

NESTING OF THE MARSH HAWK AT DELTA, MANITOBA

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ONE way of gaining insight into the complex phenomenon of predation is through careful local studies of predatory species. The food habits of the Marsh Hawk (*Circus cyaneus hudsonius*) vary greatly both seasonally and geographically, a fact brought to light by many writers, among them Ridgway (1877), Fisher (1893), McAtee (1935), Breckenridge (1935), May (1935), Errington and Breckenridge (1936), Bent (1937), Randall (1940), Selleck and Glading (1943), and Grange (1948). During June and July, 1947, I studied the food habits and nest life of the Marsh Hawk on an area supporting also a concentrated breeding population of waterfowl—the Delta Waterfowl Research Station. This paper is a report on my findings. I am indebted to William H. Elder for his supervision of the study and his aid in the preparation of the manuscript. Many helpful suggestions were made by H. Albert Hochbaum, director of the Station. Richard W. Sutton, of the Manitoba Museum in Winnipeg, identified some of the small-bird remains.

THE STUDY AREA AND NEST SITES

Description of the Area. The Delta Marsh, a vast stand of yellow cane (*Phragmites*), broken by Cadham Bay and many sloughs and potholes, extends southward from Lake Manitoba to the black earth wheatlands of the Portage plains. The bays and sloughs are bordered by bulrush (largely *Scirpus acutus*) and cattail (*Typha latifolia*). Stands of whitetop grass (*Fluminea*) grow in close association with the *Phragmites*. The Delta area has been described in detail by Hochbaum (1944).

The greater portion of the study area, the part indicated on the inset in Figure 1, lies at the southern end of Lake Manitoba. Eleven Marsh Hawk nests were under observation during this study. The five nests (Nos. 5, 6, 8, 9, and 11) at which I obtained food-habits data presented here were all within a one-square-mile part of the greater area.

Locating Nests. I found all 11 nests between June 14 and June 27. All nests contained eggs and/or nestlings when discovered. In locating nests I found the following technique to be most successful. Frequent observation of both sexes simultaneously in flight over a given area indicated that a nest was nearby, especially if exchanges of prey were observed. Further observations revealed

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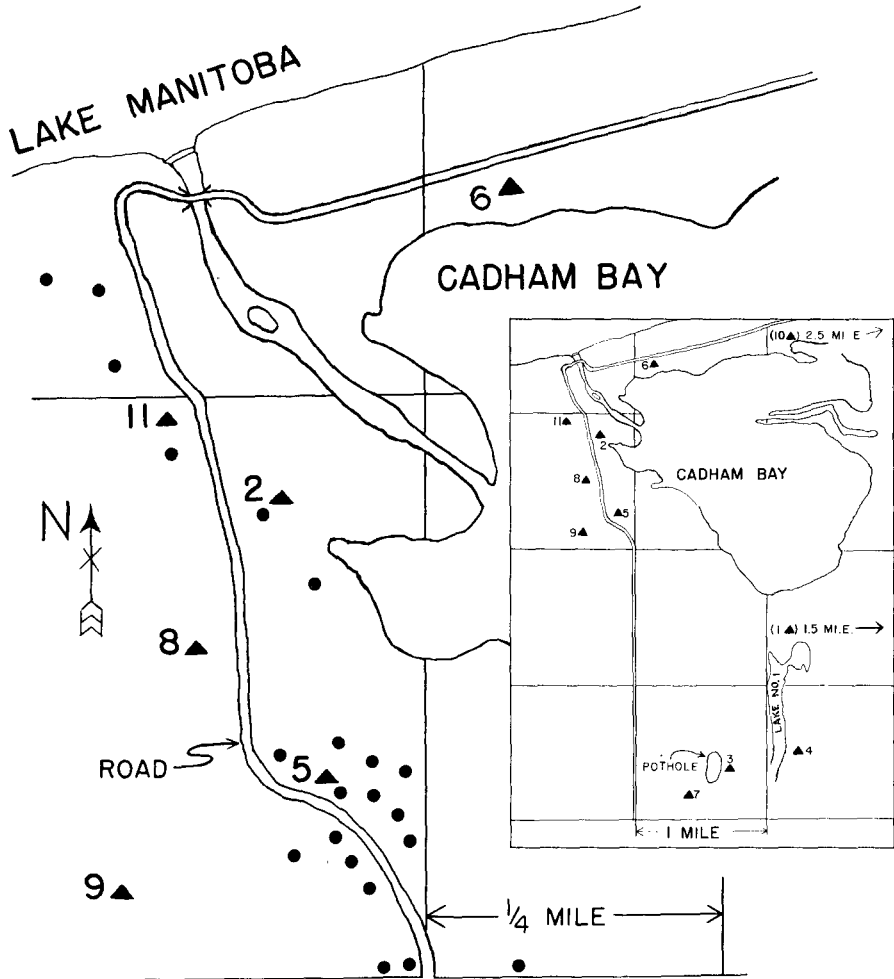


