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SOUTH AMERICA

A record of a dwarf brocket from lowland Madre de Dios, Peru

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Resumen

Los venados enanos sudamericanos (*Mazama* spp.) incluyen varias especies poco conocidas. En esta nota reportamos a una especie de venado enano capturado fotográficamente en el bosque húmedo lluvioso cerca de la parte baja de la cuenca del río Los Amigos, en el sudeste de Perú. Creemos que es el primer registro publicado de una especie de venado enano en un bosque húmedo lluvioso de Perú y posiblemente el primer registro seguro de un venado enano en la cuenca amazónica baja. El venado fotografiado es de color marrón-rojizo brillante y se diferencia morfológicamente por varios rasgos de la especie geográficamente más cercana, y único registro de una especie de venado enano peruano, *M. chunyi*, conocido de los bosques andinos montanos de Bolivia y sudeste de Perú. Por lo tanto, este parece ser el registro de una especie nueva para Perú. De las especies previamente descritas, se parece mas a *Mazama nana*, conocida únicamente del bioma del Bosque Atlántico Interior del sudeste de Brasil, del noreste de Argentina y el adyacente Paraguay. Hasta que no se tenga un espécimen, no se podrá determinar con seguridad a que especie pertenece.

The South American dwarf brockets (*Mazama* spp.) are known from few museum specimens, and their geographic ranges and population status are poorly known (Wemmer 1998; IUCN 2002). We report here on a dwarf brocket photographed by camera trap in the Madre de Dios region of SE Peru. We believe that this is the first published record of a dwarf brocket in the lowland Amazonian rainforest of Peru and, possibly, the first unambiguous record of dwarf brocket from all of the Amazonian lowlands. It seems to be a new species record for Peru and comprises either a major range extension of a known species or, possibly, an undescribed taxon.

Four species of dwarf brockets are recognized: the Brazilian dwarf brocket, *Mazama nana*, from moist forest in S Brazil, E Paraguay, and NE Argentina; the Peruvian dwarf brocket, *M. chunyi*, from forests of the eastern Andean slopes of N Bolivia and S Peru (1,500-3,200 m); the red dwarf brocket, *M. rufina*, from the western Andes of S Colombia, adjacent Ecuador and N. Perú (1,500-3,500 m); and *M. bricenii* from the Andes of W Venezuela and adjacent Colombia (Hershkovitz 1982; Czernay 1987; Eisenberg 1989; Redford and Eisenberg 1992; Duarte 1996, 1997; Duarte and Gianonni 1996; Emmons and Feer 1997; Wemmer 1998; Eisenberg and Redford 1999; Rumiz 2002, in press). However, Czernay (1987) mentioned unconfirmed records of dwarf brockets from the

Xingu and Tapajos regions of the central Amazon. Although not a taxonomic entity, the dwarf brockets are readily distinguished from the larger brocket deer by their small size (Table 1) (fawns of the larger species are spotted).

During a general camera-trap mammal survey in the lower Rio Los Amigos area, Madre de Dios, SE Peru (Conservation Concession of the Amazon Conservation Association; Trolle 2003b), we photographed a dwarf brocket by a mineral lick in floodplain forest on 8 April 2003 (trapping site: 12º32.632'S; 70º04.540'W; elevation ca. 200 m). The camera-trapping method and equipment are described in Trolle (2003a).

Table 1. Characteristics of different species of Mazama deer

Species	HB (cm)	SH (cm)	HB (cm)	Ear (cm)	WT (kg)	Description
M. americana	105-144	67-80	105-144	8.4-10.6	24-48	Brilliant reddish brown with greyish brown neck; legs blackish distally.
M. gouazoubira	90-125	35-65	90-125	9.0	11-25	Dull greyish brown.
M. nana	60-100	45-50	60-100	8.0-9.7	15-20	Dark reddish brown. Ears oblong and pointed.
M. chunyi	72	38	70	6.3	11	Brown with dark grey foreparts and neck; contrasting light brown underparts of both neck and body; muzzle very short and thick. Ears short and rounded at tips.

References: Czernay 1987; Duarte 1996; Emmons and Feer 1997; Eisenberg and Redford 1999; 6 photos of M. chunyi *supplied by Damián I. Rumiz.*

The deer is small, gracile, and not much taller than a collared peccary, *Pecari tajacu,* camera-trapped at the exact same spot. One of the authors, also camera-trapped at the same spot, measures 36 cm from the top of the foot to the knee (Fig. 1). The deer is bright chestnut red-brown dorsally, with sides and venter coloured as back. The legs are blackish-brown distally, darkening from just above the knee and heel-joints. The crown and front of the rostrum are blackish, as are both surfaces of the ears, which are large and tapered at the tips. The tail is not visible in the photo, and the head is blurred, but appears to lack antlers. Color photos can be viewed at http://amazonconservation.org/home/. We believe that it is not a subadult *M. americana*, which at this size would have relatively longer legs in relation to body size, and obvious white spots (see photo in Tirira, 1999). *M. americana* fawns also apparently lack black on the legs and face (Tirira, 1999). All adult *M. americana* that we photographed at the same mineral licks have some to many pale irregularities in the fur, of the kind visible in the dwarf deer (Photo 2, taken by D. LaRosa). We do not know if these are just irregularities in the lie of the fur or scars from bot-flies or other causes.

We have compared our photo with several photos of Mazama nana (in Czernay 1987; Duarte, 1996; two sent by M. Barbanti, and one by D. Varela), M. chunyi (six photos from Bolivia supplied by Damián I. Rumiz), and M. rufina (Czernay 1987, Hershkovitz 1982). The dwarf brocket from lowland Madre de Dios resembles neither the (geographically closest) Peruvian species, M. chunyi, nor M. rufina, (which has recently been recorded in the NW Andes of Perú; J. Barrio, *pers com.*) in either body proportions or shape of the head (Table 1). M. chunyi is more robust, with relatively shorter legs, and has smaller, broader, more rounded ears and a shorter and broader muzzle.

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Figure 1. Dwarf brocket deer at Rio Los Amigos, with parallel photo of LHE for scale.

Damián I. Rumiz), and M. rufina (Czernay 1987, Hershkovitz 1982). The dwarf brocket from lowland Madre de Dios resembles neither the (geographically closest) Peruvian species, M. chunyi, nor M. rufina, (which has recently been recorded in the NW Andes of Perú; J. Barrio, pers com.) in either body proportions or shape of the head (Table 1). M. chunyi is more robust, with relatively shorter legs, and has smaller, broader, more rounded ears and a shorter and broader muzzle. M. chunyi has a gray to black head and neck and blackish mid-dorsum, while M. rufina is similar in color to the Rio Los Amigos deer. The deer in our photo looks similar to M. nana in shape, but differs in some color features, including blackish lower legs and an apparently pale inner thigh (M. Brabanti, pers. comm.; Table 1). These lowland dwarf deer are more gracile than any Andean deer, with slender legs and head and body morphology like miniature gray brockets (M. gouazoubira).

A lifetime resident of the Madre de Dios region and experienced hunter and former hunting guide and park guard, Darío Cruz Vani, told us that he has seen similar deer several times along the río Heath and adjacent Bolivia, usually in floodplain forest, but that he rarely encounters them. *Mazama nana* is said to favor dense vegetation such as bamboo thickets (Redford and Eisenberg 1992; Emmons and Feer 1997), and the small size of the dwarf brockets may be an adaptation to life in dense undergrowth. This inaccessible habitat may explain why the dwarf brockets have so rarely been found. Our total camera-trapping effort for the mammal survey in the Rio Los Amigos area was 501 camera-trapping nights. We obtained nine captures of *Mazama americana* (Fig. 2) and *M. gouazoubira* and only one of the dwarf brocket. Camera traps were placed mainly on human trails in relatively open, tall forest and by mineral licks. The unique photographic capture of a dwarf brocket may imply that the favoured habitat of the species is dense vegetation such as bamboo thickets, and suggests that a more habitat-focused approach may be needed to catch it.

In conclusion, we feel certain that the dwarf brocket photographed in lowland Madre de Dios is not the

Figure 2: Adult Mazama americana *photographed in the same area as the dwarf species (photo G. D. LaRosa).*

montane *Mazama chunyi*, nor *M. rufina* and, thus, it is a new species for Peru. We provisionally consider this deer as an unidentified *Mazama* species, identification must await confirmation with a specimen. If it turns out to be an *M. nana* of different coloration, this would constitute a major range extension for *M. nana*, from the Rio Parana basin of Brazil and adjacent rainforest areas, to the western Amazon rainforest, approximately 2,000 km distant. Unlike the majority of the larger lowland ungulates of South America that have large geographic ranges (Emmons and Feer 1997), the dwarf brockets all seem to have relatively limited distributions. Brockets apparently have a relatively high potential for divergence in different biomes, as attested by the approximately 45 named forms. It is therefore possible that the reddish-brown dwarf brocket in lowland Madre de Dios is an undescribed species.

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Bibliography

Czernay, S. F. 1987. Die Spiesshirsche und Pudus. A. Ziemsen Verlag, Wittenberg Lutherstadt, Germany.

Duarte, J.M.B. 1996. Guia de Identificação dos Cervídeos Brasileiros. FUNEP, Jaboticabal, Brazil.

Duarte, J.M.B. (ed.). 1997. Biologia e Conservação de Cervídeos Sul-americanos: *Blastocerus, Ozotoceros* e *Mazama*. FUNEP, Jaboticabal, Brazil.

Duarte, J.M.B., and M.L. Gianonni. 1996. A new species of Deer in Brazil (*Mazama bororo*). Deer Specialist Group News 13:3.

Eisenberg, J.F. 1989. Mammals of the Neotropics, Vol. 1, The Northern Neotropics: Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana. University of Chicago Press, Chicago.

