

## CRESTED CARACARA FOOD HABITS IN THE CAPE REGION OF BAJA CALIFORNIA, MEXICO

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**ABSTRACT.**—The diet of the Crested Caracara (*Caracara plancus*) in the Cape region of Baja California, Mexico was studied by analyzing 195 pellets collected beneath 10 occupied nests in 1990 and recording prey brought to two nests containing young in 1990–91. Our results showed that Crested Caracaras fed opportunistically on mammals (mainly lagomorphs), reptiles (mainly iguanas and snakes), carrion of domestic animals such as cattle and dogs, and invertebrates (mainly Coleoptera and Orthoptera). The caracaras' ability to kill live prey was denoted both by the high frequency of reptile and bird remains in pellets, and by the high frequency of remains of recently killed birds, lizards and hares that were carried to nests. Our observations at nests indicated that Crested Caracaras killed as much as 63% of vertebrate prey in pellets, while invertebrates may all have been captured alive. Numerically, live prey comprised about 88% of the diet of caracaras in the Cape region. In terms of ingested biomass, lagomorphs (both carrion and killed prey), reptiles (both carrion and killed iguanas, snakes) and carrion of cattle, represented the most important food sources. We discuss the importance of slaughterhouses, henhouses and garbage dumps for young caracaras in the Cape region.

**KEY WORDS:** Caracara plancus; Crested Caracara; food; Baja California, Mexico.

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Hábitos alimenticios de Caracara plancus en la región del Cabo, Baja California, México

**RESUMEN.**—La dieta del caracara común (*Caracara plancus*) fue estudiada en la región del Cabo, Baja California, México, analizando 195 egagrópilas colectadas bajo 10 nidos activos en 1990 y registrando las presas traídas a dos nidos conteniendo 3 y 1 pollos en 1990 y 1991, respectivamente. El caracara es una rapaz oportunista que se alimenta principalmente de lagomorfos, iguanas, culebras, carroña de animales domésticos, e invertebrados (coleópteros y ortópteros). De acuerdo a nuestras observaciones en nidos y al análisis de egagrópilas, estimamos que los caracaras cazaron el 63% de los vertebrados, mientras que los invertebrados fueron todos cazados. Por lo tanto, en términos de frecuencia, las presas vivas representaron alrededor de 88% de la dieta, aunque fueron lagomorfos y reptiles (presas y carroña de ambos grupos), y la carroña de ganado quienes proveyeron la mayor biomasa. Se discute sobre la importancia de los mataderos, granjas avícolas y basureros en la dieta de los jóvenes caracaras en la región del Cabo.

[Traducción Autores]

Among caracaras, the Crested Caracara (*Caracara plancus*) is the species with the widest distribution in America, ranging from Florida, Texas and southern Arizona, through most of Mexico, particularly in deserts and tropical areas (Peterson and Chalif 1973), south to Tierra del Fuego (Brown and Amadon 1968). In spite of its wide distribution, very little is known on the ecology and feeding habits of this species. Currently, studies on its breeding ecology are being carried out in different areas of its distribution (Texas, Dickinson and Arnold 1996; Mexico, Rodríguez-Estrella et al. unpubl. data; Florida, J. Morrison pers. comm.; Argentina, A. Travaini pers. comm.). The Crested

Caracara is described to be opportunistic but largely carrion-feeding raptor (Sherrrod 1978, Johnsgard 1990), although it may hunt living prey and steal food from other birds (Bent 1938, Hamilton 1981, Whitacre et al. 1982, Rodríguez-Estrella and Rivera 1992). Descriptions of its diet have been largely anecdotal and few quantitative data have been published on variation in feeding habits throughout its range (Bent 1938, Haverschmidt 1947, Sprunt 1954, Glazener 1964, Brown and Amadon 1968, Richmond 1976, Layne et al. 1977, Kilham 1979, Thiollay 1980, Mader 1981, Whitacre et al. 1982, Lyons 1988, Wallace and Temple 1987, Palmer 1988, Yosef and Yosef 1992, Dickinson 1995).

