

FOOD HABITS OF BUTEO HAWKS IN NORTH-CENTRAL UNITED STATES¹

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The data comprising the basis of this paper have been derived chiefly from recent studies in Iowa, Minnesota, and Wisconsin. While many stomachs have been sent in to us from various sources at different times, we have purposely avoided, except as otherwise indicated, the inclusion of data from material more than a few years old or from material not handled by ourselves personally. Our main objective has been to present a contemporary picture of the food habits of Buteo hawks in localities characteristic of north-central states environment.

We believe that stomach examinations have given us the most reliable data on the feeding habits of this genus of hawks, although we have supplemented stomach examinations whenever possible by field observations. Pellet analyses have been of some aid, but the usefulness of this technique in the study of Buteo is limited; bones of most prey animals withstand the digestive processes of these birds imperfectly if at all under ordinary conditions, and hence the pellets are not of the greatest value for quantitative work (Errington, 1932).

A particular effort has been made to distinguish between killed prey and food evidently eaten as carrion², but we have no way of knowing just what progress we have made in this respect. It is apparent that hawks of comparatively clumsy types, including Buteos, frequently feed on carcasses of one sort or another which they find dead in the first place. In view of the economic importance of certain species (poultry, game birds, etc.) that are known to be killed in large numbers by traffic and are well represented in the diets of some of our principal flesh-eaters, a clearer differentiation between foods eaten in connection with predation or with scavenging is much to be desired.

Aside from examination of rather complete carcasses retrieved from the possession of hawks in the field, some idea of the relative proportion of prey to carrion may be gained through careful examination of the contents of stomachs and gullets, especially of the latter in which the food is likely to be nearly in the same condition as when

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²We use the word "carrion" in this paper as denoting animal material which had been dead for some time before having been eaten, though not necessarily putrid.

eaten. Parenthetically, it should be pointed out, however, that the identification of a given item of food in a hawk stomach as carrion does not answer the question of whether the hawk had returned after a time to prey that had been killed or whether it had merely found a carcass acceptable as food; an investigator frequently has to weigh evidence according to probability and in the light of field experience.

In practice, we find that the portions of an animal eaten are useful in indicating whether the food represents probable prey or carrion. Gullet contents consisting of large quantities of skin, feathers, nearly meatless skeletal fragments (especially hindquarters or such bones as the sternum and synsacrum of large birds), with very little fleshy substance in the whole mass before digestion has taken place, suggest that there wasn't much left of the carcass at the time that the hawk started its meal. The presence of eggs or larvae of blow flies or sarcophagous insects of similar habits may be significant. Killed prey may often be suggested by heads and other parts of a victim usually eaten first by specific raptors, by solid masses of flesh (such as the upper breast meat of medium-sized birds), or by material comparatively free from dirt but mixed with particles of clean, incidentally ingested vegetation.

RED-TAILED HAWK—*Buteo borealis*

Data from the wooded and hilly dairy and agricultural lands of south-central Wisconsin.

The following generalization by Errington (1933a) is based upon the examination of 105 items of fresh prey retrieved from nests or from field feeding places, 7 gullet contents of juvenals, 15 stomachs of adults, and 17 pellets of superior quality.

"A composite of the redtail's food habits might be compiled from the 165 individuals of prey tabulated as quantitative data: cottontail (*Sylvilagus*) [including 8 or more juvenals], 18; arboreal squirrel (mainly *Sciurus niger rufiventer*), 11; Franklin's ground squirrel (*Citellus franklini*), 3; striped ground squirrel (*Citellus tridecemlineatus*), 49; chipmunk (*Tamias*), 3; Norway rat (*Rattus norvegicus*), 1; meadow mouse (*Microtus*), 42; deer mouse (*Peromyscus*), 4; house mouse (*Mus*), 1; weasel (*Mustela*), 1; shrew (5 *Blarina*, 1 *Sorex*), 6; young horned lark (*Otocoris*), 1; domestic pigeon (young?), 1; domestic chicken (all young but 2), 18; gallinule (*Gallinula*), 1; snake (1 *Heterodon*, 1 *Pituophis*, 2 *Thamnophis*), 4; frog (*Rana*), 1."

