Food-niche Relationships between Chilean Eagles and Red-backed Buzzards in Central Chile

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The Chilean Eagle (*Geranoaetus melanoleucus australis*; 2,000 g) and the Red-backed Buzzard (*Buteo polyosoma polyosoma*; 960 g) are relatively abundant raptors in central Chile (Johnson 1965: 240–243). Information about their food habits, however, is only anecdotal (Johnson 1965). In this paper we report the analysis of the 120 whole pellets of Chilean Eagles and 253 whole and 46 fragmented pellets of Red-backed Buzzards collected beneath perches in La Dehesa (33°21'S, 70°32'W; 875 m elevation; 20 km east of Santiago) between August 1973 (early spring) and May 1974 (mid-fall). Samples of 72 pellets of Chilean Eagles and 203 pellets of Red-backed Buzzards were measured and dry-weighed, giving the following figures, respectively ($\bar{x} \pm$ SE): length, 56.1 ± 1.0 mm and 39.3 ± 1.4 mm; width, 31.6 ± 0.4 mm and 19.4 ± 0.6 mm; weight, 7.5 ± 0.3 g and 2.6 ± 0.2 g. Prey were identified to the species level when possible, and their abundance estimated as half the number of jaws found; we discriminated juvenile and adult rabbits in the diet according to jaw sizes. The following parameters were computed: (1) food-niche breadth, using the formula of Levins (1968: 43), which gives values between 1 and the number of categories used, 11 in this case; (2) food-niche overlap, using the formula of Pianka (1974: 2142), which renders values ranging between 0 and 1 (no overlap to complete overlap, respectively); (3) mean weight of mammalian prey (we regarded this parameter as an estimate of the mammalian prey size selected by the raptors). This computation was made with the prey weights reported in Table 1, but the significance

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TABLE 1. Prey of Chilean Eagles and Red-backed Buzzards in La Dehesa, central Chile. Weights of adult small mammal prey were taken from Glanz (1977); their vernacular names are in parenthesis. *n* = number of individual prey detected in the pellets.

Prey types	Weight (g)	Eagles		Buzzards	
		n	%	*n*	%
MAMMALS					
Rodents			75.9		89.3
Abrocoma bennetti (chinchilla rat)	219	13		47	
Akodon olivaceus (olivaceous akodon)	40	—		10	
Octodon degus (degu)	230	98		225	
Oryzomys longicaudatus (rice rat)	45	1		7	
Phyllotis darwini (leaf-eared mouse)	66	5		56	
Unidentified	—	12		4	
Lagomorphs			18.8		6.1
Oryctolagus cuniculus (European rabbit)	534[a]	32[b]		24	
Marsupials			0.0		1.0
Marmosa elegans (mouse opossum)	40	—		4	
BIRDS			1.2		3.3
Unidentified Passeriformes	—	2		13	
LIZARDS			0.6		0.3
Liolaemus sp. (common lizard)	—	1		1	
SNAKES			3.5		0.0
Philodryas chamissonis (long-tailed snake)	—	6		—	
TOTAL PREY		170		391	

[a] Juvenile individuals (about 3 months old).
[b] Including 4 adult individuals (about 9 months old; 1,300 g).

of differences between the two distributions was evaluated after normalizing weight data with a log-transformation, using the Student's *t*-test (Sokal and Rohlf 1969: 220).

Both the Chilean Eagles and Red-backed Buzzards preyed mainly on rodents, lagomorphs being second in numerical importance (Table 1). The staple prey of the two species seemed to be the diurnal rodent *Octodon degus,* which accounted for similar fractions in their diets (57.7% and 57.6%, respectively). Consumption of rabbits (*Oryctolagus cuniculus*) was higher by eagles than by buzzards, but both took mostly juveniles (4 adults were found in eagle pellets). Food-niche breadths were very similar (2.626 for Chilean Eagles, 2.684 for Red-backed Buzzards), and food-niche overlap extensive (0.951). The species differed significantly ($P < 0.001$), however, in the mean weight of mammalian prey taken [308.2 g ± 17.1 (SE) for eagles, 213.0 g ± 5.6 for buzzards]. This was associated with the lesser importance of small rodent prey and the higher consumption of rabbits (including adult-sized individuals) in the diet of the large Chilean Eagles. Probably the Red-backed Buzzards, by being smaller, hunted mainly the smallest rodents and were unable to kill or handle prey as large as an adult rabbit.

In sum, the species' composition and their relative abundance in the diet were extremely similar between Chilean Eagles and Red-backed Buzzards at La Dehesa, thus producing a very high overlap of their food-niches. Prey-size selection, however, would permit a certain degree of differential utilization of food resources.

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Stones: an Important Incubation Stimulus for Gulls and Terns

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Species of *Larus* gulls and *Sterna* terns (Family Laridae) differ from most birds in having three brood patches for incubation instead of a single large brood patch. Gulls usually lay 3 eggs, occasionally 2 or 1 egg, and very rarely more than 3 eggs (for a literature review see Coulter 1973, unpublished M.Sc. Thesis, Oxford, England, Oxford University). The most common clutch size for temperate terns varies from year to year and from place to place, but is usually 3 or 2 eggs (Lack 1968, Ecological adaptations for breeding in birds, London, Methuen & Co., Ltd.), although some tropical terns, such as Sooty Terns (*Sterna fuscata*) lay only 1 egg. An examination of the incubation behavior of the Black-headed Gull (*Larus ridibundus*) (Beer 1961, Behavior 18: 62) and the Black-billed Gull (*Larus bulleri*) (Beer 1965, Auk 82: 1) suggested that gulls incubating three eggs sat for longer periods of time and resettled less frequently than birds on either fewer or more eggs. Baerends et al. (1972, Behavior Suppl. 17: 134) have shown that Herring Gulls (*Larus argentatus*) did the least resettling, preening, and nest building when incubating three eggs. I have found that Western Gulls (*Larus occidentalis*) on the Farallon Islands, California are typical in having three brood patches (Coulter unpubl. obs.) and usually lay three eggs (Coulter 1973). Furthermore, birds sitting on three eggs sit for longer periods of time with less frequent