Here, we present information on the diet of a population of Crested Caracaras during the breeding season in the Cape region of Baja California, Mexico.

#### STUDY AREA

We studied caracaras in the xerophyllous scrub vegetation of the Cape region of Baja California (109°60'–111°45'W, 25°45'N). The vegetation is characterized by cardón (*Pachycereus pringlei*), dagger cactus (*Stenocereus gummosus*), mesquite (*Prosopis articulata*), palo verde (*Cercidium microphyllum*), Adam's tree (*Fouquieria diguetii*), plum tree (*Cyrtocarpa edulis*), copal (*Bursera* spp.), lombay (*Jatropha cinerea*) and cholla (*Opuntia cholla*). The elevation of the area ranges from 0–250 m. This zone is characterized by a mean annual precipitation of 150.6 mm, a winter rainy season and an annual temperature range between 22.1–23.4°C.

#### METHODS

The breeding season of the Crested Caracara in the Cape region extends from February–August. We collected pellets and prey remains during the breeding season of 1990, particularly in April, May, June and July. Feeding habits were determined by analyzing 195 fresh and whole pellets collected in and around 10 occupied nests. As Chi-square tests did not detect significant differences in the type of prey appearing in pellets from all nests ( $P > 0.05$ ), we pooled all data. Pellets from nests located near henhouses were eliminated from the analysis to avoid an overrepresentation of carrion in the diet. For identification, we compared remains of skulls, bones, hairs, scales, feathers and invertebrates with known reference specimens at the Centro de Investigaciones Biológicas del Noroeste (CIBNOR, Mexico). Prey remains in pellets were identified to the closest possible level of taxonomic resolution. Food-niche breadth was estimated using the Levins (B) index (Krebs 1989). Numbers of prey species were used for computation of niche breadth.

As it was not possible to determine whether mammalian and reptilian prey represented in the pellets were captured alive or collected as carrion by caracaras, we made observations from a blind at a nest one day ( $N_1 = 675$  min) and at a second nest for seven days ( $N_2 = 3102$  min) to determine the proportion of prey types transported to the nest by adults that were freshly-killed (Richmond 1976, Mader 1981). Nest 1, containing three young near fledging age, was observed on 16 May 1991 and all prey adults brought to the nest were recorded. In 1992, we made similar observations at nest 2 which contained one young approximately two wk old. We observed prey deliveries at this nest from 25 September–21 October, when the young caracara fledged. We analyzed our data in terms of ingested biomass. If a prey item was heavier than 500 g, we considered that the prey was probably consumed as carrion. Mean prey weights were obtained from specimens trapped in the field and from those stored at CIBNOR.

Additionally, the number and age (immature, adult; Clark and Wheeler 1987) of caracaras feeding on carrion at slaughterhouses, henhouses and garbage sites were recorded (Rodríguez-Estrella 1996). Whenever caracaras

were found feeding on roadkills, we recorded the species on which they were feeding.

#### RESULTS

Crested Caracaras preyed on a broad variety of vertebrates and invertebrates ( $B = 6.3$ ). Prey species richness was over 60 species (Table 1). The most important prey in terms of numbers were insects (mainly Orthoptera and Coleoptera) which represented 68% of the prey items identified (Table 1,  $N = 2152$ ). In terms of biomass, mammals (mainly *Lepus* and *Sylvilagus*) and reptiles (spiny-tailed iguana [*Ctenosaura hemilopha*], and snakes) were the most important prey (almost 80% of ingested biomass, Table 1). We considered that small mammals, birds, small to medium reptiles, and insects, were preyed upon by caracaras as live prey because we recorded caracaras both carrying recently killed items to the nest (Table 2) and killing those prey. Whether mammals and reptiles >500 g appearing in pellets were captured alive and carried to the nests remains unknown, but our observations of prey transported to nests by adults made this seem doubtful. At nest 1, adults delivered one mouse, five birds, one spiny-tailed iguana, one piece of a lagomorph and one unidentified lizard. None of these were >500 g. At nest 2, one kangaroo rat (*Dipodomys merriami*), two woodrats (*Neotoma lepida*), one bird, five lizards, one snake and several pieces of apparently freshly-killed hares and rabbits, none of which were >500 g, were delivered (Table 2). We also observed adult caracaras hunting, pursuing and killing live prey on six occasions: two White-winged Doves (*Zenaida asiatica*), two Inca Doves (*Columbina passerina*) and two spiny-tailed iguanas. Again none of these prey were >500 g.