Errington goes on to conclude that the amount of damage red-tails may do to barnyard flocks "varies with the individual hawk and with the degree of exposure of the fowls and their ability to look out

for themselves. Old redtails that distrust man keep away from habitations where most poultry is congregated; these wary ones rarely get chickens except a few that wander far out in coverless fields. Juvenals, awkward hunters, seem to be the boldest raiders, but adults unusually tempted may lose some of their caution."

In the latter connection, and having a bearing on the popular supposition that hawks "once chicken killers, always chicken killers", we may again quote relative to studies of a redtail nest (Errington 1933a): "I was unable to obtain many real quantitative data . . . but judging by the masses of feathers always in sight and by the pellets from the youngsters, I feel safe in stating that this family of redtails lived almost exclusively upon young domestic chickens from the last of April to the forepart of June. From June 8 to about June 20, the diet was cottontail and ground squirrel, with some chicken. From the last third of June to July 9, the pellets of the tethered³ juvenal showed little except cottontail, ground squirrel and mouse." In another nest (also with tethered young), observed from May to July, chickens occurred most prominently from May 21 to June 5, sparingly both before and after these dates.

From the evidence, it then appears that the redtail's depredations upon domestic chickens are more a matter of convenience of access at times when and in places where the chickens are most vulnerable as prey. We suspect that preference plays a minimal rôle in governing the food habits of any of the Buteos, though plainly the hunting habits of individual birds may be modified by experience. Indeed, the readiness of the redtail to turn to the fresher grades of carrion when that is easier to get than live prey leads us to question that this hawk cares especially what it eats as long as the food is acceptable and may be secured with apparent safety.

Additional Wisconsin data on the feeding of the redtail represent mainly those recorded from winter field observations: carrion pig, 1; cottontail (including one that was carrion), 3; meadow mouse, 5; striped ground squirrel, 1; carrion domestic chicken, 1; cock ring-necked pheasant (*Phasianus colchicus torquatus*), 1; starving bobwhite (*Colinus virginianus*—see Errington, 1933b), 2. One stomach contained carrion domestic chicken.

A number of probable redtail winter pellets were picked up at random in the field but not systematically examined; these usually consisted of cottontail and mouse fur, and frequently of domestic

³Fastened for study on the ground near the nest; for discussion of technique of tethering see Errington, 1932.

chicken feathers. Domestic chickens eaten at this season largely represented carrion, of which an abundance was made available to red-tails and other scavenging predators through the farm practice of scattering carcasses of many sorts over the fields with manure. One pellet was noted to contain remains of a mole (*Scalopus*), and another, remains of a small mink (*Mustela vison*).

By way of comparing the redtail's food habits in south-central Wisconsin with the food habits of this species in southern Michigan, we may quote English (1934) on the prey brought to a nest he had under observation: "The following specimens of vertebrate prey were brought into the nest by the adults during a period of seventy-four days, between May 2 and July 15: Avian prey: Pheasants, 7; Hungarian partridge, 3; quail, 2; flickers, 3; starlings, 2; and sparrows, 2. Mammalian prey: moles, 7; *Microtus*, 7; cottontail (juvenile), 5; weasels, 5; fox squirrel, 5; red squirrel, 1; and spermophile, 1. One milk snake was also brought in. Some of the smaller animals, especially *Microtus*, were eaten immediately and left no trace. For this reason they could not be recorded from remains found in the nest. Pellet analyses disclosed, however, that many animals were eaten which were not observed as fresh prey. On the basis of the ninety-four pellets analyzed, *Microtus* runs up to sixty-two and small birds to fifteen."

Data largely from the open farming country of "Corn Belt" Iowa.

