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NOTES ON THE BREEDING BIOLOGY OF THE MARSH HAWK IN ALBERTA AND SASKATCHEWAN

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This study of the breeding biology of the Marsh Hawk, *Circus cyaneus* (Linnaeus), was carried out in Alberta and Saskatchewan during the summers of 1959 to 1964. Four summers were spent in the Battleford area of northwest central Saskatchewan and two in the Brooks area of southeastern Alberta. The Battleford area (52' N, 108' W) is situated in the forest and grassland portion of the Boreal Forest Region (Rowe, 1959); the Brooks area (50' N, 111' W) is situated in the Grassland Region (Rowe, *op. cit.*). The two areas are roughly 250 miles apart (see Figure 1). A total of 32 nests was studied and a discussion of nest-building, eggs, egg-laying and incubation, and young and their development is presented.

The Battleford area consists of undulating, grass-covered hills interspersed with groves of aspen (*Populus tremuloides*) on a level above the

North Saskatchewan and Battle rivers, the northern boundary of the area under consideration. Approximately 35 percent of the area was under cultivation at the time of this study, the remaining portion being tree-covered or pastureland. Aspen stands grow in small to large groves at intermittent spots on hillsides and in valleys; in other locations along the North Saskatchewan and Battle rivers balsam poplar (*P. balsamifera*), white birch (*Betula papyrifera*), willow (*Salix* spp.), saskatoon (*Amelanchier*) and hawthorne (*Crataegus*) are also prevalent species. No natural coniferous growth is present although a few planted stands serve as shelterbelts on some farms. Patches of rose (*Rosa*) and snowberry (*Symphoricarpos*), locally known as "buckbrush", are numerous between the tree groves.

The Brooks area, which is situated in the Eastern Irrigation District



Figure 1. Map showing the location of the Marsh Hawk study areas.

where the annual precipitation is normally too low for the production of cereal crops, has been transformed into arable land by irrigation. Many marshes have developed here in connection with artificial lakes and backwaters. Predominant marsh plants are cattails (*Typha*) and bulrush (*Scirpus*). Bordering many of the irrigation canals and marshes are willow and poplar. A *Stipa-Bouteloua* grass association is found in those parts of the area not touched by irrigation (Moss, 1959).

Nest and Nest-building

The Marsh Hawk builds a simple nest, usually placed directly on the ground, though sometimes over water. I have no data on nest-site selection

or the initial construction of the nest; Pettingill (1956) proposes that the need of suitable support and protection governs the selection of the nest site. The nests I studied were in positions of this nature.

Van Tyne and Berger (1961) distinguish six ways in which the labour involved in nest construction by birds may be divided between the male and female. In my study, only the female Marsh Hawk was observed to construct the nest; however, both adults were observed carrying nest-material to the nest site, the male hovering over the female at the nest site and dropping the material to her. Nesting materials were added throughout the nesting season. An adult female was observed at 7:00 a.m. on July 7, 1964, carrying nesting material (grass) to her nest in the cattails near Brooks. At this date the nest contained one young approximately three weeks old and three unhatched eggs.

In my study I found nests placed in several kinds of plant cover, and this seemed to have some influence on nest success.

In the Battleford area 21 nests were on the ground in clumps of snowberry and rose. Seven nests were measured; these nests averaged 50.0 mm (1.97 in) in depth (much shallower than those situated above water in a marsh) with an average outside diameter of 390 mm (16.18 in) and inside diameter of 250 mm (9.84 in). As the nestlings grew they gradually trampled the nest against the ground. At about three weeks of age the nestlings began to move out and hide in the surrounding vegetation.

TABLE 1. Summary of clutch sizes, hatching success and fledging success of Marsh Hawk nests studied from 1959 to 1962 in the Battleford area, Saskatchewan.

Year	No. eggs in clutches	No. eggs hatched	Per cent hatching success	Per cent fledging success	Mean clutch size
1959	26 (5)*	19	73.07	68.42	5.30
1960	24 (7)	19	79.16	100.00	3.42
1961	18 (5)	16	88.89	100.00	3.60
1962	17 (4)	4	23.46	00.00	4.45
Totals	85 (21)	58	$\bar{x} = 62.35$	$\bar{x} = 67.11$	$\bar{\bar{x}} = 4.18$

* The number of clutches studied.

