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DIET OF BREEDING CINEREOUS HARRIERS (*CIRCUS CINEREUS*) IN SOUTHEASTERN BUENOS AIRES PROVINCE, ARGENTINA

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KEY WORDS: *Cinereous Harrier*; Circus cinereus; *breeding diet*; *trophic niche breadth*; *Argentina.*

The Cinereous Harrier (*Circus cinereus*), one of two South American harriers, is widespread and distributed from Colombia and Ecuador, through Perú, Bolivia and Paraguay, southwestern Brazil to Tierra del Fuego and Islas Malvinas (Grossman and Hamlet 1964, Canevari et al. 1991, del Hoyo et al. 1994). In Argentina, it is most common in Patagonia and Islas Malvinas (Narosky and Yzurieta 1987) but it has also been recorded throughout northwestern, central and, occasionally, the northeastern parts of the country (Canevari et al. 1991). The Cinereous Harrier inhabits savannas, grasslands, wetlands, marshes, lagoons, shrubsteppes, and shrublands 0–4500 m elevation (Jiménez and Jaksic 1988, Canevari et al. 1991, Narosky and Di Giacomo 1993, del Hoyo et al. 1994).

Little has been reported about the Cinereous Harrier The few previous studies of this species have focused on aspects of ecology and behavior (Jiménez and Jaksic

[1] Deceased.

1988) and breeding biology (Narosky and Yzurieta 1973, Saggese and De Lucca 1995). General information about its feeding habits suggests that it eats birds, small mammals, and reptiles (Humphrey et al. 1970, De La Peña 1985, Canevari et al. 1991, del Hoyo et al. 1994). Its diet has only been analyzed in detail in southernmost Chile (Jiménez and Jaksic 1988), where it preys on insects, birds, mammals, reptiles, and arachnids. In this paper, we report on the breeding season diet and trophic niche breadth of the Cinereous Harrier in the Pampas Zone of Argentina.

METHODS

The study was carried out in Laguna de los Padres Integral Reserve (37°56'S, 57°44'W), located 16 km west of Mar del Plata City, in southeastern Buenos Aires Province. The reserve is 680 ha in size, with a gentle relief composed of low hills and plains. The climate is subhumid to humid with a mean annual temperature of 13.8°C and a mean annual precipitation of about 844 mm (J. Cionchi unpubl. data).

The breeding area studied was located in the "El Curral" Intangible Reserve Zone, an area 87 ha in size, where Cinereous Harriers nested in sympatry with Long-winged Harriers (*Circus buffoni*). The area is characterized by a mosaic of shrublands consisting of the native "Curro" (*Colletia paradoxa*), the exotic blackberry (*Rubus ulmifolius*) and modified pampean grassland genera such as *Stipa, Bothriochloa, Conium,* and *Carduus* (Cabrera and Zardini 1978). Cultivated fields, pastures, tree plantations (mainly *Eucalyptus* spp.), and suburban zones surround the core study area, which is located 400 m from the closest water (Laguna de Los Padres).

Harrier pellets and prey remains were collected every 5–6 d from nesting sites, plucking stations, and roosts from September to March of 1992–93 and 1993–94. Identification of remains of birds, mammals, and amphibians found in pellets and other prey remains was based on bones, feathers, beaks, hair, and dentition. We compared these items to collections in Museo de Ciencias Naturales de La Plata, Museo de Ciencias Naturales "Lorenzo Scaglia" de Mar del Plata along with the collections of the Laboratorio de Vertebrados, Facultad de Ciencias Exactas y Naturales-Universidad Nacional de Mar del Plata. Most prey items were identified to species. During identification, pellets and prey remains in a day's collection from each breeding pair were lumped and reconstructed by matching the remiges, rectrices, beaks, and bones of birds and the fur, skull parts, and feet of mammals. This procedure minimized the possibility of overcounting the number of individuals of each species (Marti 1987).

Weights of adult birds were obtained from the literature (Fiora 1933, Contreras 1979, Salvador and Salvador 1986, Salvador 1988, 1990, Camperi 1992) and from unpublished data of the Museo de Ciencias Naturales "Lorenzo Scaglia" (Mar del Plata City). Weights of mammals were provided by M. Kittlein (unpubl. data) and V. Comparatore and A. Barbini (unpubl. data). The weight of the common toad (*Bufo arenarum*) was taken from Langone (1994). When the sex of prey could not be determined, the mean weight of males and females for that species was used. Geometric mean weights for total prey were calculated as $\bar{x} \pm$ SE (Marti 1987). Levins' index of trophic niche breadth (Marti 1987) was calculated as follows: $B = 1/\Sigma_{i=1}^{n} p^2_i$, where pi is the proportion of prey in different categories (mainly species). B varies from 1 to n, maximum number of prey categories. If prey are equally common in all categories, then $B = n$. If all prey belong to only one category, $B = 1$.