Fig. 1. Map of part of the Delta Marsh, at the southern end of Lake Manitoba, showing Marsh Hawk nests (triangles) studied in June and July, 1947, and duck nests (circles) also active during that period.

the spot from which the female arose to meet the male as he returned with prey. When the female was presumed to be at this spot I headed directly for it. If the female failed to flush I returned later and repeated the procedure. Attempts to locate the nest were futile unless, through flushing the female, I could narrow the area to be searched down to about two square rods.

Nest Site. All 11 nests were on dry ground in the *Phragmites-Fluminea* ecotone. No nest was in a burned or mowed meadow area. Nests were placed

in cover composed largely of dead *Fluminea* and *Phragmites*. This cover furnished some protection from the start, regardless of what later growth of vegetation of the year might afford.

Each nest was about 15 inches in overall diameter. The nests were made of dead stalks of goldenrod (*Solidago* sp.) and nettle (*Urtica* sp.) and dry grasses. In the vicinity of five nests the following five plants (in order of their abundance) dominated: *Phragmites*, *Fluminea*, *Solidago*, *Lactuca* (wild lettuce), and *Cirsium* (thistle).

SOME ASPECTS OF NEST LIFE

Development of the young. The first four or five days of the nestling's life are spent almost wholly under the brooding female. During this period the male brings in all the food. The female flies up from the nest, receives the food midair from her mate, and returns immediately to feed the brood. As she alights the nestlings open their mouths in anticipation. When I visited nests in which the young were less than five days old, the nestlings all opened their mouths for food. This 'gaping response' clearly indicated their inability to distinguish between me and the parent bird.

When the nestlings reach about five days of age the female makes brief hunting flights—at first in the immediate vicinity of the nest, but gradually farther and farther away as the young develop. These food-gathering excursions sometimes keep her away for considerable periods. If the male arrives when his mate is not there he drops his prey from the air on or near the nest and leaves immediately. I have never seen a male Marsh Hawk feed the young directly in the nest.

Nestlings about five days old and older behave quite differently from younger birds. When a human being approaches the nest the parent hawks utter warning notes and the young respond by leaving the nest and hiding in the dense cover close by. With frequent repetition of this egress, small nooks are formed around the nest, usually as many nooks as there are nestlings. With continued use these nooks extend radially as far as ten feet from the nest, functioning as escape lanes.

Defended Area and Hunting Range. Breckenridge (1935: 271-272) concluded that "the function of the male Marsh Hawks during that period when the young were being fed was that of hunting for food and that they guarded the nests only at those times when the females were feeding the young or during the few short periods when females were away hunting. The duties of the females consisted largely of guarding the nests and feeding to the nestlings the food brought in by the males." Of ten nests observed by me at Delta, six were defended against my intrusion largely by the female, three largely by the male, and one almost entirely by the male. The area defended against my intrusion proved to average about 650 yards in diameter, with the nest about in the center.

Throughout the area reported on in this study the adult hawks demonstrated

rather uniform behavior in following certain avenues of flight to and from nests. Individual pairs almost invariably used certain areas as hunting range. Overlap in use of these areas was not uncommon, but I never saw the birds chasing or fighting each other. Presumably they had settled earlier the problem of territorial boundaries. Errington (1930: 238) said of Marsh Hawks observed by him in Wisconsin: "Intraspecific raptorial relations grew more amicable as the summer progressed."

Social Behavior in the Colony. That six of the nests I observed were rather closely grouped within an area slightly exceeding one square mile is evident from an examination of Figure 1. Nest 2 was broken up by a mammalian predator before the eggs hatched. There was a lesser concentration of three nests in the Lake No. 1 area (see inset, Fig. 1). These two groups were, at least to some extent, colonial. Dr. Errington informs me (*in litt.*) that he too has noticed the tendency of Marsh Hawks to establish their nests in "clumps," despite territorial antagonisms.

