EGG AND NESTLING MORTALITY IN RED-WINGED BLACKBIRDS

A Seminar

Presented to the

Graduate School

Wisconsin State University, La Crosse, Wisconsin

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

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July 1971

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WISCONSIN STATE UNIVERSITY - LA CROSSE

GRADUATE COLLEGE

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I recommend acceptance of this seminar paper to the Graduate College in partial fulfillment of this candidate's requirements for the degree Master of Science in Biology.
The candidate has completed his oral seminar report.

August 2, 1971
Date

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This seminar paper is approved for the Graduate College.

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ACKNOWLEDGEMENT

I would like to express my gratitude to Dr. Howard Young of La Crosse State University for his assistance in this study, and to the Wisconsin Ornithological Society for a scholarship grant in 1971.

ABSTRACT

This study was undertaken to examine the mortality rates for the eggs and nestlings of small passerines. The Red-Winged Blackbird (Agelaius phoeniceus) was selected because of the availability of nests in the area. A marsh located on Goose Island about seven miles south of La Crosse, Wisconsin was used as the specific study site.

The nesting period was examined from the first part of May until the middle of July. The results indicated an egg survival of 84%, a nestling survival of 60%, and an overall survival of 46%, with 35% of the active nests successfully fledging young. The egg and nestling survival produced a negatively skewed curve indicating a higher mortality for nestlings than for eggs, but when this data was added to adult survival it produced a positive skewed curve.

A review of other studies showed wide variations in nesting success of Red-winged Blackbirds. Further studies should attempt a correlation of environmental data with nesting success.

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INTRODUCTION

This study is an attempt to add to present information concerning early mortality in the life of altricial birds. A number of papers on this subject were published eight to thirty years ago, including papers by Young (1963), Nice (1957), Peterson and Young (1950), Smith (1943) and Williams (1940), but there seems to have been a decline in the number of these studies in recent years. There is also a general lack of papers which include survival curves for the egg and nestling survival.

The study was pursued on a cattail marsh located on Goose Island in the Mississippi River just south of La Crosse, Wisconsin. It contained about twenty-three acres and is surrounded by a variety of habitats (see Figure 1). The north end has as its boundary a small pond while the west side is bordered by a narrow strip of trees running approximately half of its length. The woods is composed of the common locust (*Robina Pseudoacacia* L.) mixed with river birch (*Betula nigra* L.), black oak (*Quercus velutina* Lam.) and the American elm (*Ulmus americana* L.). The eastern and southern sides of the marsh fade into open fields of reed canary grass (*Phalaris arundinacea* L.) with interspersed clumps of sandbar willow (*Salix interior* Rowlee), and river birch

(_Betula nigra_ L.).

The marsh area has a predominance of arrowhead or duck potato (_Sagittaria cuneata_ Sheldon) with a scattering of both types of cattails (_Typha latifolia_ L., _Typha angustifolia_ L.), bulrushes (_Scirpus cyperinus_ L.), bur-reed (_Sparganiaceae americanum_ Nutt.), a large sedge (_Carex_ sp.) and reed canary grass (_Phalaris arundinaceae_ L.).

The marsh is quite low and would likely contain some water throughout the summer if precipitation occurred regularly. There was evidence of muskrat work in several areas of the marsh and raccoon tracks were also noted. This would be considered a typical marsh of the Mississippi Rivers bottom.

MATERIALS AND METHODS

Field observations for this study were conducted from June 17 to July 18 during the summer of 1970 and from May 18 to July 18 during the summer of 1971. Nests were located by walking back and forth over the marsh searching the vegetation. As nests were located they were numbered and information about the type of vegetation, the height of the nest, and the number of eggs or young if any, was noted. The nest site was marked by placing a numbered tag on a small bamboo pole and sticking it into the mud near the nest. All discovered nests were marked in this way regardless of their content. It was hoped that empty nests might mean completed construction and they were watched for a period of about one week before they were destroyed to avoid marking them again.

In nests containing eggs an attempt was made to mark the eggs in the order of laying in 1970. This was often impossible because of the late start of the study. If two or three eggs were present they all had to be marked as number one because there was no way to determine the order in which they were laid. This procedure was not attempted in 1971.

Attempts to find new nests were made with each visit by walking different routes. The nest checks were attempted on an every other day basis and the average for the study period turned out to be 1.9 days between visits. A total of approximately 200 man hours was spent searching for nests and checking them.

The egg and nestling survival was determined from the approximate length of time the eggs and nestlings should remain in the nest. For example: if eggs were known to be laid on June 1, 2, and 3, and a visit on June 4 showed the nest to be empty the approximate time of survival for each egg would be known. Comparable information was available for nestlings which failed to fledge. This was possible only in nests which had records showing approximate time of laying or hatching. Loss of eggs previous to hatching or loss of young prior to the approximate time of fledging was considered mortality. No attempt was made to determine the exact causes of mortality in this study.

RESULTS

In 1970 a total of fifty-five nests was found of which twenty-seven were active (contained at least one egg), but only eight had records complete enough to use in compiling data. In the twenty-seven active nests there was a total of seventy-two eggs or 2.66 eggs per nest. Nine of the twenty-three active nests fledged young for a thirty-nine per cent success ratio. Some of the data were extrapolated from previous knowledge. If the time of hatching or fledging is known, the approximate time of nest construction, laying, incubation and nestling stage can be determined. The approximate time sequence for the Red-wing is four days for nest construction, four days for laying, twelve days for incubation and twelve days until fledging.

