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ECOLOGICAL DATA ON *CERDOCYON THOUS* IN BARLOVENTO REGION, STATE OF MIRANDA, VENEZUELA

DATOS ECOLOGICOS DE *CERDOCYON THOUS* EN LA REGION DE BARLOVENTO, ESTADO MIRANDA, VENEZUELA

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ABSTRACT

This paper presents a summary of the ecologcal data observed on *Cerdocyon thous* in the Barlovento Region, Miranda State, Venezuela. Aspects such as: body size, distribution, daily activity, feeding and reproductive habits on this species are discussed.

RESUMEN

Este trabajo presenta un resumen de los datos ecológicos observados en *Cerdocyon thous* en la Región de Barlovento, Estado Miranda Venezuela. Se discuten aspectos como el tamaño, distribución, actividad diaria, hábitos alimentarios y reproductivos de esta especie.

Keywords: *Cerdocyon thous*, crab-eating fox, body size,distribution, feeding, reproduction

Palabras clave: *Cerdocyon thous*, zorro cangrejero, tamaño, distribución, alimentación, reproducción

INTRODUCTION

The crab-eating fox (*Cerdocyon thous*) is a common small canid that inhabits open and forested habitats throughout Venezuela except in Margarita Island and Delta Amacuro State (Handley, 1976; Bisbal, 1990). Although its fur has no commercial value, in Venezuela is considered a game species but no hunting permits have been issued by the Venezuelan Fish and Wildlife Service. However, it is sometimes hunted by rural people because it may prey on poultry, game species, and possibly transmit rabies (Bisbal, 1987). In Venezuela, the information known on this canid is limited to reports on taxonomy (Bisbal, 1988), feeding habits, behavior and mobility (Montgomery & Lubin, 1978; Brady, 1979; Bisbal & Ojasti, 1980; Sunquist *et al.*, 1990). The data available was recorded mostly in open habitats from State of Guárico, Central Llanos region. In this paper, we are reporting ecological data on the crab-eating fox from State of Miranda.

MATERIAL AND METHODS

Fieldwork was conducted in the Barlovento region (9° 55'-10° 40' N, 66° 25'-66° 35' W) about 100 Km E Caracas city, State of Miranda in north central Venezuela. The region encompasses 4,650 Km2 divided into two major habitat types, the interior and coastal habitats. The annual mean temperature is 26°C and the total precipitation is 2053 mm which falls mainly during the nine-month wet season, May to January. The vegetation of the region is primarily a humid tropical forest (Ewel *et al.*, 1976). Deforestation due to changes in land use as agriculture and cattle raising and the construction of facilities for tourist-recreational purposes comprise the major sources of habitat disturbance and destruction. Nowadays, the landscape of Barlovento is a mosaic that is composed of secondary forest vegetation, cropland, grassland, rural and urban areas and other land uses. The vegetation types found in the region are

tropical dry and humid forests, premontane tropical humid forest, and mangrove forest. The croplands are large cacao plantations, small plots of maize, bean, banana, orange, and horticulture. Other land uses are the maintaining of water reservoirs for irrigation, cattle raising and fish culture, and paved and unpaved roads. Some tracts of primary forests are still found on the highlands of the region.

The presence and distribution of the crab-eating fox in Barlovento were surveyed making one to two-day visits to 43 different localities from July 1981 to July 1988. The first author determined the presence of crab-eating fox by visual observations, as well as by interviewing local people. Most observations were made while traveling along paved and unpaved roads from 06: 00 to 24:00 hours at Río Negro Experiment Agriculture Field Station, Simón Rodríguez University (10° 21' N, 66° 5' W) and its surroundings.

We examined nine foxes (4 males and 5 females) that were collected from nine localities between August 1981 and March 1987 (3 skulls, 3 skins, and 9 stomachs). Most of the specimens collected were road-kill animals. External body measurements, weight, and sex were recorded for each specimen. We also report data from a sample of 5 specimens collected in Barlovento region by Museo de Historia Natural La Salle (2 specimens) and the U.S. National Museum of Natural History (3).

RESULTS AND DISCUSSION

Distribution and habitat. The crab-eating fox is distributed throughout Barlovento. The foxes were observed at 23 of the 43 sites visited. Rural people pointed out that the fox is common in those localities where we did not sight them. We found this species inhabiting tropical humid forest, premontane humid forest, tropical dry forest, cacao plantations, and secondary brush vegetation from 0 to over 500 m. The animals were sighted mainly at the edge of forests and in or around secondary brush vegetation and crop fields. Handley (1976) pointed out that the 88 specimens of *C. thous* collected by the Smithsonian Venezuelan Project were taken from prairie or pasture (49 percent), marshes, croplands, yards, and orchards (15 percent), deciduous and thorn forests (19 percent) and evergreen and cloud forests (17 percent). The elevations of these habitats range from 1 to 2,000 m, but 97 percent were collected below 620 m and many specimens have been collected in the tropical dry forest (Bisbal, 1990). The edge habitats as grassland, croplands, open savannas, and brush vegetation that resulted from changes in land use have probably benefited foxes. Perhaps, that is why the crab-eating fox is so common in Barlovento. Bisbal (1987) has pointed out that increase in small mammals, other vertebrates, and invertebrates associated to habitat modifications due to different land uses are advantageous for the common fox because those items comprise the bulk of its diet.

