ARE SCATS AND RADIOTELEMETRY DATA SIMILAR INDICATORS OF HABITAT USE?

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RESUMEN

En las zonas desérticas del Norte de México una de las principales actividades económicas es la ganadería extensiva de bovinos. En la Reserva de la Biosfera de Mapimí, ubicada en el Desierto Chihuahuense, habitan dos tipos de ganado: el ganado asilvestrado y el ganado doméstico. Con el propósito de evaluar el uso de hábitat de estos grandes herbívoros, en este trabajo se comparan dos métodos de campo: a) frecuencia de excretas en transectos, cuya longitud y número es proporcional a la superficie del hábitat y b) frecuencia de localizaciones en cada hábitat usando técnicas de radiotelemetría en ciclos de 24 horas. Con ambas técnicas se obtuvieron resultados semejantes. Dos tipos de hábitat, laderas de montañas con suelos arcillosos (H9) y montes con rocas de origen volcánico (H10) fueron preferidas por el ganado asilvestrado. Los hábitats evitados fueron las mesetas (H1) y las laderas con suelos arenosos-arcillosos (H6). Sólo con el primero, se logró detectar la frecuencia de uso de hábitat en áreas escarpadas. Concluímos que ambas técnicas pueden usarse para determinar el uso de hábitat del ganado en medio ambientes desérticos.
Palabras Clave: estiércol feral, uso del hábitat, Mapimí, Desierto Chihuahuense

ABSTRACT

In the desert zones of Northern Mexico, the main economical activity is the raising of cattle. In the Mapimí Biosphere reserve, located in the Chihuahuan desert, exists two kinds of cattle: feral and domestic. To propose a reliable and standardized technique to evaluate the use of habitat, we compare two field methods: a) feces count transects, proportional to each habitat type and b)radiotelemetry relocations collected over 24 hour cycles. Both techniques gave similar results in habitat preferences and avoidances. Two habitat types, hillsides with clay soil (H9) and volcanic rocky mountains (H10) were preferred by feral cattle. The habitats avoided were flat-topped hills (H1) and hillsides with sandy-clay soils (H6). However only with feces transects could we estimate the frequency of habitat use in canyon areas where it was difficult to follow animals with telemetry. We conclude that both techniques can be applied to assessing cattle habitat use in the desert environment.
Key Words: feral cattle, habitat use, Mapimí, Chihuahuan Desert.

INTRODUCTION

In the Mapimí Biosphere Reserve, located in the Chihuahuan Desert of Mexico, the traditional and main economic activity is the free ranging of cattle. The last census gave an estimate of 7000 animals in an area of 172,000 ha. Only 33% of the area is fenced and contains 4,500 animals (Barral, 1988). In other areas, specially southeast of the reserve, co-exist feral and domestic cattle (Hernández *et al.*, 1993). A study of habitat use by cattle is of special importance in this area, where the goal of habitat protection requires cattle management and control to insure habitat conservation.

Previous studies in the area, to estimate the abundance and area use of cattle were conducted in fenced areas (Morello y Camberos, 1979) or by different methods; interview (Whyte and Burton, 1981) and direct counts (Barral, 1988). In order to propose a reliable and standardized technique to evaluate the use of habitat, we compare two field methods; feces counts transects and radio triangulation. The former was the most used (Neff, 1968 for review) but in the recent times radio-telemetry triangulation has replaced it (White and Garrott, 1986; Loft *et al.* 1991). In matter of determining the accuracy of scat counts, Loft and Kie (1988) compared both methods and concluded that scats counts are useful in ranking relative use of habitat but may not be reliable for ranking habitats that receive similar levels of use. They compared both methods considering their telemetry locations/habitats as the expected use of habitat. In this way, the accuracy of habitat use estimations from scat transects results is a function of telemetry locations/habitat. In our study we used the same statistical analysis for each data set to independently estimate use of habitat by cattle.

STUDY AREA AND METHODS

The study was conducted between March 1992 and December 1993, in an area of 42,200 ha at the southern part of the Mapimí Biosphere Reserve (26°40'N, 103°45'W) in the southern portion of the Chihuahuan Desert. The area is a level plain (average 1100 m above sea level) with poor drainage, limited on the east by a sierra of 1800 m above sea level. Montaña (1988) described the vegetational units listed below for this part of the reserve based on the main shrub and grass species, topography, and soils. In the present study we consider them as habitat types for wild cattle (Table 1).

The climate is semiarid, with an average annual rainfall of 250 mm, that occurs from July to October. The mean monthly temperature ranges are between 4°C in January and 36°C in June (Cornet, 1988). Based on temperature and precipitation patterns of the area, we regarded three defined seasons: Dry and hot (April to June); wet season (July to October); dry and cold (November to March).

Table 1
Habitat units description and their availability (Hectares).
In the description we only list the dominant forage species.

