DEVELOPMENT OF NESTLING YELLOW-HEADED BLACKBIRDS[1]

BY REED W. FAUTIN

INTRODUCTION

VERY little information is available in the literature concerning the development of the Yellow-headed Blackbird, *Xanthocephalus xanthocephalus*. Most references to this species are merely incidental, pertaining to various phases of its life history and distribution. Dr. T. S. Roberts in 1908 was the first to give this bird any serious consideration when he kept a colony of them under observation for a period of thirty-two days. The most comprehensive study of the Yellow-headed Blackbird was made by George A. Ammann (manuscript, 1938) during the years from 1933 to 1935 inclusive in the vicinity of Ruthven, Iowa, but so far as the writer knows, the results of his investigation have not yet been published.

The present paper is based on an investigation of two colonies of Yellow-headed Blackbirds in the vicinity of Utah Lake about five miles west of Provo, Utah, during the spring and summer of 1937. One hundred and twenty-eight nests were kept under observation from the time they were constructed until the nestlings left them. The larger of the two colonies, containing eighty-four nests, was located at the mouth of the Provo River on the east shore of Utah Lake and will be referred to as the 'Provo River colony'; the smaller colony, containing forty-four nests, was located northeast of the Provo River colony, about two miles east of Utah Lake in a small bulrush marsh, and will be referred to as the 'Lakeview colony.'

The nests were visited daily and the progress of each, including the weights of the nestlings, was recorded. Observations on the behavior of individual males and females and their care of the young were made from blinds. Development of the young was followed until after the time they left the nesting area.

HATCHING

Hatching began at approximately the same time in both colonies, namely, May 19 in the Provo River colony and May 21 in the Lakeview colony; it ended June 24 (Text-fig. 1). The greatest number

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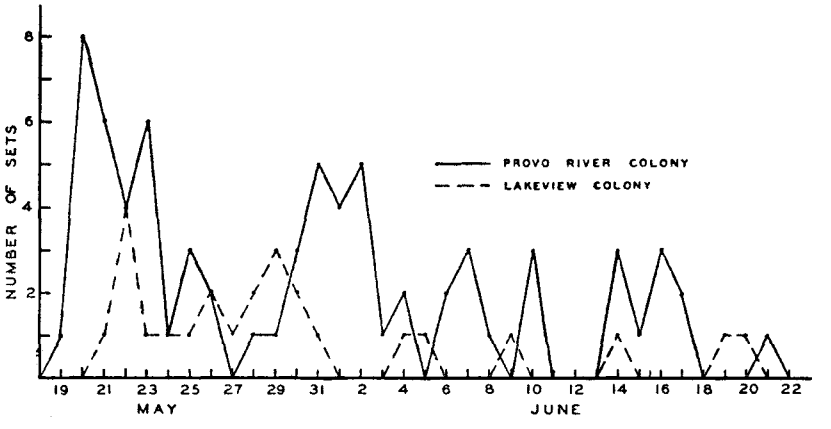
of clutches began to hatch at the first of the hatching period (Text-fig. 1) and gradually decreased until June 21.

Of all the eggs laid, 129 or 29 per cent failed to hatch with the result that only 314 young were produced from a total of 443 eggs. Of these 443 eggs, 90 or 20 per cent, were destroyed or disappeared from the nests before they had time to hatch. The other 9 per cent failed to hatch because of being addled or infertile.

GROWTH OF THE NESTLINGS

The newly hatched young are yellowish pink in color, blind, and helpless; they are practically naked except for a few scattered patches



TEXT-FIG. 1.—Daily number of clutches to begin hatching throughout the nesting season.

of neossoptiles on certain regions of their bodies. The neossoptiles do not seem to grow after the time of hatching but apparently are fully developed at the time the young birds emerge from the egg. These downy feathers are soon pushed out by the incoming teleoptiles to which some of them remain conspicuously attached, especially on the top of the head. The most conspicuous patches of neossoptiles occur on the coronal and occipital regions of the head and on the pelvic and dorsal regions of the spinal tract. Two less-noticeable patches occur on each wing and narrow oblong patches are found along the region of the upper part of the femoral tracts and on the abdominal region of the ventral tracts. A very narrow ring of neossoptiles encircles the legs at the lower part of the crural tract.

The large mouths of the newly hatched young are lined with

bright red and the corners, which protrude beyond the sides of the head, are a conspicuous yellowish white.

