

OBSERVATIONS OF A ZONE-TAILED HAWK FAMILY DURING THE POST FLEDGING PERIOD

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ABSTRACT.—Behaviour of a Zone-tailed Hawk (*Buteo albonotatus*) family were recorded during the post-fledging period at Michilia Biosphere Reserve in Durango, Mexico, from mid-July to mid-August 1981. Number of daily flights did not increase with time, but average time span for each flight increased as nestlings grew older. Juveniles repeatedly performed movements that imitated hunting behaviour of adults. Time spent by adults near the nest decreased following fledging of young. Adults delivered 5.9 ± 2.8 ($\bar{x} \pm S.D.$) prey items/d ($N = 10$ d); nestlings daily consumed an estimated 296 ± 130 g ($\bar{x} \pm S.D.$) daily. Amounts varied during the observation period. Differences in behaviour of both adults suggested that the parental role of each sex was different. Apparent aggression of adults towards young may be related to the development of juvenile flight and/or to dispersal. The family may have remained together away from the nest area, as probably occurs with other congeneric species.

Biology of the Zone-tailed Hawk (*Buteo albonotatus*) is among the least known of North American raptors (Hubbard 1974; Zimmerman 1976). No information exists on behaviour of families during the post-fledging period (Brown and Amadon 1968; Porter and White 1975; Matteson and Riley 1981). This paper describes the behaviour of a family in oak-pine forest at Michilia Biosphere Reserve in Durango, Mexico.

STUDY AREA AND METHODS

The Michilia Reserve is located in a transitional zone (2250 m) from high mountains to plateaus in the Western Sierra Madre (23°27'N and 104°18'W). Average monthly temperature varies between 12°C and 28°C and annual rainfall between 50 cm and 70 cm, falling mostly in summer (Gallina 1981).

The nest was located on the crown of an oak (*Quercus* sp.) 17 m in height on the side of a small ravine. Observations were made from 200 m away with 10 × 40 binoculars and a 40 × 25 telescope. Field work began when the 2 young seemed fledged (17 July 1981) and continued until 19 August when the juveniles apparently left the nest area. During this period, 11 d were spent observing the hawks' behavior from dawn to nightfall (approx. 0700 H–2000 H). Adults were distinguished by plumage characteristics observed in flight (one adult had a secondary broken). Individual nestlings were recognized by their sizes when observed side by side at the beginning of activity each day and then followed individually the rest of the observation period. Moreover each had different patterns of white spots on the breast. Prey consumed by the young were observed directly. Eighteen prey items had been partly consumed by adults. Weights used in biomass conversion were: Cotton Rat (*Sigmodon* sp.) 90 g; lizards 20 g; *Colaptes* sp. 125 g; *Sicalia* sp. 20 g. If partial prey items were seen then we have simply adjusted the appropriate conversion factor accordingly to what the parents brought (i.e., ¾, ½, ¼, etc., of the prey). Time spent by young eating prey and

weight of prey species captured by us assisted in compiling approximations.

RESULTS

Nestling Activity. Young of *Buteo albonotatus* gradually increased distance roamed from the nest (Table 1); flight time similarly increased (Fig. 1). Higher number of daily flights did not increase with time, rather the average time span each flight took increased as fledglings grew older (Spearman rank correlation coefficient $r_a = 0.911$; $P < 0.01$; $df = 8$; $r_b = 0.897$; $P < 0.01$; $df = 8$). There was also a positive relationship between age and proportion of daily flights in which more elaborate forms of flight maneuvers, such as gliding and circling, were employed ($r_a = 0.953$; $P < 0.01$; $df = 8$; $r_b = 0.887$; $P < 0.01$; $df = 8$).

On 23 occasions (82.1%) nestlings did not show aggressive responses to predators that were observed near the nest (e.g., Turkey Vulture (*Cathartes aura*) $N = 17$; Red-tailed Hawk (*Buteo jamaicensis*), $N = 1$; Cooper's Hawk (*Accipiter cooperi*), $N = 1$; Raven (*Corvus corax*), $N = 4$. On 5 occasions, nestling "B" attacked intruders (*Cathartes aura*, $N = 2$; *Buteo jamaicensis*, $N = 3$).