Eisenberg, J.F., and K.H. Redford. 1999. Mammals of the Neotropics, Vol. 3, The Central Neotropics: Ecuador, Peru, Bolivia, Brazil. University of Chicago Press, Chicago.

Emmons, L. H., and F. Feer. 1997. Neotropical Rainforest Mammals: A Field Guide. 2nd edition, University of Chicago Press, Chicago.

Hershkovitz, P. 1982. Neotropical deer (Cervidae). Part 1. Pudus, genus *Pudu* Gray. Fieldiana: Zool., n.s., 1:1-86.

IUCN. 2002. Red List of Threatened Species. The IUCN Species Survival Commission, www.redlist.org.

Redford, K.H., and J.F. Eisenberg. 1992. Mammals of the Neotropics, Vol. 2, The Southern Cone: Chile, Argentina, Uruguay, Paraguay. University of Chicago Press, Chicago.

Rumiz, D.I. 2002. An update of studies on deer distribution, ecology and conservation in Bolivia. Deer Specialist Group News 17:6-9.

Rumiz, D. L., E. Pardo, C. F. Eulert, R. Arispe, R. B. Wallace, H. Gómez, and B. Ríos-Uzeda. in review. New records and a status assessment of a rare dwarf brocket deer from the montane forests of Bolivia.

Tirira, D. S. 1999. Mamíferos del Ecuador. Mus. Zool. Cent. Biodiv. Amb. Pont. Univ. Católica Ec., Quito. Publ. Esp. 2.

Trolle, M. 2003a. Mammal survey in the southeastern Pantanal, Brazil. Biodiversity and Conservation 12(4):823-836.

Trolle, M. 2003b. Camera trapping in the Rio Los Amigos region, Madre de Dios, Amazonia, SE Peru. Report, Amazon Conservation Association, http://www.amazonconservation.org/home/camera_trapping_losamigos.html

Wemmer, C. (ed.). 1998. Deer: Status Survey and Conservation Action Plan. IUCN/SSC Deer Specialist Group, http://www.iucn.org/themes/ssc/actionplans/deer/Deer_contents.pdf.

Possible cattle influence on the population of two deer species at the highlands of Rio Abiseo National Park, Peru

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Resumen

Este estudio considera la posibilidad de desplazamiento por parte del ganado (*Bos taurus*) sobre las poblaciones de taruka (*Hippocamelus antisensis*) y venado cola blanca (*Odocoileus virginianus*), y explora la división de hábitat entre estos dos cérvidos en el Parque Nacional Río Abiseo, Perú. Tres áreas similares, cada una de 30km², fueron comparadas calculando la densidad de ganado por muestreo de transecto lineal. El uso de hábitat por parte de las dos especies de cérvidos fue estimado por la tasa de encuentro de camas por kilómetro de transecto. Los resultados sugieren que las diferencias en el uso de hábitat de taruka y venado cola blanca entre las tres áreas fueron influenciados por la presencia de ganado. Las densidades de ganado entre las tres áreas fueron estadísticamente diferentes. La tasa de encuentro de camas de las dos especies de cérvidos se diferenciaron con un patrón de correlación inversa comparado con la densidad de ganado. Todos los avistamientos de taruka y la mayoría de los avistamientos de venado cola blanca ocurrieron en dos de las áreas. Las dos especies de cérvidos se segregaron por hábitat y altitud, con mayor probabilidad de encontrar a la taruka en zonas rocosas y a mayor altitud. La diferencia del uso de altitud fue significante, sin traslape en sus los respectivos intervalos de confianza al 95%.

Introduction

Tarukas (*Hippocamelus antisensis*) live in the Andes, from northern Peru to northern Argentina and Chile, ranging from 2,000-3,500masl at the south to 3,500-5,000masl in Peru and Bolivia (Barrio 1998; Thornback and Jenkins 1982). Usually, tarukas live in groups, within rocky outcrops among grasslands (APECO 1996; Barrio 1999; Merkt 1987; Roe and Rees 1976). In South America, white-tailed deer (*Odocoileus virginianus*) are found from Venezuela through the Andes to Bolivia (Jungius 1974). White-tailed deer range in Peru from sea level to over 4,000masl, enduring a great variety of habitat and weather, covering both Andean slopes, thriving particularly in open areas. Currently, the taruka is listed as "Endangered" in Peru (MINAGR 1999), and as "Data Deficient" by the IUCN (IUCN 2002).

In Peru, taruka and white-tailed deer share their habitat with wild and domestic ungulates (Barrio 1998). However, domestic ungulates might compete with deer for food and space, affecting their populations. This project aimed to detect the effect of free-ranging cattle over taruka and white-tailed deer, and to determine the spatial segregation between the two deer species.

Study area

Research was conducted in April-June 2001 at the highlands of Rio Abiseo National Park (RANP) and its buffer zone (Fig. 1). The study area was a 30km long band along the eastern Andean Cordillera, at 3,800-4,300masl. Ecologically, the study area involved tropical sub-alpine paramo (ONERN 1976). Grasses and herbs dominate, shrubs occur at very low densities, and relict forests are small and isolated between them. The study area involved three areas with similar habitat (Lock 1988)—around 30km² each—differing in the density of cattle occupying the mountain ridges. Main cover in the three areas (76-83%) were rocky outcrops (44-59%) and a *Calamagrostis* sp. association (24-32%) formed by *Calamagrostis* sp., *Paspalum pilgerianum* and *Bromus lanatus* (Lock 1988).

Methods

The cattle density at each area was calculated from data gathered from non-random transects in conjunction with line transect techniques,

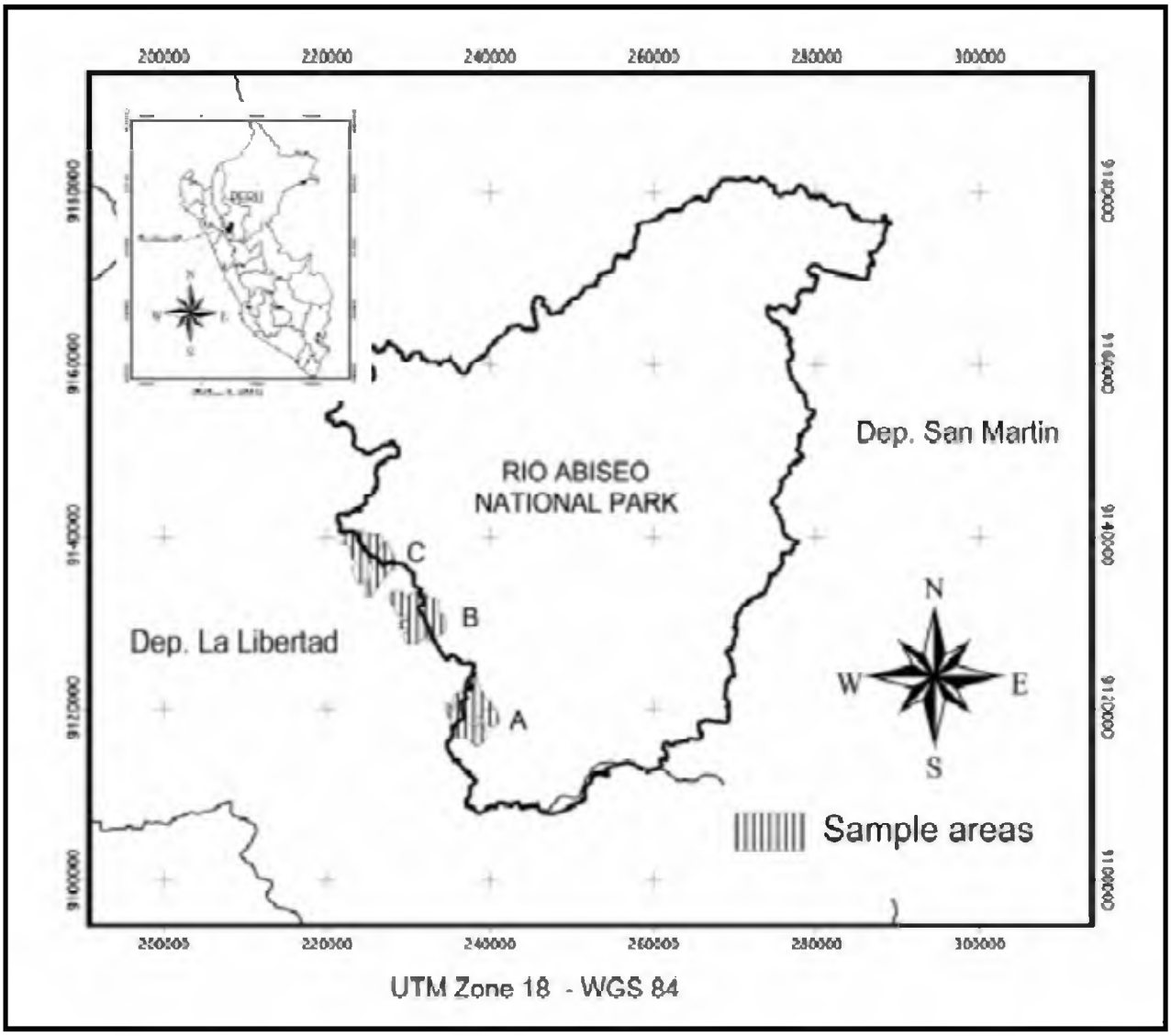

Figure 1: Study area

processing the data with the Distance population estimation software (Buckland *et al.*, 1993). Results were compared using an ANOVA. An index of use--presence of bedding places--was applied to compare deer use between the areas. Only beds observed from the transects--roughly 50 meters at each side--were included in the analysis. The utilization index in each area was the average number of bedding places encountered per kilometer. Several assumptions validated the use of bedding places. Each species' habitat use was based on location of sightings and bedding places. Habitat type was broadly qualified.