Nine stomachs, principally the contributions of Mr. Walter Thietje, of the University of Iowa Museum, for the fall and winter of 1933-34, contained cottontail in 4; meadow mouse (total of 3) in 2; Franklin's ground squirrel in 1; domestic chicken, 3; goose (?), 1; garter snake (*Thamnophis*), 1. Of these items, all three of the domestic chicken representations were judged to be carrion; likewise, the Franklin's ground squirrel and one of the cottontails. A considerable quantity of grasshoppers (*Melanoplus*) was found in one stomach, and another hawk had eaten nothing but crickets (*Gryllus*).

Food items noted in the course of field observations: cottontail, 3; *Microtus*, 1; *Peromyscus*, 2; unidentified mice, 2; Franklin's ground squirrel, 1; young domestic chicken, 1; ring-necked pheasant (a young cock and a carrion hen), 2; traffic-killed Hungarian partridge (*Perdix perdix*), 1; bob-white (including one bird weak from an undetermined cause), 2.

Thirty-two pellets were examined between the fall of 1933 and the spring of 1936. Twenty were predominantly of cottontail; 11 of mice, representing a total of about 55 *Microtus* and *Peromyscus* in approximately equal proportions; one, domestic chicken.

Data largely from the prairie agricultural lands of southern Minnesota and eastern South Dakota.

Forty-four stomachs of various races of redtails were examined, from hawks sent in to Breckenridge by individual coöperators during the fall and spring of 1932-33. Five of these were empty.

Representation of food items: carrion hog (?) in one stomach; cottontail (judged to be carrion in three instances), 8; juvenile Leporidae, probably cottontail, 2; meadow mouse, 7; deer mouse, 3; harvest mouse (*Reithrodontomys*), 1; pocket gopher (*Geomys*), 1; Franklin's ground squirrel, 2; striped ground squirrel, 4; short-tailed shrew (*Blarina*), 2; domestic chicken (judged to be carrion in three instances), 4; ring-necked pheasant (including 4 young and 4 apparently carrion), 12; song sparrow (*Melospiza*), 1; mourning dove (*Zenaidura*), 1; toad (*Bufo*), 5; frog (*Rana clamitans*), 1; salamander (*Ambystoma*), 1. Two stomachs contained small amounts of unidentified feathers; and one held a mass of badly disintegrated unidentified feathers, probably carrion.

Insects were represented in ten stomachs, of which one stomach was gorged with grasshoppers. The chief insects eaten were grasshoppers and crickets, with one *Calosoma* and some other Coleoptera, and one moth.

Twenty of this lot of stomachs are recorded as from adult hawks and twenty-one from juvenals. The carrion feeding propensities of adults and juvenals did not seem to differ significantly, as the stomachs of three adults and four juvenals revealed material considered to be mainly carrion. Four of the five empty stomachs were juvenals, however, as well as the one stomach filled with grasshoppers.

As Breckenridge (1935) has pointed out, the unusually heavy representation of ring-necked pheasants in stomachs of redtails, rough-legs and other hawks shot in western Minnesota during the fall migration may at least in part be explainable in terms other than those of direct predation. Due to the large numbers of young and inexperienced pheasants normally to be found in the fall in good pheasant country, the high traffic toll upon them at this time makes pheasant carrion an especially available source of food for the migrants. The fall hawk flights, moreover, seem to be concentrated in this area, and pheasants lost or crippled in connection with the hunting season (for a discussion of crippling losses of game birds, see Errington and Bennett, 1933) are doubtless acceptable also to about whatever hungry predators are able to find or to capture them, including raptors of clumsy types.

RED-SHOULDERED HAWK—*Buteo lineatus*

Data from the densely wooded Wisconsin River Bottomlands of south-central Wisconsin.

“May, 1930, gullet contents of nestlings: snake (probably *Thamnophis*), 1; frog (*Rana*), 1. Fresh prey in nest: meadow mouse, 1. Nest litter contained feathers of a red-winged blackbird (*Agelaius*), considerable quantities of pellet mouse fur, snake scales, and crayfish (*Cambarus*) exoskeleton fragments.” (Errington, 1933a).