One male Marsh Hawk exhibited polygamous behavior. This male defended Nest 11 and Nest 8. He favored Nest 11 in bringing food, the young of Nest 8 receiving less and less from him as the season progressed. At Nest 11 this male dived at me, striking me solidly on the head, casting my hat about ten feet away. His attack was less fierce at Nest 8. What I have just reported clearly indicates a triangle relationship of two females and one male at Nests 11 and 8.

Nest 5, which held two young hawks and an addled egg the day I found it, may also have had some connection with this triangle. I observed at this nest only one normal exchange of prey between a male and the female. Four days after this observation I saw the female rise from her nest area and fly northwest (in the direction of Nest 8) meeting a male that was returning to Nest 8. She actually *attacked* this male, seized the prey he was carrying, and returned to her nest. She attempted this again, half an hour later, but the male had no prey in his talons that time. I never saw the female of Nest 5 in contact with a male otherwise. So far as I know she raised her two nestlings without any other assistance. I am not even sure that a male bird brought food to the nest during the first five days of the fledging period.

Examination of the literature reveals two reports of polygamy and several of semi-colonialism in the Marsh Hawk, and one of polygamy each in the Montagu's Harrier (*Circus pygargus*) and the European Sparrow Hawk (*Accipiter nisus*). Reindahl (1941) found five nests of the Marsh Hawk within a radius of half a mile. A male which defended two of these nests was believed to have mated with both females. Always more alert than the other males of that area, this particular bird was very aggressive in driving intruders away. Yocom (1944), reporting on two Marsh Hawk nests 400 yards apart in an 80-acre tract, stated that the only male observed in the vicinity vigorously de-

fended both nests but that each of the two females was concerned only with her own nest. Hall (1947) reported five Marsh Hawk nests in a 5-acre area. Three nests reported by Errington (1930) were closely grouped. As for the Montagu's Harrier: Dent (1939) found that the two mates of a certain male bird nested within 70 yards of each other. At first there was some fighting between the two females. For a few days hen No. 2 showed a tendency to leave the nest out of turn when the male called hen No. 1 off to take food. On these occasions the male drove hen No. 2 back to her own nest before giving food to hen No. 1. Both broods were reared almost entirely on food brought by the one male. Hughes-Onslow (1925) has reported two female European Sparrow Hawks using the same nest.

As for the cause or function of these closely associated groups of nesting Marsh Hawks, we can only speculate. There is no evidence in support of the suspicion that unavailability of suitable nesting habitat prevents a wider distribution of nests. Perhaps the proximity of several pairs provides nest protection in the event of loss of one of the male parents. This may have been the case with Nests 11 and 8, discussed above.

The Marsh Hawk is usually monogamous, yet we know that a male bird is sometimes extremely solicitous in defense of two nests. Whether, in cases of this sort, the male is actually mated with the "second" female or not, the "second" nest is provided with more protection and food than the female alone could provide.

In contrast to the social theory just proposed, one might postulate that disparity in the sex ratio, with a preponderance of females, could lead to polygamy.

FOOD HABITS

Between June 25 and July 20 I obtained food data (56 pellets and 140 gullet regurgitations) from five nests containing 18 nestlings (Table 1). I visited the nests once or twice daily in gathering pellets cast by the young. Using the technique described by Errington (1932), I emptied the gullets by squeezing, tethering the young birds when they grew old enough to move out of sight of the nest.

The Marsh Hawk is neither powerful nor fast. It seldom takes adults of larger mammals or adult birds. Table 1 shows that meadow voles and black-birds, prolific and widespread forms, ranked first in the species' diet at Delta in the summer of 1947.

