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Seasonal changes in activity patterns of the Patagonian hog-nosed skunk *(Conepatus humboldti)* in Torres del Paine National Park, Chile

Cambios estacionales en los patrones de actividad del chingue de la Patagonia *(Conepatus humboldti)* en el Parque Nacional Torres del Paine, Chile

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ABSTRACT

Four radiocollared Patagonian skunks *(Conepatus humboldti)* were monitored from March to June 1986 in Torres del Paine National Park to determine seasonal changes in activity. As the days shortened and temperatures dropped, the skunks extended their daytime activity periods and reduced their level of nighttime activity, resulting in an overall net reduction in their daily activity. During winter, skunks used shrub and forest areas with greater frequency and grassy areas with less frequency than in summer. Home range size averaged 14.3 ha for three juvenile skunks and 13.8 ha for one adult female.

Key words: Home range, habitat use, dispersal, radio-telemetry, skunk, *Conepatus.*

RESUMEN

Utilizando técnicas de radio-telemetría fueron determinados los cambios estacionales en la actividad de cuatro ejemplares de chingues de la Patagonia *(Conepatus humboldti)* en el Parque Nacional Torres del Paine, durante los meses de marzo a junio de 1986. Al acortarse las horas de sol y disminuir la temperatura, los chingues extendieron sus períodos de actividad diurna y redujeron la nocturna, resultando en la disminución neta de su actividad diaria. Los chingues también utilizaron con mayor frecuencia áreas arbustivas y boscosas en esta época que en el verano, disminuyéndola en zonas de pastizales. El tamaño de ámbito de hogar promedio para tres chingues juveniles fue de 14,3 ha y de 13,8 ha para una hembra adulta.

Palabras claves: Ambito de hogar, uso de hábitat, dispersión, radio-telemetría, chingue *Conepatus.*

INTRODUCTION

The Patagonian hog-nosed skunk *(Conepatus humboldti)* ranges from Valdivia (Chile) and the province of Río Negro, (Argentina), to the Strait of Magellan (from 38-42° S to 54° S) (Cabrera & Yepes 1940, Osgood 1943, Cabrera 1957, Miller & Rottmann 1976, Olrog & Lucero 1980). There exists little quantitative information on the species but Fuller *et al.* (1987) reported various aspects of its biology in Torres del Paine National Park from data collected during the summer (January–March) 1986. They found that the skunks were principally nocturnal and solitary, and used primarily grassy areas when searching for food, and had several daytime resting places.

The objective of this study was to determine seasonal changes in the activity patterns and habitat use of the Patagonian hog-nosed skunk. Information collected during fall and early winter (March-June) 1986 is compared with the results of Fuller *et al.* (1987) using the same radio-collared skunks.

MATERIAL AND METHODS

The study was conducted in a 125 ha area around the Pehoé park guard station in

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the central portion of Torres del Paine National Park (52°55'S, 51°03'W) in southern Chile. Summer (December-February) is typically warm (January mean maximum temperatures = 20°C) with winds often gusting to 160 km/hr. Winter (June-August) is cold (July mean maximum temperature = 5°C) with snow and less wind. Mean annual precipitation is 546 mm, with 60% falling as rain during January to May (Pisano 1974). Due to the latitude of the study area, there is an 8.9 hour difference in daylength between summer and winter. Topography varies from relatively flat grassy areas to steep rocky cliffs with elevation ranging from 200 to 700 m above sea level.

Fuller *et al.* (1987) identified five habitat types: 1) rock, including outcrops, fallen boulders, scree slopes and earthen tunnels, 2) Grass, consisting of various graminoids (*Festuca* spp.), 3) Shrub characterized by calafate *(Berberis buxifolia)*, mata barrosa *(Mulinum spinosum)* and *Senesio patagonicus*, 4) Forest, consisting of southern beech (*Nothofagus antarctica* and *N. pumilio*) usually less than 5 m tall, and 5) Human, including storage sheds, barns, garbage sites, a vegetable garden and graded dirt roads.

Skunks were captured in cage-type live-traps (23 x 30 x 90 cm; Tomahawk No 207) and immobilized (Ramsden *et al.* 1976, Rosatte 1983) via jab-stick or blow dart. One juvenile male, two juvenile females, and one adult female were radiocollared with 35 g transmitters (AVM Instrument Company; 164 mHz). Kinship between the skunks is unknown, but it is possible that some juveniles were siblings and/or offspring ot the adult female.

