

juvenile's head but missed. The juvenile swallowed the bullhead and began sparring with the adult while vocalizing between strikes. Once, the adult's bill struck down to the back of the throat of the juvenile, which caused an injury. After that the herons were startled by a shout and the adult flew and landed about 300 m away, the juvenile remained, bleeding profusely from the corner of its mouth. It dipped its bill in water and approximately 1 min later captured and ate a 12-cm bullhead.

On 19 May 1983 between 14:14 and 14:20 at Duck Lake, 12 km north of Creston, a second observed case of extreme aggression occurred. One adult heron (A) had just captured and eaten a 10-cm largemouth bass (*Micropterus salmoides*) when a second adult heron (B) flew toward it. As B approached, A flew 10 m in the opposite direction. B then landed 15 m from A and the two faced one another, both in aggressive upright postures. B turned and in a forward posture walked slowly away from A. A then followed, still in an aggressive upright posture. A turned and in a forward posture walked slowly away from B. B followed, still in a forward posture. B then flew and landed on the back of A. B struck four glancing blows at the head and neck of A, and with its mandibles grasped A's neck just below the head and held A's head under water for 5 sec. A freed itself from B's grasp whereupon B struck and hit A on the back. A then flew and landed about 150 m from B.

On another occasion we discovered a dead heron which we believed to have been killed fighting with another heron. At 08:00 on 11 January 1979, EM observed an adult Great Blue Heron standing near a small opening in the ice near the CVWIC and a dead juvenile heron in the snow 12 m away. The carcass had a punctured cranium and in the fresh snow were spots of blood, wing tip marks, and heron tracks. No signs of a predator's activities were found in the snow or on the carcass.

We believe these incidents of extreme aggression are related to limited access to foraging sites. Deep water in summer (Forbes and Flook, unpubl.) and ice in winter restrict the access of Great Blue Herons to their foraging sites and possibly intensify competition among herons. Adults feeding young in May and the presence of fledged young on the foraging grounds in July may also increase competition. Bayer (Natl. Audubon Soc. Resear. Rept. No. 7:213–217, 1978) found that juvenile Great Blue Herons in Oregon fed non-territorially and disappeared at a greater rate over winter than did adults. He suggested that territory acquisition was essential to over-winter survival. We believe that the intense aggression we observed resulted from a shortage of suitable foraging sites, and that the risk of serious injury during aggressive fighting perhaps explains the rarity of such behavior.

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Combined-effort hunting by a pair of Chestnut-mandibled Toucans.—Combined hunting efforts have been reported for many predatory birds, including Cattle Egrets (*Bubulcus ibis*) (Wiese and Crawford, *Auk* 91:836–837, 1974), Golden Eagles (*Aquila chrysaetos*) (Meinertzhagen, *Ibis* 14:530–535, 1940), Lanner Falcons (*Falco biarmicus*) (Mebs, *Vogelweit* 80:142–149, 1959), Eleonora's Falcons (*Falco eleonora*) (Walter, *Eleonora's Falcon*, Univ. Chicago Press, Chicago, Illinois, 1979), and Crested Caracaras (*Polyborus plancus*) (Whitacre et al., *Wilson Bull.* 94:565–566, 1982), with either of two general scenarios occurring: one

bird works as a "beater," flushing prey while another bird follows, ready to exploit any sudden appearance of prey, or two (or more) birds pursue the prey, either simultaneously or alternately. Observations of an individual of one species using a member of another species as a "beater" have also been made (Bourne, *Ibis* 102:136, 1960; Currie, *Ibis* 102:475, 1960; for review see Rand, *Fieldiana:Zoology* 36:1-71, 1954).

The Chestnut-mandibled Toucan (*Ramphastos swainsonii*), occurs from Honduras to western Ecuador. It is said to subsist primarily on fruits but also preys opportunistically on insects, small reptiles and amphibians, and on the eggs and young of other birds. Although some observations of predation on insects, bird eggs, nestlings, and lizards have been reported (Laughlin, *Condor* 54:137-139, 1952; Koepcke, *J. Orn.* 113:138-160, 1972; Skutch, *Publ. Nuttall. Ornith. Club*, No. 10, 1972; Howe, *Ramphastos swainsonii*, pp. 603-604 in *Costa Rican Natural History*, D. Janzen, ed., Univ. Chicago Press, Chicago, Illinois, 1983), little information is available on actual hunting behavior. Here we describe observations of two Chestnut-mandibled Toucans preying on a lizard.