General food habits studies by Fisher (1893) and McAtee (1935), based on stomachs collected from all parts of the United States throughout the year, indicated that mice and other rodents were staple foods of the Marsh Hawk. In Pennsylvania, in 1939, Randall (1940) found mice to be the staple food throughout the year except in June and July, during which months they were second only to young passerine birds. During the spring and summer of 1932

TABLE 1
FOOD ITEMS GATHERED AT FIVE MARSH HAWK NESTS, JUNE 25-JULY 20, 1947

	Nest Number					Total
	5	6	8	9	11	
Mammals						
Meadow Vole (<i>Microtus pennsylvanicus</i>)	20	28	21	13	38	120
Young Muskrat (<i>Ondatra zibethica</i>)	0	0	5	0	3	8
Richardson's Ground Squirrel (<i>Citellus richardsonii</i>)	4	0	2	1	1	8
Young Snowshoe Rabbit (<i>Lepus americanus</i>)	1	0	1	0	3	5
Red-backed Vole (<i>Clethrionomys gapperi</i>)	2	1	0	0	1	4
Franklin's Ground Squirrel (<i>Citellus franklinii</i>)	3	0	0	0	0	3
Norway Rat (<i>Rattus norvegicus</i>)	1	0	0	1	0	2
Pocket Gopher (<i>Thomomys talpoides</i>)	1	0	0	0	0	1
Jumping Mouse (<i>Zapus hudsonicus</i>)	0	1	0	0	0	1
Total Mammals	32	30	29	15	46	152
Birds						
Nestling Red-wing (<i>Agelaius phoeniceus</i>) and/or Yellow-headed Blackbird (<i>X. xanthocephalus</i>)	1	2	0	7	3	13
Young American Coot (<i>Fulica americana</i>)	2	0	3	3	1	9
Clay-colored Sparrow (<i>Spizella pallida</i>)	0	0	1	2	1	4
Young Pintail (<i>Anas acuta</i>)	0	0	0	0	2	2
Young Shoveller (<i>Spatula clypeata</i>)	0	0	0	1	0	1
Young American Bittern (<i>Botaurus lentiginosus</i>)	0	1	0	1	1	3
Young Marsh Hawk (<i>Circus cyaneus</i>)*	0	1	1	0	0	2
Long-billed Marsh Wren (<i>Telmodytes palustris</i>)	0	0	0	1	0	1
Cowbird (<i>Molothrus ater</i>)	0	0	0	1	0	1
Red Crossbill (<i>Loxia curvirostra</i>)	0	1	0	0	0	1
Leconte's Sparrow (<i>Passerherbulus caudacutus</i>)	1	0	0	0	0	1
Unidentified passerines	0	1	0	1	2	4
Total Birds	4	6	5	17	10	42

TABLE 1—Continued

	Nest Number					Total
	5	6	8	9	11	
Reptiles						
Plains Garter Snake (<i>Thamnophis radix</i>).....	1	0	0	0	1	2
Amphibians						
Leopard Frog (<i>Rana pipiens</i>)...	2	0	1	0	1	4
Manitoba Toad (<i>Bufo hemiophrys</i>).....	1	0	0	0	0	1
Total Amphibians.....	3	0	1	0	1	5
Insects						
Beetles (Coleoptera).....	2	1	0	0	2	5

* At Nest 6 I saw the young hawks peck at the smallest of the brood almost constantly. It finally died and was eaten by its siblings. At Nest 8 one young one died and was eaten by its siblings.

and 1933, in Minnesota, Breckenridge (1935) found that mice ranked second numerically to passerines, but that most of the food *by weight* was Striped Ground Squirrels (*Citellus tridecemlineatus*) and young Cottontail Rabbits (*Sylvilagus floridanus*). Errington and Breckenridge (1936) found that mice ranked second numerically to Sciuridae in summer at Madison, Wisconsin, from 1929 to 1931. Sowls (1948) considered mice and fledgling blackbirds the principal food at Delta.

My snap trapping in the *Phragmites-Fluminea* ecotone in 1947 indicated an abundance of *Microtus*. Sowls (*in litt.*) rated the general population-level of *Microtus* in 1947 as "medium."

Red-wings and Yellow-headed Blackbirds were abundant in 1947 and nestlings of these species formed an important part of the diet at some Marsh Hawk nests. My data show, however, that they were captured principally during the first half of the Marsh Hawk's nestling period. Of 13 individuals taken, 7 appeared in Nest 9. By contrast, I did not find either species at Nest 8.

Some prey species tend to appear in the gullet- or pellet-remains in waves or groups. Young American Coots (*Fulica americana*) appeared July 9, reached a peak near July 15, then declined. Waves of this sort reflect a prey species availability or vulnerability definitely correlated with abundance of juveniles.

Young muskrats appeared in a wave (July 6-19) and at only two nests: five at Nest 8 and three at Nest 11. This 'selective' diet may actually be quite fortuitous, reflecting local abundance or availability of prey species, or merely the individual prowess, age, or idiosyncracies of the captor.