Habitat	Hectares	Description
H1	8,495	Calcareous flat-topped hills with *Yucca torreyana*, *Fouqueira splendens* (ocotillo) and *Tridens pulchellus* grasses.
H2	6,162.5	Calcareous hillside with *Prosopis glandulosa* (mezquite) and *Atriplex acanthocarpa* (salt-bush).
H3	5,025	Ephemeral chanels and flood zones, with *P. glandulosa* and *Hilaria mutica*.
H4	312.5	Calcareous hills with *Acacia constricta*
H5	1,687	Low hills with *Agave asperrima* and *Agave lecheguilla*.
H6	11,675	Hillsides with sand-clay soils. Alternating woody bandes of tall *P. glandulosa* and low *Larrea tridentata* with the grass species *H. mutica*.
H7	4,850	Sierras and high mounains. Rocky soils with *F. splendens*, *A. asperrima*, *A. lecheguilla*, *Euphorbia antisyphilitica* and *Heteropogon contortus*.
H8	3,293	Volcanic hillsides with *F. splendens* and *O. rastrera*.
H9	575	Hillsides with clay soils. The main species are *P. glandulosa* and *H. mutica*.
H10	125	Volcanic rocky mountains with *Opuntia microdasys* and *Hechtia glomerata*.

A total of twenty seven belted transects (500 x 10 m = 0.5 ha) were established within the ten habitat types that were enclosed within the area used by radiocollared animals. This number of transects was the maximum that could be physically sampled per season. The number of transects placed in each habitat type was based on the proportion each type was to the total area (Table 1). The maximum number (8 = 4 ha) was established in habitat type H6 and the minimum number (1) in the four smallest habitat types (Table 1). Each transect was marked by color flags, sampled once every season recording fresh cattle feces. All recorded feces were painted in order to differentiate them in the next sampling. Additionally, six cows (3 feral and 3 domestic) were equipped with radio-collars (Telonics, Inc) in the 151 MHz range. Animals were located by triangulation from 2 consecutive bearings with a yagi antenna. Previous to beginning the study we estimate triangulation error of 5°. Data recorded for each observation included habitat type according to Montaña (1988). The cows were located hourly over 24-hour periods. In all, they were located 1067 times.

For both field methods we evaluated the relative use of each habitat by a G test to determine if the cows were associated to any particular habitat. As there are no

enclosures, we considered the 42,200 ha as the available area. The analysis of utilization-availability data was conducted following Neu *et al.* (1974).

RESULTS AND DISCUSSION

Results of telemetry methods are known to be dependent on the number of animals sampled, the number and kind of locations collected (Smith *et al.* 1981; Laundré and Keller, 1984) and the time of day locations are taken (Palomares y Delibes, 1992). There are also sources of error associated with the method and equipment (Springer, 1979; White and Garrott, 1986; Schmutz and White, 1990). However, we assumed that the results obtained from this technique are still a valid estimate of population habitat use. When we compare the results obtained from telemetry locations with feces transect method, we obtained the same general results but, as pointed out by Loft and Kie (1988), there are differences in the order that each habitat is preferred or avoided (Table 2). These differences might be explained by differences in the methods we use. However, we think that these differences were a function of behavior and social factors that only can be detected by radio-telemetry methods.

Table 2

G-test values, percentages, preference (+) or avoidance (-) of each habitat by scats counts transect (TRANSECT) and by radio-telemetry locations (TELEMETRY).

	TRANSECT		TELEMETRY	
Habitat (%)[1]	G test(%)[2]	+/-	G test(%)[2]	+/-
H1(20.1)	- 53.9(3.3)	-	- 23.3(17.8)	ns
H2(14.6)	- 35.2(9.8)	-	- 9.5(13.7)	-
H3(11.9)	45.3(16.2)	+	412.1(35.4)	+
H4(0.7)	109.9(5.9)	ns	- 2.7(0.2)	-
H5(4.0)	- 12.4(2)	-	- 15.2(1.1)	-
H6(27.7)	- 90.9(9.1)	-	- 46.4(22.9)	-
H7(11.5)	- 19.7(9)	ns	0(0)	-
H8(7.8)	- 25.5(3.3)	-	- 15.8(0.6)	-
H9(1.4)	627.6(24.2)	+	147.3(7.9)	+
H10(0.3)	619.8(17)	+	2.3(0.5)	+
G test	P< 0.001		P< 0.001	

[1]Actual percent of total area.

[2] Estimated percent use of habitat.

