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NESTING SUCCESS DURING THREE SEASONS IN A SONG SPARROW POPULATION

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THE number of young fledged in a bird population depends on many factors: survival of adults during the nesting season; length of the nesting season, which is conditioned by the weather both at the beginning and the end; number of eggs laid and number of broods attempted; amount of food available for the young; efficiency of the parents; and degree of interference by a large variety of influences, including human activities, heavy rains, parasitism by the Cowbird (*Molothrus ater*) in certain regions, and the various enemies—reptilian, mammalian, and avian—that prey upon the eggs and young.

For the past four years I have been studying Song Sparrows (*Melospiza melodia beata*) on "Interpont," an area of some forty acres of waste land, described more fully elsewhere (Nice, '31a, '31b), in the flood plain of the Olentangy River west of our home in Columbus, Ohio. Most of the adult birds involved have been banded with colored and aluminum bands (the latter always on their left legs), while each nestling has been given an aluminum band on its right leg.

In 1929 I concentrated on two pairs of Song Sparrows, but since then have studied a considerable number of these birds, having results on the success and failure of 147 nests during three seasons. Observations were continued throughout the season of 1930, but in 1931 they were terminated on June 6th, and in 1932 on June 14th. The results for the first two years were closely similar, but the third showed marked differences.

NUMBER OF YOUNG FLEDGED PER PAIR IN ONE SEASON

The season of 1929 was exceptionally early, nesting by the Song Sparrows beginning ten days earlier than in 1930 or 1931 and fully two weeks before it did in 1932 and 1933. At the time of our departure on July 17th I believed the nesting activities

of the two pairs I was studying were practically over (although Song Sparrows rarely nest into September). Each pair made four attempts; one pair had one failure and three successes, raising nine young, while the other had two failures and two successes, raising five young.

In 1930 the numbers of young fledged per pair by fifteen pairs that survived the season were as follows: 0, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 6, 7, 7, 10—a total of 64, an average of 4.3 a pair. The last four figures represent two broods each; hence 18 broods were raised, averaging 3.6 young to a brood.

With sixteen pairs the numbers of attempts at nesting were known; four made four attempts, while twelve made only three. The numbers of successes (a "success" meaning that at least one Song Sparrow was raised) ranged from 0 to 3, eight pairs having one success each, and six pairs two.

During the year of 1930 there occurred in Ohio "the *greatest drought* of record" . . . "amounting almost to a climatic disaster." The three months of the Song Sparrow breeding season were characterized by a "warm and abnormally dry" May, "the driest June save one in 47 years," and the "driest July in 77 years" (Alexander, '31). The mean temperature in July was 77°F. or 2.1° above normal.

This extraordinary drought did not affect the young in the nest adversely, only two young in the whole season dying of starvation; this happened in the latter part of June with a pair of parents both of which had been hatched the previous year. The July young left the nest at the normal time without loss from lack of food, but it is true that most of the broods were small to begin with—four birds in but one nest, three birds in two nests, and two birds in three nests.

But the drought brought on the molt of the adults about two weeks early and thereby put a stop to nesting. The evidence for this is two-fold. In 1929 I did not record any signs of molt before we left Columbus on July 17th, but in 1930 quite a number of the adults were decidedly molting by this date. Moreover, fall singing by the adult males on their territories started from fourteen to eighteen days earlier in 1930 than it did in 1929 or 1931. There was far more singing in the fall of 1930 than there has been in the other three falls that I have been studying the Song Sparrows, evidently correlated with the abnormally early finish of the molt.

In Cornwall, Ryves ('30) observed that in 1929 Blackbirds (*Turdus merula*) and Song Thrushes (*Turdus philomelus*) failed to raise third broods, perhaps because of "a drought and heat wave late in June and almost the whole of July."

Poultrymen can bring on the molt in laying hens by reducing their water ration, by giving them only grain to eat and thereby upsetting their protein balance. Could something of this sort have happened with the Song Sparrows?

It is clear that the breeding season of 1930 was cut short and that in a normal year many of the pairs would have made further attempts at nesting and more young would have been fledged. The raising of only 4.3 young per pair cannot be representative of the average season.

SIZE OF SETS AND SIZE OF BROODS

The numbers of Song Sparrow eggs in the nests found from 1930 to 1932 are shown in Table I and the size of the broods raised in Table II. The size of the sets are given, not as they were laid, but as they stood after a loss of 14 to 16 eggs due to Cowbird activity. (Cowbird eggs and nestlings are omitted.)

