

wax. The long period over which the bulbul fed on wax suggests that it encountered no problems in using a food item undigestible to most animals. The honeyguide-bulbul interactions also suggest the obstacles presented by honeyguides in the possible evolution of beeswax-eating habits by other birds in the range (Asia, Africa) of honeyguides.

When bulbuls came to the feeder after honeyguides had been feeding we noted that the bulbuls usually went directly to the particular site that the honeyguides had vacated. Possibly the bulbuls could have acquired some capability to digest wax from wax pieces that had been "mouthed" by, or disgorged by honeyguides, if digestion of wax esters occurs by microbial fermentation, as suggested by Friedmann and Kern (1956; but see Roby et al. 1986, who discuss wax digestion by enzymatic hydrolysis).

Our observations suggest that landbirds other than honeyguides have, or can develop, the ability to utilize beeswax, and we agree with Diamond and Place that many birds may have the capacity to digest wax.

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The effect of observer variability on the MacArthur foliage density estimate.—Scientists have used the technique developed by MacArthur and MacArthur (1961) for many years to estimate shrub and tree foliage density during studies of avian-habitat relationships (MacArthur et al. 1966, Recher 1969, Willson and Moriarty 1976, Dickson and Segelquist 1979, Conner et al. 1983). Conner and O'Halloran (1986) compared the accuracy of estimates made using the MacArthur technique with actual leaf surface area and biomass. They determined that the MacArthur and MacArthur (1961) technique provided an excellent relative estimate of the surface area and biomass of foliage and supported its use to measure foliage in avian-habitat studies. Although Conner and O'Halloran (1986) suggested correction factors to adjust the technique to provide more exact estimates of leaf surface area, they did not examine an important potential bias of the technique. Because the technique requires an observer to estimate when 50 percent of a black-and-white checkered board is obscured by foliage, the comparability of studies by different researchers is in question. The experience of an observer in estimating how much the density board is obscured also has the potential to affect variability and accuracy of foliage estimates.

Observer differences can affect foliage density estimates in two major ways. First, the basic accuracy of the estimation is at question; how close is the observer's estimate to the desired 50 percent obscuration of the black-and-white checkered density board? Second, how consistent is the observer in making estimations?

Methods.—A basic problem with comparing the accuracy and abilities of different observers is damage to the vegetation because of repeated measurements made at each test location. To avoid this problem a series of photographs (100) was taken of a black-and-white checkered density board. Each photograph (12.7 × 17.7 cm) was taken at a different location with varying proportions of the density board obscured by foliage. Thirteen of the

TABLE 1
COMPARISONS OF OBSERVER ESTIMATES OF FOLIAGE OBSCURITY OF A BLACK-AND-WHITE CHECKERED DENSITY BOARD

Foliage estimator	Average percentage obscured	Standard deviation	Coefficient of variation (%)	Correlation to actual (r)
1 (Actual)	50.6	15.8	24.9	1.00
2 (Random)	51.3	28.0	78.6	0.22
3	55.2	17.5	30.5	0.59
4	71.0 ^a	20.4	41.7	0.68
5 ^b	54.3	15.1	22.9	0.85
6 ^b	48.5	15.5	24.1	0.78
7 ^b	52.1	14.5	21.2	0.71
8	37.0 ^a	14.2	20.2	0.58
9	42.3 ^a	14.3	20.5	0.83
10	38.4 ^a	17.3	29.8	0.69
11	61.6 ^a	18.3	33.5	0.79
12	70.7 ^a	16.7	27.8	0.76
13	70.4 ^a	18.3	33.6	0.86
14	45.5	15.3	23.3	0.85
15	40.1 ^a	14.3	20.6	0.82
16	31.8 ^a	13.8	18.9	0.72
17 ^b	51.5	15.9	25.3	0.64
18	48.5	13.2	17.5	0.72
19	43.0 ^a	13.8	19.1	0.77
20	50.3	18.0	32.3	0.78
21	46.6	16.2	26.1	0.74
22	72.7 ^a	14.7	21.6	0.69
23	52.6	15.5	23.9	0.84

^a ANOVA, Duncan's New Multiple Range Test, $P < 0.05$.

^b Experienced observer (observers 3, 4, 8–16, and 18–23 were inexperienced).

photographs contained only pine foliage, 55 only deciduous foliage, and 32 varying mixtures of pine and deciduous foliage. All photographs were taken in young pine plantations in Nacogdoches County, eastern Texas. The square density board was positioned so that its center was 1 m above the ground and photographs were taken with the camera lens also 1 m above the ground. Surface area of the density board was 0.5 m².

The percentage of the checkered density board that was actually obscured by foliage was measured on each photograph with a dot grid matrix (9 dots/cm²) as described by Conner and O'Halloran (1986). Twenty-one individuals examined each of the 100 photographs and estimated the percentage of the checkered density board that was obscured by foliage. Four of the observers were experienced with the MacArthur method, while the other 17 were not. In addition to the percentage estimates made by the 21 observers, a random numbers table (Rohlf and Sokal 1969) was used to randomly select a value ranging between 1 and 99 percent for each photograph as a random estimate of percentage of the board obscured by foliage.

Means and standard deviations for all observers and the random values were compared with actual foliage obscurity determined by using the dot grid matrix. Pearson correlations of actual foliage percentages with each observer's estimates were calculated.