Weights of the nestlings were recorded daily or in some instances only every two days throughout the period that the young remained in the nest. In order to identify each individual in the nest, threads of different colors were tied around their legs at the time they were first weighed. On the day of hatching the young varied in weight from 2.6 to 4.8 grams, depending on the time of day when they had hatched before being weighed, with an average of 3.7 grams. Those that had just emerged from the egg weighed 2.6 to 3.6 grams, with 3.3 grams as the most frequent weight.

The study of growth rates was of necessity limited to the period during which the nestlings remained in the nests; this averaged about ten days. The greatest average increase in weight per day occurred between the fifth and sixth days, and amounted to 6.0 grams (Text-fig. 2, A). An average gain in weight of 5.2 grams per day was made during the period when the nestlings were from three to seven days old, whereas the average increase per day from the time of hatching up to twelve days of age was 4.2 grams. During a cold rainstorm which lasted for sixteen hours some of the nestlings lost as much as 2.3 grams in body weight and most of those that survived added little or no weight during that time. The percentage of growth per day was greatest the first day after hatching when it averaged about 60 per cent, and in the case of one brood reached 94 per cent (Text-fig. 2, B). As the nestlings grew older the percentage of gain in body weight gradually decreased until by the ninth day it was down to about 5 per cent.

The rate of growth varied considerably in different broods and in different individuals of the same brood. Nestlings of the same age varied as much as 15 to 20 grams in weight by the time they left the nest; at that time the smaller ones were as well feathered and as able in handling themselves as the larger ones. Inasmuch as there is a great difference in the size of the adult males and females, the western birds averaging 91.4 grams and 56.4 grams respectively (Ammann, 1938), it is quite probable that this difference in the size of the nestlings is due to difference in sex although their plumage shows no sexual differentiation until after the post-juvenal molt. On the basis of this difference in the size of nestlings of the same age, the sex ratio of the nestlings was estimated as 51 per cent females in the Lakeview colony and 55 per cent females in the Provo River colony.

As is indicated by the growth curve (Text-fig. 2, A), the nestlings

do not reach the size of the adult before leaving the nest but continue to grow for some time thereafter. The maximum weight of male nestlings at the time they left the nests was 60 grams with an average of 54 grams, which is only 59 per cent as heavy as the adult males; that of the nestling females was 40 grams with an average of 36 grams, or 64 per cent of the weight of the adult females. This is probably due to the fact that the young birds leave the nest at a very early age (about ten days), before they have reached their full development, as will be seen later.

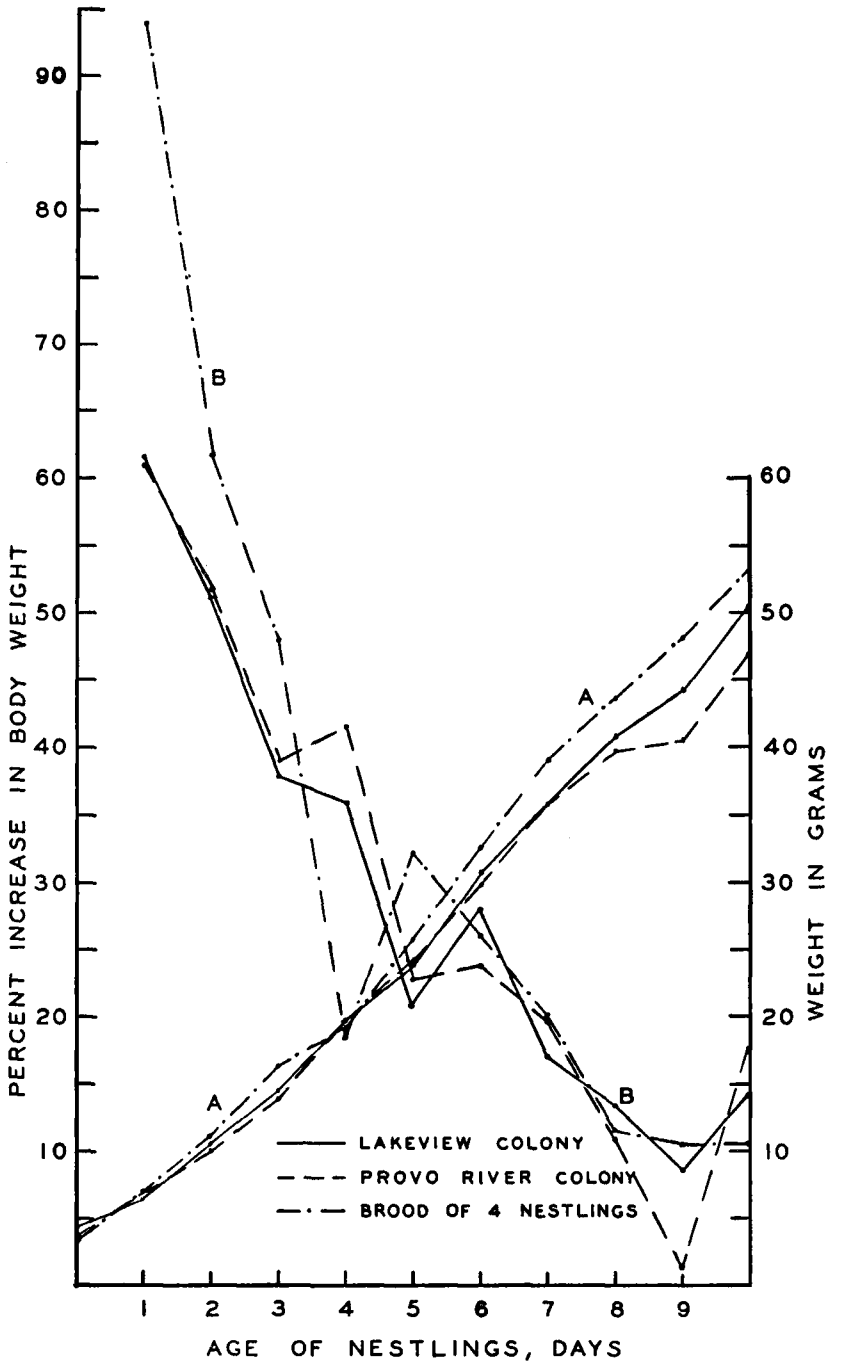
According to Ammann (1938) the growth of the juvenal plumage is completed by the twenty-fifth day; at this time the post-juvenal molt is well under way although the remiges and rectrices are not fully developed until the young are about forty days old.