Total percent fledging success in the Battleford area was high in 1959, 1960 and 1961 (see table 1) in the snowberry habitat. In 1962, of four nests in snowberry-rose habitat, none was successful in producing any young, each nest being destroyed by unknown factors.

In the Brooks area nine out of 11 nests were in cattail marsh and the nest was constructed in the form of a platform. Five nests were measured, with an average depth of 240 mm (9.45 in.), an average outside diameter of 630 mm (24.80 in) and inside diameter of 255 mm (10.03 in). A nest of this type is a bulky but durable structure with its great depth providing security against potential increase in the water level. The nest is buoyant, floating on the water surface like a raft. As the nestlings grew the nest became soggy and water-logged but supported them.

In the Brooks area nine nests in cattails had a much better fledging success than two found in wheatgrass (*Agropyron*) cover (see table 2). The latter two nests showed a hatching success comparable to other situations and other years but failed to produce any young which reached the flying stage. The young simply disappeared, which would indicate a high degree of predation once the eggs had hatched. Those nests placed in cattails, however, showed a similar percent hatching success but also a very high total percent fledging rate (100% in five out of seven nests observed in cattails). These nests, being out in a marsh over water, are less accessible to most of the potential mammalian predators in this area; for example, the coyote (*Canis latrans*), striped skunk (*Mephitis mephitis*) and badger (*Taxidea taxus*). Predation by



Figure 2. Nest and eggs of the Marsh Hawk on the ground in wheatgrass, Brooks, June 3, 1964.

gulls (*Larus* spp.) was not observed at nests in the cattails but was observed on one occasion (June 19, 1964) at a nest situated in wheatgrass cover.

Three nests situated in cattails in the Brooks area were analyzed for their percentage floral composition. In one nest the Russian thistle (*Salsola*) comprised 85% of the floral components, the remaining 15% being *Aster* (10%), *Typha* (3%) and *Stipa* (2%). The second nest was constructed with Russian thistle, cattail, aster and lined with aspen, wheat (*Triticum*) and speargrass. The third nest was composed of Russian thistle and aster lined with pasture sage (*Artemisia frigida*).

One nest situated in *Agropyron* cover in the Brooks area (see Fig. 2) was also analyzed. Wheat comprised 98% of the total floral composition with Russian thistle and speargrass making up the remaining 2%.

Many avian predators use the same nest year after year, the Ferruginous Hawk (*Buteo regalis*) and the Rough-legged Hawk (*B. lagopus*) being good

TABLE 2. Summary of percent fledging success of nests situated in *Typha* cover and *Agropyron* cover in the Brooks area, 1963 and 1964.

	Total No. eggs laid	Total No. hatched	Average hatching success	Average per cent fledging success
<i>Typha</i> cover	29 (9)*	18	62.07	83.33
<i>Agropyron</i> cover	11 (2)	7	63.63	00.00

*Number of nests in the sample.

examples. In each case the nest is lined and added to each year until it becomes a large size, sometimes, in the case of the Rough-legged Hawk, having as many as 10 layers (Hanson, Queneau, and Scott, 1956). Marsh Hawks do not use the same nest over again; however, whether they use the same nesting site or clump of plant cover again I cannot say. I have found their nests in the same clump of snowberry in the Battleford area for four consecutive years, but as the

adults were not colour-marked or banded it was impossible to be sure they were the same birds. Again in the Brooks area a nest was located in the same small marsh for two consecutive years (but in different parts of the marsh), and once again it was impossible to say whether they were the same birds. In England, Richmond (1959) states that "once a pair of Hen Harriers (*Circus cyaneus*) have established a territory, they return to the same area year after year, often

TABLE 3. Summary of clutch sizes, hatching success and fledging success of Marsh Hawk nests studied in 1963 and 1964 in the Brooks area, Alberta.

Year	No. eggs in clutches	No. eggs hatched	Per cent hatching success	Per cent fledging success	Mean clutch size
1963	12 (3)*	5	41.66	100.00	4.00
1964	37 (8)	23	60.27	69.57	4.62
Totals	49 (11)	28	$\bar{x} = 57.14$	$\bar{x} = 75.00$	$\bar{\bar{x}} = 4.45$

* The number of clutches studied.

TABLE 4. Incubation periods of the Marsh Hawk, Brooks, Alberta, 1964.

