Ground Dwelling Beetles in Burned and Unburned Vegetation[1]

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Highlight

Pitfall trapping of ground dwelling beetles in burned and unburned stands of shrub steppe vegetation showed that the same four species occurred in both places. However, more *Eleodes hispilabris* and *Pelecyphorus densicollis* were caught in the unburned vegetation.

One of the most obvious disturbances to shrub steppe vegetation is fire. Big sagebrush (*Artemisia tridentata*) and antelope bitterbrush (*Purshia tridentata*) are killed by summer burning, and many years are needed for shrubs to recolonize such areas (Fig. 1). The abundant understory herbs Sandberg bluegrass (*Poa secunda*) and cheatgrass brome (*Bromus tectorum*) are affected lightly by fire. Sandberg bluegrass sprouts from perennial crowns. The seeds of cheatgrass buried in the soil are not completely destroyed and these germinate when autumn precipitation is favorable (Klemmedson and Smith, 1961).

Little is known about the impact of fire on shrub steppe insects. This note reports the results of a pitfall trap survey of ground dwelling beetles in adjacent stands of burned and unburned shrub steppe vegetation on the Atomic Energy Commission's Hanford Reservation in Southeastern Washington during 1967.

Methods

A wildfire burned over several hundreds of acres of shrub steppe vegetation during midsummer of 1961. The burn was restricted by a highway which served as a fire break. The land on either side of the highway is similar in elevation, soil, topography, and vegetation, so that the major difference between the two sides is the fire disturbance (Fig. 1). Grazing has not been permitted on either side of the highway for at least 25 years.

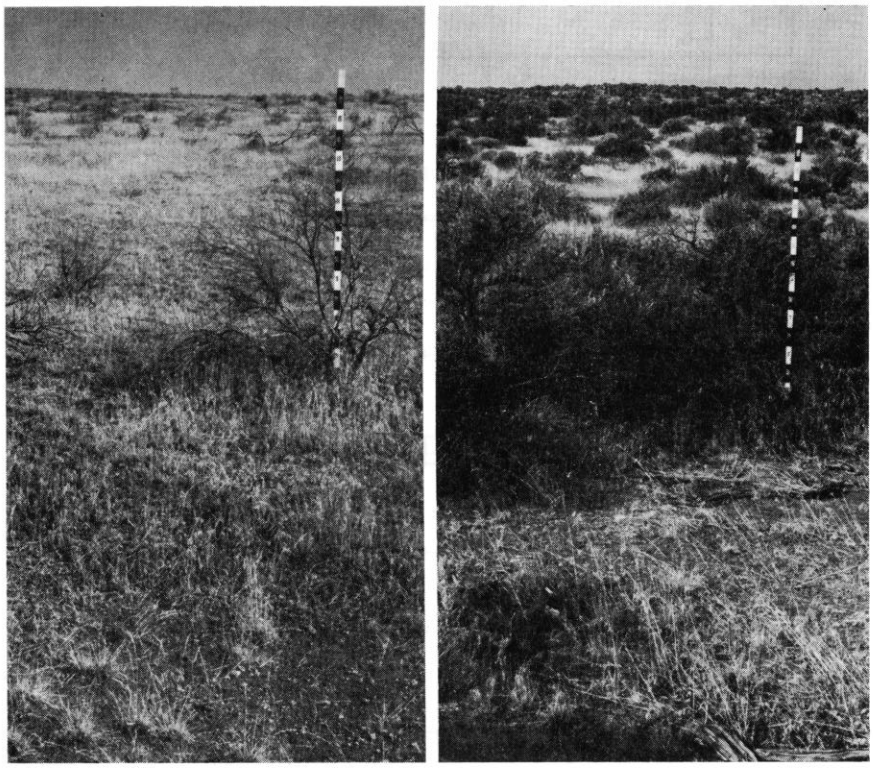

FIG. 1. View of burned (left) and unburned (right) stands of shrub steppe vegetation.

Three study sites were located along the highway with approximately one mile distance between sites. Each site consisted of ten traps, with five traps located in the burned and five in the unburned vegetation. The traps were placed about 100 yards from the highway, in areas removed from the disturbances caused by highway construction and maintenance vehicles. The traps consisted of cans buried in the soil to their rims and arranged in a line spaced about ten feet apart. The traps were visited each week from early March to late November. All beetles were removed and released several feet away from the trap in which they were captured.

Results

The results of the trapping are shown in Table 1 and Figure 2. Four species of beetles were frequently caught. Three species, *Eleodes hispilabris*, *Pelecyphorus densicollis*, and *Eusattus muricatus* (Tenebrionidae) are believed to be mostly phytophagous (Hatch, 1965) while *Calosoma luxatum* (Carabidae) is predaceous.

A definite seasonal pattern of above ground activity was observed. *Pelecyphorus* was present only in autumn (Fig. 2). *Eleodes* was present throughout the study period, but was most abundant in May and June. *Eusattus* and *Calosoma* were most often caught in the spring, and they were not caught at all in late summer and autumn.