CARE OF THE YOUNG

The young are brooded by the females during the day for only two or three days after hatching; the amount of time spent by the females in brooding their young does not exceed 25 per cent. After the nestlings are three to five days old they are not actually brooded but the females often stand over the nest with outstretched wings to afford protection to the nestlings from the direct rays of the sun. Although no observations were made after dark it is probable that the young are brooded at night.

For the first day or two after the young are hatched they are fed either by regurgitation or else on food materials so small that they escaped notice, for during that time the females were seldom seen carrying food in their mouths although the young were visited six to seven times per hour. Probably they were fed by regurgitation during that time, since Wheelock (1905) reports that the young are fed by this method during the first two days after hatching. The younger nestlings receive small articles of food such as spiders and small beetles but as they become older, larger insects such as grasshoppers, damselflies and dragonflies constitute a large part of their food.

When the nestlings are young the food is usually divided between two or more members of the brood but as they become older an entire mouthful of insects or one entire large insect such as a dragonfly or a grasshopper may be given to one individual. Those that are fed first are the ones whose vigor in giving the response for food is greatest. This response is present from the first day the young are hatched and is evidently initiated by stimuli of sound and touch because the eyes do not open until the third day after hatching.



TEXT-FIG. 2.—Growth rates of Yellow-headed Blackbird nestlings. *A*, average daily increase in body weight (in grams); *B*, average daily percentage increase in body weight.

Previous to that time a rustling of the vegetation or a slight movement of the nest is sufficient to cause them to open their mouths and extend their necks. So strong is this response that nestlings only two and three days old and so chilled that they were actually blue, feebly raised their heads and opened their mouths for food when the writer approached their nest.

The rate at which food is brought to the nest varies considerably depending on the success of the female in locating food materials, the time of day, and the age of the nestlings. The average number of feedings per hour for all ages and all times of the day was 9.6. The time of day when the young were fed least often was from 1.00 to 4.00 p. m., when it amounted to 7.1 times per hour. After the young are four to five days old, the female remains at the nest only long enough to feed them and to inspect the nest for the presence of waste materials.

The length of time the young are fed, including the period after leaving the nest, was not accurately determined because they move about in the dense vegetation so much. No young were seen foraging for themselves before four to five weeks after the first young in the colony had hatched, although they could have obtained some of their food from among the vegetation before that time. Even during the molting period after the birds had left the nesting areas, the young were often seen following the adults about, coaxing for food.

