Pacific Treefrog Population Changes as a Response to the Absence of Livestock Grazing

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Livestock grazing has been repeatedly associated with changes in vegetation diversity and structure (Milchunes et al. 1988), and alterations in the abundance of fauna, including reptiles, mainly lizards. (Bock et al. 1990; Janzen 1976), birds (Bock et al. 1984), rodents and lagomorphs (Linsdale 1946; Reynolds 1950; Heske and Campbell 1991) and even invertebrates such as ants (Heske and Campbell 1991), but also there are no previous studies about frogs.

Also, most of the previous studies concerning vegetation and fauna responses have been done on grasslands of desert and semi-desert habitats (Anderson and Holte 1981; Brown and Heske 1990; Chew 1982; West et al. 1984).

The present study was done in a tropical deciduous forest in Mexico, which has been subject to overgrazing for the last 200 years (Arriaga 1990; Arriaga and León de la Luz 1989). It is during this period when the impact of the livestock grazing has been so important, that it has profoundly changed the vegetation structure and composition of a biogeographic entity: the Cape Region (Arriaga and Cancino, 1992).

INTRODUCTION

The Pacific Treefrog *Hyla regilla* is a small treefrog (1.9—5 cm) widely distributed, including in its range the West coast of the United States of America, the Southwest coast of Canada and the Baja California Peninsula of Mexico (Stebbins, 1982). In spite of its broad distribution, in that it is found in a wide variety of habitats from sea level up to high into the mountains (3540 m) and that generally is locally abundant, there are no previous studies concerning the ecological responses of their populations to the environmental effects of human activities.

Most of the studies regarding this species are devoted to its distribution (Bradford, 1989; Reichmen, 1991), its behavior (O'Hara and Blaustein, 1988; Perrill, 1984; Rose and Brenovitz, 1991) and even its physiology (Sherwood et. al., 1986), and there are no previous studies with this species at the Cape Region.
MATERIAL AND METHODS

The study was performed at La Sierra de La Laguna Baja California sur, México. La Sierra de La Laguna is a mountainous complex that runs north-to-south in the Cape Region reaching altitudes up to 2,100 m. The vegetation of the zone comprises four main physiognomic–floristic associations (León et al., 1988): desert scrub, tropical deciduous forest, oak–pine forest and pine forest. The tropical deciduous forest comprises most of the biological diversity of all regions (Ortega, 1990) and includes approximately 20,000 hectares (Morelos, 1988).

In the tropical deciduous forest, at the Casas Viejas study site, is an enclosure system comprised of 4 units of 2,400 m² each that was established in 1989. During September 1991 we established five areas 25 m in length, and separated them by 10 m, covering a total area of 625 m². Outside the enclosure, sufficiently far to maximize the distance to the fences surrounding the enclosure, (35 m) but close enough to match as closely as possible the perennial vegetation and substrate conditions of the area inside the enclosure, we established an equivalent set of areas, also 625 m².

Comparisons of treefrog populations were made by counting the number of frogs observed per given length of time spent steadily looking for them. Frogs were detected by their movements. All counts were performed following different routes.

Around each trap station, for an area of 1 m², the layout of ground cover and the relative percentages of the different types: bare soil, annual plants and grasses, rocks, fallen tree-trunks. Additionally, we recorded the number of rocks and their size in three categories by diameter (under 20 cm, over 50 cm, and in-between), tree density and specific richness and, finally, average tree height and cover.

RESULTS

During the field work a total of 20 treefrogs were observed inside the enclosure system; only 2 were seen outside. Table 1 details the differences in frog population found between the sites, and shows they are highly significant.

If we take into account the microhabitat characteristics on both sides of the fence, it can be observed (Table 2) that there are remarkable differences between the vegetation density and availability. However, the only significant differences are those concerned with the grass and herb cover and average height (taller inside than out), and the proportion of bare soil, (higher outside).

The other aspects of microhabitat considered (Table 2) were those related to the structure, density and diversity of the perennial vegetation as well as the fallen trunk and stones cover and availability; these do not shown any significant difference.

DISCUSSION

The herpetofaunal responses to livestock grazing has been relatively little studied, although it has been found that grazing reduces lizard populations (Jones. 1981) and that lizards are very sensitive to the changes caused by livestock (Bock et al., 1990); there does not exists any previous work dealing with the Pacific treefrog’s population responses to the effects of livestock grazing, and, certainly, none regarding any ecological aspect of this species in the Cape Region.

The treefrogs at La Sierra de La Laguna are closely dependent on the availability of water (Alvarez et al., 1988) and it is known that through its range distribution H. regilla individuals are chiefly ground–dwellers found among low plants (Stebbins, 1982). This generalization could be supported by this work: microhabitat features such as grass and herb cover could play an important role in the success of this species.

As can be seen in Table 2, the abundance and height of the grasses, as well annual herbs, are significantly higher inside the enclosure. This could help to explain why there are more individuals of H. regilla inside the enclosure: they are more protected and they could find more prey in the ungrazed zone.

Livestock grazing could affect treefrog density directly and indirectly. Indirectly, livestock might impact
treefrog density by altering the variety of species of vegetation. This reduces the protective cover from predators and the food available for insects, affecting this insectivorous species. Also, the cattle may directly affect the treefrog populations by disturbing the individuals and even crushing them as they repeatedly wander in a specific zone.

However, it seems necessary to study specifically the behavioral responses of H. regilla individuals to the direct and indirect effects of livestock grazing by experimentally offering distinctively additional cover and food in order to quantify such responses.

CONCLUSION

It seems evident that it is necessary to experimentally study the behavioral responses of the treefrog individuals inside and outside the studied areas. However, this paper establishes an interesting Bock, C.E., H. Smith & J.H. Bock. 1990. The effect of livestock grazing upon abundance of the lizard. Sceloporus scalaris, in Southeastern Arizona. J. Herpetology 24(4):445–446.


BIBLIOGRAPHY


Table 1.
Number of the Pacific Treefrog Individuals Found Inside and Outside the Enclosure.

<table>
<thead>
<tr>
<th>Day</th>
<th>Outside</th>
<th>Inside</th>
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</tr>
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<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Totals</td>
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<td>20</td>
</tr>
</tbody>
</table>

\( t = 8.958 \quad p < 0.05 \)

(Table 2 is on page 6)