

the artificial but enriched diet afforded these nestlings, a diet that may have accelerated development (relative to naturally occurring rates of development) of whatever brain structures underlie the restlessness phenomenon. Considerable experimental evidence indicates that malnutrition in very young organisms can retard brain development (Manocha 1972: 60–91, Winick 1975), and it is possible that free-living nestlings seldom receive truly optimal diets for neuronal development.

This explanation, however, remains highly speculative. The two nestlings I observed may not be entirely representative of the general robin population. It was unfortunate that the day on which dusk activity first emerged was the same day that the birds had to be moved into cages, as it is conceivable that the restlessness occurred somewhat prematurely because of the move. Given that the move was made a full 14 h before dusk, however, and given that the birds themselves forced the move by their own abandonment of the nestbowls, the confounding probably was not crucial to the present results.

In any event, the present results were very close to those predicted. It was possible, after all, that the high activity at dusk would actually be evident as soon as the birds were physically capable of showing significant locomotor behavior (around day 10); alternatively, the restlessness might not have appeared before autumn or even until the birds were fully mature. Thus, the finding of restlessness on day 13 can be considered as further support for the premise that the high activity of captive robins at dusk is in fact a behavioral correlate of the roosting tendency in this species.

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Prey of the Harris' Hawk in Central Chile

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Although the Harris' Hawk (*Parabuteo unicinctus*) is widely distributed in Chile (Blake 1977), little is known about its food habits. Johnson (1965) reported that it "preys indiscriminately on rabbits, rats, small birds, reptiles, and frogs, but is also quite ready to raid chicken-roosts or dovecoats when the opportunity arises." Greer and Bullock (1966) analyzed stomachs of two freshly killed individuals in Malleco and found "a lizard (*Liolaemus* sp.), a rat (*Rattus* sp.), and parts of a rabbit (*Oryctolagus cuniculus*)." Because the presently available information is either anecdotal or scarce, we wished to quantify the incidence of different prey items in the diet of the Chilean Harris' Hawk on a sounder data base.

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TABLE 1. Prey of the Harris' Hawk in central Chile, as recorded from pellets and from prey remains at nests. Values are numbers of prey individuals in each category.

	Pellets (<i>n</i> = 32)	Remains (<i>n</i> = 134)	Combined total (<i>n</i> = 166)	Percent of total
RODENTS	31	127	158	91.9
<i>Abrocoma bennetti</i> (chinchilla rat)	3	19	22	
<i>Akodon longipilis</i> (long-haired akodon)	1	1	2	
<i>Akodon olivaceus</i> (olivaceous akodon)	1	1	2	
<i>Octodon degus</i> (degu)	22	89	111	
<i>Phyllotis darwini</i> (leaf-eared mouse)	2	10	12	
Unidentified	2	7	9	
LAGOMORPHS	1	1	2	1.2
<i>Oryctolagus cuniculus</i> (Old World rabbit)	1	1	2	
PASSERIFORMS	—	3	3	1.7
<i>Pteroptochos megapodius</i> (turco)	—	1	1	
<i>Turdus falklandii</i> (Chilean robin)	—	1	1	
Unidentified eggs	—	1	1	
OPHIDIANS	—	3	3	1.7
<i>Philodryas chamissonis</i> (long-tailed snake)	—	2	2	
<i>Tachymenis peruviana</i> (short-tailed snake)	—	1	1	
LACERTILIANS	2	4	6	3.5
<i>Liolaemus</i> sp. (lizard)	2	4	6	
TOTAL PREY	34	138	172	100.0

We collected pellets ($n = 32$) and prey remains ($n = 134$) under three nests of Harris' Hawks found in two localities 20 km east of Santiago: La Dehesa ($33^{\circ}21'S$, $70^{\circ}32'W$) and Los Dominicos ($33^{\circ}23'S$, $70^{\circ}31'W$). Pellets were measured and dry-weighed, rendering the following figures: length, 44.4 ± 1.7 mm ($\bar{x} \pm SE$); width, 20.5 ± 0.9 mm; weight, 3.0 ± 0.4 g. Subsequently, the contents were separated by hand. Each pellet had only one prey item inside it, excepting those containing lacertilians, which were always mixed with other prey. All items identified in the pellets were also found in the remains picked up under the nests. The reverse was not true, as passeriforms, eggs, and ophidians were present only in the remains. Data from both sources are shown in Table 1.