FOOD

The kinds of food received by the nestlings were determined by direct observation of the feeding activities and by the examination of stomach contents. Both of these methods revealed that the food was primarily animal matter, chiefly insects (Table 1). The kinds of insects received seemed to be those most available to the females. In the Provo River area where midges (*Chironomus*) were abundant and damselflies (Zygoptera) were common, these two insects were most frequently seen being carried to the nests. When the stomach contents of the nestlings were examined, *Chironomus* was found to be present in 41 per cent and constituted an average of 22 per cent of all stomach contents examined; some stomach contents were 84 per cent *Chironomus* (Table 1). At the Lakeview colony where chironomids were very scarce none was found in the stomachs of the nestlings. Grasshoppers and beetles were very abundant in the vicinity of the Lakeview colony because it was surrounded by fields and pastures. The stomach contents of nestlings from this colony contained an average of 39 per cent grasshoppers, with a maximum

of 84 per cent, and an average of 18 per cent beetles with the grasshoppers occurring in 87 per cent of the stomachs examined and the beetles in 75 per cent (Table 1). Inasmuch as the Provo River colony was situated on the shore of a lake these two groups of insects were not so abundant and the stomachs of the young contained an average of only 12 per cent grasshoppers and 17 per cent beetles; the former occurred in only 9 per cent of the stomachs and the latter in 76 per cent. This high percentage of occurrence of beetles is due to the presence of water beetles (*Hydrophilidae* and *Dytiscidae*), while the ground beetles (*Carabidae*) occurred in only 29 per cent of the stomachs and constituted only 4 per cent of their contents.

These results indicate that the food of the young is obtained by the females within the immediate vicinity of the nesting areas. Open fields were within a quarter-mile of the Provo River colony and large open marshes within a like distance from the Lakeview colony, yet the principal kinds of insect food found in those places were very scarce in the stomachs of the young from these respective colonies. Observations of individual females also indicated that they obtained most of the food within comparatively short distances of their nests.

The literature on the food of young Yellow-headed Blackbirds indicates that it is entirely animal matter but in this study vegetable material, chiefly grass-seeds and grain (Poaceae, *Triodia,* and *Hordeum vulgare*), were found to constitute an average of 1.6 per cent of the stomach contents of the nestlings in the Provo River colony and 7.6 per cent of those in the Lakeview colony (Table 1).

Mollusks are also occasionally fed to the young, occurring in 37.8 per cent of the stomachs examined and constituting an average of 1.25 per cent of their contents (Table 1). Wheelock (1905) found that snails, water slugs, and larvae were included in the diet of the young 'Yellow-head.' Gabrielson (1914a) found that 62 per cent of all insects fed to the nestlings were mayflies. Some of the other insects he observed being carried to the nests were larvae, dragonflies, and grasshoppers. Roberts (1909) gives grasshoppers and "a large black larva of some sort which was obtained from among the decayed vegetation in the shallow water along the edge of the slough" as constituting the chief food supply of the nestlings.

SANITATION OF THE NEST

The nests are kept very clean by the females. In only three nests, when the young were ready to leave, was there any noticeable accumulation of excreta. After each feeding the female usually probes about in the bottom of the nest for waste materials or waits on the rim of the