Radiolocations were determined by triangulation using a four element handheld antenna and an AVM Instrument Company receiver. Observers often were able to approach skunks within 10 m without disturbing them. Skunks were usually located twice a day, once during each activity and resting period. Locations were plotted on a gridded map, drawn with the aid of aerial photos, and recorded as X-Y coordinates. Home range sizes were calculated by the minimum convex polygon method (Odum & Kuenzler 1955). Habitat availability was determined by placing a dot grid over the map, including only the area used by the four skunks. Chi-square tests were used to determine differences in habitat use and availability and differences in habitat use among different time intervals.

Activity patterns of the skunks were determined using either the yagi antenna or an omni-directional whip antenna permanently mounted 3 m off the ground. Changes in signal strength caused by the flexing of the 20 cm antenna on each radiocollar indicated that a skunk was active. Activity patterns were determined for two periods, from 19 April to 16 May (fall) and from 26 May to 19 June (early winter). Percent activity was calculated for each of 24 one-hour periods. Samples of activity were taken randomly during 24-hour observation periods, and no more than one sample per individual was taken per hour.

RESULTS

During fall skunks initiated major activity periods between 1800-2000 hr versus 1700-1900 hr during early winter (Fig. 1). The one-hour difference in the initiation of activity for these periods corresponds to the one-hour difference in sunset. Total daily activity (the unweighted mean percent activity for all 24 one-hour activity periods) decreased from 50% during fall to 39% during early winter. Although the skunks remained relatively more active during the night, early winter activity never surpassed 80%. The skunks also became more active during the warmer periods of the day in early winter; mean percent activity was 22% during 1200–1500 hr in winter vs. 4% in fall.

The March-June ranges of the three juvenile skunks averaged 14.3 ha (range = 10.8–18.4 ha) similar to that of the adult females which was 13.8 ha (Table 1). The skunks did not use habitats in proportion to their availability ($P < 0.001$). When active, they utilized mostly grassy areas, and areas of human activity. When inactive skunks were found primarily in forest habitat (Table 2).

DISCUSSION

During winter, dusk occurs much earlier than in the summer and the number of daylight hours are greatly reduced. As in summer (Fuller *et al.* 1987), skunks initiated

their periods of major activity at dusk. Although there were more hours of darkness in fall compared with summer, skunks maintained nocturnal activity levels above 85% for ten hours during both periods and were active for the same total amount of time (50%). The similarity of summer and fall activity patterns in spite of the increase in the number of hours of darkness suggest that activity is not strictly related to darkness.

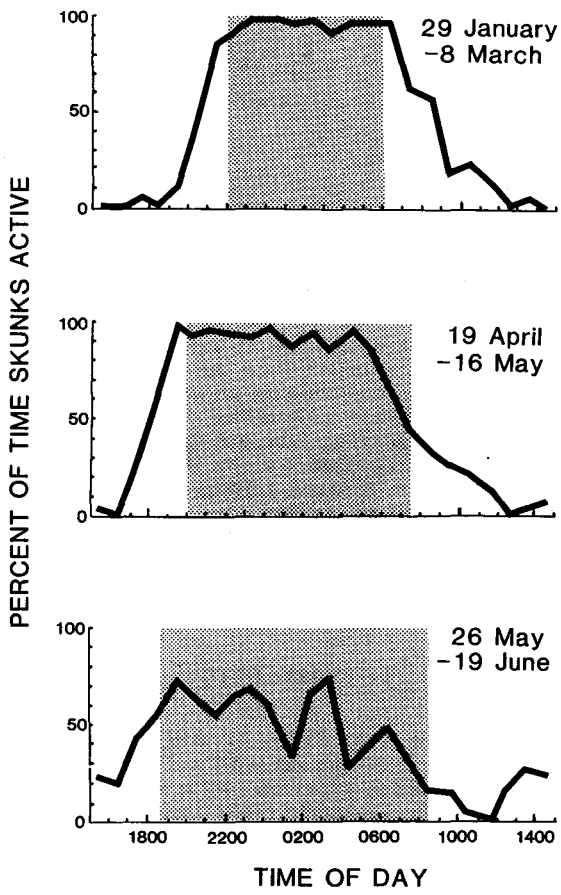

Fig. 1: Percent activity of Patagonian hog-nosed skunks from January-June 1987. Shaded areas indicate average period of darkness for each period. The mean number of samples for 29 January-8 March = 31 (range = 19-45); 19 April-16 May = 31 (range = 24-41); 26 May-19 June = 23 (range = 10-40). Data for January to March is from Fuller *et al.* (1987).