These observations were made on Barro Colorado Island, Panama, on 5 May 1983. We first observed the pair of toucans at 14:00, perched about 10 m away from us. After we had watched them for about 60 sec, one flew to a large silkcotton tree (*Ceiba pentandra*), touched its feet to the trunk, hovered momentarily and then returned to its perch 4 m away. Within 1-2 min, the other toucan flew towards the tree, flushing an *Anolis frenata* (about 30 cm long) which scurried down the trunk and halted under a large philodendron (*Philodendron* sp.) leaf. Four min later one of the toucans flew directly at this leaf, flushing the lizard onto the exposed trunk. As the lizard ran down the trunk, the second toucan, who had been watching attentively, flew towards the lizard and attempted to catch it with its bill. One toucan perched on a vine next to the tree trunk, while the other perched about 7 m away. For the next 3-4 min they both watched the trunk. Then the toucan perched 7 m away flew and brushed past the tree, again flushing the lizard from beneath a large leaf. As the lizard ran down the tree and onto the opposite side of the trunk from this toucan, the second toucan pursued the lizard in a spiralling chase down the trunk, finally catching it in its bill. The bird then flew to an understory perch and began crushing the lizard in its bill by means of a biting action. The second toucan flew to a perch only 3 m away from the first and watched. After 20 sec of biting, shaking, and occasionally beating the lizard against the perch, the lizard's tail fell to the ground. The nearby toucan immediately hopped and flew down to the forest floor, picked up the tail in its bill, and flew to another perch. By this time the first toucan had ceased shaking the lizard. As the second toucan swallowed the tail, it was joined by the first toucan, still carrying the lizard in its bill. After 1-2 min, the toucans departed together.

With but one observation of Chestnut-mandibled Toucan pair-hunting behavior, we can draw no conclusions about the intent of cooperation or lack of it. Several behavioral traits show their ability to cooperate, however, and suggest that cooperative hunting is possible. They are gregarious, mates preen each other, and often feed one another fruit (Skutch 1972). Well after breeding, males defend portions of fruiting trees against all other frugivores except their mates (Howe 1983). Hunting in pairs may increase the success rate in capturing elusive prey, as has been suggested for some of the other pair hunting birds mentioned above.

A question arising from these observations is whether or not both toucans getting a portion of the lizard was strictly a coincidence. Autotomizing of tails is an escape mechanism frequently used by lizards (Dial and Fitzpatrick, *Science* 219:391-393, 1983), and could be learned by predators. The behavior of the toucans, including the fact that shaking of the lizard stopped just after the tail fell off, suggests that the process was not new to them, although the possibility remains that it was unexpected.

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Brigham Young University, and thank the staff of the Smithsonian Tropical Research Institute, Barro Colorado Island, who provided facilities while we were in Panama. Alexander Skutch, Neal Smith, Burt Monroe, and Henry Howe kindly provided suggestions and comments on an earlier draft of this note.—DAVID P. MINDELL AND HAL L. BLACK, *Dept. Zoology, Brigham Young Univ., Provo, Utah 84602. Accepted 19 Mar. 1984.*

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Birds predominate in the winter diet of a Barn Owl.—Barn Owls (*Tyto alba*) are thought to prey primarily upon small mammals (Marti, *Condor* 76:45–61, 1974; Hamilton and Neill, *Am. Midl. Nat.* 106:1–9, 1981; Bunn et al., *The Barn Owl*, T. & A. D. Poyser, 1982). This note describes an instance of a Barn Owl feeding primarily on birds. A single Barn Owl of unknown sex roosted in a barn on the Marais Temps Clair Wildlife Area, St. Charles Co., Missouri, from approximately November 1980–March 1981. The 373-ha area comprises a large riverine marsh surrounded by agricultural land.

Forty regurgitated pellets were collected from the barn in August 1981 and examined for identifiable remains. Skulls, feet, and feathers of birds, and skull, mandibles, and fur of mammals were contained in the pellets and were used to identify prey, primarily by comparing with museum specimens. Numbers of individuals consumed were determined by counting skulls or skull fragments within pellets. Biomass of each prey type was estimated from published weights (Marti 1974) and museum specimens.

Avian material occurred in 39 of 40 (98%) pellets and mammalian remains occurred in only four (10%). Remains of 21 Red-winged Blackbirds (*Agelaius phoeniceus*), four Starlings (*Sturnus vulgaris*), one Rusty Blackbird (*Euphagus carolinus*), one Common Grackle (*Quiscalus quiscula*), one *Microtus* sp., and one *Peromyscus* sp. were identified. Based on prey weight estimates (in parentheses) the relative contribution to diet biomass of these taxa was as follows: Red-winged Blackbird (60 g) 69.6%; Starling (80 g) 17.7%; Rusty Blackbird (65 g) 3.6%; Common Grackle (100 g) 5.5%; *Microtus* sp. (45 g) 2.5%; *Peromyscus* sp. (20 g) 1.1%. Birds comprised 96.7% of the food ingested.

Marsh areas of the Marais Temps Clair Wildlife Area were used by large flocks of “black-birds” during winter 1980–81. Although Barn Owls typically feed on small mammals, their diets have been shown to shift to include more avian prey when rodent populations decline (Hawbecker, *Condor* 47:161–166, 1945; Otteni et al., *Wilson Bull.* 84:434–448, 1972; Smith et al., *Great Basin Nat.* 32:229–234, 1972). No studies in North America have documented a proportion of birds in the diet as large as that reported here. Lacking information on small mammal abundance, we don't know if the higher incidence of birds resulted from a decline in rodent populations or was simply a dietary response to a readily available concentration of marsh dwelling birds.

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