In 1971 a total of 106 nests was located of which eighty-eight were active. Fifty one had data complete enough to establish dates of nesting activity as shown in Figures 2 and 3. Some of these dates were also extrapolated according to previous information. A total of 220 eggs was found in the eighty-eight active nests for an average clutch size of 2.50 eggs. Thirty of the eighty-eight active nests fledged young for a 34.1% success ratio.

This produced a total of 161 nests for the two year period of which 111 were active and fifty-nine of them had complete information available. The average clutch size for the study was 2.56 eggs per nest. Thirty-nine of the one hundred eleven active nests in the study successfully fledged young. This would mean approximately 35.1% of the nests would be successful. Figures 2 and 3 illustrate the changing pattern of nesting as the season progresses, and also indicate that the 1970 data related primarily to renesting.

At the peak nesting period in 1971 there were 48 active nests on the study site. This would be approximately 2.0 nests per acre, but nest distribution tended to be clumped rather than random. This was due to the vegetative patterns of the marsh, the polygynous breeding habits of the species, and territorialism of the males.

DISCUSSION

The survival of eggs and young in altricial birds has been reported by many individuals, including a very comprehensive study by Nice in 1957. The results of these studies vary greatly.

NESTING SUCCESS:

Nice (1957) listed nest success of many species, that is what percentage of the active nests actually produced young, at forty-nine per cent. Nest success for this study was thirty-nine per cent in 1970, but this figure could have been low because of the late start of the checks in that year. It is possible that some of the listed active nests had fledged young earlier and the eggs which were infertile were still present in the nest. However in 1971 nesting success was 34.1% and the factor mentioned above had been removed. The total nesting success for this study is 35.1% which contrasts with the figures listed by Nice.

Goddard and Board (1967) reported a nest success of 26.7% for the Red-winged blackbird in a study done on farm ponds or other artificial water collecting devices in Oklahoma, and Young (1963) reported that 150 of 518 or 28.9% of the nests successfully fledged young on a cattail marsh similar to the one in this study.

Frances (1971) compiled data from eight nesting studies of the Red-winged Blackbird some of which are already mentioned in this paper. His data also show large variations in the results. He included studies done in cattail marshes, as in this one, but also tidal marshes, salt bays, brackish bays, and upland areas. His success figures for studies in cattail marshes show that 37.8% of the nests were successful.

Literature on nest-success, relating specifically to the Red-winged Blackbird, therfore show a range from 26.7% to 39%, well below the 49% general success figure listed by Nice (op cit) for small passerines. The two-year success (35.1%) for this study is close to Frances's summary percentage for Red-wing nesting in cattails, suggesting that the La Crosse population was typical in this regard.

Frances also attempts to correlate variations of the environment with nesting success. These variations included the type of vegetation the nest was constructed in, the time of nesting (i.e. early or late), the nest height, the habitat type, the geographical locality and the year or season of nesting. A correlation of nest height with nesting success was reported by Holcomb and Twiest (1968) who reported a range of nest success from 17.2% for nests twenty-four inches and under to 34.8% for nests thirty-eight inches and over. Frances questioned the validity of these figures because of variations in the types of habitat where the nests were found. This correlation was attempted in the present study with entirely different results. First of all, the nest heights at La Crosse did not compare to those of Holcomb and Twiest. Only two or three nests over twenty-four inches were found in this study. One of the reasons for this is that nearly 100% of the nests were in cattail or sedge while those reported in the cited study were also found in several types of upland shrubs. Nesting of this type seems to be relatively scarce in the Goose Island study area. Goddard and Board (1967) also reported data relating nest height to success. They divided the heights into four categories: 0 - 12 inches, 13 - 24 inches, 25 - 36 inches, and over 36 inches. The success ratios they reported were 38.2%, 27.2%, 22.6%, and 19.4% respectively. Frances (1971) indicated that these differences were not significant when tested by a Chi Square Test.

The nest heights in this study are categorized into two classes as indicated by Table I. The results indicate that the nests eighteen inches and under were the most successful with 38 per cent of the active nests fledging young while the nests over eighteen inches were slightly less successful at 32 per cent. It is interesting that in all studies the lower nests are more abundant. It is probable these results really indicate equal success between the two groups of nests. There are possibilities of several factors interacting here. Although lower nests might be more susceptible to flooding and non-flying predators, the higher nest is generally more exposed to the dangers of hard rainfalls, flying predators and perhaps the radiation of the sun. It is also possible nest height should be compared only in homogeneous nesting sites because nests in shrubs would likely have different ecological factors affecting them than nests in cattails at the same height.

Frances (op cit) also indicated that nests initiated before June first were more successful than later nest and Fankhauser (1964) reported better success percentages for renesters. He reports that seven of sixteen first nests were successful while four of five renest attempts succeeded. Data from the present study is not sufficient to examine the question.

The most obvious feature of the studies on Red-wing Blackbirds to me is their great variability. They vary from season to season, from locality to locality, and from habitat to habitat.

The reasons for these differences need more detailed study. Perhaps precise meteorological data should be collected along with nest data, or a more extensive assessment of plants, those used for nest sites and those contributing to the general habitat, should be made. Perhaps predator and food populations, or water and soil chemistries also need to be categorized before we can gain insight into the reasons for the variability of success in the Red-wing. Frances (op. cit) also indicates a possibility of energy balances between radiation energy and that contained in the egg and nestling might be of some consequence. Further research along these lines should consider one or more of these factors.