Nest No.	Egg No.	Date laid	Date hatched	Incubation Period
1	4	May 28	June 27	31 days
	5	May 30	Did not hatch
2	6	May 19	June 18	31 days
3	4	May 15	June 24	41 days

Average incubation period = 34.3 days.

TABLE 5. Hatching rhythm of Marsh Hawk chicks in three nests in the Brooks area, 1964.

Nest No.	Egg No.	Date hatched
1	1	infertile
	2	June 23
	3	June 26
	4	June 27
	5	June 29
Average hatching interval = 1.5 days		
2	1	disappeared
	2	June 15
	3	June 16
	4	June 16
	5	June 18
	6	June 20
Average hatching interval = 1.0 days		
3	1	June 20
	2	June 22
	3	June 24
	4	June 26
Average hatching interval = 2.0 days		

within a few yards of the spot where the original nest was built." It was not stated whether this observation was based on the return of colour-marked birds.

Eggs, Egg-laying and Incubation

The Marsh Hawk lays bluish-white eggs which are occasionally spotted with brown over their entire surface. Measurements of 16 eggs from the Brooks area averaged 45.6 x 36.2 mm (1.79 x 1.42 in) with extremes of 44.5 to 47.0 mm (1.75 to 1.84 in) in length and 35.0 to 37.0 mm (1.37 to 1.45 in) in width. Bent (1961) gives the average of 84 Marsh Hawk eggs as 46.6 x 36.4 mm.

From tables 1 and 3 it may be seen that the average clutch size of 21 nests studied at Battleford from 1959 to 1962 was 4.18 eggs with extreme clutch sizes of three to six eggs. Of nine nests studied at Brooks in 1963 and 1964 the average clutch was 4.45 eggs with extremes of four to six eggs. Hammond and Henry (1949) reported an average of 5.05 eggs per nest in North Dakota. Maximum clutch sizes of nine eggs (Bent, 1961; Pearson, 1936) and ten eggs (Baumgardner, 1942) have been recorded.

Egg-laying began prior to completion of the nest and after the first one or two eggs were laid the female continued to construct and line the nest. Upon deposition of the last egg the nest was generally completed. Each egg was laid during the early morning hours at an interval of two days (in five clutches). Incubation, begun prior to completion of the clutch, was shared by both parents,



Figure 3. Fourteen-day-old Marsh Hawks, Battleford, June 28, 1960.

the female participating to a greater extent. Both parents defended the territory against intruders during the pre-egg-laying, egg-laying and nestling stages, with the degree of participation varying from one nest to another. The incubation period (calculated using the laying and hatching dates of the last egg in the clutch) was found to be 34.3 days (see table 4).

Young and Their Development

Since incubation commenced prior to laying of the entire clutch the eggs in each clutch did not hatch simultaneously. Table 5 shows the hatching rhythm of three nests in the Brooks area, 1964, with an overall hatching interval between each egg in a clutch being 1.59 days. The average length of time required for each egg to hatch

TABLE 6. Yearly hatching peaks for the Marsh Hawk in the Battleford and Brooks study areas.

Area	Year	Mean hatching date
Battleford	1959	June 17
Battleford	1960	June 15
Battleford	1961	June 18
Battleford	1962	June 21
Overall mean hatching date=June 17		
Brooks	1963	June 13
Brooks	1964	June 18
Overall mean hatching date=June 15		



Figure 4. Thirty-five-day-old Marsh Hawk, Battleford, July 11, 1960.

(from the time it pipped to the emergence of the chick) was about 24 hours. The chick's egg-tooth was sloughed off at about five days of age (11 chicks observed).

Table 6 shows the hatching peaks for the Marsh Hawk for four years in the Battleford area and two years in the Brooks area. The overall hatching peak (calculated by averaging the hatching peaks of each clutch) was June 17 and June 15, respectively.

Young Marsh Hawks are altricial, that is, they are incapable of locomotion and entirely dependent upon the parents for food. They remained in the nest for about 35 days (see table 7), all the while being fed by the parents. At the time of hatching they are covered with whitish down tipped with buff on their dorsal and ventral surfaces. Their fleshy tarsi are whitish-yellow and their irises are brown at hatching, the former becoming yellowish-orange prior to fledging and the latter remaining the same.