RESULTS

We collected 63 pellets and 45 prey remains from five Cinereous Harrier pairs breeding in 1992–93 and five pairs breeding in 1993–94. The pellets had a mean length of 35.9 ± 8.0 mm (±SD) and a mean width of 17.7 ± 2.9 mm ($N = 53$). A total of 104 prey items was identified from three taxonomic classes that included 20 vertebrate species and unidentified items (Table 1). Levins' index was 7.1 ($N = 20$). Birds accounted for 94% of the total prey items, followed by mammals (5%). Only one amphibian was identified (Table 1).

Avian prey included 14 species, with passerines being the most common of all prey (88%) (Table 1). Among passerines, House Sparrows (*Passer domesticus*) (21%), Rufous-collared Sparrows (*Zonotrichia capensis*) (19%), and Grassland Yellow-finches (*Sicalis luteola*) (19%) were the most abundant species in the diet. Doves (15%), the Eared Dove (*Zenaida auriculata*), and the Picui Ground-Dove (*Columbina picui*), were the second most numerous taxa consumed (Table 1). Among mammal prey, rodents were the most common (3%), followed by lagomorphs (2%) (Table 1). Prey weights of animals consumed ranged from 1.5 g (bird egg in one pellet) to 300 g (juvenile European hare, *Lepus capensis*) (Table 1). The geometric mean weight of prey was 31.2 g ± 5.5 (±SE). Most prey (84%) weighed <60 g, and the most abundant prey were Grassland Yellow-finches, House Sparrows, and Rufous-collared Sparrows.

Birds contributed most to the total prey biomass (81%), with Eared Doves (28.2%) being the main contributor. House Sparrows (14.3%), Rufous-collared Sparrows (9.2%), and Grassland Yellow-finches (6.7%) were also important in the biomass. Biomass contributed by mammals was 15%, with juvenile European hares contributing the highest value (12.5%). Amphibian biomass was low (3.8%) in the diet of this harrier (Table 1).

DISCUSSION

Birds were the most common prey in the diet of the Cinereous Harrier, both numerically and in terms of biomass. Birds are the most common prey of many other species of *Circus* (Schipper 1973, Baker-Gabb 1981, Barnard et al. 1987, Witkowski 1989, González López 1991, del Hoyo et al. 1994, Bó et al. 1996). Cinereous Harriers preyed primarily upon passerine birds such as House Sparrows, Rufous-collared Sparrows, and Grassland Yellow-finches.

The food habits we recorded differed from those re-

Table 1. Percent total frequency of prey items, mean individual weight, and percent total biomass in the diet of Cinereous Harriers during the breeding season in southeastern Buenos Aires Province, Argentina.

PREY	% TOTAL FREQUENCY	MEAN INDIVIDUAL WEIGHT (g)	% TOTAL BIOMASS
Amphibia	(1.0)[a]		
Bufonidae			
Bufo arenarum	1.0[b]	180	3.8
Birds	(94.0)		
Nonpasserine			
Columbidae			
Columbina picui	5.5	55	6.9
Zenaida auriculata	9.5	135	28.2
Picidae			
Colaptes campestris	1.0	200	4.2
Passerine			
Tyrannidae			
Tyrannus melancholicus	1.0	45	0.9
Troglodytidae			
Troglodytes aedon	1.0	10	0.2
Emberizidae			
Sicalis luteola	19.0	16	6.7
Sicalis luteola (egg)	1.0	1.6	<0.1
Sicalis spp.	2.0	16	0.7
Zonotrichia capensis	19.0	22	9.2
Sporophila caerulescens	1.0	11	0.2
Molothrus bonariensis	2.0	62	2.6
Molothrus badius	2.0	53	2.2
Carduelis magellanica	3.0	15	0.9
Carduelis chloris	3.0	25	1.6
Ploceidae			
Passer domesticus	21.0	31	14.3
Unidentified Passeriformes	2.0	23[c]	1.0
Unidentified birds	1.0	46[d]	0.9
Mammals	(5.0)		
Leporidae			
Lepus capensis (juveniles)	2.0	300	12.5
Muridae			
Oxymycterus rufus	1.0	70	1.5
Akodon azarae	1.0	21	0.4
Unidentified murids	1.0	45[e]	0.9
Total Number of Prey Items	104		

[a] Total by prey class.
[b] Total by prey species.
[c] Average of the three most common passerine birds in the sample.
[d] Average of all the birds in the sample.
[e] Average of the two murids in the sample.

ported previously. In southernmost Chile, Jiménez and Jaksic (1988) identified a total of 1259 prey items of which 33.6% were insects, followed by birds (27.2%), mammals (19.1%), reptiles (19.1%), and arachnids (1.0%). House (in Jiménez and Jaksic 1988) also indicated that Cinereous Harriers in Chile preyed predominantly upon rats and field mice (species names not provided by these authors), and that they also ate birds, insects, and reptiles. In Tierra del Fuego, the Cinereous Harrier did not prey on birds, taking only lizards and rodents (Humphrey et al. 1970). The absence of reptiles in the diet of birds from our study area in part might

have been due to their lower availability in comparison to Chile and Patagonia.

In terms of biomass, birds were the most important group in the diet, a finding that was similar to that of Jiménez and Jaksic (1988) in southernmost Chile. Three species, Eared Dove, House Sparrow, and Rufous-collared Sparrow, made up over 52% of the biomass in our study.