Results

1) Cattle density in the sampled areas

Cattle average density from south to north was: A) 6.4 individuals/km^2, B) 1.2 individuals/km^2, C) 0.2 individuals/km^2. Statistical differences were: A-B ($t=12.31$, d.f.=32, $p<0.01$) and B-C ($t=2.12$, d.f.=7, $0.05<p<0.1$). Density averages were more different if A and C are compared.

2) Encounter rate of deer bedding places

The encounter rate was measured by kilometer of transect traveled on each area.

Due to the large number of zeros and high skewness of the data distributional curves for both species, the data was analyzed by the Wilcoxon-Ranks test.

White-tailed deer.- Total beds for each area were: A: 8; B: 11; C: 30. Comparisons were: A-B (Z=-1.83, p=0.068); A-C (Z=-1.35, p=0.176); B-C (Z=-1.18, p=0.237). Actual observations: A=1, B=3, and C=5 sightings involving eight individuals. Sexual structure was 4 adult males, 6 females, 1 juvenile male, and 1 fawn. There was no statistically significant difference between the areas, but total bedding places and sightings showed a larger population in the northern area (C).

Taruka.- Total beds for each area were: A: 2; B: 34; C: 58. Comparisons were: A-B (Z=-2.02, p=0.043); A-C (Z=-1.83, p=0.068); B-C (Z=-0.14, p=0.893). The only statistically significant difference at 0.05 level involved A and B, however, between A and C was also significant. Actual observations: A=0, B=2 sightings involving 9 individuals, and C=4 sightings involving 13 individuals. Sexual structure was 5 adult males, 1 juvenile male, 12 females, and 4 fawns. Average group size was 3.7±2.07. Total bedding places and sightings showed that taruka concentrated in B and C, especially in C.

3) Segregation between taruka and white-tailed deer

Twenty-five out of 28 taruka records (>100 individual beds and sightings), but only half of white-tailed deer records, were located inside rocky areas. Tarukas were more likely to be found in rocky outcrops than white-tailed deer. The habitat use difference between deer species was highlighted by altitude use. Altitude intervals (95%C.I.) were 4152-4204masl for taruka, and 4035-4098masl for white-tailed deer. This difference was significant (F=2.33, p=0.05). Interestingly, white-tailed deer beds were located at a higher altitude than sightings. While 9 out of 12 sightings (75%) were below 4,000masl, only 12 out of 39 bedding locations (31%) were below 4,000masl

Discussion and Conclusions

There was an inverse correlation between cattle density and habitat use by either taruka or white-tailed deer. Also, despite the low density for both species, actual sightings were lower in the area with higher cattle density. We infer that both deer species preferred areas without cattle. Therefore, for whichever reason, deer species are being affected and displaced by cattle ranching around RANP highlands.

Other factors contributed to these results. The southern areas—A and B—endure heavier hunting pressure than C. However, taruka data were very similar between B and C, questioning the hunting effect on taruka. But hunting could affect white-tailed deer, which densities were higher in C. The presence of hunters and cattle are related considering that feral cattle belong to the same people that hunt. Furthermore, cattle owners walk with dogs, which run down tarukas (Barrio 1998), and probably kill taruka fawns (APECO 1996). The displacement-because-of-cattle correlation existed and should be taken into account for management purposes in Andean protected areas.

Habitat segregation might allow the coexistence of the two similar-sized species. Taruka used rocky areas more frequently than white-tailed deer. Isolation is a threat to the survival of this taruka sub-population. There is few available habitat to the northwest of RANP, and the southeast is affected by heavy grazing and hunting. Based on the study, I estimate that the taruka population around RANP highlands does not exceed 50 individuals. If the taruka population to the northwest does not largely exceed this number, the survival of this sub-population is at risk. Overall, the taruka population in Peru is fragmented (Barrio 1998), making it vulnerable to extinction (McCullough 1996; Wiens 1996).

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References

Asociación Peruana para la Conservación de la Naturaleza (APECO). 1996. Evaluación preliminar del estado de la población de tarucas *Hippocamelus antisensis* en el Parque Nacional del Río Abiseo (PNRA) y de sus requerimientos de conservación. APECO, Cooperación Técnica Holandesa - Embajada de los Países Bajos. Perú.

Barrio, J. 1998. Population and habitat viability analysis of the taruka (*Hippocamelus antisensis*) in the southern Andes of Peru. M.S. Thesis. University of Florida, Gainesville, Florida.

Barrio, J. 1999. Población y hábitat de la taruka en la Zona Reservada Aymara-Lupaca, Perú. Pages 453-460 *in* T. Fang, O. Montenegro, and R. Bodmer (eds.). Manejo y Conservación de Fauna Silvestre en América Latina. La Paz, Bolivia.

Buckland, S., Anderson, D., Burnham, K., and Laake, J. 1993. Distance Sampling: estimating abundance of biological populations. Chapman and Hall, London, U.K.

International Union for Conservation of Nature and Natural Resources (IUCN). 2002. The 2002 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland.

Jungius, H. 1974. Beobachtungen am Weißwedelhirsch und an anderen Cerviden in Bolivien. *Z. Säugertierkunde*, 39:373-383.

Lock, R. 1988. Proyecto de desarrollo ganadero en áreas vecinas al Parque Nacional Río Abiseo: Inventario y evaluación agrostológica. Convenio APECO-AIDER. Pataz, Perú.

McCullough, D. 1996. Spatially structured populations and harvest theory. *J. Wildl. Manage.*, 60: 1-9.

Merkt, J. 1987. Reproductive seasonality and grouping patterns of the north Andean deer or taruca (*Hippocamelus antisensis*) in southern Peru. Pages 388-401 *in* C. Wemmer (ed.). Biology and management of the cervidae. Smithsonian Institution Press. Washington, D.C.

Ministerio de Agricultura (MINAGR). 1999. Anexo: Categorización de especies amenazadas de fauna silvestre. Decreto Supremo N° 013-99-AG. Prohiben caza, extracción, transporte y/ o exportación con fines comerciales de especies de fauna silvestre no autorizados por el INRENA, a partir del año 2000, publicado el 19 de mayo de 1999.

Oficina Nacional de Evaluación de los Recursos Naturales (ONERN). 1976. Mapa Ecológico del Perú. Guia explicativa y mapa. ONERN, Perú.

Roe, N., and Rees, W. 1976. Preliminary observations of the taruca (*Hippocamelus antisensis*: Cervidae) in southern Peru. *J. Mammal.*, 57:722-730.

Thornback, J. and Jenkins, M. 1982. The IUCN Mammal Red Data Book. Part 1: Threatened mammalian taxa of the Americas and the Australasian zoogeographic region (excluding Cetacea). IUCN, Gland, Switzerland.

Wiens, J. 1996. Wildlife in patchy environments: metapopulations, mosaics, and management. Pages 53-84 *in*: D. McCullough (ed.). Metapopulations and wildlife conservation. Island Press. Washington, D.C. and Covelo, California.

Environmental catastrophe induce a decline in the endangered northernmost Huemul (*Hippocamelus bisulcus*) deer population in central Chile

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RESUMEN

El futuro de la población más septentrional del huemul es incierto. De hecho, según los análisis realizados a prospecciones realizadas desde 1980 hasta 2003 se observó que la población de la Reserva Nacional Ñuble y sectores aledaños disminuyó hasta en un 80%. Posterior a 1995 se observó una fuerte disminución de la abundancia de huemules tanto en los grupos ubicados dentro como fuera de la reserva. Estos datos estarían relacionados con la ocurrencia de una tormenta de nieve, evento climático sin proporciones ocurrido en 1995, el cual habría extinguido localmente varios grupos de huemules tanto dentro como fuera del área protegida. Se sugieren actividades de manejo más intensivas para la recuperación de la población como restauración de hábitat y translocación de individuos, de lo contrario la especie se extinguirá definitivamente de Chile central.

INTRODUCTION

The huemul deer (*Hippocamelus bisulcus*) which inhabits only in Chile and Argentina, is endangered in both countries and today is at the edge of extinction (IUCN, 2002). Its original distribution extended from 34° to 53° S in Chile along the Andean foothills and mountains. Today remain around 45 huemuls in the northernmost population (Nevados de Chillán area) distant almost 500 km of it closer population (In Argentina). Here, huemuls live in fragmented groups mainly in mountainous private owned farms and in two protected areas. One of them is the Ñuble National Reserve (NR).

In despite of conservation actions developed as habitat acquisition, protection by wildlife guards, public education, it has couldn't revert its condition and population has continued reducing even inside the Ñuble NR and if the current scenario continues it population would extinguish soon (Povilitis, 1998, 2002). Though these activities began on '70s, the causes of the population decline are still unclear, but is suspected that human activities as forest clearing, poaching, and the construction of pipe and gas-line in huemul habitat in the Ñuble NR are among principals threat to its survival joint to the competence with livestock and genetic depression (Povilitis, 1983; López, et al 1994).

Nevertheless, the disappearance of huemuls inside a protected area complicate the explanation for its reduction. According to Povilitis (1979) "the fluctuation in group size, resulting from random demographic and environmental events, likely plays a key role in the disappearance of small, isolated huemul groups". In this paper I analyze a large data set of up to 23 years and propose an environmental catastrophe, a snow storm ocurred in 1995 as a source for the reduction of the huemul population in the Ñuble NR and bordering places.

METHODS

The study area is placed in Ñuble NR and surrounding sites around it in central Chile (36°58' S, 71°25' W: Figure 1). The zone is a hillside, with abundant rocky outcrops and scarce soil's development. In general, this area is characterized by presenting valleys of glacial origin where the *Nothofagus pumilio* forests are dominant at 1.700 m.a.s.l.