HATCHING AND FLEDGING SUCCESS:

Nice (op. cit) reported data from 7,788 nests and 21,951 eggs of various species from twenty-eight studies in the U. S., six in England and one in Germany. She reported a hatching success of sixty per cent, but she did not have sufficient information to indicate fledging success. The hatching success for this study was higher at 76.4% for the two year study, and it was much higher, ninety-three per cent for the summer of 1970.

Information from Nice's report also indicates large variations in the results of various studies. Two of the studies she reported on are of the Red-wing blackbird: Smith (1943), and Williams (1940). Williams reported a hatching success (214 eggs) of seventy-three per cent and a fledging success of forty-nine per cent.

Young's (1963) study of early mortality of the Red-wing blackbird in a cattail marsh in the La Crosse area, showed a survival from eggs to fledging of twenty-one per cent. This contrasts with a sixty-eight per cent survival in 1970, a forty-three per cent survival in 1971 and a collective survival rate of 46.0% in this study. H. M. Smith (op cit) reported survival in two populations of Red-wing blackbirds. Population A hatched seventy-four per cent of 563 eggs and fledged eighty per cent of the young for an over-all survival of fifty-nine per cent. Population B hatched seventy per cent of 544 eggs and eighty-four per cent of the young were fledged for an identical over-all survival. Nice (op cit) also reported a study of a similar species, the Yellow-headed blackbird (Xanthocephalis sp.), by Fautin (1941), indicating the hatching success (443 eggs) to be seventy-one per cent and the fledging success at twenty-two percent. Young (op cit) reported 30% of the eggs (369) producing young in the same species. The variations in these studies may be caused by variable habitats or weather conditions.

MORTALITY PATTERNS:

These data on reproductive success (number of eggs producing fledglings) are more meaningful than the data on nest success. A female may have one or two unsuccessful nests and still produce fledglings in a third successful attempt.

Figures 4, 5, and 6 indicate that the mortality rates for young birds are higher than for the eggs. This is also indicated by Nice (1937) for the Song Sparrow (Melospiza melodia) Young (1963) for the Red-wing and Holcomb (1969) for the Goldfinch (Spinus tristis).

These Figures (4, 5, and 6) exhibit what is termed a negatively skewed survival curve. This is an indication that the mortality rate increases as the age of the organism increases. A positively skewed curve would curve in the opposite direction and would indicate a high mortality rate for the early part of life and then decreasing mortality would occur as the organism grows older. According to Deevey (1947), "Most survivorship curves hitherto published including those of man, Drosophila, Hydra, Agriolimax, the mouse, the vole, the black widow spider, Tribolium, and other laboratory animals are variants of the diagonal type, or rather are intermediate between type I and type II." The type I and II curves Deevey refers to here are the negatively skewed and the straight diagonal types respectively. The diagonal line would indicate a uniform mortality rate.

It should be noted that the time span represented in this study is only a short portion of the time it is possible for a blackbird to live. In Figure 7 taken from Deevey (1947) a generalized survival curve for small passerines is presented. Deevey did not use data pertaining to egg and nestling mortality in computing this curve, and this could be misleading if used to represent a life survival curve as indicated by the addition of egg, nestling and first year mortality. In Figure 8 egg and nestling survival from this study have been combined with the adult survival. This gives the curve a positive skew showing most mortality occurs in the first 24 days of life. An estimated 75% mortality from fledgling to 1 year was used which seems to be reasonable according to data reviewed from the banding of passerine nestlings, Young(1963).

While the data on nest success and egg and nestling survival are variable they do produce similar survival curves. Johnston (1956) and Young (1963) are two studies which treat this subject and their survival curves are similar to those of this study. Their negatively skewed aspect indicates an increase in mortality of eggs and nestlings as their age increases. This could be due to increased activity by the young as they mature or to the parents' activity as the young demand more care. It is also possible the nest would become less protective because of deterioration or changes in the vegetation supporting it.

Studies of this sort are valuable in monitoring the reproductive success of natural populations and in view of recent evidence /Porter and Wiemeyer (1969)/ concerning the effect of pesticide residue on avian hatching success. Additional studies similar to this one could provide information for further evaluation. Other factors (pollution, radiation, etc.) which influence natural populations might also be investigated in a similar manner.