When compared with the diet of Long-winged Harrier (Bó et al. 1996), which nests sympatrically with the Cinereous Harrier, we found that the values of trophic niche breadth were similar for the Long-winged Harrier (standarized Levins' index – B′ = 0. 21) and the Cinereous Harrier (B′ = 0.19; $N = 34$). There was both overlap and divergence in the prey of these sympatric species (Pianka's overlap index = 0.67; this value calculated from data of this study and data of Bó et al. 1996). For both species, birds were the most abundant prey. For the Cinereous Harrier, birds comprised 94.2% of the diet whereas for the Long-winged Harrier, birds comprised 80%. Both harriers preyed principally upon passerines (Cinereous Harrier = 81.2%, Long-winged Harrier = 61.2%), with Rufous-collared Sparrows being most common in both diets (Cinereous Harrier = 19%, Long-winged Harrier = 27.5%). The Long-winged Harrier preyed upon aquatic birds (7.2%) which did not occur in the diet of the Cinereous Harrier. Mammals were the second most common taxa consumed by the two harriers, although the percentage varied (Cinereous Harrier = 5%, Long-winged Harrier = 17.5%). Utilization of terrestrial prey was comparable with observations of Narosky and Yzurieta (1973) who found that Cinereous Harriers were more terrestrial hunters than Long-winged Harriers.

Minimum prey weight did not vary between Cinereous Harriers (1.5 g: Grassland Yellow-finch egg) and Long-winged Harriers (1 g: insects) but the maximum weight was greater in Long-winged Harriers than that in Cinereous Harriers (Long-winged Harrier = 450 g White-faced Ibis, *Plegadis chihi*; Cinereous Harrier = 300 g juvenile European hare). However, the geometric mean weight was similar (Cinereous Harrier = 31.2 ± 5.5 g; Long-winged harrier = 32.4 ± 11.2 g).

Birds contributed most of the biomass in the diet of both species, with a higher percentage for Cinereous Harriers (81%) than for Long-winged Harriers (68%). However, the species contributing most of the biomass were not the same. Cinerous Harriers ate mainly Eared Doves and Long-winged Harriers ate mainly White-faced Ibis.

RESUMEN.—Se estudió la dieta del Gavilán Ceniciento (*Circus cinereus*) durante dos períodos reproductivos en la Reserva Integral Laguna de Los Padres, Provincia de Buenos Aires. El área de nidificación se encuentra en un ambiente arbustivo circundado por campos cultivados, pasturas, montes, lagunas y áreas suburbanas. Se recolectaron 63 egagrópilas y 45 restos presa, provenientes de 10 parejas nidificantes. Se identificaron 104 items presa, corespondiendo el 94% a las aves, el 5% a los mamíferos y un solo anfibio. La amplitud de nicho trófico (B) fue de 7.1 ($N = 20$). Los paseriformes fueron las presas más comunes (88%) del total de items presa, dentro de las cuales el Gorrión (*Passer domesticus*), el Chingolo (*Zonotrichia capensis*) y el Misto (*Sicalis luteola*) fueron las principales especies capturadas. La media geométrica del peso de presas consumidas fue de 31.2 g ± 5.5 ($\bar{x}$ ± SE) (rango = 1.5–300 g). En cuanto a la biomasa aportada las aves contribuyeron en un 81%. La dieta del Gavilán Ceniciento en la provincia de Buenos Aires difirió con otras áreas de estudio (Chile y zona Patagónica) pero presentó similitud con su congénere el Gavilán Planeador (*Circus buffoni*) nidificando en simpatría.

[Traducción de Autores]

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ABUNDANCE OF THE OGASAWARA BUZZARD ON CHICHIJIMA, THE PACIFIC OCEAN

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KEY WORDS: *Ogasawara buzzard*; Buteo buteo toyoshimai; *Bonin*; *endemic*; *density*.

The Ogasawara buzzard (*Buteo buteo toyoshimai*) is an insular subspecies of the Common Buzzard (*B. buteo*, Ornithological Society of Japan 1974, Brazil 1991, Monroe and Sibley 1993). It is endemic to the Ogasawara (Bonin) Islands, which lie about 1000 km south of Tokyo in the Pacific Ocean. It usually nests on rocky cliffs (Funatsu and Chiba 1991), although tree nesting has been recently reported (Takagi and Ueda 1998, Kato and Suzuki 1999). It differs from a nearest subspecies, *B. buteo japonicus*, because of its drab plumage with less brown on the uppers and its longer beak and shorter wings and tarsi (Momiyama 1927).

The Ogasawara buzzard is listed as an endangered species in Japan (Japan Environmental Agency 1998) because the population is so small. It is known to inhabit the two island groups of the Ogasawaras, Chichijima-retto, and Hahajima-retto (Brazil 1991), with total areas of 38.2 km^2 and 27.0 km^2, respectively (Ogasawara Natural Environmental Group 1992). Among the islands, Chichijima is the largest and probably supports the largest population of buzzards. It is also the most developed of the Ogasawara Islands with a human population of about 1900 in 1998. In the early 1990s, the number of pairs of Ogasawara buzzards on Chichijima was estimated to be