Between 1980 and 2003, 1524 field surveys were conducted within and outside Ñuble NR to detect huemul presence. Surveys covered eight places inside and fourteen around Ñuble NR. Huemul presence was registered trough fresh tracks presence (Povilitis, 1979). An estimator of huemuls frequency (F) was calculated for year's surveys with the

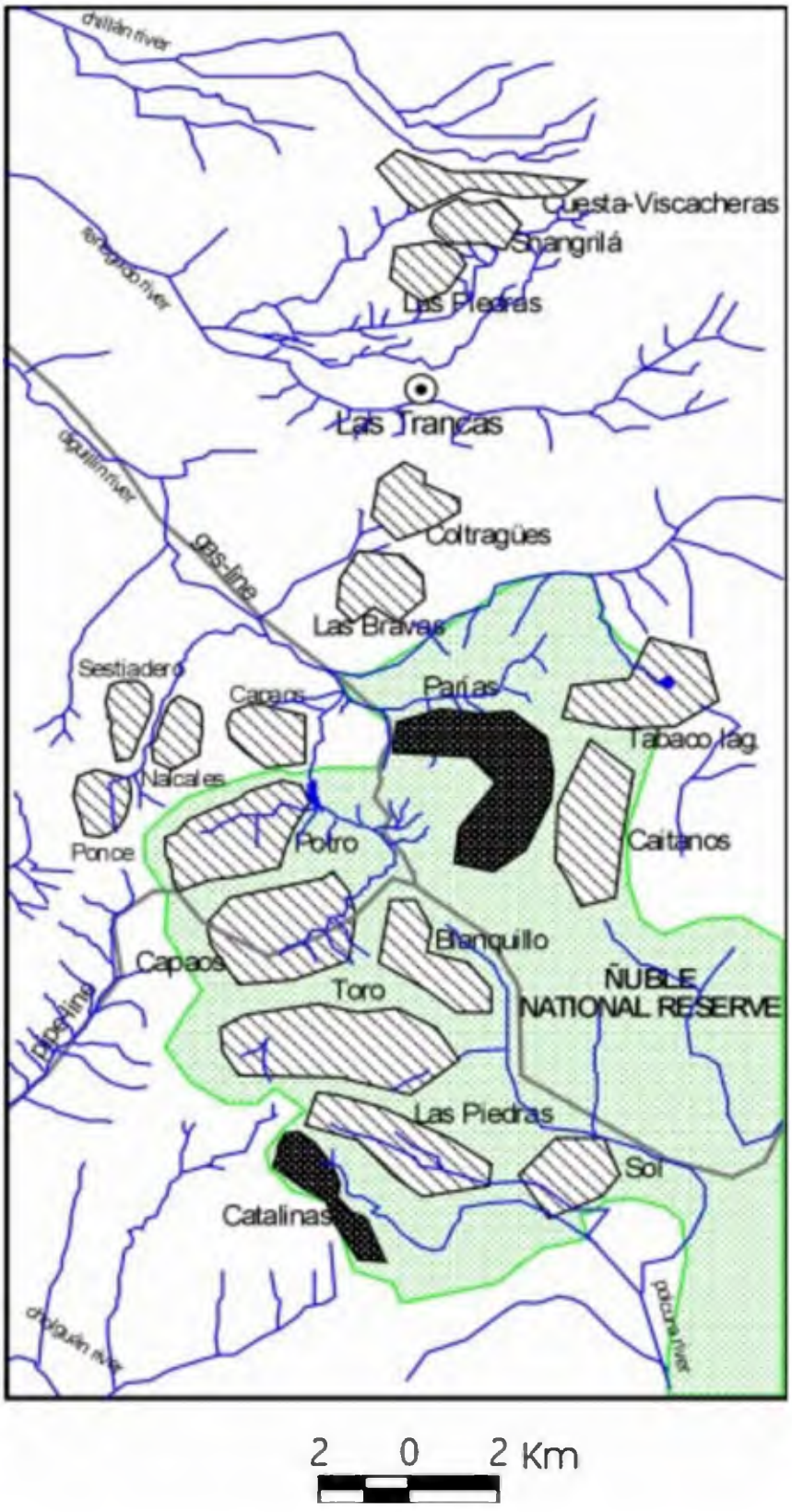

Figure 1. Current distribution of the huemul in the Ñuble National Reserve and sourrondings sectors. In black filled figures are sites with presence of huemul groups.

formula: F= (V*100)/P. Where, P is the total of surveys per year and V is the number of surveys with positive results. A Chi-square analysis was carried out to determine preferences of the animals for the sectors located inside or outside the protected area. Also, a Kruskal-Wallis test was employed to assess the effect of the environmental event in the abundance of huemuls in the groups inside or outside the reserve (Zar, 1984).

RESULTS

A total of 758 surveys were carried out inside Ñuble NR and 766 in the sectors bordering to this. Of them 360 and 278 surveys were positive, for Ñuble NR and bordering sectors, respectively. Huemul's tracks were found more often in sectors located inside than outside the reserve according to those expected by random (c^2=5.55, p <0.05, d.f. =1; Figure 2). Huemul abundance differed between before and after the occurrence of snow storm in 1995 considering the huemul abundance for the reserve ($H_{1.21}$= 11.75; p <0.001) and for surrounding sites ($H_{1,21}$= 14.53; p <0.001).

A tendency of an increase of the frequency of groups placed into Ñuble NR and a reduction in the frequency of groups outside the reserve between 1980-1990 was observed, respectively. Nevertheless, a evidence of a strong reduction in 1996 surveys was detected for both, inside and outside the reserve

groups, which could be related to the strong snow storm occurred in 1995 in the mountainous zone of Chile and Patagonia (Figure 2).

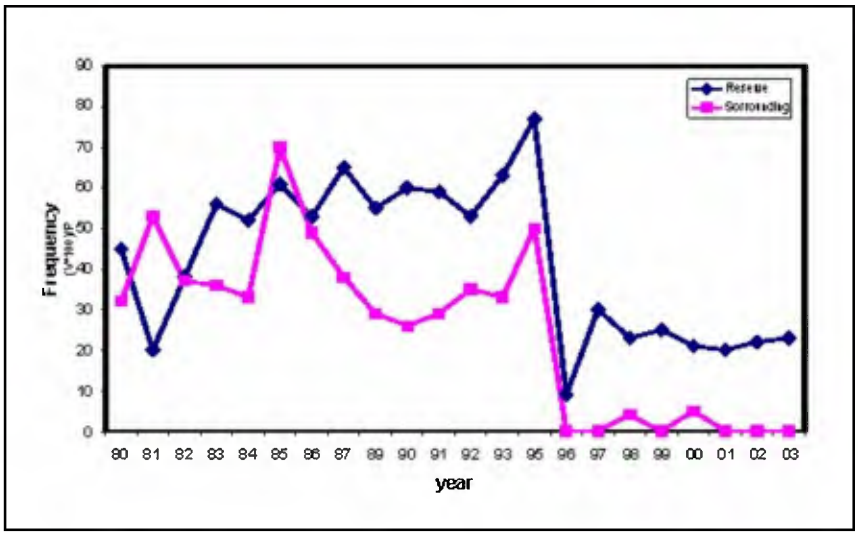

Figure 2. Relative abundance of huemul population in groups located inside and outside Ñuble National Reserve between 1980 and 2003 in central Chile.

DISCUSSION

To protect effectively a species that has suffered an intense populational reduction and that is at the edge of the extinction, it should be first determinate the causes that have led it to this state (Caughley, 1994). Huemul populations it had reduced primarily of course because human effect and its related activities, thus, in 1974 was established a program to conserve the species in the whole country (Aldridge & Montecinos, 1998). In the Nevados de Chillán area, the effort were assigned to protect habitat and public education. Thus, in earlier stage of this (between 1985-1995) the population inside Ñuble NR showed a tendency to recovery. In the meantime, outside the reserve, threats continued acting and the population followed decreasing, mainly by habitat fragmentation by urbanization and competence with livestock (López, 1994).

In the Ñuble NR and surrounding areas, huemul population after 1995 suffered a strong reduction in their relative abundance which is related to the occurrence of a storm of snow, an environmental catastrophe, which affected to southern Chile and preferably to the mountainous areas, where the accumulation of snow was enormous (5 mts in some cases). Furthermore, a drought occurred among 1997 and 1998 could be have worsened the scenario. In fact it is calculated that the current population is only 20% of what there were in 80's, that was already scarce. Also, all the existent groups located outside of the reserve have extinguished, and persist only two groups inside the reserve (Las Parías and Las Catalinas), those which seem to be isolated one of another, which complicates even more the population's future (Figure 1).

The climatic phenomenon is suggested as a big responsible for this population's sudden and drastic decrease, due to the fact that huemuls could have died directly for effect of the excessive accumulation of snow or by hunters or dog persecution when they had down to lower places where less snow existed. Another explanation is the reduced number of this population and the potential inbreeding, low of genetic variation, and random loss of adaptive alleles through genetic drift. Loss of genetic variation can be particularly high for population experiencing local extinctions (Gilpin, 1991). Genetic factors may contribute to disease susceptibility and less adaptability to the environment (Allendorf and Leary, 1986; Gilpin, 1987) in huemul.

The extinction of species without doubts is a multicausal phenomenon. Reason why, only by means of a detailed study of the diverse variables that affect huemul's populational dynamics of the l we will be able to determine the correct management activities for their conservation. In this regards, we are now focused in protect wintering habitats of the remainder groups and in a restoration program to increase

huemul population through translocation and habitat restoration with both exotic and native species. Management activities are urgent because random events as environmental catastrophe and genetic drift could have this time irreversible results.

Acknowledgements

I thanks the work of wildlife guards who give their lives to protect the fauna, to Idea Wild and CONAF for the support of this study.

