

## OBSERVATIONS ON THE FOOD AND NESTING OF THE BROAD-WINGED HAWK (*BUTEO PLATYPTERUS*) IN NORTHEASTERN KANSAS

HENRY S. FITCH

University of Kansas  
 Natural History Reservation  
 Lawrence, Kansas 66044

Since the University of Kansas Natural History Reservation was established as a natural area in the northeastern corner of Douglas County, Kansas, in 1948, rapid successional changes have occurred. Many species have changed their status on the area. One such species is the Broad-winged Hawk (*Buteo platypterus*). During the early years of the Reservation, it was conspicuous, but after 1965, its numbers suddenly decreased and it no longer occurs there regularly.

Broad-winged Hawks were seen frequently only in the northwestern part of the Reservation. This flat hilltop with old pastures of tall grass and clumps of brush gives way to steep hillsides of southern exposure, having a xeric woodland dominated by honey locust (*Gleditsia triacanthos*) and osage orange (*Maclura pomifera*). Dogwood (*Cornus drummondii*), plum (*Prunus americana*), sumac (*Rhus glabra*), and crabapple (*Malus ioensis*) form thickets in abandoned fields and at the edge of woodland. Elm, hickory, and oak dominate more mesic woodlands.

### SCHEDULE

The Broad-winged Hawk is a summer resident of the Reservation. Fourteen recorded arrival dates from 1950 through 1965 ranged from 13 April to 28 April, with an average of 19 April. In 1962 the hawks were seen less frequently than before. After 1965, they were not seen regularly and there was no assurance that any particular record represented an arrival date.

The timing of three nestings observed on the Reservation in 1954, 1957, and 1958 varied only a few days. The hawks established territories, acquired mates, and built nests quickly. By the end of April, the birds were laying eggs. Riley (*The Osprey* 6:21, 1902), quoted by Bent (*Life histories of American birds of prey. Order Falconiformes. Part 1.* Dover Publications, Inc., New York, 1961), described a more lengthy nest-building period than was recorded on the Reservation in 1954, 1957, and 1958.

On 4 May 1957, a hawk was flushed from a nest, and on 9 June eggshell was found beneath this nest. On 11 June, when the nest was examined for the first time, there were three nestlings. The largest weighed 73 g and the smallest, appearing to be newly hatched, weighed 27 g. Bent (*op. cit.*) stated that incubation is between 21 and 25 days, but possibly this was an underestimate. In a nest found in 1954, the two young hatched a day apart, on 6 and 7 June. The nest found in 1958 had young about 11

days ahead of those in the nest found in 1954. A 3-day head start would have been provided by an earlier arrival date in 1958. The following schedule is suggested as typical.

19 April—average arrival date  
 20-25 April—establishment of territory, acquiring of mate, and nest building  
 26 April to 5 May—egg-laying  
 May and sometimes first week of June—incubation  
 June and early July—young in nest  
 June 30 to July 11—fledglings leaving nest

### DEVELOPMENT OF YOUNG

At hatching young weighed 27 or 28 g. An egg that was pipped at 08:30, 7 June 1954, was still in process of hatching at 16:00; the hatchling was still wet and moving feebly.

Records were most complete for the nest found in 1954; figures 1 and 2 show the growth of its two young. At hatching they were the same size, but the first hatched one day before the second. The initial advantage may have permitted it to compete more successfully, or sexual difference may have caused differential growth. The difference in size and weight increased until the smaller was taken by a predator at an age of 21 days.

The hatchlings had long, fluffy, white down and often pecked at each others faces. Quills of remiges were in evidence on day 9 and grew to lengths of 5, 8, 11, 14, 25, and 30 mm on successive days thereafter. Vanes of feathers emerged on day 16 and were 20 mm by day 19 and 40 mm by day 21. On day 19, a nestling stood erect with threatening posture when disturbed. At day 23, it struck with its feet and pecked at the investigator. At day 24, feathers concealed the down over most of the body. At day 25, the fledgling fought vigorously to avoid being handled, and at day 35, it flew from the nest. Presence of the investigator may have hastened its departure.

Rectal temperatures taken at 4-9 days were: 38.2, 38.3, 38.6, 38.2, 38.3, 38.4, 39.7, and 39.7°C, but at 20, 21, and 22 days rectal temperatures of the same two nestlings were: 41.6, 41.4, 42.3, 41.7, 41.4, 41.7, and 42.0°C.

### FOOD HABITS

Broad-winged Hawks on the Reservation were seen to hunt by watching from a low and inconspicuous perch on a fence post or in a tree, from which prey was detected and taken with a sudden short glide.

Prey was observed in nests or sometimes was withdrawn with spatulate forceps from crops of the nestlings. After identification, such morsels were refed to the hawks. Remains found in the pellets disgorged at the nest usually seemed to be the same individual prey animals found earlier at the nests. In a few instances there was no possibility of duplication. In 1954 and 1958, the fledglings were confined in a wire cage at the nests, and the adults continued to bring prey.