Body size. Mean external body measurements were calculated for both sexes in the juvenile and adult age classes (Table 1). Adult male and female foxes differ slightly in total length and tail, but are similar in body mass. Eisenberg (1989) reported that the crab-eating fox's head and body length averages 650 mm and the tail 300-mm in northern South America. Thus, it is likely that at Barlovento foxes are somewhat smaller in size. In a taxonomic study of *C. thous* in Venezuela, Bisbal (1988) reported external and cranial measurements from five different populations of the species. The external body measurements from the populations of the Cordillera de la Costa, State of Falcón, and Llanos region of Venezuela and from northeastern Colombia are similar to the ones recorded in this study, but differ in size from States of Bolivar-Amazonas population. This author recognizes two subspecies of crab-eating fox in Venezuela, *C. thous thous* (Linnaeus, 1766), south of the Orinoco River, type locality Suriname and *C. thous aquilus* (Bangs, 1898), north of the Orinoco River, type locality Santa Marta in northern Colombia.

Daily activity pattern. The crab-eating fox is primarily nocturnal at Barlovento but sometimes it can be sighted early in the morning or afternoon. A total of 38 foxes were sighted alone (30 individuals) from 06:00 to 24:00 or in pairs from 19:00 to 22:30 hours (4 pairs), either foraging or traveling along the edge of the forest, or crossing paved and unpaved roads between second growth vegetation in the open field. The daily activity pattern was estimated based on the frequency of sighting. Twenty-nine (76.3 percent) of the foxes sighted

Table 1. External body measurements (in centimeters) and weight (in kilograms) for *Cerdocyon thous* in Barlovento region, State of Miranda (s. d. enclosed in parenthesis). M=male, F=female; N=number of samples; TL=total length, HF=hind foot.

Age Group	Sex	N	TL	Tail	HF	Ear	Weight
Juvenile	M	1	70.0	22.0	-	5.5	-
	F	2	66.1(1.9)	20.1(0.1)	11.6(0.4)	6.0(0.5)	1.9(0.05)
Adult	M	3	89.3(4.1)	28.7(4.0)	14.0(0.8)	7.1(1.1)	4.6(0.5)
	F	7	88.2(1.8)	27.0(1.5)	13.2(0.8)	6.8(0.7)	4.4(0.6)

were active mainly from 18:00 to 24:00 hours. However, some foxes were seen active during the morning from 06:00 to 10:00 (15.8 percent) and the afternoon from 13:00 to 17:00 (7.9 percent) hours. In the savanna woodland of the Llanos region (State of Guárico), the crab-eating fox usually travels regular foraging routes in pairs or in family units and is active primarily at night from 18:00 through 06:00 of the following day (Montgomery & Lubin, 1978; Brady, 1979; Sunquist *et al.*, 1990). Brady (1979) pointed out that the activity period outside this time segment appeared to be related to problems with thermoregulation since the few foxes he observed foraging during the day showed evident signs of overheating and quickly returned to cover. In the southeastern Brazilian forest, the azara's fox, *Cerdocyon thous* azarae, travels singly or in pairs (Coimbra Filho, 1966).

Feeding habits. Food items separated from nine stomach contents examined are shown in Table 2 with their respective percentage of volume and frequency of occurrence.

The number of food items recorded was similar between the seasons. During the wet season, the most important food items are fruits, birds, and insects. In the dry season, mammals, insects, and reptiles seem to be more important. Fruits were only ingested during the wet season and amphibians during the dry season.

Food of plant origin was more important (79.8% by volume) than animal food (16.2%) in the diet of the crab-eating fox throughout the year. By volume, fruits (73.1%), insects (5.3%), and mammals (4.3%) are the principal foods ingested by foxes. In terms of frequency, insects (55.6%), fruits (55.5%), mammals (44.4%), birds (33.3%), and reptiles (22.2%) contribute to the annual diet.

Avian material accounted for 33.3% of the stomach contents and 2.9% by volume. Birds ingested by foxes were mainly chickens (*Gallus* sp.). Lizards and toads were consumed less than expected considering their abundance in the study site suggesting that these are complementary items for foxes in Barlovento region.

Insects of at least three orders occurred in 55.6% of the stomachs, with an annual volume of 5.3%. Beetles and butterflies accounted for the majority of insects consumed. Spiders were only recorded as traces in 11.1% of the stomachs.

Male and female foxes eat basically the same food items. By volume, male consume mainly fruits (77.0%), insects (11.1%), vegetal remains (8.1%), birds (0.4%), and reptiles (0.3%), whereas females consume fruits (71.0%), mammals (6.9%), vegetal remains (5.9%), birds (4.4%), reptiles (3.9%), amphibians (1.9%), and insects (1.8%). No significant differences by volume and frequency of occurrence were detected in the diet between the sexes (Mann-Whitney U-test, $P>0.05$).