Huemul (*Hippocamelus bisulcus*) ecology research: conservation planning in Chilean Patagonia

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Resumen

El huemul (*Hippocamelus bisulcus*) es una especie que habita el sur de la cordillera de los Andes de Chile y Argentina. Se encuentra actualmente en peligro de extinción (IUCN) y su población se estima en menos de 1000 individuos en grupos aislados y fragmentados. En Chile, el huemul se encuentra protegido en 13 Parques y Reservas Nacionales, manejadas por la Corporación Nacional Forestal (CONAF). La conservación del huemul es prioridad para CONAF, sin embargo su protección se considera inadecuada debido al pequeño tamaño de las áreas protegidas y a su baja conectividad. Las principales amenazas para la especie son: pérdida y alteración de los hábitats naturales por incendios forestales, tala de bosques y ganadería, caza furtiva y predación por perros, enfermedades trasmitidas por ganado doméstico y predación natural por puma (*Puma concolor*).

El año 2000, con financiamiento de la Iniciativa Darwin, comenzó este proyecto de tres años. El objetivo principal fue abordar algunos aspectos de la ecología del huemul. Se seleccionaron tres sitios de estudio y se capturaron diecisiete animales (10 machos y 7 hembras) los cuales fueron marcados con radio collares durante este período. Se ha recolectado información sobre patrones de movimientos, ámbito de hogar, mortalidad y uso de hábitat.

Introduction and status

The huemul (*Hippocamelus bisulcus*) inhabits the southern Andes of Chile and Argentina (Figure 1). Historical accounts suggest that huemul were abundant between Central Chile (34° S) and the Magellan Strait (54° S) but now the geographical range has become reduced and fragmented, and the species is classified as endangered (Wemmer at al 1998). Huemul are now protected in 13 Chilean National Parks and Reserves, which are managed by CONAF (National Forest Service). Conservation of the huemul is considered a high priority for CONAF, but there are concerns that protection is inadequate, due to insufficient habitat within the protected areas and poor connectivity among them. The main threats to the species are: habitat loss and degradation due to forest fires (mainly during the 1930-40's), logging and farming, diseases from livestock, poaching, disturbance and predation by domestic dogs, as well as natural predation by puma (*Puma concolor*).

In 2000, a three-year project funded by the Darwin Initiative was started. The project was developed jointly between CONAF, Raleigh International, the Forest Research Agency, the Macaulay Institute and the Universidad Católica de Chile, (with support from the Wellcome Trust). The main emphasis of the project was to obtain information on the ranging behaviour of huemul, particularly in relation to the two main land uses in the area, logging and livestock grazing. In addition, we wanted to develop capture and handling methods for huemul and obtain preliminary information on survival rates and sources of mortality. We also promoted

Figure1. Adult huemul at Tamango National Reserve, Chile (Photography by C. Galaz).

environmental education and huemul conservation issues in schools and local communities.

Methods

Three study sites were used for the project. One protected area, Tamango National Reserve (47° 11'S, 72° 29'W), with an area of 6,925 ha and two unprotected areas, La Baguala (47° 08'S, 72° 12'W; 1,600 ha) and Candonga (46° 14'S, 72° 26'W; 1,300 ha), providing opportunities to assess the effects of logging and livestock. The animals were captured by darting using anaesthetic drugs. As a result of trying different protocols, a combination of Medetomidine and Ketamine, reversed with Atipamezole proved the most satisfactory. During each capture, samples were taken for genetic analyses, and to assess condition of the animals (blood, tissue, faeces, and hair). Seventeen animals were captured and fitted with radio-collars (14 VHF, 2 GPS, and 1 satellite transmitter). We also established pellet count transects, and vegetation plots for plant composition and coverage.

Results

We found that adult huemul have a relatively small and stable home range, and usually associate in small groups. For those individuals which did not undertake long-distance movements (the majority), mean home range area was approximately 400 ha. Analysis of habitat selection revealed a preference for lenga (*Nothofagus pumilio*) forest and rocky cliffs, and avoidance of grassland and steppe.

Previous observations have suggested that huemul make altitudinal migrations, moving up slope in summer and down in winter. However only some of the radio-collared animals in our study areas made such movements, revealing considerable differences between individuals, but a tendency for greater movement in some sites than others. Most animals made only relatively small seasonal movements (if at all) indicating that year-round habitat needs are normally met within a relatively small and stable home range.

Animals were found to be affected by logging operations, in one case making a long distance (9 km) movement to avoid disturbance. Huemul also tended to avoided areas grazed by livestock.

Several deaths of marked animals occurred during the study, from a variety of causes. Taking account of known births and deaths to marked animals, the net rate of increase was only 0.98, suggesting that populations were barely able to maintain their numbers. Given that most of marked animals were living in protected areas, this is not encouraging. The low rate of growth was due to a combination of mortality to both fawns and adult females. The causes of death included puma predation (2 cases on adults), fox (*Pseudalopex culpaeus*) predation on fawns (4cases), drowning (1 collared deer), poaching (1case), and attack by dogs (3cases on adults). We did not find evidence that huemul are affected significantly by infections or parasitic diseases,

including those typical of domestic livestock.

During the project attacks or chases by dogs were observed on two occasions and we received many anecdotal reports of similar attacks to huemul in the region. It is believed that many instances of poaching are motivated by the need to feed dogs owned by subsistence livestock farmers.

In addition to ecological research on huemul, the project was also involved in publicity and education, to raise awareness of the need for conservation of the species. Talks were given to farmers, forestry companies and schools, as well as radio and television programs and support given to sponsored events. The project has attracted interest from political leaders, particularly following publicity over the illegal killing of one of the radio-collared animals by a local farmer.

Final Conference

The end of the project was marked by a conference, presenting the results obtained from field research. The workshop involved 50 participants from different countries and was held in Cochrane (Aysén Region, Chile), in October 2003. The abstracts and presentations hold at the conference are available in English and Spanish in a CD. For information please contact Cristián Saucedo.

Conclusions & Recommendations

This project has developed methods of capture for huemul which will prove useful for future research projects and possible re-introduction programs, in areas where huemul have become scarce or locally extinct.

The little information we have on population dynamics suggests that huemul numbers are limited by a combination of high adult and juvenile mortality. Clearly, efforts to reduce illegal hunting through public education programmes need to continue. In the meantime, more evidence for causes of fawn mortality needs to be sought.

Huemul occur at low densities in all environments in Region XI, and adult home ranges are relatively small and stable. This suggests that effective breeding sizes may be low, unless augmented by occasional immigration. Conservation planning is needed to identify and if possible maintain corridors to reduce the risk of isolation in the future.

Acknowledgements

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La Universidad Nacional de la Amazonía Peruana (UNAP), el Durrell Institute of Conservation and Ecology (DICE) de la University of Kent, Canterbury y la Wildlife Conservation Society (WCS) se sienten muy complacidos de anunciarles la realización del VI Congreso Internacional sobre Manejo de Fauna Silvestre en la Amazonía y Latinoamérica. El mismo, a llevarse a cabo entre el 05 al 10 de setiembre del 2004 en la ciudad de Iquitos, capital Amazónica del Perú.

En tal sentido, los organizadores de este VI Congreso les dan la mas cordial bienvenida invitándoles a participar de este gran evento que cada vez va creciendo en número de participantes y en calidad.

Durante este congreso se pondrá especial énfasis en la presentación de lecciones aprendidas. Es por ello, que las áreas temáticas deberán incidir en las lecciones aprendidas, para poder ser aplicadas según cada caso. Es decir, se dará oportunidad de presentar y discutir los logros alcanzados a la fecha sobre las acciones de manejo de fauna silvestre y en base a las lecciones aprendidas poder aplicarlas en el diseño, formulación, implementación, evaluación de metodologías y de planes de manejo de fauna silvestre.

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NORTH AMERICA

Diversificación productiva por medio del venado cola blanca (*Odocoileus virginianus veraecrucis*), en el Campo Experimental "Las Margaritas", México

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Abstract

The Experimental Field "Las Margaritas", in the North Mountain Range of the Puebla State, Mexico, possesses extensive surface and preserve some areas of tropical rain forest, where permits that exist "*in situ*" the white-tailed deer, subspecies "*veraecrucis*". By the indirect transects method of tracks census, we conclude that the animal is distributed in 1.271.58 Has to the north of the Experimental Field. The density deer population average of 2,13 animals/Km^2; s = 0,35; and VC = 16,62%. By it, the absolute population is of 27 individuals. We made listing than other wildlife animals in the area, we registered six species of reptiles. A great diversity of birds with 96 species, existing species in danger of extinction as: *Cairina moschata*, *Micrastur ruficolis*, *Crax rubra*, *Amazona oratrix*, *Ramphastos sulfuratos* and *Dryocopus lineatus*. Twenty species of mammals, emphasizing felids in danger of extinction as: *Leopardus pardalis* and *Panthera onca*. It is logged off that "Las Margaritas", has high representative biological diversity of the tropical humid, the ecosystem more diverse of Mexico. This is an area of great importance ecological. Therefore the investigation, the biological experimental and technology transfer, for conservation, management and sustainable its wildlife. Is very important the natural presence form the white-tailed deer, and species in danger of extinction. The technological Diversified Cattle model, is a social, environmental, and economic alternative for the rural producers, to stop the tendencies of deterioration of the natural resources, and to diminish the levels of poverty and exclusion in the North Mountain Range, from Puebla Estate, Mexico.