TABLE 1

FOOD OF NESTLINGS BY VOLUME PERCENTAGES

Age of nestlings (days)	1–2	3–4	5–6	7–8		9–10		11–12		Average per cent		Maximum per cent		Per cent frequency	
Colony taken from	L.V.	P.R.	P.R.	P.R.	L.V.	P.R.	L.V.	P.R.	L.V.	P.R.	L.V.	P.R.	L.V.	P.R.	L.V.
Number of stomachs	2	2	6	5	2	2	1	2	3						
PLANT FOOD	0.5	T	T	T	28.0	4.5		9.0	2.0	1.6	7.6	15.0	56.0	40.0	50.0
Poaceae	0.5								2.0				4.0		25.0
Triodia						4.5						9.0		6.0	
Hordeum vulgare								9.0				15		12	
Atriplex				T								T		6.0	
Unidentified fragments		T	T	T	28.0				T			T	56.0	24	25.0
ANIMAL FOOD	99.5	100	100	99.9	72.0	95.5	100	91.0	98.0	98.4	92.4	100	100	100.0	100
Mollusca		0.5	1.0	1.4	2.5		4.0	3.0	0.7	1.1	1.4	5.0	5.0	47.0	37.5
Araneida (total)	9.5	57.5	20.7		T				T			71.0	18.0	65.0	50.0
1. Thomisidae		1.0										2.0			
2. Pissuridae		43.5	15.2									87.0			
3. Microphantidae		13.0	5.5									22.0			
Orthoptera (total)	31.0		1.6	15.6	12.5	33.0	61.0	26.0	82.0	12.1	39.0	75.0	84.0	90.0	87.5
1. Gryllidae						T						T			
2. Locustidae	23.5			15.6	11.5	33.0		3.5				75.0	30.0		
3. Acrididae	7.5		1.6		1.0			22.5	82.0			25.0	84.0		
Odonata (total)	29.5	3.5	40.0	14.8	5.0		T	58.0	26.3	25.8	18.5	81.0	59.0	70.0	75.0
1. Anisoptera	12.5	T			5.0			58.0		6.8	4.4	70.0	10.0	17.6	25.0
2. Zygoptera	17.0	3.5	40.0	14.8			T		26.3	19.0	14.1	81.0	57.0	53.0	62.5
Hemiptera (total)		T	0.5	1.8	T			1.0	T	0.8	T	9.0	T	47.0	25.0
1. Corixidae				T								T			
2. Nabidae		T	0.2									1.0			
3. Reduviidae			T									T			
4. Coreidae			0.3	1.6				T	T			8.0	T		
5. Pentatomidae			T	0.2	T			1.0				1.0	T		
Homoptera (total)	T	T		0.2					T	T	T	1.0	T	17.6	12.5
1. Cicadellidae	T	T							T			T	T		
2. Cicadellidae (nymphs)				0.2								1.0			

TABLE 1—*Continued*

FOOD OF NESTLINGS BY VOLUME PERCENTAGES

Age of nestlings (days)	1–2	3–4	5–6	7–8		9–10		11–12		Average per cent		Maximum per cent		Per cent frequency	
Coleoptera (total)			6.7	23.4	32.5	62.5	35.0	3.0	15.3	17.0	18.2	95.0	54.0	76.0	75.0
1. Cicindellidae			0.3	2.5	4.5		4.0	T	9.3			6.0	28.0		
2. Carabidae			0.8	0.4	2.5			T	2.0			5.0	6.0		
3. Hydrophilidae		T	0.6	19.0	25.5			0.5	2.0		7.1	3.0	51.0		27.5
4. Hydrophilidae larvae			5.0			59.5		T	1.7	14.5		94.0	5.0	41.0	
5. Elateridae						T						T			
6. Scarabaeidae						3.0			0.3			6.0	1.0		
7. Curculionidae			T	0.4			31.0	2.5				3.0	31.0		
8. Dytiscidae (larvae)			T	1.1								4.0			
Lepidoptera (total)				5.0	19.0				T	1.5	4.7	25.0	38.0	6.0	27.5
1. Lepidopterous larvae					19.0				T				38.0		
Diptera (total)	26.0	38.0	23.5	31.2						22.0	6.5	84.0	52.0	47.0	12.5
1. Chironomidae		38.0	23.5	31.2						22.0		84.0		41.0	
2. Tabanidae	26.0												52.0		
3. Misc. fragments		T										T			
Hymenoptera (total)	3.5	0.5	5.8	6.4	1.0				1.6	2.1	1.7	32.0	7.0	41.0	50.0
1. Eurytomidae		0.5										1.0			
2. Formicidae	3.5		0.5	T	1.0				1.6			2.0	7.0		
3. Sphecidae			T	3.0								T			
4. Apoidae				3.4								17.0			
5. Andrenidae			5.3									32.0			
6. Misc. fragments	T				T								T		

"T" indicates a trace (less than 0.1 per cent).

nest for the fecal sacs to be extruded. From the time the young are first hatched until they are three or four days old the fecal sacs are frequently swallowed by the females but as the young become older these sacs are carried a short distance from the nest and dropped.

RÔLE OF THE MALE

The males aid very little in caring for the nestlings. Only two males were observed to make any attempt to feed the young. One of these fed the young eight times during a period of eight hours and six minutes while the female fed them 102 times during the same interval. The other male fed another brood of nestlings eight times while the female fed them 92 times during the same period. No young were observed being fed by the males before they were six days old. Roberts (1909) observed males feeding the young to a limited extent, both in the nest and after they had left, but Gabrielson (1914a) failed to find any males feeding the young or carrying food that might have been intended for them.