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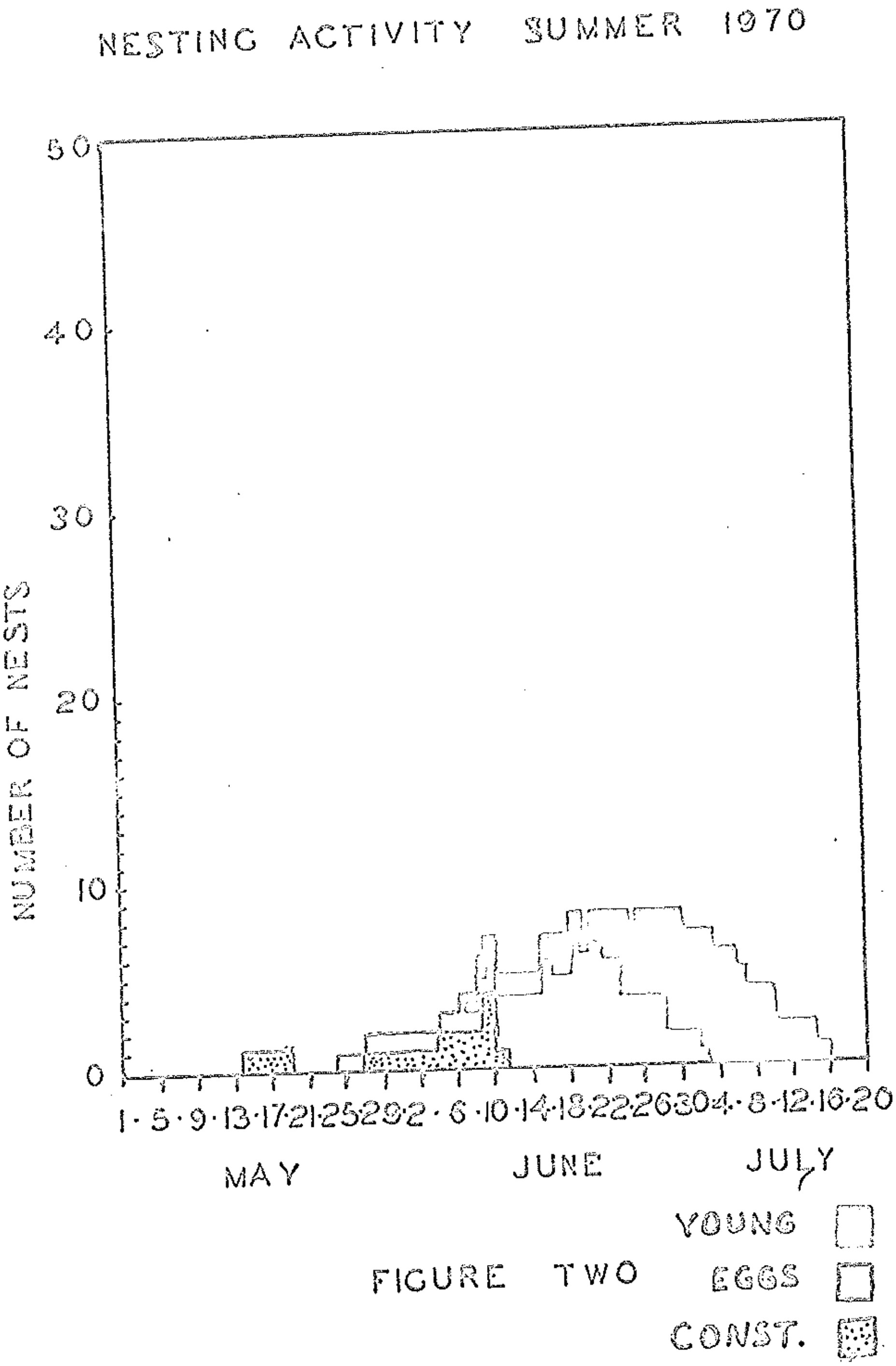
NESTING ACTIVITY SUMMER 1970
NUMBER OF NESTS
50
40
30
20
10
0
1·5·9·13·17·21·25·29·2·6·10·14·18·22·26·30·4·8·12·16·20
MAY
JUNE
JULY
YOUNG
EGGS
CONST.