Introducción

El Campo Experimental "Las Margaritas" (CE "Las Margaritas"), pertenece al Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), ubicado en la Sierra Nororiental de Puebla, México. Su objeto es fortalecer la investigación básica, aplicada y transferencia tecnológica, para incrementar la producción agropecuaria en forma sostenible, para la conservación y aprovechamiento de los recursos naturales. Su extensa superficie cerril de 2.523 Ha, altitud promedio de 500 msnm con clima subtropical húmedo, precipitación media anual de 3.000 mm y temperatura media anual de 21°C; y la conservación de 404 Ha de bosque tropical perennifolio, ha permitido que aún exista "*in situ*" el venado cola blanca de la subespecie de Veracruz (*Odocoileus virginianus veraecrucis*) (Villarreal y col. 2002)

Metodología

Para determinar la distribución y densidad poblacional de la especie, se aplicaron varias metodologías. Sin embargo, debido a factores como la densa vegetación del área muestreada, la baja población de vendos y al acoso al que han sido sometidos, los métodos directos en transectos diurnos y nocturnos resultaron

ineficientes ya que es prácticamente imposible ver un venado. Por otro lado, entre los métodos indirectos, aquellos que se aplican al Nº de grupos de excretas fecales, también resultaron ineficientes; debido a los factores antes señalados además de la humedad del sitio, que descompone rápidamente los pellets de las excretas; que son utilizados por insectos coprófagos. Por tal motivo, se optó por el método indirecto de conteo de huellas en transectos (Tyson, 1959).

Resultados y discusión

El área de distribución de la especie se ubica al norte del predio, en una superficie de 1.271 Ha de las cuales 240 son de bosque tropical perennifolio intacto, 600 Ha de acahual y el resto de pastizal. El Coeficiente de Agostadero es de 4,74 Ha/ Unidad Animal (COTECOCA, 2001): por lo que el área tiene una capacidad de carga de 268 UA. La media ponderada obtenida fue de C = 2,13 (individuos/Km^2 o 46,9 Ha/ ind.); con desviación estándar de s = 0,35; y un coeficiente de variación de CV = 16,62 %. Por lo tanto, podemos estimar una densidad absoluta en el área de distribución de 27 individuos. La densidad poblacional del venado cola blanca veracruzano, es muy baja comparándola con otras regiones de México. La densidad promedio del venado cola blanca texano (*Odocoileus virginianus texanus*), en los matorrales xerófilos de la Planicie Nororiental es de 20 ind./Km^2 (Villarreal, 1999). Algunos otros trabajos en el norte del país muestran densidades semejantes, entre 1,2 y 2,0 ind./Km^2 en la Reserva de la Biosfera "La Michilia, en Durango (Galindo-Leal y Weber, 1998), con la subespecie de Coues (*Odocoileus virginianus couesi*) .

En cuanto a regiones tropicales también en México; en la Estación Biológica "Chamela" en Jalisco, con la subespecie *sinaloae*, en bosque tropical caducifolio, la densidad poblacional varia entre 5,5 y 22,2 ind./Km^2 (Mandujano y Gallina, 1993). Por otra parte, en diferentes ejidos forestales con bosque tropical perennifolio y acahuales de Quintana Roo, se han encontrado densidades semejantes al CE "Las Margaritas", que van de 1,76 a 2,9 ind./Km^2 de la subespecie *yucatanensis* (Ávila, 1996). Los resultados obtenidos en diferentes estudios de venado cola blanca mexicano (*Odocoileus virginianus mexicanus*) en la Mixteca del Estado de Puebla, arrojan densidades entre 1,4 y 12,5 ind/ Km^2 (Villarreal y col. 2002) . La baja densidad poblacional, del venado cola blanca en el predio, indica que este importante recurso faunístico se encuentra en peligro de extinción en la zona.

También se obtuvo un listado de otras especies de fauna silvestre existentes en el predio con los siguientes resultados: se registraron solamente seis especies pertenecientes a cinco familias de reptiles. En cuanto a aves existe una gran diversidad, ya que se identificaron 96 especies pertenecientes a 36 familias de 14 ordenes, destacando especies en peligro de extinción como: pato real (*Cairina moschata*), halcón selvático menor (*Micrastur ruficolis*), hocofaisán (*Crax rubra*), loro cabeza amarilla (*Amazona oratrix*), tucán real (*Ramphastos sulfuratos*) y carpintero grande crestirrojo (*Dryocopus lineatus*). Por último, se identificaron 20 especies de mamíferos, clasificadas en 11 familias y 6 órdenes, es importante destacar la presencia de felinos en peligro de extinción como: ocelote o xaltigrillo (*Leopardus pardalis*) y el jaguar o tigre (*Panthera onca)*. La presencia de hábitat con densa cobertura vegetal, abundante agua y suficientes presas, permiten la existencia de estos importantes depredadores.

El CE "Las Margaritas" tiene alta diversidad biológica, que es representativa del trópico húmedo, el ecosistema con mayor biodiversidad de México. Por lo que debe ser considerada como un área ecológica de gran importancia, posiblemente única en el Estado de Puebla y la región centro del Estado de Veracruz. Por lo tanto, el predio posee gran potencial para la investigación y la diversificación experimental biológica y productiva, así como la transferencia de tecnología, por medio de la

conservación y manejo del venado cola blanca veracruzano y su hábitat.

La transferencia tecnológica denominada Ganadería Diversificada, la cual combina la explotación extensiva de bovinos de carne con el aprovechamiento sostenible del venado cola blanca y otras especies de fauna silvestre, en la cacería deportiva y el turismo ecológico desarrollado por la ANGADI (Asociación Nacional de Ganaderos Diversificados Criadores de Fauna), en el noreste de México (ANGADI, 2001). Es la alternativa tecnológica, que es posible instrumentar en CE "Las Margaritas" y otros predios de la región.

Además, el establecimiento de una UMA (Unidad de Manejo para la Conservación de la Vida Silvestre) (SEMARNAP; 1977), que opere también como Estación Biológica, para la conservación, investigación y transferencia tecnológica de la fauna silvestre y su hábitat, es compatible con el actual uso productivo y experimental del suelo en ese predio. El manejar y aprovechar en forma racional y sostenida la fauna silvestre, es una alternativa económica, ambiental y social para los productores rurales, que puede coadyuvar a detener y revertir las tendencias de deterioro de los recursos naturales, así como a disminuir los niveles de pobreza y marginación, en la Sierra Norte de Puebla y el centro de Veracruz

Referencias Bibliografías

ANGADI (Asociación Nacional de Ganaderos Diversificados Criadores de Fauna). 2001. XIII Asamblea General Ordinaria y XII Congreso Nacional de Ganadería Diversificada. Nuevo Laredo, Tams.

Ávila, G. 1996. Estudio de Abundancia y Distribución del Venado en Selvas de Quintana Roo, en: Memorias del V Simposio Sobre Venados En México. UNAM, ANGADI, UQR. pp.119-124.

COTECOCA (Comisión Técnico Consultiva para la Determinación Regional de los Coeficientes de Agostadero), 2001.. SAGARPA, Delegación en el Estado de Puebla, Subdelegación Agropecuaria.

Galindo-Leal, C y M., Weber. 1998. El Venado de la Sierra Madre Occidental: Ecología, manejo y conservación. Primera "ed." EDICUSA CONABIO, México D. F. 272 pp. (141 y 142; 153).

Mandujano, S. y S. Gallina. 1993. Densidad del Venado Cola Blanca Basada en Conteos en Transectos en un Bosque Tropical de Jalisco. Acta Zoológica Mexicana. Instituto de Ecología, A. C. Nº 56: 37 pp.

SEMARNAP (Secretaría del Medio Ambiente Recursos Naturales y Pesca). 1997. Programa de Conservación de la Vida Silvestre y Diversificación Productiva en el Sector Rural.1997-2000. México. Primera "ed." México. pp. 10-14, 82-93, y 135-136.

Tyson, E. L. 1959. A deer drive VS track census. Transnational North America Wildlife Conference. 24: 457-464.

Villarreal, J. 1999. Venado Cola Blanca; Manejo y Aprovechamiento Cinegético. Unión Ganadera Regional de Nuevo León. 401 pp.

Villarreal, O.; F. Tomé y J. Castillo. 2002. Diversificación Productiva por Medio del Venado Cola Blanca (*Odocoileus virginianus veraecrucis*), en el Campo Experimental "Las Margaritas". Memorias del VIII Simposio sobre Venados en México. UNAM, UAT, ANGADI. Huamantla, Tlaxcala, México. pp 65-75.

Identificación de fuentes de agua de origen vegetal, para el venado cola blanca mexicano (*Odocoileus virginianus mexicanus*), en el sur del Estado de Puebla, México

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Abstract

The Mexican white-tailed deer, has a distribution of 547.540 Has in the Mixteca region, to the south of the Puebla State, Mexico. This region excluded and poor, has semidry climate, its principal vegetation are the tropical deciduous forest and arid brushwood. One of the habitat components, to keep up and management that species is the water. We identified the vegetal water sources available, because in the region are presented long time of drought,. We made 25 traveled through of field, covering all the places of a representative area. We collection all the species of flowers and fruits, that they were identified as consumed by the deer. The collection was weighed in field, and subsequently they were dehydrate in laboratory. We identified ten species, 61,5 % are fruits, 30,8 % flowers and 7,7% *Opuntia spp.* The flowers of *Ceiba parvifolia* obtained greater humidity contains 89,24%, followed by the flowers of *Pachisereus webery* 89,1%; in third place the fruits of *Ficus spp.* 86,89% and in fourth place the fruits of *Spondias purpurea* 86,6 %: the plant with smaller percentage of humidity contains was *Opuntia spp.* 65,72%. The most abundant species in the place of study is *Acacia farnesiana*, followed by the *Ceiba parvifolia* and *Pachycereus webery*. We consider as basic to conserve the deer in the region to: *Ceiba parvifolia*, *Pachisereus webery*, *Ficus spp.*, *Ficus contifolia*, *Acacia farnesiana* and *Opuntia spp.* The countrymen have to developed diverse activities of management, that take into account the basic factors of the habitat, the water, food, cover and space. Conserve and promote the establishment alternative watering sites, as the wild plants that provide succulent flowers and fruits, consumed for the white deer. It is a important strategy, to the conservation an management the deer, in the tropical deciduous forest of the Mixteca region, in Puebla Estate, Mexico.