Wide variation in the food habits of several pairs of Marsh Hawks in the

same part of California was reported by Selleck and Glading (1943). I noted this sort of variation at Delta. At Nest 9 the food included 15 mammals and 17 birds; at Nest 10, 46 mammals and 10 birds. Variations at five nests in a one-square-mile area clearly showed that conclusions based on a study of any one nest (see Randall, 1940) might not be at all representative of the area as a whole.

RELATIONSHIPS BETWEEN MARSH HAWKS AND WATERFOWL

The nesting of waterfowl close to Marsh Hawk nests is not uncommon. Houston (1949: 224) found 18 waterfowl nests within 100 yards of a Marsh Hawk's nest in the Yorkton district of Saskatchewan, nine of them within 50 yards—a Blue-winged Teal's (*Anas discors*) 15 yards away, and a Mallard's (*A. platyrhynchos*) 10 yards away. Over half of these waterfowl nests were started after the hawk's nest had been built. In central Saskatchewan in the breeding season of 1937, Furniss (1938: 25) obtained no evidence that Marsh Hawks were eating ducklings. Around one slough, "within a radius of 50 yards," were a Marsh Hawk nest, three Mallard nests, and one nest of the Common Crow (*Corvus brachyrhynchos*). All were successful. Again in Saskatchewan, Eastgate (1944: 11) found a Marsh Hawk nest about five feet from a duck nest. Mrs. Eastgate informed me (by letter) that crows destroyed all the hawk eggs but that the duck eggs hatched successfully.

Lyle K. Sowls (*in litt.*) has generously provided me with information concerning 21 duck nests (of six species) known by him to have inhabited my study-area while I was making this study. Note, in Figure 1, how close these duck nests were to the Marsh Hawk nests. *At least* 21 duck nests were within the hunting ranges of the Marsh Hawks I was studying.

I found remains of three ducklings in two Marsh Hawk nests: two Pintails (*Anas acuta*) about a week old in Nest 11, and one Shoveller (*Spatula clypeata*) about three weeks old in Nest 9. I obtained no evidence that the hawks were killing adult ducks. Sowls (*in litt.*) rated the population-level of ducks during the period of my study as "low."

I observed very little antagonism between Marsh Hawks and ducks. Once I saw a duck flying between a circling female hawk and the hawk's nest. The hawk "dived" and missed, and the duck made off in haste, unpursued. On numerous occasions I saw a hawk sailing, with apparent indifference, over an adult duck or brood of ducklings swimming in a ditch. Once I saw a brood of Redhead (*Aythya americana*) ducklings in a ditch move quickly into the cane at the edge when a hawk approached.

SUMMARY

In June and July, 1947, at Delta, Manitoba, I studied eleven Marsh Hawk nests, paying special attention to the food of the young hawks. The nests were

all on dry ground in unburned, unmowed parts of the *Phragmites-Fluminea* ecotone. Some were close enough together to suggest semi-colonialism. Nesting evidently required dead vegetation as cover from the start.

The best way to find a nest was through seeing a male hawk drop food midair to a female, then flushing the female direct from the nest.

During about the first five days of their lives young Marsh Hawks observed by me were brooded almost constantly by the female. They were fed by the female but all food was brought in by the male. During this period the nestlings opened their mouths for food when I appeared at the nest.

When the nestlings became about five days old the female obtained some of their food and she spent more and more time hunting as they grew. The male continued to bring food, but he did not feed the young direct. The young, warned by their parents' cries, hid in nooks about the nest. These nooks eventually lengthened, becoming escape lanes.

Six of the nests observed were defended against my intrusion largely by the female, three largely by the male, one almost exclusively by the male.

In a total of 56 pellets and 140 gullet-regurgitations obtained from 18 nestlings at five nests June 25 to July 20, the Meadow Vole, Red-wing, and Yellow-headed Blackbird, prolific and widespread forms, were the prey species most often represented. Other important prey species: ground squirrel, coot (young) and muskrat (young).

Observations indicated such wide variation in the hunting habits of the several pairs of hawks as to suggest that conclusions based on a study of any one nest might be misleading.

In part of the area I studied, six hawk nests and 21 duck nests (six species), were simultaneously active, yet I obtained no evidence that the hawks were preying on adult ducks and the only evidence that ducklings were being captured were the remains of two individuals at one nest, of one at another.

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