The females seem to excel the males in the care of the young. If a female is present at the nest the male will wait until she has left before approaching with food. If the male is present at the nest when the female arrives he immediately leaves.

Coues (1874) reports that the males desert the females during the time of incubation and caring for the young; however, the observations of others, including Roberts (1909), Gabrielson (1914b), Ridgway (1889), Linsdale (1938), and Ammann (1938), do not confirm this statement. The males often fly into the neighboring areas to feed but they return to their respective territories after a short time (Fautin, 1940). Records of the time spent in and out of their territories revealed that on an average the males spent 55 per cent of their time within their territories and 45 per cent outside.

LEAVING THE NEST

The young, when about ten days old, are often found perching on the rim of the nest and frequently hop down into the vegetation when the nest is approached. Although no young were seen to leave the nests voluntarily, the nests were found to be abandoned when the young were nine to twelve days old. Roberts (1932) states that the young remain in the nest for about twelve days and Ammann (1938) found that they leave at all ages varying from seven to fourteen days but that the usual age of leaving is about eleven days.

Under certain circumstances, as when the nest is destroyed by a storm or tipped over, the young are forced to leave sooner than they normally

would. Under such conditions they were found to survive if they were not less than eight days of age. Where there are four nestlings, the nest becomes so well filled by the time the young are eight to ten days old that it is almost impossible to fit them back into it again after they have been removed. Such crowded quarters probably exert some influence in forcing them to leave somewhat sooner than otherwise. Thus nests containing four or five young were often abandoned a day or two earlier than nests containing smaller broods. All of the young usually left the nest at about the same time but not infrequently some left before others. Young which were hatched on the same day usually left the nest on the same day.

The young are unable to fly at the time they leave the nest but they are very adept at making their way through the vegetation. After abandoning the nest they never return to it but are to be found among the vegetation down near the surface of the water, sometimes sitting on the dead floating vegetation. The color of the nestlings blends very well with the dried stalks and leaves of the vegetation so that when remaining quiet they are very difficult to find. After leaving the nest they remain in the vegetation until they learn to fly. For the first four or five days they move about by hopping from one stem or leaf to another with remarkable agility. Following this hopping stage they make short flights of about two to four feet and thus gradually develop their ability to fly. By the time they are three weeks old they are frequently seen to make short flights of about 25 yards. From this stage on, their ability to fly develops very rapidly and they are soon seen pursuing their parents, coaxing noisily for food.

MORTALITY

The toll of nestlings taken by natural forces and by certain undetermined natural enemies of the Yellow-headed Blackbird is very heavy. In this study, cold rainstorms accompanied by wind were one of the primary causes of the destruction of the young (Table 2). Only one such storm occurred during the nesting season but it left in its wake a high percentage of destroyed nests, eggs and young. The percentage of nestling mortality attributed to the direct effects of this storm, based on the number of young in the nests at the time of the storm's occurrence, May 30, amounted to 39 per cent in the Provo River colony and 22 per cent in the Lakeview colony. The difference in the mortality of these two colonies was largely due to differences in the kinds of vegetation present and to a possible difference in the intensity of the storm at the two places. The tamarisks (*Tamarix gallica*) and willows (*Salix* sp.) of the Provo River area, being tall

and limber, sway back and forth in the wind with the result that a number of nests were torn away from their moorings allowing their contents to roll into the water. The shorter and more dense bulrush stalks (*Scirpus validus*), in which the Lakeview colony was situated, were less subject to being whipped by the wind and the nests were placed down nearer the surface of the water. In the Provo River colony four nests were completely destroyed and seven others torn loose and tipped over, whereas only one nest was damaged in the Lakeview colony.

This storm also killed many nestlings without destroying the nests (Table 2). In some nests all of the young were killed while in others part of them managed to survive. The nestlings that suffered most were those from three to six days of age. Those younger than that received the protection of the more constantly brooding females and those older than six days were well enough protected by their own feathers and the development of body temperature-regulating mechanisms to enable them to survive.

In both colonies many nestlings disappeared suddenly, leaving no clues as to their fate. Roberts (1909) reports that the entire progeny of a colony in Minnesota was destroyed by some agency, the identity of which he was unable to determine. Thompson (1934) and Linsdale (1938) also refer to nests being emptied of their contents. Some of the young may have been removed alive by the females because one female was seen to perform such an act. Others may have died from exposure, neglect, internal parasites, crowding or other causes and then been removed by the females. Still another possibility is that some of them were taken by snakes. Dawson (1923) found a bull snake coiled up beneath the nest of a Yellow-headed Blackbird in California and Ammann (1938) found a garter snake in the act of swallowing a nestling in Iowa.