Adult, but especially immature caracaras were frequently recorded feeding on carrion at henhouses, slaughterhouses and garbage dumps (Rodríguez-Estrella 1996). Most roadkills where caracaras fed were of hares ( $N = 20$ ), cows ( $N = 10$ ), horses ( $N = 5$ ), small reptiles ( $N = 5$ ), small mammals ( $N = 5$ ) and domestic dogs ( $N = 3$ ). Caracaras also fed on maggots (*Cochliomyia macellaria*) at carcasses, adding up to 150 items that one adult ate in 5 min. Caracaras tended at times to follow tractors in fields being plowed catching grasshoppers and small mammals killed by plow.

#### DISCUSSION

The Crested Caracara in the Cape region is an opportunistic raptor feeding on mammals (mainly

Table 1. Diet of the Crested Caracara in the Cape region of Baja California, Mexico in 1990 as determined from 195 pellets collected at nests. Totals show the number of individuals per group and the ingested biomass in grams. Asterisks indicate that computing weights were a maximum of 500 g.

SPECIES	WEIGHT (g)	% FREQ. <sup>1</sup>	% BIOM.	% APPEAR. <sup>2</sup>
<b>Mammalia</b>				
<i>Lepus californicus</i>	500*	3.6	21.9	39.5
<i>Sylvilagus auduboni</i>	500*	2.4	14.8	26.7
<i>Ammospermophilus leucurus</i>	102	0.8	1.0	9.2
<i>Thomomys umbrinus</i>	103	0.8	1.0	8.7
<i>Chaetodipus arenarius</i>	26.0	0.3	0.1	3.6
<i>Dipodomys merriami</i>	42.0	0.3	0.1	3.1
<i>Peromyscus eva</i>	13.8	0.4	0.1	4.1
<i>Peromyscus</i> sp.	13.0	0.05	tr*	0.5
<i>Neotoma lepida</i>	148	0.3	0.5	3.1
Unidentified rodents	25.0	0.8	0.2	8.7
<i>Canis latrans</i>	500*	0.1	0.9	1.5
<i>Spilogale putorius</i>	500*	0.05	0.3	0.5
Total <sup>3</sup>		213	71 959.1	
<b>Aves</b>				
<i>Falco sparverius</i>	93	0.05	0.05	0.5
<i>Callipepla californica</i>	189.5	0.1	0.2	1.0
<i>Zenaidura macroura</i>	152.9	0.8	1.6	9.2
<i>Columbina passerina</i>	38	0.1	tr*	1.0
<i>Geococcyx californianus</i>	210	0.2	0.5	2.1
<i>Melanerpes uropygialis</i>	54	0.4	0.2	4.1
<i>Colaptes auratus</i>	82	0.1	0.1	1.0
<i>Myiarchus cinerascens</i>	27.4	0.2	0.1	2.1
<i>Aphelocoma coerulescens</i>	84	0.4	0.4	4.1
<i>Campylorhynchus brunneicapillus</i>	49	0.05	tr*	0.5
<i>Phainopepla nitens</i>	25.4	0.05	tr*	0.5
<i>Cardinalis cardinalis</i>	43	0.05	tr*	0.5
<i>Icterus cucullatus</i>	31.8	0.3	0.1	3.1
<i>Polioptila californica</i>	6	0.05	tr*	0.5
<i>Carpodacus mexicanus</i>	21	0.3	0.1	3.6
<i>Passer domesticus</i>	22.4	0.05	tr*	0.5
Unidentified birds	25	3.0	0.9	32.2
Total		131	7606.4	
<b>Reptilia</b>				
<i>Callisaurus draconoides</i>	23.9	0.1	tr*	1.5
<i>Ctenosaura hemilopha</i>	500*	1.9	11.9	21.5
<i>Dipsosaurus dorsalis</i>	60.7	0.6	0.4	6.7
<i>Phrynosoma coronatum</i>	36	1.9	0.8	20.5
<i>Sceloporus hunsakeri</i>	52.5	0.1	0.1	1.5
<i>Sceloporus licki</i>	16.5	0.9	0.2	10.8
<i>Sceloporus monserrattensis</i>	17	0.5	0.1	5.6
<i>Sceloporus zosteromus</i>	29.5	0.1	0.05	1.5
<i>Cnemidophorus maximus</i>	24.9	1.2	0.4	13.3
<i>Lampropeltis getulus</i>	229	0.1	0.4	1.5
<i>Masticophis flagelum</i>	300	0.6	2.2	6.7
<i>Pituophis melanoleucus</i>	280	0.2	0.8	2.5
<i>Salvadora hexalepis</i>	170	0.2	0.4	2.1
<i>Crotalus enyo</i>	500*	0.2	1.1	1.5
<i>Crotalus ruber</i>	500*	0.4	2.3	4.1
Unidentified reptiles	25	0.2	0.1	2.6