The data reported give the first view of the annual diet composition of *Cerdocyon thous* at Barlovento region, north central Venezuela. The results suggest foxes are opportunistic feeders with a higher frugivorous tendency than insectivorous or carnivorous. But feeding habits are still poorly known because only a small number of gastric contents were analyzed.

Table 2. Percentages of volume (V) and frequency (F) of food items of the crab-eating fox in Barlovento region, State of Miranda. T=trace.

Food items	Wet Season N=7		Dry Season N=2		Annual N=9	
	%V	%F	%V	%F	%V	%F
ANIMALS	5.63	71.4	71.17	100.00	16.17	77.8
Mammalia	0.29	28.6	25.23	100.00	4.30	44.4
Flesh and bone remains	0.29	28.6	25.23	100.00	4.30	44.4
Aves	3.22	14.3	1.20	100.00	2.90	33.3
Gallus sp.	3.22	14.3			2.70	11.1
Collumbina talpacoti			0.30	50.00	0.05	11.1
Unidentified bird			0.90	50.00	0.15	11.1
Reptilia	0.11	14.3	15.01	50.00	2.50	22.2
Mabuya mabouya	0.11	14.3	15.01	50.00	2.50	22.2
Amphibia			7.51	50.00	1.21	11.1
Bufo granulosus			7.51	50.00	1.21	11.1
Insecta	2.01	57.1	22.22	100.00	5.26	55.6
Lepidoptora	0.68	14.3	7.78	100.00	1.83	33.3
Coleoptera	1.27	14.3	14.44	100.00	3.83	55.5
Hymenoptera	T	14.3			T	11.1
Larvae	0.06	28.6			0.05	11.1
Arachnida	T	14.3			T	11.1
PLANTS	92.76	71.4	12.31	50.00	79.83	77.8
Fruits	87.07	71.4			73.08	55.5
Vegetal remains (leaves, bark, twigs, seeds)	5.69	71.4	12.31	50.00	6.75	66.7
PARTICULATE MATERIAL	1.61	57.1	16.52	100.00	4.00	66.7

This preliminary survey shows that fruit, insects, and mammals seem to be the main items of the annual diet. These results contrast with those reported by Bisbal & Ojasti (1980) and Brady (1979) in a study of the feeding habits of *Cerdocyon thous* from several regions of Venezuela and State of Guárico, respectively. Bisbal & Ojasti (1980) examined 104 stomach contents sampled from several localities in the regions of lowland Llanos (47 samples), highland Llanos (29), Bolivar State (16) and Falcón State (12). In their study, animal food items by volume (73.0%) are more important than fruits (24.0%), in general, throughout the year. The order of importance of animal items, by volume, on an annual basis is as follows: mammals (26.0%), amphibians (13.0%), insects (11.0%), reptiles (10%), birds (9.0%), and crustaceans (2.5%). However, when the yearly dietaries composition of the fox in the States of Bolivar and Falcón are considered alone the quantities of fruits consumed are as important as are animal food items. Fruits make about 53.5% and 39.7% and animal items 36.3% and 60.8% of the animal diet, by volume, respectively. Brady (1979) reported the diets of 12 crab-eating foxes for the central highland llanos of State of Guárico. The foxes consumed insects (54.0%), small vertebrates (20.0%), fruits (18.0%), and carrion (7.0%) during the wet season, and small vertebrates (48.0%), crabs (31.0%), insects (16.0%), carrion (3.0%), and fruits (2.0%) in the dry season.

It is likely that sample size, regional differences in climate pattern and habitat types, availability of potential foods and the methodology used to record the feeding habits of the crab-eating fox are responsible for the contrasting results compared above. Data on feeding habits resulted from analysis of stomach contents in Bisbal & Ojasti (1980) and this study, whereas Brady (1979) recorded the foods of this fox by direct observation of 12 individuals based on 165 prey captures.

Additionally, Brady's observations were conducted during two three-week field surveys, one in the wet season of 1976 (June) and the second in the dry season of 1977 (April) in open habitats at a cattle ranch from central State of Guárico. The samples examined by Bisbal & Ojasti (1980) were collected during different years in several localities with heterogeneous climate pattern and habitat types from four distinct regions, each of them larger than Barlovento and Brady's study site.

Breeding activity. At Barlovento, lactating female foxes were observed in August and juveniles were either collected or seen in April, July, September, and December. The ages of four juveniles specimens, one each for those months indicated above, were estimated as: >90, 63, 71, and 76 days, respectively, suggesting that they were probably born in January, May, July, and October. Estimation of age was based on Brady's (1978) data on growth and development of three litters of pups maintained in captivity. Thus, we think that this species breeds throughout the year in our study area.

The data on the breeding activity of crab-eating foxes in the wild is limited to Brady's (1979) survey conducted in the central llanos of Venezuela (State of Guárico). He pointed out that it is likely that most births occur around January and February and that the breeding season is extended because a dark juvenile with a parent was sighted in April and the carcass of a lactating female was found in June.

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