

Because the female had stopped calling while osprey B was still in view, it is likely that osprey B was her mate; the female generally called in the presence of intruders and never called when only her mate was present. In addition, osprey B behaved aggressively toward all of the males entering the nest area. Osprey B left the nest area without returning to the nest, however, so the identification of osprey B is not certain.

The use of a rock as a tool by an osprey has not previously been reported. Rock-dropping behavior has been reported in Egyptian vultures (*Neophron percnopterus*), which drop rocks on ostrich (*Struthio camelus*) eggs to open them (J. Alcock 1970, *Ibis* 112:542). Rock dropping has also been reported by Janes (1976, *Condor* 78:409), who observed nesting common ravens (*Corvus corax*) dropping rocks on human intruders. Hypotheses explaining the osprey's rock-dropping behavior include the following: (1) if osprey B was the breeding male at the Wilcox West nest, it may have used the rock to displace an intruding male from the nest area, or (2) the rock-dropping behavior may have been displacement activity, irrelevant behavior produced by the interplay of conflicting drives (J.L. Gould 1982, *Ethology*, Norton, New York, NY U.S.A.).

Some birds have been observed to demonstrate considerable intelligence (e.g., T.H. Turney 1982, *Bull. Psychon. Soc.* 19:59-62; I.M. Pepperberg 1983, *Anim. Learn. Behav.* 11:179-185); the observed incident of rock-dropping by an osprey suggests the possibility that ospreys are capable of insight learning (see J.C. Welty and L. Baptista 1988, *The life of birds*, Saunders, New York, NY U.S.A.). Osprey B may have redirected a nest-material-carrying mechanism to solve a new problem: that of an agonistic encounter with osprey A. Heinrich (1988, *Condor* 90:271-274) suggested that the rock-dropping behavior observed in ravens by Janes may have been purposeless displacement activity. This hypothesis could also explain the rock-dropping behavior of osprey B.—**John P. Roche, Department of Biological Sciences, Central Connecticut State University, New Britain, CT U.S.A.** Present address: Center for the Integrative Study of Animal Behavior, Indiana University, 402 N. Park Ave., Bloomington, IN 47405 U.S.A.

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WINTER CARRION FEEDING OF RED-TAILED HAWKS IN OKLAHOMA

The red-tailed hawk (*Buteo jamaicensis*) is one of the best-known, most widely distributed hawks in North America (P.A. Johnsgard 1990, *Hawks, eagles, and falcons of North America*. Smithsonian Inst. Press, Washington, DC U.S.A.; C.R. Preston and R.D. Beane 1993, *Red-tailed hawk*. Pages 1-24 in *The birds of North America*, No. 52. Acad. Nat. Sci., Philadelphia, PA U.S.A.). Studies of red-tailed hawk diets revealed that the prey was mainly small mammals, but also birds, reptiles, amphibians, and insects (S.K. Sherrod 1978, *Raptor Res.* 12:49-121; Johnsgard 1990; Preston and Beane 1993). Red-tailed hawks usually hunt live prey; incidents of carrion feeding in this species are few and scattered (Sherrod 1978). However, carrion feeding is difficult to document using traditional pellet and stomach content analyses (P.L. Errington 1933, *Condor* 35:19-29; P.L. Errington and W.J. Breckenridge 1938, *Wilson Bull.* 50:113-121; Preston and Beane 1993). Here we report three observed incidences of carrion feeding by adult red-tailed hawks in northcentral Oklahoma during late winter 1993.