Table 1. Continued.

SPECIES	WEIGHT (g)	% FREQ. <sup>1</sup>	% BIOM.	% APPEAR. <sup>2</sup>
Unidentified snakes	500*	2.7	16.8	28.7
Total	263		67 038.1	
Invertebrata				
Arachnida	0.5	0.05	tr*	0.5
Theraphosidae	5.0	0.05	tr*	0.5
Scorpionidae	2.0	0.6	tr*	6.2
Solifugae	0.5	0.2	tr*	0.5
Chilopoda	2.0	0.1	tr*	0.5
Coleoptera	0.5	0.7	tr*	7.2
Carabidae	0.37	0.7	tr*	5.1
Scarabaeidae	0.5	0.5	tr*	3.1
Tenebrionidae #1	0.5	10.9	0.06	40.0
Tenebrionidae #2	0.13	4.3	tr*	20.5
Cerambycidae	1.0	0.3	tr*	2.1
Orthoptera	0.75	0.2	tr*	1.5
Gryllidae	1.0	29.9	0.4	37.9
Acrididae	2.0	11.8	0.3	26.7
Tettigonidae	1.0	0.2	tr*	1.5
Dermaptera				
Formiculidae	0.5	3.1	tr*	9.2
Hymenoptera	0.5	0.4	tr*	2.6
Odonata	1.0	0.05	tr*	0.5
Diptera	0.5	0.05	tr*	0.5
Unidentified	1.0	4.1	0.05	22.6
Total		1466	1470.4	
Unidentified carrion	500*	3.7	15.6	40.5
Total		79	27 300.0	
GRAND TOTAL		2152	175 374.0	

\* tr < 0.05% of total prey biomass.

<sup>1</sup> Total number of individuals of each prey type  $\times$  100 divided by the grand total number of prey.

<sup>2</sup> Number of occurrences of each prey type  $\times$  100 divided by the total number of pellets; because of this, the sum of frequencies may be above 100.