During observation periods, juveniles repeatedly performed movements that imitated, and often exaggerated, hunting behavior of adults. Some of these behaviors (e.g., picking up small objects, "hunting" thick branches, etc.) are quite common in many raptors (Ficken 1977). Other behaviors observed were 1) "capturing objects": a juvenile would hurl itself, flapping its wings or diving, towards the tip of a thin tree branch, a pine cone, or a twig on the ground,

Table 1. Percentage of total observation time spent by 2 juvenile Zone-tailed Hawks (A and B) at different distances from the nest during post-fledging dependence period.

OBS. PERIOD		DISTANCE				N (MIN)
		IN NEST	<200 M	200-400 M	>400 M	
1st week	A	61.7	38.3	0.0	0.0	3600
	B	9.2	90.2	0.0	0.0	3600
2nd week	A	3.5	82.6	12.8	1.0	1299
	B	0.2	96.8	0.0	2.9	1440
3rd week	A	8.5	81.8	5.7	4.0	1320
	B	6.1	83.7	5.7	4.5	1320
4th week	A	0.0	47.6	14.3	38.1	1320
	B	0.0	44.7	11.4	43.9	1320

and seize the object with its talons. Several times the young bird broke up the twig or pine cone and bit the object while in flight. Object capture was first observed during the third week (N = 12) and more often in the fourth (N = 57); 2) "hunting from a perch" while perched a juvenile would repeatedly look at the ground, then launch from its perch and "capture" a twig on the ground only to drop the twig as soon as flight was resumed. Perch hunting was observed twice in the last week.

Adult-Young Interactions. Time spent by adults near the nest decreased dramatically following fledging of young. In the first week, adult "A" remained in the defended area near the nest most of the time (78.3%), while "B" was rarely present (4.12%). During subsequent weeks, time spent near the nest by both adults was limited (4.1%, 0.0% and 0.2% for "A," and 0.8%, 4.3% and 2.0% for "B"). Adult "A" seemed to defend the area most of the time and attacked possible predators (*C. aura*, N = 12; *B. albonotatus*, N = 1; *B. jamaicensis*, N = 4; and *C. corax*, N = 13) 83.3% of the 30 times both were present; "B" responded aggressively only 12.5% of 8 encounters with potential predators (*C. aura*, N = 2; *B. jamaicensis*, N = 1; *A. cooperi*, N = 1; and *C. corax*, N = 4). Difference between the two responses was statistically significant (G = 11.4; P < 0.01; df = 1; G test, Sokal and Rohlf 1979).

Parents delivered prey to young who tore food apart and fed by themselves. Adults brought mostly Cotton Rats (N = 20) lizards (*Sceloporus* spp; N = 26) and small to medium-sized birds (*Sicalia* sp; N = 2. *Colaptes* sp. N = 6 and 6 unidentified birds).

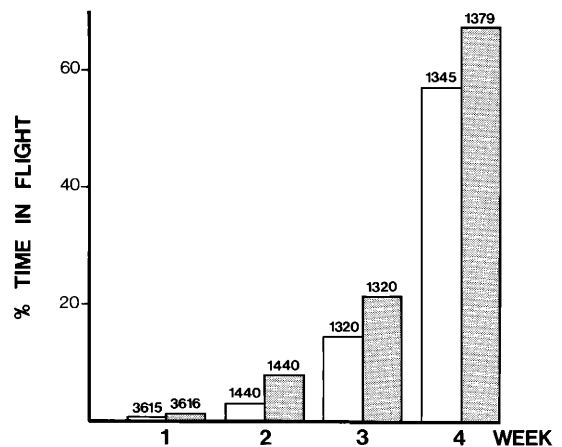


Figure 1. Percentage of total observation time spent in flight by juvenile from the first to the fourth observation week. Open bars: young A; Shade bars: young B.

Of 59 occasions during which the adults could be identified, "B" brought prey 40 times and "A" only 19, values different from those predicted by random sampling ($\chi^2 = 7.48$; P < 0.01; df = 1). Both adults usually carried food in their talons (96.8%; N = 63), although adult "A" carried small lizards in its beak on 2 occasions.