On 26 February 1993, at about 1000 H, an adult red-tailed hawk was observed feeding on the decaying carcasses of fish in the backyard of a home in Meeker, Oklahoma. Several domestic cats (*Felis domesticus*) were feeding on the fish when the hawk chased them away. The hawk then fed on the fish for almost 15 min, and it returned several hours later on the same day to continue feeding on the fish. On 1 March 1993, at about 1645 H, an adult red-tailed hawk was seen perched on a freshly killed domestic cat in the middle of a small, two-lane paved road in Stillwater, Oklahoma. The hawk was observed to feed on the cat for about 20 min. On 2 March 1993, at about 1330 H, an adult red-tailed hawk was seen sitting on the carcass of an adult eastern cottontail (*Sylvilagus floridanus*) along the shoulder of a two-lane highway approximately 6.5 km west of Stillwater, Oklahoma. The hawk was observed to feed on the rabbit for about 15 min, interrupted only by passing cars.

Small amounts (<2% of diet) of mammalian and avian carrion were found in red-tailed hawk winter diets in Iowa, Wisconsin, Minnesota, South Dakota, and California (Errington 1933, *Condor* 35:19-29; Errington and Breckenridge 1938, *Wilson Bull.* 50:113-121; Fitch et al. 1946, *Condor* 48:205-234). Carrion made up only 1.2% of the red-tailed hawk diet from across the U.S. with all 13 cases of suspected carrion feeding occurring between mid-November and

late February (A.K. Fisher 1893, USDA Div. Ornithol. Mammal., Bull. 3, Washington, DC U.S.A.). Carrion feeding by red-tailed hawks may be more prevalent than food habit studies suggest, particularly in winter in locations where favored prey become scarce. However, it remains unclear when carrion becomes acceptable as food to red-tailed hawks. Red-tailed hawks in Arkansas concentrated winter feeding activities around poultry farms where carrion (dead chickens) was readily taken (D. James pers. comm.). However, fresh carcasses located near nests were never used by Alaskan red-tailed hawks, even during food shortages (C.M. Lowe 1978, M.S. thesis, Univ. Alaska, Fairbanks, AK U.S.A.). Red-tailed hawks apparently have a remarkable capacity for modifying their diet to accommodate local prey including carrion. In addition to stomach and pellet content analyses, field observations of feeding red-tailed hawks can shed some light on the types of food red-tailed hawks or other raptor species will take when prey are scarce.

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FRUIT-EATING BEHAVIOR OF A BARRED FOREST-FALCON

Barred forest-falcons (*Micrastur ruficollis*) are known to prey on reptiles, birds, amphibians, small rodents, and insects (L. Brown and D. Amadon 1989, Eagles, hawks, and falcons of the world. Wellfleet Press, Seacacus, NJ U.S.A.; R.K. Thorstrom et al. 1991, *Condor* 92:237-239; R.K. Thorstrom 1993, M.S. thesis, Boise State Univ., Boise, ID U.S.A.). I am unaware of any published record of this species feeding on fruits. Here, I describe two observations of fruit eating by an incubating female barred forest-falcon in Guatemala.

While studying a population of barred forest-falcons in Tikal National Park, Guatemala (17°13'N, 89°36'W), I observed the same female on 24 April 1989 and 14 April 1991 after she left her nest cavity. On both occasions, after preening for 2 min, the falcon flew to the ground and immediately began feeding on the small fallen fruits of a palo de tzol tree (*Tikalía (Blomia) prisca*). The bird fed for approximately 1 min during each observation. After it finished feeding it flew to a perch near the nest, rested briefly, then flew back into the nest cavity. This fruit-eating behavior occurred at 1–2 wk after egg laying.

Among Falconiformes, frugivory has been documented in swallow-tailed kites (*Elanoides forficatus*; W.H. Buskirk and M. Lechner 1978, *Auk* 95:767–768; T.O. Lemke 1979, *Condor* 81:207–208.), and in a number of diurnal scavenging species including the genera *Milvus*, *Gypohierax*, *Phalcooboenus*, *Polyborus*, *Daptrius*, and *Milvago* (L. Brown and D. Amadon. 1989. Eagles, hawks, and falcons of the world. Wellfleet Press, Seacacus, NJ U.S.A.). Frugivory may be more common in tropical forest raptors than the few reports indicate, but because of dense forest structure and the secretive behavior of most species, it is difficult to observe.

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