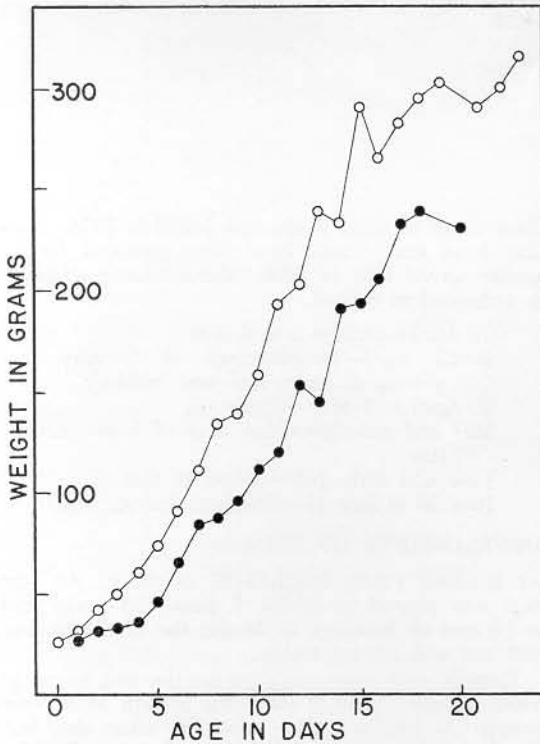


FIGURE 1. Growth of two nestling Broad-winged Hawks measured in terms of weight.

In the three nests that were observed in 1954, 1957, and 1958, recorded prey items totaled 138 (table 1). Of the 35 birds brought as prey all but one were nestlings. They included 7 Cardinals (*Cardinalis cardinalis*), 6 Yellow-billed Cuckoos (*Coccyzus americanus*), 2 Kentucky Warblers (*Oporornis formosus*), 2 Brown-headed Cowbirds (*Molothrus ater*), 1 Tufted Titmouse (*Parus bicolor*), and 17 that were not definitely identified.

Many of the identifications were made from small portions of the animals that remained uneaten or were found in the nestlings' crops. Weight of the individual prey animal usually was not known, so a typical weight was selected usually based on the average of a substantial series of live individuals weighed. With extrapolation from an average weight for each prey species, it was calculated that the total biomass for the 138 prey items recorded was approximately 2.6 kg. More than 60% of the items weighed between 10 and 30 g.

Records of prey brought to nests were most complete in 1954. The nest observed that year was found 9 days before the first egg hatched and usually was visited four or five times each day while nestlings were present. Probably most of the prey items brought by the adults were observed, but some brought soon after dawn may have been too far digested to have been discovered. When two or more items of the same kind were delivered at about the same time, dismembered remains in the nestlings' crops may not have been recognized as belonging to more than one individual.

An average of 1.94 prey items per day were recorded brought to the nest. On 14 different days two prey items were brought, on 8 days three items were brought, on 8 days one item was brought, on

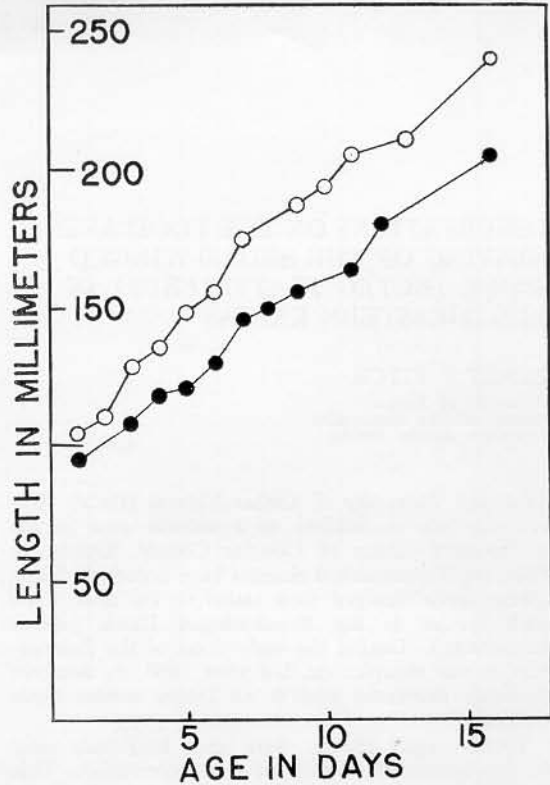


FIGURE 2. Growth of two nestling Broad-winged Hawks measured in terms of body length.

3 days nothing was brought, and on 2 days four items were brought. For the 5 successive weeks of observations, number of prey items brought per day averaged 1.28, 2.71, 2.29, 2.00, and 1.43. Deliveries were most frequent during the second week when growth was most rapid. For the entire period the adults contributed on the average a little less than one prey item apiece per day. There seemed to be a slight tendency for the adults to bring prey more frequently as the day progressed. Between 07:30 and 10:00 prey was present on 45.5% of visits (33); this increased gradually during the day until between 5 pm and 7:30 pm prey was present on 56.5% of visits (46).