Activity of the nestlings during their early period of growth (until about 10 days of age) is restricted to simple reflexes relating to grasping the floor of the nest with their feet, to keeping their bodies upright and to feeding. A high-pitched "cheek-cheek" is uttered by the nestlings at this stage. They began to use their feet as a means of defense at about 14 days of age, turning over on to their backs and clawing at an intruder. It was at this time that the young began to tear up some of their food which previously had been torn up by the parents. At about 21 days of age many chicks scattered around the nest site and hid in the surrounding vegetation. Figures 3 and 4 show young Marsh Hawks at about 14 days and 35 days of age, respectively.

Figure 5 presents the growth of 10 Marsh Hawk chicks from the time of hatching to fledging and table 8 shows the growth using weight and length of the tarsus and wing chord. Since

TABLE 7. Time spent in the nest by young Marsh Hawks in the Brooks area 1964.

Nest No.	Date hatched (average of entire brood)	Date left nest	Age (in days)
3	June 22	July 27	35
4	June 13	July 16	35
5	June 20	July 23	35
8	June 12	July 15	34

Average age of chicks at time of departure = 34.7 days

TABLE 8. Growth of the Marsh Hawk in the Brooks area, 1964. Measurements of both sexes are treated together.

Age in days	No. in sample	Mean weight in gm	Mean tarsus length in mm	Mean wing chord length in mm
3	14	74.5	32.0 (1.26)*	31.7 (1.25)*
13	14	296.2	67.3 (2.65)	120.0 (4.72)
15	14	356.2	73.3 (2.89)	143.6 (5.65)
20	14	418.7	82.2 (3.24)	195.6 (7.70)
22	14	445.0	83.3 (3.28)	213.0 (8.39)
24	14	487.5	84.0 (3.31)	229.6 (9.04)
27	14	506.2	84.8 (3.34)	253.3 (9.97)
29	14	481.2	85.0 (3.35)	269.3 (10.60)
33	1	375.0	80.0 (3.15)	268.0 (10.55)

Corresponding measurements in inches given in parentheses.

Dissection was not carried out to validate identification of sex based on external morphology, both sexes are treated together although the females are the larger in most raptor species. Although the sample is small (Figure 5) it may be noted that a slight drop in weight occurred prior to fledging. The activity of the young of many species of birds increases prior to fledging resulting in an increased energy consumption and consequently

a drop in weight. This may be the case with the Marsh Hawk.

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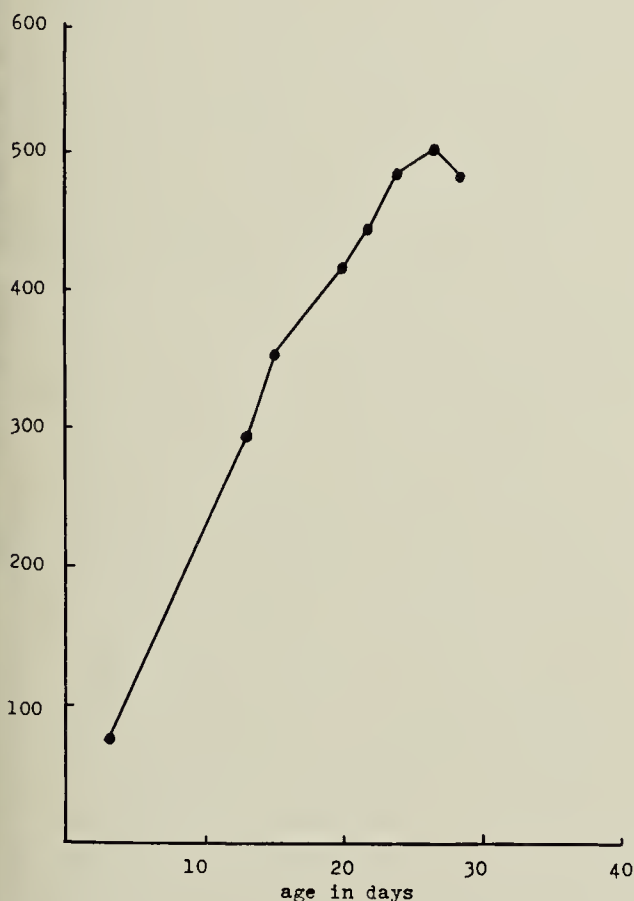


Figure 5. Growth in the Marsh Hawk at Brooks, Alberta, 1964.