FIGURE TWO

NESTING ACTIVITY SUMMER 1971

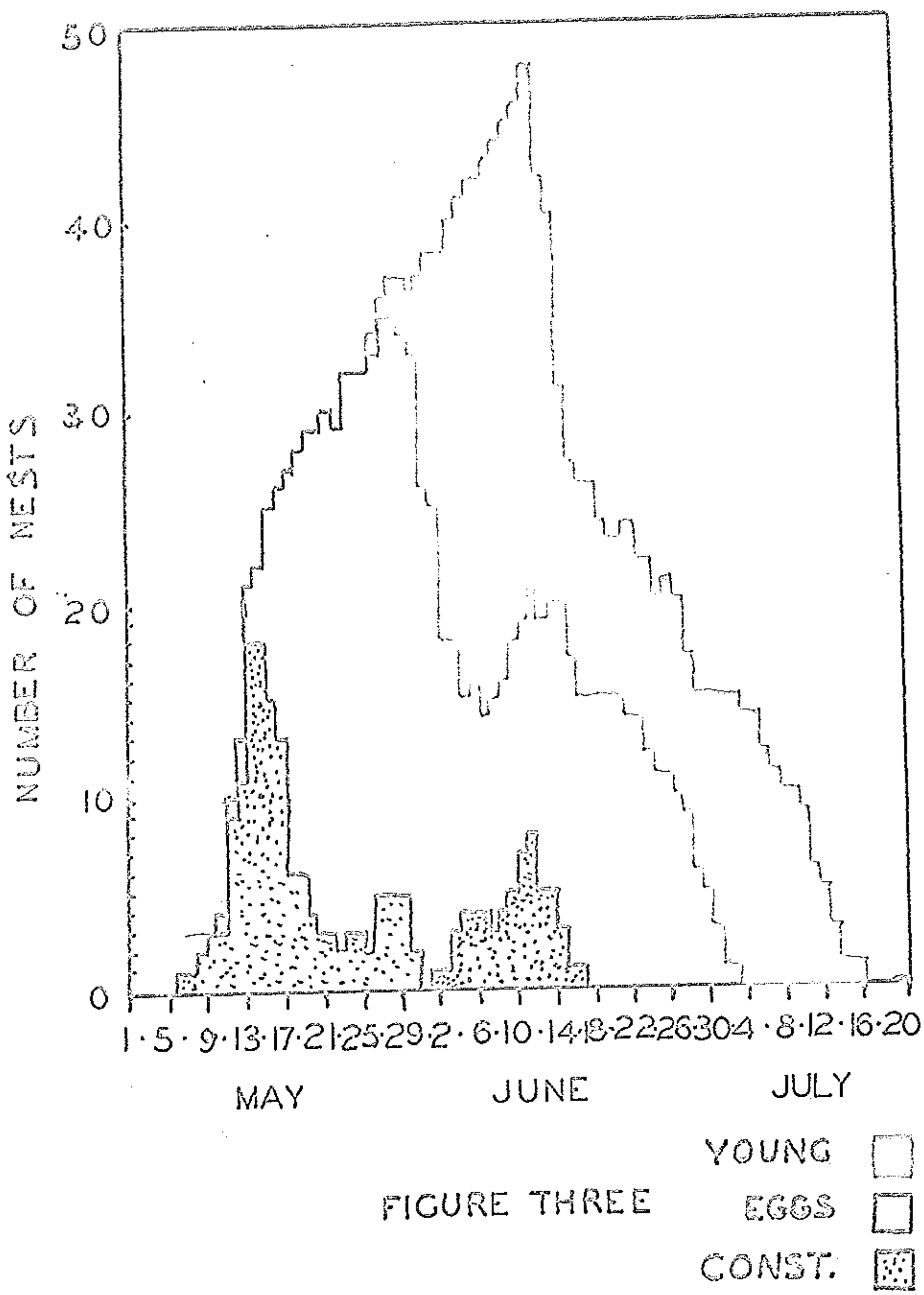

FIGURE THREE

EGG AND NESTLING SURVIVAL 1970

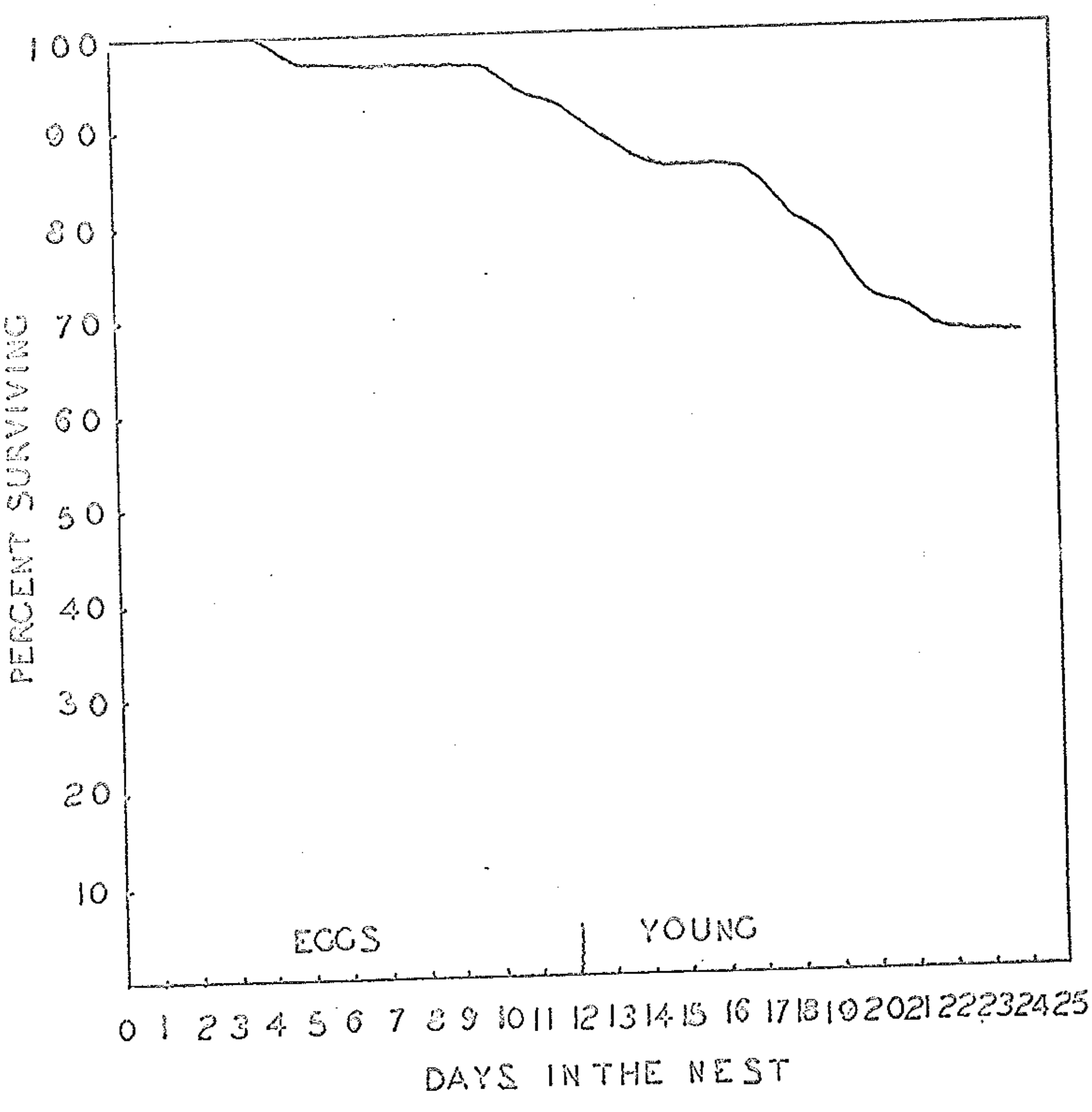

FIGURE FOUR