#### COMPETITION WITH OTHER BUTEOS

From 1953 through 1956, Red-shouldered Hawks (*Buteo lineatus*) were present on the Reservation. The territory of one overlapped that of a pair of Broad-winged Hawks. "In encounters . . . dominance was not clear-cut, nor was any actual fighting observed" (Fitch, Univ. Kansas Publ. Nat. Hist. 11: 63, 1958).

A Broad-winged Hawk territory was within the territory of a pair of Red-tailed Hawks (*Buteo jamaicensis*). On many occasions interspecific encounters were observed, with one or two individuals of each kind soaring and making occasional threatening swoops. Friction between the two species was reduced by (1) the Broad-winged Hawk's habit of perching where concealed by foliage; (2) its preference for rocky and scrubby hillsides that were relatively little used by the Red-tailed Hawks; and (3) its relative indifference to humans.

TABLE 1. Prey of the Broad-winged Hawk and Red-tailed Hawk on the University of Kansas Natural History Reservation, comparing relative frequency and biomass.

	Prey of Broad-winged Hawk (138 items)			Prey of Red-tailed Hawk (541 items)		
	No. of occurrences	Percentage frequency	Percentage biomass	No. of occurrences	Percentage frequency	Percentage biomass
"Bird" <sup>a</sup>	35	25.3	27	30	5.5	3
Ring-necked snake	13	9.4	3	23	4.2	trace
Prairie vole	9	6.5	10	39	7.2	2
Shrew ( <i>Blarina-Cryptotis</i> )	9	6.5	4	4	.8	trace
Cottontail	7	5.1	14	128	23.6	48
Blue racer	7	5.1	7	8	1.7	1
Great Plains skink	6	4.3	7	1	trace	trace
Beetle	6	4.3	trace	4	.8	trace
Mole	3	2.2	6	14	2.9	2
Glass lizard	2	1.4	2	13	2.4	1
Pine vole	2	1.4	2	46	8.5	3
Grasshopper	2	1.4	1	2	trace	trace
Five-lined skink	13	9.4	3	—	—	—
Red bat	4	2.9	2	—	—	—
American toad	3	2.2	4	—	—	—
Collared lizard	2	1.4	4	—	—	—
Harvest mouse	2	1.4	1	—	—	—
Caterpillar	2	1.4	trace	—	—	—
Cicada	2	1.4	trace	—	—	—
Black rat snake	2	1.4	1	148	27.3	33
Racerunner	1	trace	trace	—	—	—
Prairie king snake	1	trace	1	—	—	—
Bullfrog	1	trace	trace	—	—	—
Cotton rat	—	—	—	14	2.6	1
Copperhead	—	—	—	35	6.5	5
Squirrel	—	—	—	6	1.1	trace
Carter snake	—	—	—	5	trace	trace
Wood rat	—	—	—	4	trace	trace
Bull snake	—	—	—	2	trace	trace
Other	4	2.9	1	15	4.9	1

<sup>a</sup> See text for list of species.

As closely related predators partly sympatric in their breeding ranges, the Red-tailed Hawk and the Broad-winged Hawk compete for food using some of the same prey species. For comparison with food records of the Broad-winged Hawk a total of 541 records of food items of the Red-tailed Hawk were obtained on the Reservation over an 11-year period: 1949 (10), 1952 (50), 1954 (4), 1955 (66), 1958 (241), and 1959 (170) (table 1). All were from pellets found in or beneath the nests. For all years except 1959, the Red-tailed Hawk nest where pellets were gathered was in a territory overlapping that of the Broad-winged Hawks that were studied. Changing availability of prey in time and space doubtless affected the comparison to some extent. Approximately 25% of the food biomass taken by the Red-tailed Hawk was in direct competition with the Broad-winged Hawk. For the Red-tailed Hawk prey items were calculated to average 106 g, in contrast to an average of 19 g for the Broad-winged Hawk.

#### SUMMARY

The Broad-winged Hawk was studied on the University of Kansas Natural History Reservation in north-eastern Kansas at approximately the western edge of its breeding range. The preferred habitat was scrubby and thorny second-growth woodland, with limestone outcrops and the adjacent brushy pastures

and old-fields. Average arrival date was 19 April, with a little more than 2 weeks variation for 14 years of records. Establishment of territories, finding of mates, nest-building, and most egg-laying takes place before the end of April. Nestlings make most of their growth in June and are fledged in early July, at an age of about 35 days.

A total of 138 prey items obtained from three nests included 26 kinds of prey, no one of which made up much more than one-sixth of the total. Nestling birds of cardinal or cuckoo size and small snakes and lizards were the favorite kinds of prey. The parent hawks brought, on the average, a little less than one prey animal apiece per day to a nest that was under observation while nestlings were in it. In this nest one young hatched a day earlier than the other and grew more rapidly.

Both Red-shouldered Hawks and Red-tailed Hawks were competitors of Broad-winged Hawks on the study area. Competition involved both active aggression and use of some of the same food resources. An estimated 25% of the food taken by the Red-tailed Hawk was in direct competition with the Broad-winged Hawk. The latter species tended to take much smaller prey (average 19 g) than the former (average 106 g).

Accepted for publication 9 May 1973.