Introducción

El venado cola blanca mexicano (*Odocoileus virginianus mexicanus*) es una de las catorce subespecies que se distribuyen en México (Hall, 1981; Halls, 1984). Al sur del Estado de Puebla en la región Mixteca, esta subespecie tiene una distribución de 547.540 Ha (Villarreal y Guevara, 2002). La región es pobre y marginada, su economía esta sustentada en las actividades agropecuarias; los tipos de vegetación en su topografía cerril son: el bosque tropical caducifolio, los matorrales xerófilos y el bosque de galería entre otros. Su clima va del subhúmedo, al semiseco y seco (Villarreal, 2000).

El venado cola blanca es el animal de caza mayor más importante de México (Villarreal, 2001). Por lo tanto, la región representa un gran potencial para el manejo y aprovechamiento sostenible de esa especie, mediante el turismo cinegético en UMA's (Unidades de Manejo para la Conservación de la Vida Silvestre) (SEMARNAP, 1997). Para el manejo de la especie y su hábitat, es necesario tomar en cuenta los componentes como: agua, alimento cobertura y espacio (González, 2001). La disponibilidad del agua varía durante las diferentes épocas del año (Mandujano y Gallina, 1995): los requerimientos de la especie también varían de acuerdo a la distribución del recurso, y la etapa fisiológica del animal (Bello y col. 1996).

En regiones caracterizadas por largos estiajes, la especie tiene como alternativa de consumo de agua, el roció de la mañana y la contenida en frutos como *Spondias purpurea* (Mandujano, Gallina y Bullock, 1994; Mandujano y Martínez-Romero, 1997). El agua, es utilizada por los venados para mantener el balance hídrico y disminuir su temperatura corporal: si su pérdida es mayor que la ganancia, el animal entra en estrés y puede morir (Mandujano y Gallina, 1995). Los requerimientos de agua para venados adultos del género *Odocoileus*, es de 2 a 4 litros diarios (Alcalá y Enríquez, 1999). Debido a que en la Mixteca poblana el estiaje es entre seis y ocho meses (Villarreal, 2000): identificar las especies de flores y frutos que el venado cola blanca consume, como fuente alternativa de agua, es una importante contribución para la conservación y manejo de la especie y su hábitat.

Área de estudio

El sitio de estudio fue la UMA (Unidad de Manejo para la Conservación de la Vida Silvestre) San Miguel Ejido, Municipio de Chiautla de Tapia, Puebla, México; debido a que ese predio, representa en forma general las condiciones ecológicas de la Mixteca poblana. La UMA tiene una superficie cerril de 1.250 Ha y altitud de 800 a 2.060 msnm. Su vegetación es la selva baja caducifolia, en las partes superiores de los cerros se encuentra bosque latifoliado esclerófilo caducifolio, y en las barrancas selva mediana subcaducifolia (Villarreal, 1997). Existen dos climas con lluvias en verano, el cálido subhúmedo y el semicálido subhúmedo; el uso de suelo es la ganadería extensiva de bovinos (Villarreal, 1997).

Metodología

Se realizaron 25 recorridos de campo cubriendo toda la superficie de la UMA: se colectaron las especies de flores y frutos de temporada, que se han identificado como consumidas por el venado en el área y la revisión literaria como: Mandujano, Gallina y Bullock (1994); Mandujano y Gallina (1995); Bello y col. (1996); Mandujano y Martínez-Romero (1997); Villarreal (1999); Arceo (1999); Alcalá y Enríquez (1999); Villarreal (2000) y ANGADI (2001).

Colectadas las muestras de flores y frutos, se pesaron en campo con una balanza CHAUS de 120 x 0,1 g; luego se depositaron en bolsas de papel, apuntado nombre común, fecha y sitio de colecta. En laboratorio, los ejemplares se introdujeron en una secadora botánica, a temperatura constante de 60° C, durante cinco días. Deshidratadas las muestras se pesaron nuevamente, para obtener el peso de agua y materia vegetal, por la diferencia de ambos pesos se obtuvo el porcentaje de humedad. Después se realizó una sumatoria por especie, y se obtuvo la media aritmética para conocer el porcentaje final de humedad, para cada especie de planta colectada.

Tabla 1. Especies de plantas que consume el venado cola blanca, porcentaje de humedad y época de floración en la región Mixteca, Puebla, México

Nombre común (científico)	Parte colectada	Porcentaje de humedad	Época de floración y/o fructificación
Pochote (*Ceiba parvifolia*)	Flor (pétalos)	89,24	Noviembre a Febrero
Pitaya (*Pachycereus weberi*)	Flor	89,1	Junio a Julio
Amate Blanco (*Ficus spp.*)	Fruto	86,89	Abril a Mayo
Ciruelo silvestre (*Spondias purpurea*)	Fruto	86,6	Enero a Marzo
Pitaya (*Pachycereus weberi*)	Fruto	86,68	Agosto a Octubre
Tezcalamate (*Ficus contifolia*)	Fruto inmaduro	79,14	Enero a Octubre
Pochote (*Ceiba parvifolia*)	Flor (receptáculo)	78.24	Noviembre a Febrero
Tezcalamate (*Ficus contifolia*)	Fruto maduro	76.62	Enero a Octubre
Casahuate Blanco (*Ipomoea murycoides*)	Flor	76.25	Diciembre a Marzo
Espinillo (*Acacia spp.*)	Fruto (vaina)	74,05	Junio y Julio
Guamúchil (*Pithecellobium dulce*)	Fruto (vaina)	73,33	Noviembre a Mayo
Huizache (*Acacia farnesiana*)	Fruto (vaina)	68,09	Diciembre a Mayo
Nopal (*Opuntia spp.*)	Cladodio	65,72	Todo el año

Resultados y discusión

Se colectaron e identificaron un total de diez especies, de las cuales el 61,5% son frutos, 30,8% son flores y 7,7% cladodios. La flor de *Ceiba parvifolia*, obtuvo el mayor porcentaje de humedad, seguida por la flor de *Pachycereus weberi*, el menor porcentaje de humedad fue de *Opuntia spp.* (Tabla 1).

La especie más abundante en el sitio es *Acacia farnesiana*, seguida de *Ceiba parvifolia* y *Pachycereus webery*. La más escasa es *Spondias purpurea*. La flor de *Ceiba parvifolia* es consumida ávidamente por los venados en la Mixteca poblana (Villarreal, 2000). Los cladodios de *Opuntia spp.*, aun y cuando son los que presentaron menor porcentaje de humedad, son muy importantes ya que pueden ser consumidos durante todo el año, siendo una buena alternativa de agua. Consideramos que todas las especies colectadas son una importante fuente de agua, para la especie durante el estiaje en la región (Octubre a Junio). Consideramos como más importantes: *Ceiba parvifolia*, *Pachycereus weberi*, *Ficus spp.*, *Ficus contifolia*, *Acacia farnesiana Opuntia spp.*

Para la conservación y aprovechamiento sostenible del venado cola blanca en la Mixteca poblana, deben desarrollarse diversas actividades de manejo, que tomen en cuenta los factores básicos del hábitat como son el agua, alimento, cobertura y espacio. Debido a ello, conservar y fomentar el establecimiento de fuentes de agua alternativa, como son las plantas silvestres que proporcionan flores y frutos suculentos, que son consumidos por el venado cola blanca, resulta ser importante estrategia de conservación y manejo del hábitat en favor de ese cérvido en las UMA's de la región.

Referencias bibliografías

ANGADI (Asociación Nacional de Ganaderos Diversificados Criadores de Fauna). 2001. XIV Asamblea General Ordinaria y XIII Congreso Nacional de Ganadería Diversificada. ANGADI. Nuevo Laredo, Tamaulipas, México.

Alcalá, C. y E. Enríquez. 1999. Manejo y Aprovechamiento de Venados. INIFAP (Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias); Centro de Investigación Regional de Noroeste; Campo Experimental Carbó. Folleto Técnico Nº 3. pp. 18-19.

Arceo, G. 1999. Hábitos Alimentarios del Venado Cola Blanca en un Bosque Tropical Caducifolio de Jalisco. Tesis de Maestría. Facultad de Ciencias. UNAM.

Bello, J.; R. E. Sánchez-Mantilla; A. Pérez-Arteaga; S. Mandujano, S. Gallina y M Equihua. 1996. Patrones de uso de Asociaciones vegetales y fuentes de agua por el venado cola blanca en un matorral xerófilo de Nuevo León. V Simposio sobre venados de México. UNAM, ANGADI, UAQR. pp 158-169.

González, F. 2001.Evaluación de Poblaciones y Hábitat de la Fauna Silvestre. Manual del Curso Taller Internacional sobre Técnicas Aplicadas a la Conservación y Manejo de Fauna Silvestre. COLPOS, US Fish and Wildlife Service, BUAP, FPPUE, Mazamiztli, A. C., SDR, SEMARNAT, CEFFASIP, SEDURBECOP. Puebla, Pue. México. pp 59-98

Mandujano, S. y L. E. Martínez Romero. 1997. Fruit fall caused by chachalacas (*Ortalis poliocephala*) on red mombim trees (*Spondias purpurea*): Impact on terrestrial fruit consumers, especially the White Tailed Deer (*Odocoileus virginianus*). Studies on Neotropical Fauna and Environment. 32: 1-3.

Mandujano, S.; S. Gallina y S. H. Bullock. 1994. Frugibory and dispersal of *Spondias purpurea* (Anacardiaceae) in a tropical dry forest of Mexico. Revista de Biología Tropical 42: 105-112.