All four species of beetles occurred in burned and unburned vegetation. The trap data indicate that the ab-

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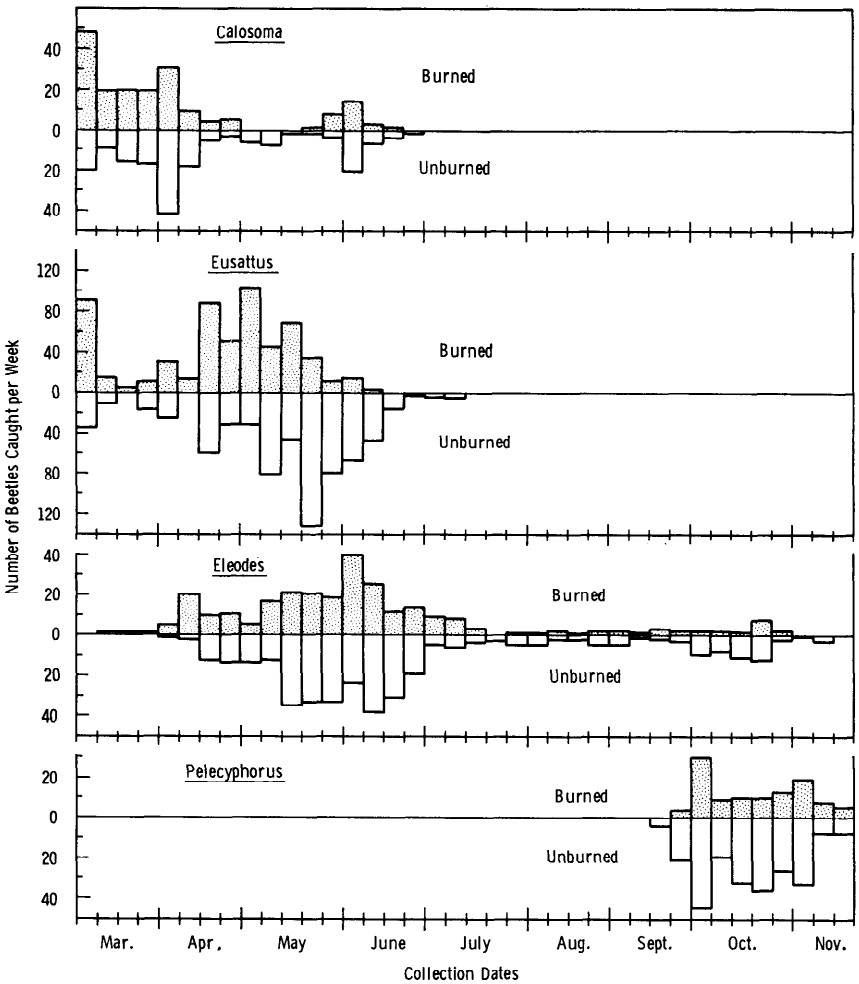

FIG. 2. The total weekly catch of ground dwelling beetles in burned and unburned shrub steppe vegetation—March through November—1967.

sence of big sagebrush and antelope bitterbrush did not open up the plant community to invasion by exotic species of ground dwelling beetles. If anything, the burning appeared to reduce the catch of *Pelecyphorus* and *Eleodes* (Table 1). It is concluded that the presence of shrubs is not necessary for the persistence of populations of ground dwelling beetles, but there may be some benefits to populations if shrubs are present.

Pitfall traps do not yield direct information on population densities (i.e., number/unit area) because trap catches can be influenced by beetle mobility as affected by weather as well as by population density (Southwood, 1966). However, ground dwelling beetles in shrub steppe communities can be numerous, at least in certain years. Rickard and Haverfield (1965) made a gross estimate of 16 beetles per square meter in sagebrush dominated vegetation.

The ecological role of phytophagous beetles is not fully known. *Eleodes hispilabris* has been reported as a serious pest to dryland wheat, with larvae and adults contributing to damage (Wakeland, 1926). The larvae live in the soil for 2–3 years, presumably feeding on underground plant parts at least during the times of the year when temperature and moisture regimes are favorable. The life histories of *Eusattus* and *Pelecyphorus* are not known in detail. If larvae should feed exclusively on actively growing roots, they could reduce aboveground plant yields, especially if larvae are numerous. If phytophagous beetles are mostly detritus feeders, then their role in the plant community could be regarded as beneficial, since they would accelerate the turnover of essential mineral nutrients and promote the growth of plants.

The role of ground dwelling beetles needs further study from the viewpoint of insect ecology and its relationship to range management.

Table 1. The total catch of ground dwelling beetles in burned and unburned shrub steppe vegetation–1967.

Taxa	Total catch		χ^2 value (based on total*)[1]	
	Burned	Unburned		
Calosoma	183	181	0.14	Not significant
Eusattus	647	697	0.26	Not significant
Eleodes	280	379	14.86	$P < 0.01$
Pelecyphorus	103	236	52.20	$P < 0.01$

* At all sites, a test of homogeneity of χ^2 was not significant; thus, the data from the three burned and three unburned locations were pooled.

[1] The chi-square values were calculated by Dr. J. M. Thomas.

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