Nestlings begged for food with loud and continuous "chirps" as soon as one of the parents entered the nest area. Vocalizations were heard throughout the fledgling period and often occurred during the third and fourth weeks even when adults were not present. During the first week of observation, parents would most often bring food to where young were perched (93.3%; N = 30). In the later weeks the young would commonly approach adults for food (76.5% of observed food exchanges N = 17, in the second week; 90%; in the third week, N = 30 and 100% in the last week, N = 6). Prey was presented to the young in the nest during the first week (76.7%; N = 30) or on perches 100 m away. Later, feeding never took place in the nest. Feeding did occur 54.3% of the times within 100 m radius of the nest, 24.2% between 100 and 200 m, and 12.1% at >200 m between the second and fourth weeks of observation. Prey was transferred in the air only 9.3% (N = 63) of the time.

Adults delivered a mean of 5.9 ± 2.8 ($\bar{x} \pm S.D.$) prey items/d (N = 10 d) to the nestlings, which consumed an estimated 296 ± 130 g ($\bar{x} \pm S.D.$)

daily. Amounts varied during the observation period. During the first two weeks young received 352 ± 113.7 g ($\bar{x} \pm$ S.D.) of food/d ($N = 7$), and during the last two weeks 165 ± 21.8 g/d ($N = 3$). In 18 out of 39 cases (46.1%) which we were able to see clearly, adults brought only portions of prey animals. Zone-tailed Hawks would not consume prey which fell on the ground (5%; $N = 63$). Of the remaining prey, 93% was consumed by a single nestling and 7% was consumed by both young at the same time.

Juveniles being harassed by adults or each other was often observed. One juvenile harassing the other occurred once in the second week, none in the third week and 10 times in the fourth. Adults were observed to harass their young 8 times during the final week of observation.

DISCUSSION

Young of *Buteo albonotatus*, like those of other raptors, gradually increase the distance roamed from the nest and progressively develop flight techniques (Johnson 1973; Harper 1976; Kussman 1977; Sherrod 1983; Woffinden and Murphy 1983; González et al. 1985). Imitation of adult hunting maneuvers, also observed in other raptors (Ficken 1977; Paull 1977; Bildstein 1980; Johnson 1986), can be considered a form of play that helps with development and training of muscles used during hunting (Bekoff 1976; Fagen 1976). We do not believe these behaviors correspond to failure at catching prey, since we did not see juveniles capture prey during observations.

As in other raptors (see Mueller and Meyer 1985), the different behaviour of both adults suggests that the parental role of each sex was different. The smaller adult "B," probably the male, was mainly hunting and bringing prey to the young, while adult "A," probably the female, defended the nest area.

Apparent aggression of adults towards young may be related to the development of juvenile flight and/or to dispersal (Brown and Amadon 1968; Trivers 1974; Milburn 1979; Sherrod 1983). In this last sense aggression can be interpreted as a behavior directed to chase offspring off the adults' hunting ground (Alonso et al. 1987). Adult-juvenile and juvenile-juvenile aggressive interactions may indicate increasing tensions among family members as adult care of young decreases, as expected in parent-offspring conflict prior to family rupture (Trivers 1974). Juveniles, however, seemed to demand the same degree of attention from parents throughout the ob-

servation period. On the other hand, as our data might suggest and for some raptors living in temperate climates (Alonso et al. 1987), the dispersal of a *Buteo albonotatus* family group is initiated by the parents. Obviously, our results should be considered as preliminary, since our reported observations are based upon a single pair. No evidence exists to support the idea that juveniles actually separated from adults during the observation period. The family may have remained together away from the nest area, as probably occurs with other congeneric species (Johnson 1986).

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New England Hawk Watch Conference. The New England Hawk Watch will hold a one day conference on subjects related to raptors and raptor migration. The conference will be held on Saturday, 7 April 1990, at the Holiday Inn in Holyoke, Massachusetts (site of previous NEHW conferences). The program is presently in the planning stage. Following the day's events, there will be a banquet with Peter Dunne as guest speaker. **For more detailed information and pre-registration write to: HAWKS, P. O. Box 212, Portland, Connecticut 06480 USA.**