influence species occurrence. Such differences in geographic distribution may be expected more with groups such as scorpions and solpugids whose capability for migration is extremely limited, whereas spiders through their ballooning adaptations would be expected to be more widely distributed.

Within each geographic area, arachnids differ in species and abundance in relationship to the different plant communities. Where similar predatory niches are

TABLE 1. No. of collection attempts and specimens of arachnids collected in three geographic areas.

| Area   | Trap periods <sup>1</sup> | Spiders | Scorpions | Solpugids | Phalangids |
|--------|---------------------------|---------|-----------|-----------|------------|
| Nevada | 52,080                    | 5,600   | 1,471     | 1,000     | 575        |
| Idaho  | 20,490                    | 500     | 282       | 72        | 0          |
| Utah   | 3,590                     | 829     | 198       | 34        | 0          |

<sup>1</sup>No. pit traps x no. 24-hr periods operated.

TABLE 2. Species diversity of arachnids in three geographic areas.

| Area                    | No. species collected |           |           |            |
|-------------------------|-----------------------|-----------|-----------|------------|
|                         | Spiders               | Scorpions | Solpugids | Phalangids |
| Total species collected | 138                   | 10        | 29        | 2          |
| Nevada                  | 94                    | 9         | 28        | 2          |
| Idaho                   | 42                    | 1         | 6         | 0          |
| Utah                    | 40                    | 5         | 3         | 0          |
| In both Nevada & Utah   | 15                    | 4         | 2         | 0          |
| In both Nevada & Idaho  | 7                     | 1         | 2         | 0          |
| In both Idaho & Utah    | 6                     | 1         | 0         | 0          |
| Common to all areas     | 3                     | 1         | 0         | 0          |

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TABLE 4. Ecological predominance of arachnid species in three geographic areas.

|        | Most Widespread                 |           | Most Abundant                   |
|--------|---------------------------------|-----------|---------------------------------|
|        |                                 | Spiders   |                                 |
| Nevada | <i>Calilena restricta</i>       |           | <i>Psilochorus utahensis</i>    |
| Idaho  | <i>Calilena restricta</i>       |           | <i>Schizocosa avida</i>         |
| Utah   | <i>Psilochorus utahensis</i>    |           | <i>Psilochorus utahensis</i>    |
|        |                                 | Scorpions |                                 |
| Nevada | <i>Vaejovis confusus</i>        |           | <i>Vaejovis confusus</i>        |
| Utah   | <i>Paruroctonus boreus</i>      |           | <i>Paruroctonus boreus</i>      |
|        |                                 | Solpugids |                                 |
| Nevada | <i>Hemerotrecha californica</i> |           | <i>Hemerotrecha californica</i> |
| Idaho  | <i>Eremobates septentrionis</i> |           | <i>Eremobates septentrionis</i> |

TABLE 3. Arachnid abundance in predominant plant communities.

|        | Most Species |           | Fewest Species |
|--------|--------------|-----------|----------------|
|        |              | Spiders   |                |
| Nevada | Blackbrush   |           | Juniper        |
| Idaho  | Sagebrush    |           | Rabbitbrush    |
| Utah   | Juniper      |           | Blackbrush     |
|        |              | Scorpions |                |
| Nevada | Mixed        |           | Juniper        |
| Utah   | Blackbrush   |           | Sagebrush      |
|        |              | Solpugids |                |
| Nevada | Hopsage      |           | Blackbrush     |
| Idaho  | Rabbitbrush  |           | Goosefoot      |

demonstrated, as between spiders, scorpions and solpugids, the occurrence of each group would be expected to differ within the same community. For example, in Nevada the spiders were most common in the blackbrush and mixed communities, whereas the solpugids were least common in the blackbrush and most common in the pinyon-juniper and hopsage-wolfberry where the spiders and scorpions were not abundant. In Idaho the spiders were most abundant in the sagebrush and least in the rabbitbrush, whereas the solpugids were most abundant in the rabbitbrush. In Utah the scorpions were most abundant in the blackbrush, whereas the spiders were least abundant there.

The relationship of arachnid species to vegetative type is not a direct one, but an interrelationship between a variety of environmental-influencing factors such as cover, food, moisture, temperature, and edaphic conditions. Specific data on these influencing factors are not available for correlation with the results summarized here. Such data are necessary for complete ecological interpretations, and such correlative studies are desirable for a

better understanding of these interrelationships. However, knowledge of species diversity alone in different geographic areas as well as predominant plant communities is sufficient to determine ecological indicators that may be monitored relative to changes in environmental quality.

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