Mandujano, S. y S. Gallina. 1995. Disponibilidad de agua para el venado cola blanca en un bosque tropical caducifolio de México. Vida Silvestre Neotropical 4 (2): 107-118.

SEMARNAP (Secretaría del Medio Ambiente Recursos Naturales y Pesca). 1997. Programa de Conservación de la Vida Silvestre y Diversificación Productiva en

el Sector Rural.1997-2000. México. Primera "ed." México. pp. 10-14, 82-93, y 135-136.

Villarreal, O. 1997. Estudio de Preinversión: Infraestructura Básica Complementaria para un Criadero de Venado Cola Blanca (Odocoileus virginianus mexicanus) en San Miguel Ejido, Chiautla, Puebla. Programa de Desarrollo Rural Sustentable de la Mixteca. SEMARNAP Delegación Federal en el Estado de Puebla.

Villarreal, J. 1999. Venado Cola Blanca; Manejo y Aprovechamiento Cinegético. Unión Ganadera Regional de Nuevo León. 401 pp.

Villarreal, O. 2000. El Aprovechamiento Sustentable del Venado Cola Blanca Mexicano (*Odocoileus virginianus mexicanus*); una Alternativa para el Uso del Suelo en Región de la Mixteca Poblana. *Memorias del VII Simposio sobre Venados de México*. UNAM, ANGADI. Cuidad Universitaria, México. D. F. pp 127-152.

Villarreal, O. 2001. Potencial Cinegético de la Región Central de México. Manual del Curso Taller Internacional sobre Técnicas Aplicadas a la Conservación y Manejo de Fauna Silvestre. COLPOS, US Fish and Wildlife Service, BUAP, FPPUE, Mazamiztli, A. C., SDR, SEMARNAT, CEFFASIP, SEDURBECOP Puebla, Pue. México. pp 333-338.

Villarreal, O. 2002. El "Grand Slam" del Vendo Cola Blanca Mexicano, una Alternativa Sostenible. Archivos de Zootecnia, Vol. 51, Nº 193-194. Instituto de Zootecnia; Facultad de Veterinaria. Universidad de Córdoba, España. pp 187-193.

SHORT COMMUNICATIONS

Inuit qaujimajatuqangit of winter habitat use and population changes of Peary caribou and muskoxen on High Arctic islands in Nunavut, Canada

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During the last 40 years, population fluctuations of endangered Peary caribou (*Rangifer tarandus pearyi*) and muskoxen (*Ovibos moschatus*) living on the Queen Elizabeth, Prince of Wales and Somerset islands have caused concerns at local, national and international levels. Until recently, biologists have largely attributed declines of these populations to density-independent snow cover conditions. On the other hand, Inuit have also attributed some population fluctuations to past seismic exploration, density-dependent population growth, and interactions between the two species. To better understand these fluctuations and conserve these populations, patterns of historic and recent population change and habitat use need to be examined. The best source of long-term information may be from knowledgeable persons who have regularly interacted with these populations over several decades. We are collecting and compiling historical and recent Inuit qaujimajatuqangit (i.e., ecological knowledge of Inuit) regarding long-term patterns of habitat use by Peary caribou and muskoxen on the High Arctic islands. Hunters and Trappers Organizations (HTOs) in Resolute Bay, Grise

Fiord and other communities identify Inuit elders and hunters that can describe spatial and temporal changes in Peary caribou and muskox populations within the study area. Each informant is interviewed to establish his/her biographical map, describe changes in caribou and/or muskoxen seasonal distributions and abundance during his/her lifetime, and discuss ecological, human and other factors that may have caused changes observed in the populations. The geographical information obtained from these interviews is stored in a GIS database. Inuit informants have described massive population changes, seasonal migrations and emigrations over the past 70 years on several islands, and have identified a variety of causes for these changes. The information provided by each informant often overlaps with that of other informants, but several informants provided unique information because of their special interests in certain geographic areas or animal biology. Compiled information will be reviewed at a meeting with all informants to confirm, correct and add information as required The assembled Inuit qaujimajatuqangit will be compared with the results of aerial and ground surveys, remote sensing, satellite telemetry and ecological research.

Detection of recovery of populations of endangered Peary caribou and muskoxen, using distance sampling and skills of Inuit hunters

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Dynamics of most populations of endangered Peary caribou and muskoxen are poorly understood, with those populations on Bathurst and nearby islands being the best documented. The Bathurst Peary caribou population peaked in 1961 and again in 1994 at about 3000, but declined to lows of about 250 in 1974 and less than 100 in 1997. Since1975, the indigenous Inuit population has initiated self-regulated actions to conserve this population, but have opposed other initiatives. They have also questioned the reliability of past survey estimates. In 2000, we developed a new ground-aerial survey methodology, which we implemented on Bathurst Island in May 2001 and also on Cornwallis and western Devon islands in May 2002 and 2003. Inuit hunters surveyed large areas by snowmobile to detect watersheds where Peary caribou and/or muskoxen occurred; this ground survey provided the Inuit with an independent minimum count for comparison with aerial survey results. The Inuit identified extensive areas where neither species occurred or where they were confident that they had counted all animals present. In watersheds where the Inuit observed signs of animals, we conducted an aerial survey at 40% coverage, assuming 500-m strips x 2. In other areas where the Inuit could not adequately conduct a ground survey, we conducted an initial 20%-coverage aerial survey, increasing coverage to 40% for any watersheds where signs of caribou or muskoxen were detected. Using distance sampling on the aerial survey data, we determined three population estimates for Bathurst and nearby islands, after truncating the maximum distance from transects based on varying criteria. The highest estimate (289, 95% CI: 166-503), with the best model fit, yielded coverage of only 21%. The sample size for caribou was adequate, but not for muskoxen on Bathurst Island. Caribou recruitment was good with calf:cow ratios of 44:100. Since 1997, the population apparently has been recovering at a rate comparable to the 15-20% annual growth that occurred during 1981-94. Estimates for both species were also determined for the other areas surveyed in 2002 and 2003. Evidence of significant

interannual changes in the distribution of Peary caribou was also detected. The management implications of these surveys regarding the future recovery of these populations as well as in establishing harvest quotas are currently being discussed at local, territorial and national levels.

Remote sensing of winter foraging habitats of Peary caribou and muskoxen on the Queen Elizabeth Islands, Nunavut, Canada.

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During the past 40 years, populations of muskoxen (*Ovibos moschatus*) and endangered Peary caribou (*Rangifer tarandus pearyi*) on the Queen Elizabeth Islands (QEI) have experienced wide fluctuations. One hypothesis attributes the cause of serious declines to severe snow cover conditions. However, research has not yet documented that severe snow cover has extended throughout the winter range of any population, or that similar snow cover conditions did not occur in years of population increase or stability. Furthermore, the proportion of a population's winter range where snow prevents access to forage by these ungulates has not been estimated in winters with either "normal" or "severe" snow cover. Between 1995 and 1998, a dramatic population declines occurred on Bathurst Island during winters that appeared severe. In 1994 Inuit had predicted such a decline because they said that there were "too many" caribou and muskoxen on the island after previous population increases. This prediction raises the question whether density-dependent factors may have been aggravated by weather-related density-independent factors. To adequately assess the roles of such factors, a method for assessing snow cover and winter forage conditions across the potential winter range of such populations is required. As part of an interdisciplinary program needed to conserve Peary caribou and muskoxen, we are using current and historical Landsat and IKONOS data to index and map usable winter foraging habitats of Peary caribou and muskoxen on the QEI, based on the distribution of snow-free patches and associated vegetation. We will also estimate the inter-annual variability in the proportion of snow-free patches where animals may gain access to forage during winter. Landsat images for the study area from 1990 through to 2002 during late winter are being analysed to assess relationships between snow coverage and changes in Peary caribou and muskox populations. During winter 2003, Landsat-ETM+ and IKONOS imagery were captured in conjunction with field validation of snow coverage, depth, and ram and surface hardness. These results were compared with distributions of caribou and muskoxen during aerial surveys. This should allow us to develop a signature of snow characteristics where these animals forage during late winter.

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ASIA

Conservation and Restoration of Eld's Deer

A 'Workshop on the Conservation and Restoration of Eld's Deer', which was held 10-12 November 2003 at the Conference Center in Khao Kheow Open Zoo, Chonburi, Thailand. The 41 participants included all the historic range states for the species: India, Myanmar, Thailand, Cambodia, Laos, Vietnam, and China (Hainan Island). Eld's deer (*Cervus eldi*) is composed of 3 subspecies that are all currently endangered with extinction in Southeast Asia. The meeting was co-sponsored by Smithsonian Institution's National Zoological Park, the Wildlife Conservation Society, and the Thai Zoological Parks Organization. The 3-day workshop consisted of a one day reporting session from all range state representatives and selected experts, and two days focused on strategic conservation planning designed to develop specific projects, action steps, timelines, and individuals committed to carrying out specified projects. The highlights of the meeting were the reports of wild populations of *Cervus eldi siamensis* in Cambodia and Lao, and the commitment of Zoo Thailand to establish a captive breeding facility for the species that incorporates genetic management. The group agreed to meet again in late 2004 to review progress on action steps that were identified at the workshop for each subspecies. A complete workshop report is available upon request. Bill McShea (wmcshea@crc.si.edu).

Eld´s deer DSG-Sub-Group

Following a successful meeting of researchers and managers interested in Eld's deer (*Cervus eldi*) at Khao Kheo Open Zoo in Thailand (November 10-13, 2003), the organizers have considered an interesting opportunity to form a formal study group within the framework of the Deer Specialist Group. This Eld's Deer Conservation Group will post regular communications among members and hold an annual conference for the next few years as it works to turn around the decline of this Southeast Asian species. The next annual meeting will be held in Thailand in November 2004. All interested parties can obtain more information by contacting Bill McShea at wmcshea@crc.si.edu.