In the Lakeview colony 19 per cent of the young were found dead in the nests and partly eaten. In most instances they were not dismembered but the flesh had all been removed from the bones. Since no ants were found in the nests some small animal, whose weight could be supported by the vegetation, may have been responsible for such depredations. The navigator shrew (*Neosorex palustris navigator*) was suspected of these losses but this could not be proved.

Other nestlings were found dead in the nests apparently because of neglect or desertion by the females. Weydemeyer (1936) and Ammann (1938) have found similar cases of mortality. Flooding of nests has been listed as one of the major causes of nestling mortality by Henninger (1915) in Wyoming and by Gabrielson (1914b) and Ammann

TABLE 2

FACTORS CONTRIBUTING TO THE MORTALITY OF NESTLINGS

Causes of mortality	*Provo River Colony*		*Lakeview Colony*	
	No. of nestlings	*Per cent*	*No. of nestlings*	*Per cent*
Nests completely destroyed by storm	6	2.6	0	0
Nestlings dead in nest (cause unknown)	8	3.5	2	2.3
Nestlings suddenly disappearing from nest (cause undetermined)	71	31.1	27	31.4
Nestlings missing after storm but nest not destroyed	10	4.3	8	9.3
All young killed by storm (remaining in nest)	8	3.5	0	0
Part of young killed by storm (remaining in nest)	17	7.4	4	4.6
Nest tipped over causing nestlings to fall out	21	9.2	0	0
All young dead in nest (apparently due to exposure or neglect)	8	3.5	0	0
Female removed living nestlings from nest while being observed	3	1.3	0	0
Died from large blister on side of body (sunburn)	1	0.4	0	0
Nestlings all dead in nest—partly eaten (cause undetermined)	0	0	16	18.6
Part of nestlings dead in nest and partly eaten	0	0	3	3.5
Drowned	0	0	2	2.3
Total mortality	153	66.8	62	72.0
Mortality due to storm May 30	41	*39.2	12	*21.6

* Percentages are based on number of nestlings at time of storm and not on the total number of the colony.

(1938) in Iowa. This is probably an important cause of mortality in areas where considerable fluctuations of the water level occur. Other minor causes of mortality are exposure to the sun and drowning. A number of nestlings were found floating in the water below the nest from which they had been frightened or had accidentally fallen.

This study as well as those of Roberts (1909) and Ammann (1938) indicate that the nestling mortality of this species is very high but probably varies from one year to another depending on the weather conditions and the amount of predation. The entire progeny of the colony studied by Roberts in Minnesota was destroyed resulting in a 100 per cent mortality. The nestling mortality of the Provo River colony amounted to 67 per cent and that of the Lakeview colony to 72 per cent, thus giving an average of 69.5 per cent for the two. This is very high in comparison with the nestling mortality of the Song Sparrow as shown in a six-year study by Nice (1937) amounting to 40 per cent and the nestling mortality of Bluebirds (Laskey, 1940) which amounted to 43 per cent in 1938 and 51 per cent in 1939.

Out of 314 nestlings, hatched from 443 eggs, 215 were destroyed before they were old enough to leave the nest. This gives a percentage of success (i. e., young fledged from the total number of eggs laid) of 22.4. This is very low when compared with the average nesting success of 52 per cent for bush- and tree-nesting passerine birds from eleven different studies as compiled by Kalmbach (1939).

From the following table it will be seen that when the nesting success of marsh-nesting birds alone is considered there is a wide range of variation from total failure of the Yellow-headed Blackbird to 78 per cent success in the Red-winged Blackbird.

TABLE 3

Species and Locality	*Reference*	*No. of nests or eggs*	*Per cent of success*
Red-winged Blackbird (New York)	Allen (1914)	51 nests	78
Red-winged Blackbird (Indiana)	Perkins (1928)	24 nests	57
Red-winged Blackbird (Louisiana)	Kalmbach (1939)	281 eggs	27
Boat-tailed Grackle (Louisiana)	McIlhenny (1937)	74 nests	54
Yellow-headed Blackbird (Minn.)	Roberts (1909)	62 nests	0

Various observers have reported very heavy mortalities for the Tricolored Blackbird, *Agelaius tricolor*. Belding (1890) found many young dead in their nests; Neff (1937) reports whole colonies deserting full sets of eggs and young without any apparent cause and other colonies deserting because of damage done to the cattails and bulrushes by heavy winds; Lack and Emlen (1939) report mass destruction of eggs by some undetermined agent; and Mailliard (1900) suggests that the rapid growth of tules in which nests have been situated has caused desertion of early (low) nests in favor of higher building sites. He also cites heavy predation by Swainson's Hawk (*Buteo swainsoni*). These reports and other causes of mortality that have been previously cited, indicate that the hazards encountered by marsh-nesting birds are varied and numerous and that birds which nest in marshes are subjected to very heavy reproductive losses.