EGG AND NESTING SURVIVAL 1971

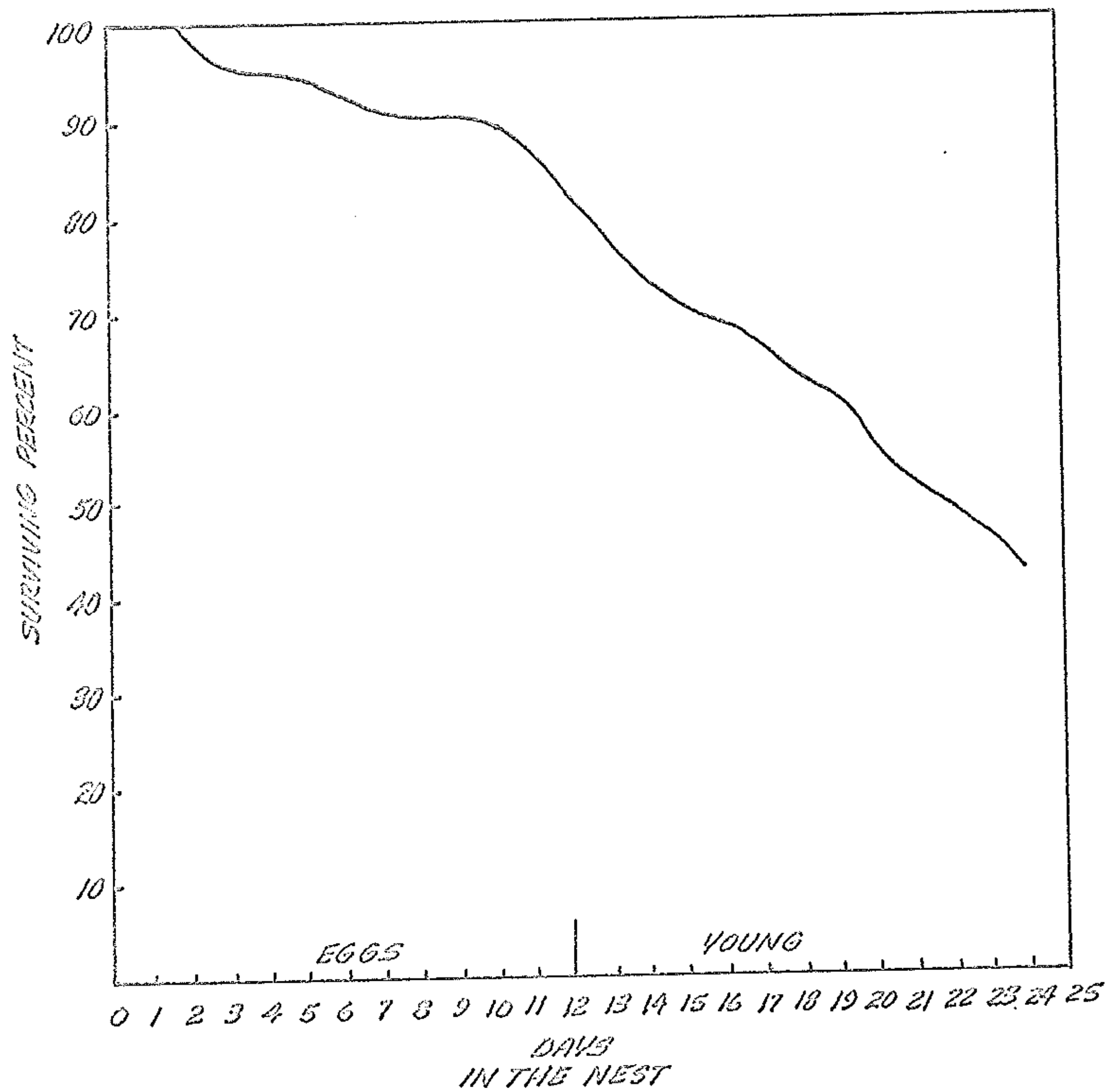

FIGURE FIVE

EGG AND NESTING SURVIVAL 1970-71

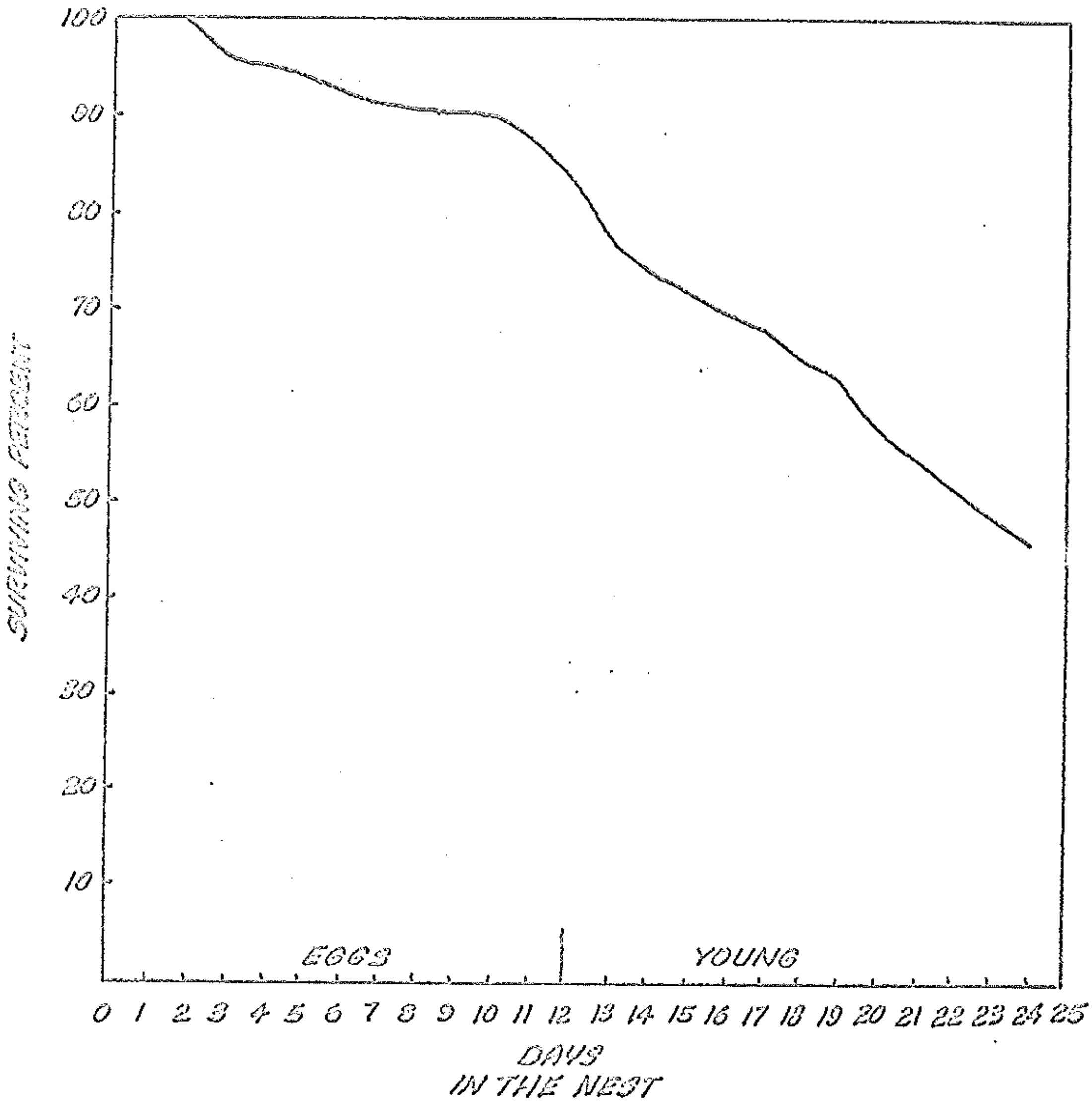

FIGURE SIX

SURVIVAL CURVE FOR SMALL PASSERINES