<sup>3</sup> Total number and biomass per group

lagomorphs), reptiles (mainly iguanas and snakes), carrion of domestic animals such as cattle and dogs, and invertebrates (mainly Coleoptera and Orthoptera). Its opportunism is evidenced not only by the breadth of its food niche, but also by the fact that as many as nine prey species can be found in a single pellet. The caracara's ability to kill live prey is denoted by the high frequency of mobile prey including reptiles and birds that appear in pellets and are brought to nests, apparently having been captured alive. Its predatory ability is also demonstrated by the six captures we observed of live prey (doves and lizards) and observations of active prey pursuit and capture elsewhere (Richmond, 1976, Layne et al. 1977, Whitacre et al. 1982).

We were not certain as the proportion of lagomorphs that were taken as carrion or live prey but,

according to our direct observations, we estimated that caracaras killed about 63% of vertebrate prey in pellets (considering conservatively that 35% of lagomorphs were captured as live prey). We assumed that all invertebrates were all captured as live prey. Based on our numerical analysis of the diet, we felt that live prey represented 88% of the diet of caracaras in the Cape region. However, in terms of ingested biomass, lagomorphs (both carrion and killed prey), reptiles (both carrion and killed spiny-tailed iguana and snakes) and carrion of cattle, represented the most important food sources. In Texas, Dickinson (1990) found that the majority of the caracara's diet at nest sites consisted of live-caught prey (61%), with carrion comprising 39%.

Crested Caracaras in Baja California fed nest-

Table 2. Prey items brought to nests of the Crested Caracara in the Cape region, Baja California, Mexico.

PREY	NUMBER	NOTES
Nest 1, 16 May 1991		
Mammals		
<i>Lepus californicus</i>	1	1 piece of leg
Unidentified rodent	1	complete item
Birds		
<i>Zenaida asiatica</i>	1	complete item
<i>Carpodacus mexicanus</i>	1	complete item
Unidentified bird	3	20–30 g, complete
Reptiles		
<i>Ctenosaura hemilopha</i>	1	complete item
Unidentified lizard	1	complete item
Total items	9	
Rate/day	9	
Rate/hour	0.80	
Nest 2, 25 September–21 October 1992		
Mammals		
<i>Sylvilagus audubonii</i>	2	1 leg, 1 head
<i>Lepus californicus</i>	12	8 pieces of legs, 2 heads
<i>Dipodomys merriami</i>	1	complete item
<i>Neotoma lepida</i>	2	complete item
Birds		
Unidentified bird	1	20–30 g, complete
Reptiles		
<i>Cnemidophorus</i> sp.	3	complete item
<i>Sceloporus</i> sp.	2	complete item
Unidentified snake	1	ca. 100 g fresh snake
Total items	24	
Rate/day	5	
Rate/hour	0.46	

lings mainly with vertebrate prey captured alive, as observed in studies elsewhere (Richmond 1976, Mader 1981), but proportions of prey groups differed. Levy (1988), analyzing 30 pellets collected beneath a nest in Arizona, found that 26% of the pellets contained scales of *Phrynosoma* lizards, 93% contained arthropod remains, and seldom were hairs of lagomorphs identified. Dickinson (1990) reported that invertebrate prey brought to the nests accounted for only 3% of items.

Immature caracaras seem to depend mainly on carrion and invertebrates during the postfledging period as evidenced in our observations that most immatures foraged near slaughterhouses, hen-houses, garbage sites (Rodríguez-Estrella 1996) and cultivated areas rather than in natural areas. Carrion in human refuse areas is a predictable source of food and cultivated areas attract high

numbers of invertebrates (mainly Orthoptera). Thus, these feeding areas are probably important for young caracaras in the Cape region. Indeed, what appeared to be family groups of two adults and one to three young were commonly observed during the postfledging period feeding on human refuse sources and agricultural areas (35.1%,  $N = 74$  group observations). We had the impression that adults lead juveniles to predictable food sources. Additional studies on feeding behavior of immature and adult caracaras during the postfledging period deserve further attention in order to better understand the process by which juveniles learn to find predictable food sources.

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