The Red-shouldered Hawk is fairly common in Iowa, but we find that we have practically no data enabling us to make an original contribution on its food habits. The general impression we have gained from field experience is that its food habits do not differ so very much from those of the Broad-winged Hawk, except that it may exert a little more pressure upon small mammals.

BROAD-WINGED HAWK—*Buteo platyterus*

Data from a lake-side tract of almost virgin woodland in south-central Wisconsin.

“July, 1929, material from one nest: chipmunk, 1; meadow mouse, 1; shrew (*Blarina*), 4; red-winged blackbird, 1; garter snake, 1; unknown quantities of insects (largely *Phyllophaga* and other Coleoptera).” (Errington, 1933a).

Data mainly from the partly wooded portions of eastern Iowa and southern Minnesota.

The seventeen stomachs examined were chiefly those sent to Errington by Thietje and to Breckenridge by Minnesota cöoperators. Most of the hawks were taken either in May, 1933, or in September, 1934.

Except for one stomach which was empty, all but one of this collection contained few to many insects, these comprising the principal contents of eight stomachs and being well represented in five more. Five hawks had swallowed large quantities of mud and three much plant material, apparently in connection with their feeding on animals inhabiting low, wet places. In one instance, the mud and vegetation were mixed and the mass had the general aspect of sod; the associated prey animals were two Carabid larvae and an earthworm.

Vertebrates listed in the analyses: cottontail (including carrion adult and one very young individual), 3; carrion striped ground squirrel, 1; small snake (*Storeria*), 2; unidentified snake, 1; toad (*Bufo*), 5; frog (*Rana*), 4.

Insects listed include wood ants (*Formicidae*), 8; May beetle (*Phyllophaga*) larva, 1; *Geotrupes*, 2; *Canthon*, 6; click beetle (Elatridae) larva, 1; ground beetle (*Harpalus*), 2; unidentified Carabid larvae, 12; Coleoptera debris, unknown number of genera and individuals. One stomach contained a mass of Diptera larvae and Lepidoptera larvae mixed. Of ten individuals of Lepidoptera larvae distinguished in other stomachs, five were Noctuids (cutworms and armyworms). Orthoptera were most heavily represented, the records showing counts of 113 grasshoppers (*Melanoplus*), 3 meadow grasshoppers (*Conocephalus*), and 1 cricket (*Gryllus*). Other invertebrates were a spider (Arachnida) and the previously mentioned earthworm (*Lumbricus*).

SWAINSON'S HAWK—*Buteo swainsoni*

Data from western Minnesota.

Two of three fall stomachs (one was empty) sent in to Breckenridge by coöperators contained nothing except insect material, almost wholly Orthoptera, with one beetle and one Noctuid larva.

Data from the vicinity of a nest in the timber of a dry creek, Haakon County, western South Dakota.

On August 23, 1934, Errington found one grown juvenal still staying about the nest, and collected seventeen fresh and recent pellets. The nest debris was of Leporidae, meadowlark, and snake remains, with a scattering of insect fragments.

Representation of prey: juvenile Leporidae (including 3 questionably identified as young jack rabbits and 2 as young cottontails), in 6 pellets; deer mouse, 1; prairie dog (*Cynomys*, including at least 1 young), 11; meadow lark (*Sturnella*, including traces in 2 pellets), 8; unidentified small birds (probably Fringillidae), 4; snakes (including only traces in 7 pellets), 16; insect remains (usually present in comparatively small quantities) in 16. A certain amount of vegetation was found, especially burdock (*Arctium*) seeds which we suspected of having been the stomach contents of the meadowlarks.

The high representation of both prairie dogs and meadowlarks is surprising to us, but the terrific drought season of 1934 may have in some way rendered these species unusually available. The snake identifications, made by Mrs. F. N. Hamerstrom, Jr. and the late Professor J. E. Guthrie for thirteen of the pellets, indicate that garter snakes (*Thamnophis*) and blue racers (*Coluber*) were eaten in about equal proportions.