There is a clear prevalence of rodent items, accounting for nearly 92% of total prey. Of these, the strictly diurnal *Octodon degus* is by far the most common prey taken by the Harris' Hawk in the area, in accordance with the diurnal hunting habits of this raptor (Johnson 1965). The remaining rodent prey have been reported (Glanz 1977) to be either crepuscular (*Akodon longipilis* and *Akodon olivaceus*) or nocturnal (*Abrocoma bennetti* and *Phyllotis darwini*). However, these species can also be trapped during the day (Fulk 1975, 1976), thus explaining their presence, in small amounts, in the diet of the hawk. The two rabbits found were juveniles. Other potential mammalian prey available in the area are the rodents *Oryzomys longicaudatus*, *Rattus rattus*, and the caenolestid marsupial *Marmosa elegans*, all of them nocturnal (Jaksić and Yáñez 1979). The passeriforms and ophidians present in the sample also have diurnal activity periods (see Johnson 1965 and Donoso-Barros 1966, respectively). The only egg found in the sample was most probably of a passeriform species.

The Harris' Hawk in central Chile can thus be characterized as a specialist rodent predator feeding mainly on diurnal prey. The content of pellets nearly matches prey remains found below nests of the hawk but fails to reveal the consumption of passeriforms, eggs, and ophidians.

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Aggressive Displays in Nonbreeding Canvasbacks

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The classical works of Heinroth (1911), Hochbaum (1944), Lorenz (1951, 1952, 1953), and Johnsgard (1965) have documented the reproductive displays of most members of the family Anatidae. Although the reproductive displays of ducks have been described thoroughly, much less is known about their aggressive displays during the nonbreeding period. Here I describe three aggressive displays that occur in nonbreeding Canvasbacks (*Aythya valisineria*), describe an aggressive pushing sequence that usually is preceded by the three displays, and comment on the function, evolution, and ecological significance of this behavior.

The study was conducted near Georgetown, Georgetown County, in coastal South Carolina during the winters of 1975 through 1977. The major research area contained four man-made impoundments where 200–500 Canvasbacks could be observed daily from early November to March. These impoundments ranged from 7.75 to 12.85 ha in size and from 0.50 to 1.50 m in depth. Three of the impoundments were freshwater, with banana water-lily (*Nymphaea mexicana*) as the major food. One impoundment had brackish water, with muskgrass (*Chara* spp.) and widgeon grass (*Ruppia maritima*) as major foods. At each impoundment, behavioral observations were made from permanent blinds or from a vehicle, with minimal disturbance to the birds. Aggressive interactions were recorded with 35-mm slides and with 16-mm movie film. Threatening and pushing sequences were timed with a stopwatch.

Smith (1977) has recognized the significance of displays as effective modes of communication. He also indicated that displays involved in aggression usually do not involve physical contact between individuals. In this paper, a display is defined as a behavioral act performed by one individual that causes a change in the behavior of a second individual. A chase occurs when one bird swims rapidly after a retreating bird with the head thrust forward and the bill slightly opened. A fight involves exchanges of biting and wing hitting between individuals.

Canvasbacks that overwinter in large open-water regions such as the Chesapeake Bay typically feed in dense flocks (pers. obser.). In my study area Canvasbacks did not feed in groups but dove at individual foraging sites (Alexander and Hair 1979). These foraging sites were separated by approximately 3–6 m and were vigorously defended against conspecifics.

I observed three distinctive aggressive displays among these birds:

1) *Bill-in-water*.—An individual (male or female) performed this display (Fig. 1a) as it surfaced from a dive, when an intruding conspecific had approached the foraging site closer than 3 m. The body profile was very low in the water, and the tip of the bill remained in the water. No bill-cleaning or feeding at the surface was associated with this display. The bird sat motionless in this posture until the intruder withdrew or intensified the encounter (e.g. chase, fight). At 3–5 m from the surfacing individual, I could detect a subdued wheezing “*rrrr-rrrr-rrrr*” vocalization as the bird displayed to an intruder. When a diving bird surfaced in the absence of an intruder, neither the visual display nor the vocalization was performed. In 65% of the observed encounters, the Bill-in-water display supplanted intruding Canvasbacks.

2) *Head-pump*.—An individual used this display (Fig. 1b) as it swam toward the foraging site of a conspecific. The body profile was high on the water, and the bird performed a vigorous upward thrusting of the head 2–3 times in succession. In this display, the bill was approximately 45° above the horizontal. During the pumping motion, the emphasis was on the upward thrusting of the head rather than the downward movement, as in precopulatory pumping (Lorenz 1951). In 70% of the observed encounters, Head-pumping was adequate to supplant a diving bird.

3) *Bill-on-chest*.—Individuals that were separated by a few cm up to 6 m performed this display (Fig.