AFTER DEEVEY 1947

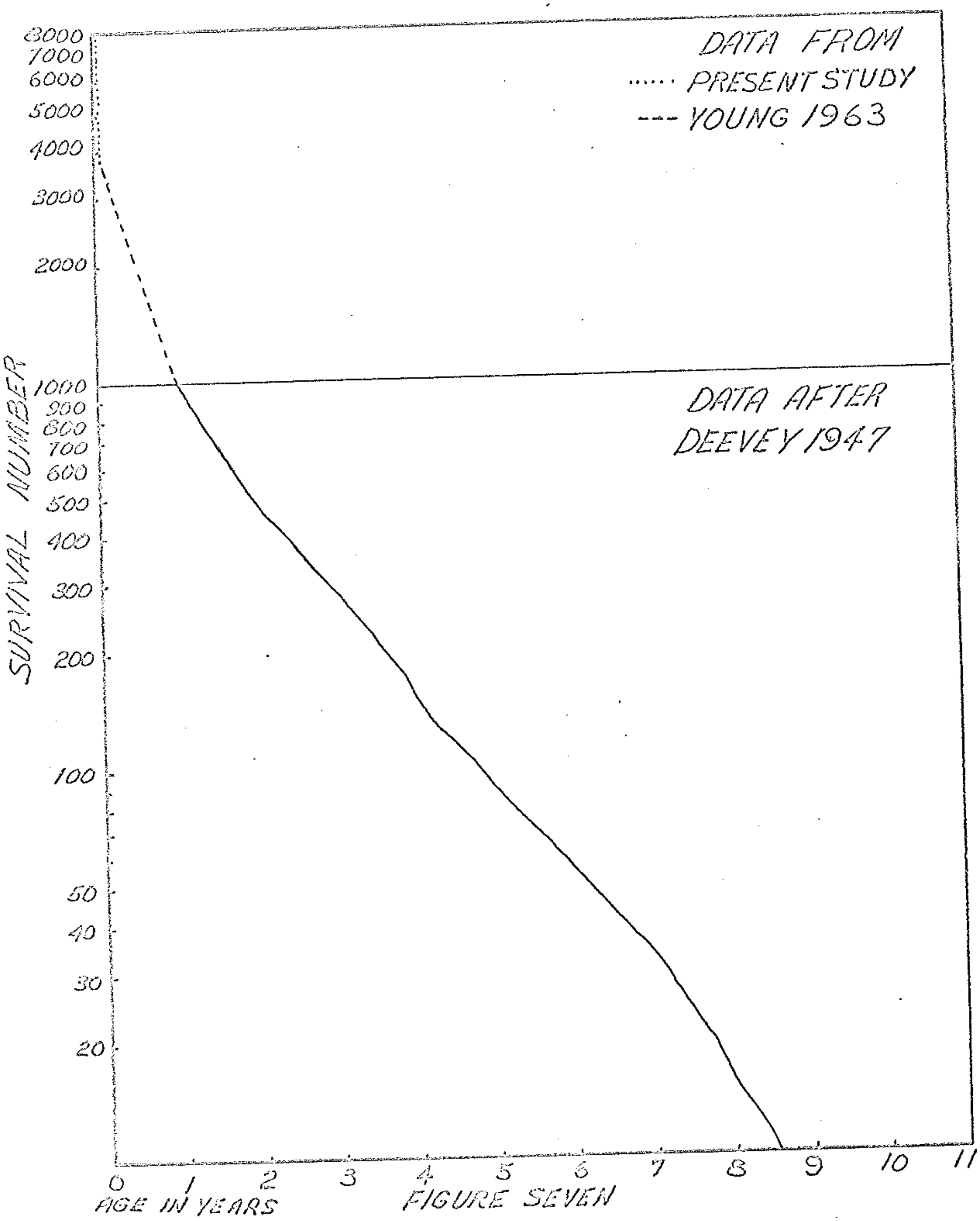

FIGURE SEVEN

SURVIVAL CURVE FOR REDWINGED BLACKBIRDS
DATA AFTER FLEDGING IS ESTIMATED

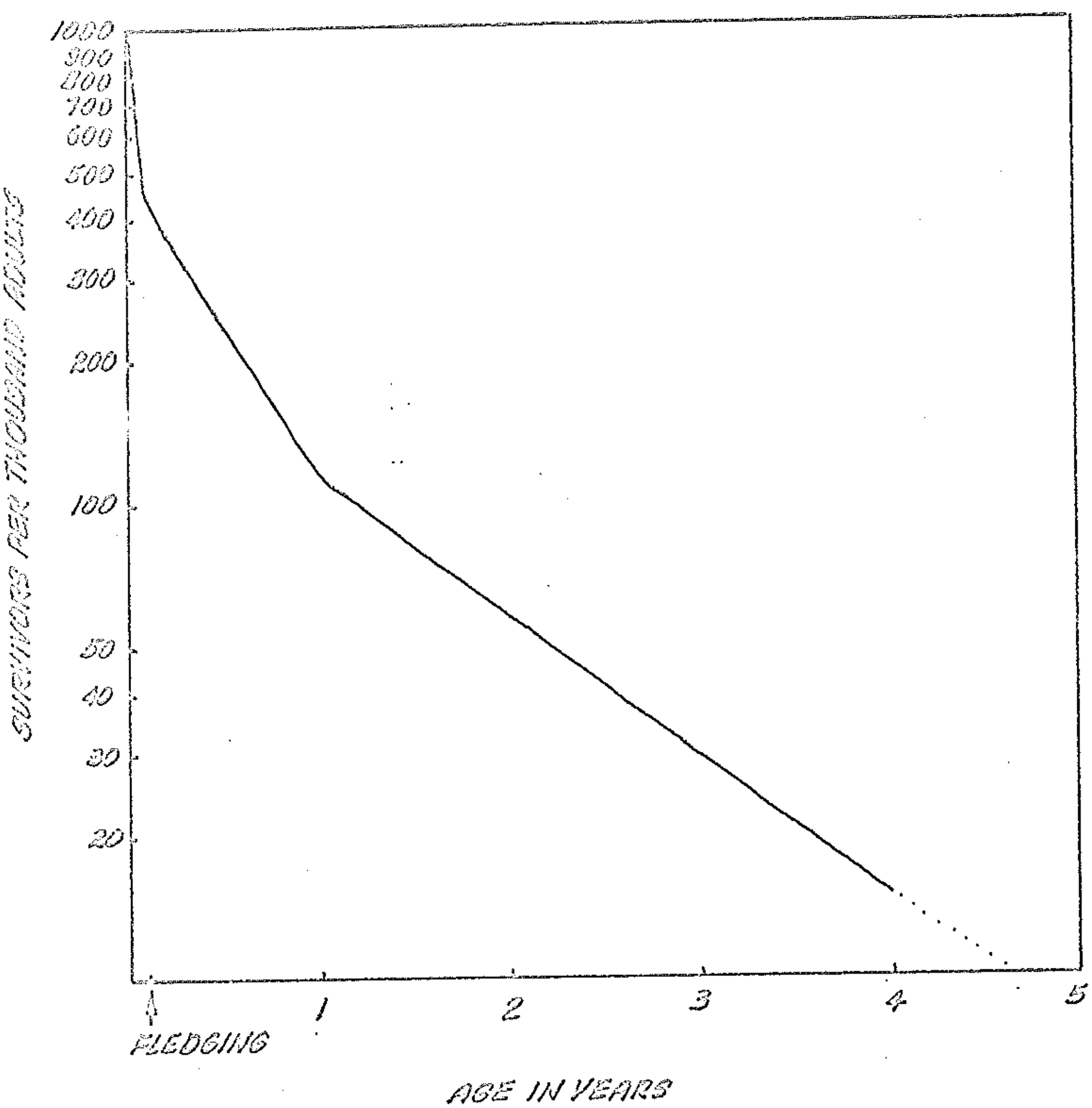

FIGURE EIGHT

RELATIONSHIP OF NEST HEIGHT TO SUCCESS

	NUMBER SUCCESSFUL	NUMBER UNSUCCESSFUL	PERCENTAGE SUCCESS
EIGHTEEN INCHES & UNDER	24	40	38
OVER EIGHTEEN INCHES	15	32	32

TABLE ONE