We were surprised, too, by the rather incidental representation of insects in the pellets, even after the young had doubtless been hunting

“on their own” for some time. Those insects eaten were mainly *Melanoplus* and Carabid beetles, of which *Chlaenius* and *Harpalus* were identified. Grasshoppers were sufficiently abundant so that one would have expected them to have been taken in greater numbers; Errington has frequently observed the Swainson's Hawk in this region feeding in the manner described by Taverner (1926, p. 196): “It varies its rodent food with grasshoppers it catches on the ground with clumsy gravity, making heavy hops with waving wings and short runs hither and thither as it grabs the nimble insects with talons that look absurdly big and formidable for the purpose.”

AMERICAN ROUGH-LEGGED HAWK—*Buteo lagopus sancti-johannis*

Data from wooded, hilly agricultural lands of south-central Wisconsin.

“Falls of 1929 and 1930, stomach contents of 5 Rough-legged Hawks shot by hunters and farmers: meadow mouse, 8; shrew (*Sorex*), 1; a few insects, mainly crickets (*Gryllus*).” (Errington, 1933a).

Data predominantly from prairie farming country of central Iowa, southern Minnesota, and eastern South Dakota.

The twenty-three stomachs examined were mostly sent in to Breckenridge by Minnesota and South Dakota coöperators during the fall, winter, and spring of 1932-33.

Items listed: Carrion jack rabbit (*Lepus*), 1; cottontail (at least two of which were known to be carrion), 8; juvenile Leporidae (probably cottontail), 3; *Mus* (all in one stomach), 5; *Microtus*, 42; *Peromyscus*, 8; unidentified mice, 2; Franklin's ground squirrel, 1; striped ground squirrel, 2; domestic chicken (including one carrion and one young), 3; ring-necked pheasant (including two young individuals and three evidently carrion), 7; unidentified small bird, 1. One stomach contained remains of a grasshopper and two others small quantities of crickets.

A comparison of the stomach contents of redtails and roughlegs would indicate a decided similarity in their food habits, but our field observations on the two species suggest some distinct differences. The Rough-legged Hawk, while larger in appearance, is in our opinion actually much less formidable as a predator than the redtail. The roughleg has impressed us as being slower and weaker than the redtail and even more prone to feed upon carrion. We have noted the former hawk picking away at the remains of traffic victims along highways, as well as at miscellaneous carcasses in fields, and to this extent its food habits correspond to those of the redtail. We have few observa-

tions, however, which lead us to think that the roughleg is often disposed to attack prey of a size greatly exceeding that of a ground squirrel or a young cottontail. It is to be suspected that the poultry and pheasant remains in the stomachs may represent mainly carrion feeding, with the possible exception of the more immature individuals eaten.

CONCLUDING REMARKS

As a genus, the Buteos are stocky and rather clumsy hawks, varying in size, strength, and habitat. They may be frequently seen soaring over woods and fields and show a partiality for such perching places as the tops of dead trees, telephone poles, and fence posts. With respect to temperament and intelligence, there is considerable variation with the species, the redtail in our estimation being the most spirited, the most tameable, and the most generally adaptable.

We have little reason to believe that preference for some type of prey influences the food habits of the species herein discussed to any conspicuous extent, although the "education" of each individual bird and its resulting routine of hunting undoubtedly does. What a redtail or any other Buteo eats is largely a matter of what is to be had without too much trouble; what is conspicuous enough to be readily seen by a hungry bird; what is within the bird's power to capture and to handle; or what is already available in the form of a carcass beside a highway, along a lake shore, or in a field or a woodlot. The feeding of all mid-west Buteos upon rodents, snakes, invertebrates, and whatever else they may recognize as eligible food and can readily get claws on, reveals a conforming to ecological pattern that combines, as well as is controlled by, the elements of naturalness and necessity.

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