Results.—All observer estimates of the percentage that foliage obscured the black-and-white checkered density board were significantly correlated (Pearson correlation, $P < 0.001$) with the actual obscurity as measured by the dot grid matrix. Although random obscurity values were also correlated to the actual measures, the magnitude of significance was lower ($P = 0.013$, Table 1). The average correlation of estimates by the four experienced observers with actual foliage was $r = 0.75$ and inexperienced observers also averaged $r = 0.75$.

The coefficient of variation (CV) for random foliage values (78.6) was much greater than CVs for the actual foliage present or any of the 21 observer estimates (Table 1). Experienced observers had a slightly lower average CV (CV = 29.6) than did nonexperienced observers (CV = 32.3), but estimates of experienced observers were not significantly different from inexperienced observers (ANOVA, $P > 0.10$).

Estimates of 11 observers were significantly different from the actual foliage values (ANOVA, Duncan's New Multiple Range Test, $P < 0.05$, Table 1). Six observers consistently estimated percentages lower than the actual percentages, while five observers estimated consistently higher percentages. The foliage estimates of 10 observers (all four experienced observers plus six inexperienced observers) were not significantly different from the actual foliage present.

Discussion.—All observer estimates were very highly correlated with actual foliage values, indicating that relative differences in foliage estimates within each separate research study should be reliable. This agrees with the observations of Conner and O'Halloran (1986). Comparability between studies might be increased if only experienced observers are used to collect data used in research studies. Training for field personnel that provides feedback on accuracy of foliage estimates (direction and percentage deviation from actual foliage obscurity) should be considered.

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Diet of Gurney's Buzzard in the Puna of Northernmost Chile.—Gurney's, or Red-naped, Buzzard (*Buteo poecilochrous*), is confined to the Puna zone at elevations above 3500 m along the Andean range, from Colombia south through Ecuador and Peru, to northernmost Chile and adjacent regions of Bolivia and Argentina (Vaurie 1962, Brown and Amadon 1968). According to Johnson (1965) "Very little is known of its habits," except for scant behavioral information reported on a pair breeding in southwestern Peru (Johnson 1967). Little is known about its population status (Jaksić and Jiménez 1986), and we found no studies of its diet in the specialized literature. Herein we report quantitative information on the diet of Gurney's Buzzard in the high Andean plateau (Puna) of northernmost Chile.

On 1 March 1988 we found a recently abandoned nest of Gurney's Buzzard (some of its feathers were inside) on a cliff ca 4800 m elevation at Choquelimpie (18°19'S, 69°18'W, see Paynter 1988 for more information on this locality). The date corresponds to the end of both the breeding season and the warm/rainy season in the Puna, when air temperatures average 12°C. The vegetation is that of a cold steppe dominated by dwarf shrubs (e.g., *Adesmia spinosissima*, *Baccharis incarum*) and bunchgrasses (e.g., *Festuca orthopylla*, *Stipa* sp.). In areas where the watertable emerges, swampy vegetation prevails, dominated by cushion plants (e.g., *Distichia muscoides*, *Oxychloe andina*). We collected regurgitated pellets below the nest and prey remains from inside it. The state of pellets and of remains implied that they represent the diet of Gurney's Buzzard during the breeding season. We analyzed pellets using standard procedures described by Marti (1987). To gauge prey contents against prey availability in the field, we recorded the presence of all vertebrates in the area. We collected anurans by hand, lizards by snaring, and small mammals by trapping. We assessed small mammal abundance with an average of 150 medium-sized Sherman traps, operated for five nights, totalling 800 trap-nights, and with three gopher coil spring traps, operated during two nights.

Mammals made up a numerically small part of the diet of Gurney's Buzzard (Table 1). The only instance of carrion consumption was represented by the hooves of either a domestic goat or a sheep found among nest remains. All other prey likely was taken alive. By live-trapping we collected 16 rodents of five species in the area: eight Puna vesper-mouse (*Calomys cf. sorellus*), three Puna tucotuco (*Ctenomys opimus*), two Puna greater mouse (*Auliscomys sublimis*), two Leaf-eared mouse (*Phyllotis* sp.), and one White-bellied field mouse (*Akodon albiventer*). The most abundant rodent in the area (vesper mouse) was not among the prey of Gurney's Buzzard. Conversely, Tschudi's cavy (*Cavia tschudii*) and Andean field mouse (*Akodon andinus*) were among its prey but were not captured in the traps.

Birds contributed a minor component of the diet, mainly with thinocorids and fringillids (Table 1). We identified 34 species of birds in the area, among them two Tinochoridae, Gay's Seed-snipe (*Attagis gayi*) and D'orbigny's Seed-snipe (*Thinocorus orbignyianus*), and seven Fringillidae: Plumbeous Sierra-finch (*Phrygilus unicolor*), White-throated Sierra-finch (*P. erythronotus*), Ash-breasted Sierra-finch (*P. plebejus*), Grey-hooded Sierra-finch (*P. gayi*), White-winged Diuca-finch (*Diuca speculifera*), Yellow-rumped Siskin (*Carduelis uropygialis*), and Black Siskin (*C. atrata*).

Reptiles were represented in the diet only by lizards (Table 1). In the area we collected three, or possibly four, *Liolaemus* species: striped lizard (*L. alticolor*), James' lizard (*L. jamesi*), variable lizard (*L. multiformis*), and *Liolaemus* sp. (this latter may be a juvenile stage of variable lizard). Of these species, the two former were the most abundant and were represented accordingly among the Buzzard's prey. Only a single amphibian, a frog or toad, was found among prey remains in the nest (Table 1). In the area we collected the spiny toad (*Bufo spinulosus*) and two leptodactylids, rufous frog (*Pleurodema marmorata*) and Peruvian