Porcentaje de actividad de chingues de la Patagonia. Entre enero y junio 1987. El área sombreada indica el período promedio de oscuridad para cada período. La información para enero a marzo es de Fuller *et al.* (1987).

TABLE 1

Home range sizes of four radiocollared Patagonian hog-nosed skunks in Torres del Paine National Park, Chile. Number of locations listed in parentheses.

Tamaños de los ámbitos de hogar de cuatro chingues de la Patagonia determinados por radiotelemetría en el Parque Nacional Torres del Paine, Chile. Número de localizaciones está entre paréntesis.

Sex	Age	Jan. 25-March 8[a]	March 9-June 8
M	Juv	11.6 (47)	13.8 (47)
F	Juv	10.0 (105)[b]	18.4 (54)
F	Juv	7.4 (45)[c]	10.8 (48)
F	Ad	16.4 (37)	10.8 (48)

a From Fuller *et al.* (1987).
b Not including 3 locations.
c Not including 1 location.

In early winter, however, with lower temperatures and the presence of snow, the skunks reduced the total amount of time they were active to 39% and increased daytime activity. These shifts in activity suggest that the skunks change their strategies for maintaining body temperature and energy requirements from summer and fall to winter. The decrease in overall daily activity in early winter, which is also found in striped skunks *(Mephitis mephitis)* in North America (Sunquist 1974, Aleksiuk & Stewart 1977), has very obvious energetic advantages as physical activity can represent up to 25% of a mammals energy expenditure (Morrison 1968). Also, by remaining in the relative warmth of the den, especially during nightime, and increasing daytime activity, thermoregulative costs can be reduced. Energy costs would be further reduced if the skunks are capable of lowering their resting metabolic rates. Components of winter dormancy or "carnivore lethargy" have been documented in striped skunks in Canada (Aleksiuk & Stewart 1977) and we suspect the Patagonian hog-nosed skunk may also be capable of similar reduction in metabolism because skunks are often found in a deep sleep from which they awake very slowly and with difficulty.

Changes in habitat use also accompanied the temperature decreases and the presence of snow. The skunks shifted their activity from grassy areas (Fuller *et al.* 1987) to

TABLE 2

Habitat use by four Patagonian hog-nosed skunks from January to June 1986. Habitat use is significantly different from availability (Chi square, $P < 0.001$). Habitat use is significantly different between the two periods and when active versus inactive (Chi square, $P < 0.01$).

Uso de hábitat de cuatro chingues de la Patagonia entre enero y junio 1986. El porcentaje de hábitat disponible está entre paréntesis. El uso de hábitat es significativamente diferente del disponible (Chi cuadrado, $P < 0{,}001$) para cada actividad. También hay diferencias significativas entre los dos períodos y entre el uso cuando activo e inactivo (Chi cuadro, $P < 0{,}01$).

Activity / Habitat		N	Rock	Grass	Shrub	Forest	Human
Percent Available			20	14	48	17	1
Active:	25 Jan. 86-8 Mar. 86[a]	64	2	81	3	2	12
	9 Mar. 86-19 Jun. 86	34	–	47	12	15	26
Inactive:	25 Jan. 86-8 Mar. 86[a]	134	13	1	40	35	11
	9 Mar. 86-19 Jun. 86	170	–	–	39	59	1

[a] From Fuller *et al.* (1987).

areas of shrubs, forest, and human use. These changes are apparently related to an increased use of areas with less snow accumulation. The shift in resting places from rocky areas and areas of human use is not as easily explained but may also be related to lesser amounts of snow as skunks are not adapted to locomotion through deep, soft snow.

In comparison with the summer (Fuller *et al.* 1987) all the juveniles increased the size of their home ranges. This increase could be related to an increase in body size and energy requirements, or could also reflect exploratory movements associated with dispersal of individuals and the establishment of home ranges. Juvenile dispersal varied greatly between individuals, with one juvenile female establishing a home range by the end of February completely distinct from its natal home range, while a juvenile male continued to use its natal home range for the entire study. In contrast with the juveniles, and similarly to striped skunks in North America (Houseknecht 1971), the adult female skunk reduced her home range slightly, perhaps in response to lower energy requirements after weaning her young.

In conclusion, the results of this study demonstrate that skunk activity is strongly influenced by certain seasonal changes. Behavioral patterns are affected by changes in the amount of daylight and by changing temperatures.

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