Whether or not the nesting success of the Yellow-headed Blackbird in this study is typical for the species cannot be stated without verification. It is possible that this was an extremely hazardous year for them and that the per cent of success they attained in their nesting is abnormally low. Further investigation is necessary to determine this fact.

After leaving the nest the fledglings move about in the vegetation of the nesting area so that it is extremely difficult to determine their fate

and the mortality which occurs at that time, but there is evidence that some of them do get killed. One was found dead hanging from a willow, having caught one of its feet in the crotch of two branches. Others were found dead in the water. Undoubtedly some fall prey to hawks, owls, weasels, muskrats, and other predators so that the number which actually leave the nesting area is a very small per cent of the number hatched.

POST-NESTING ACTIVITIES

During the molting period which began in July the Yellow-headed Blackbirds left the nesting areas and congregated in large flocks in marshes where the growth of cattails, *Typha latifolia,* and bulrushes was most dense. Here they remained very much in seclusion during the greater part of the day, coming out only in the mornings and evenings to feed. Very often the males were found in one part of the marsh and the females and juvenals in another. This association of the females and juvenals may have been due to the greater attentiveness of the females to the young during their nestling period.

The first-winter plumage of the young is acquired by a partial post-juvenal molt as a result of which the buffy feathers of the head, neck, and breast regions of the fledglings are replaced in the males by yellowish feathers tipped with brownish on the sides of the head, throat, and breast, with a collar sometimes extending around the back of the neck. The feathers of the back, nape, crown and wings are a deep brown while those of the under parts and especially those of the belly and crural regions are somewhat paler around the edges. The autumn plumage acquired by the juvenal females is much the same as that of the adult females.

When the autumn molt was near completion, about August 1, the Yellow-headed Blackbirds, together with other species of blackbirds, came out of hiding and roved about in the fields during the day, returning to the cattail marshes to roost at night.

Migration began about September 1. By September 7 only three females could be located in the vicinity of the study areas. One week later a single juvenal male in a flock of about fifty Brewer's Blackbirds, *Euphagus cyanocephalus cyanocephalus,* was all that could be found and by September 17 all had left the vicinity of the study area.

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SUMMARY

1. Two colonies of Yellow-headed Blackbirds, containing a total of 128 nests were kept under observation from April to September.

2. The development of the young is described from the time of hatching until after they left the nest. The average weight of the nestlings at the time of hatching was 3.3 grams and at ten days of age was 51 grams; the greatest percentage of increase in weight occurred during the first day after hatching, while the greatest actual increase in body weight occurred between the fifth and sixth days, amounting to 6 grams at that time.

3. Feather development began soon after hatching; the sheaths of the primaries appeared the second day. At eight to nine days of age the contour feathers were sufficiently developed to cover all the apteria except possibly the one on the abdomen.

4. Only rarely did the males help in the feeding of the nestlings, whereas the females fed them on an average of 9.6 times per hour.

5. Food of the nestlings consisted principally of insects and spiders. The spiders and smaller insects constituted the greater part of the diet during the first few days after hatching, while larger insects such as dragonflies and grasshoppers together with some vegetable matter formed the bulk of the food as the young became older.

6. The nestlings left the nests when nine to twelve days of age and remained among the dense vegetation of the nesting area until they were able to fly.

7. Mortality of the nestlings was very high, the percentage of young fledged from the number of eggs laid being only 22. Predation and rainstorms accompanied by wind were the two principal causes of mortality.

8. A partial post-juvenal molt occurred about the last of July when the plumage of the fledgling was changed to that typical of the first-year birds. During this time the birds left the nesting areas and remained in seclusion in dense cattail marshes.

9. After most birds had completed their autumn molt they wandered about the fields in large flocks during the day, and returned to the marshes at night.

10. Migration began about September 1 and by September 17 all Yellow-headed Blackbirds had left the study areas.

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