The study area contains two kinds of cattle; domestic and feral (Hernández *et al.* 1993). Domestic animals live in bigger groups (100 vs 6 animals) and, based on radiotelemetry results, they inhabit the west zone where habitat types H9 and H10 are exclusively found (Hernández, 1995). For these reasons, H9 and H10

(with more feces) were shown as the most preferred habitats with the transect method ($P < 0.001$). Likewise because of differences in group size, habitat H1, mainly located in the eastern area and used by feral cattle, was indicated as avoided by transect method (3.3% feces). By the telemetry method, H1 was used according to its availability (17.8% locations). Habitats H4 and H7 were shown to be avoided by radio-telemetry method but used according to their availability with the transect-method. These areas represented a little canyon and sierras where radio-tracking were limited because there are no routes that permit following animals by vehicle. In this zone it would be more useful to conduct aerial surveys or visual observations (De Miguel *et al.* 1989; Lazo, 1992). By both methods the more avoided habitat was H6 (28% of the area).

In conclusion, both methods can be useful to study the habitat use of medium and big herbivores. However, there are often limits to the accuracy of each method. For example, in our study, only through radio-tracking could we determine that in the Mapimí Biosphere Reserve, there are two kinds of cattle with different habitat use behavior. However only with the transect method were we able to measure habitat use by feral cattle in somo of the mountai areas. Thus, the objetives of a study will determine which method may be preferred. For example, with our results and knowing the limitations of our radio-telemetry equipment, the transect method would be more useful to evaluate the abundance of feral cattle in the sierra in relation to the mule deer (*Odocoileus hemionus*), the only large wild herbivore in the zone. According to Gallina *et al.* (1991) in their study in Baja California Sur, this species prefers rocky broken terrain. Elsewhere, Loft *et al.* (1987) and Kie *et al.* (1991) show the influence of cattle on the habitat use of mule deer. In our sampling of the transects the only place where we found deer fecal pellets was near the sierra.

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Corytophanes hernandezi (Wiegmann, 1831)

Ejemplares examinados: (3): 1.15 km N, 1.05 km W Jalahui, 250 m, 1(MZFC 5599); 0.8 km N, 1.75 km W Jalahui, 1(ejemplar en cautiverio); 0.93 km S, 0.8 km W Jalahui, 60 m, 1(MZFC 5598).

La especie se distribuye en la vertiente del Golfo de México desde el centro de Veracruz hacia el sur hasta el noreste de Guatemala (Lang, 1989).

Los tres individuos son machos jóvenes y el intervalo de sus medidas son: LT, 148-346; LHC, 44-96 y LC, 104-250. Complementando la descripción hecha para la especie por Lang (1989), los individuos tienen 13 escamas supralabiales, 11 infralabiales, y 22 y 24 lamelas subdigitales en el cuarto dedo de las patas posteriores.

Las especímenes preservados tienen el dorso café cobrizo con reticulaciones café oscuro, en la cresta se presentan manchas de café oscuro a negro, poseen una serie de escamas puntiagudas a lo largo de la línea media dorsal del cuerpo; el vientre es crema con manchas café claro con bordes oscuros y en la garganta hay manchas café oscuras; la cola y las patas tienen bandas café claro a café oscuro.

Familia Gekkonidae

Hemidactylus frenatus Schlegel, 1836

Ejemplares examinados: (1): Jalahui, 290 m (MZFC 5600).

Esta especie introducida ampliamente es originaria del sureste de Asia. En México se le ha registrado en los estados de Baja California Sur, Campeche, Colima, Chiapas, Guerrero, Hidalgo, Jalisco, Morelos, Nayarit, Oaxaca, Querétaro, Quintana Roo, San Luis Potosí, Sinaloa, Tabasco y Veracruz (Castro-Franco, 1987; Hardy y McDiarmid, 1969; Marcellini, 1971; Reynoso, 1990; Schmidt *et al.* 1996; Smith y Smith, 1976). En Oaxacá se le ha registrado en la región de la Planicie costera del Pacífico y en el Istmo de Tehuantepec, sin ubicación exacta (Casas-Andreu *et al.* 1996); en Pinotepa Nacional (Liner y Dundee, 1969) y Puerto Angel (Chrapliwy, 1956), con este hallazgo se amplia su distribución en el estado hacia el nor-noreste en 206 km en línea recta a partir de Puerto Angel.

El ejemplar es un macho adulto, mide de LT, 119; LHC, 54; LC, 65; además de las características descritas por Hardy y McDiarmid (1969) presenta 10 a 12 supralabiales, 10 a 11 infralabiales, seis hileras dorsales de tubérculos grandes a mitad del cuerpo, dos hileras paravertebrales con 17-18 tubérculos, 28 poros femorales totales. Es necesario hacer notar que antes de esta fecha los lugareños no habían escuchado en el pueblo el sonido característico de las cuijas, lo que sugiere que inicia su invasión en la zona, debido, probablemente, al constante transporte de artículos desde Tuxtepec en donde es abundante.

Familia Phrynosomatidae

Sceloporus salvini Günther, 1890

Ejemplares examinados: (4): Jalahui, 290 m (MZFC 5629, 5630, 5631 serie de 2).

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