TABLE I
SIZE OF SONG SPARROW SETS ON INTERPONT
(Eggs eaten by Cowbirds not included)

	<i>Numbers of Nests Containing</i>						<i>Total Nests</i>
	<i>5 eggs</i>	<i>4 eggs</i>	<i>3 eggs</i>	<i>2 eggs</i>	<i>1 egg</i>	<i>0 egg</i>	
1930	14	25	19	2	1	0	61
1931	14	13	4	3	1	1	36
1932	14	26	9	1	0	0	50
	<i>Per cent of Nests</i>						
1930	23.0	41.0	31.0	3.2	1.7	0	100
1931	38.8	36.1	11.1	8.2	2.9	2.9	100
1932	28.0	52.0	18.0	2.0	0	0	100

TABLE II

SIZE OF BROODS RAISED

	<i>Numbers of Nests Containing</i>					<i>Total Nests</i>
	<i>5 young</i>	<i>4 young</i>	<i>3 young</i>	<i>2 young</i>	<i>1 young</i>	
1930	6	8	10	5	0	29
1931	7	3	4	2	2	18
1932	1	6	9	6	8	30
	<i>Per cent of Nests</i>					
1930	20.7	27.6	34.5	17.2	0	100
1931	38.8	16.8	22.2	11.1	11.1	100
1932	3.3	20.0	30.0	20.0	26.7	100

Sets containing one and two eggs either were incomplete when destroyed or contained Cowbird eggs (five cases with two eggs); the one that contained no eggs was deserted because of the deposition of a Cowbird's egg. The large number

of three-egg sets in 1930 is partly due to the inclusion of late nestings. The high incidence of five-egg sets in 1931 probably indicates a large proportion of mature females this year, occasioned by the shortened breeding season of 1930 and a consequent lack of young birds. (Juvenile females usually lay four eggs in each set, while older females very often lay five eggs in each of the first two sets.)

Table II shows a considerable shrinkage. In 1930 and 1932 there were more nests raising three birds than any other number, but in 1931 there was a large preponderance of nests raising five young. The curious thing about 1932 is the fact that exactly one nest raised five young, while six raised two, and eight raised only one Song Sparrow!

An examination of the broods of single birds gives the following data: In 1931 one Song Sparrow was raised with two Cowbirds, while in the other case the male parent had been killed and the mother during a spell of cold weather succeeded in raising only one of the young (Nice '32). In 1932 the unfavorable factors were added eggs, a combination of Cowbird nest-mates and an early drought (five young perishing in three nests) and the strange fact that enemies removed all but one nestling out of each of three nests. (When young disappeared one by one, I attributed their death to starvation, but when two, three, or four vanished over-night, I considered that some enemy had taken them.)

COMPLETELY AND PARTIALLY SUCCESSFUL BROODS

Table III gives the numbers and percentages of those broods each season that were entirely successful and those that were only partially so, only Song Sparrow eggs and nestlings being considered.

TABLE III

	COMPLETELY AND PARTIALLY SUCCESSFUL NESTS							
	Completely Successful Nests				Partially Successful Nests			
	No.	% of Total	Eggs Laid	Young Fledged	No.	% of Total	Eggs Laid	Young Fledged
1930	18	64.1	73	73	11	35.9	43	29
1931	11	61.1	50	50	7	38.9	27	15
1932	4	13.3	17	17	26	86.7	111	59

	IN PARTIALLY SUCCESSFUL NESTS				
	Nos. of Individuals	Loss per	Loss per	Per cent of	Per cent
		Partially successful nest	Total successful nest	Partially successful nests	total successful nests
1930	14	1.3	0.49	32.6%	12.0%
1931	12	1.7	0.66	44.4%	15.6%
1932	52	2.0	1.73	46.8%	40.6%

Here it will be seen that in 1930 and 1931 nearly two thirds of the broods were entirely successful, but that in 1932 this was true of only 13 per cent. Besides the great numbers of nestlings effected, the loss per nest was appallingly high, an average of two eggs or young out of every brood. In the first two years there was a 12 to 15 per cent loss out of all the successful nests, but in 1932 it reached the proportions of 40 per cent!

NUMBERS OF YOUNG RAISED IN 147 NESTS IN THREE SEASONS

In 1930 the outcome of 61 nests was known; in 1931, 36 nests; and in 1932, 50. Table IV gives a summary of the nesting success in the three seasons.

TABLE IV
NUMBERS OF YOUNG RAISED IN 147 NESTS DURING THREE SEASONS
The Nests

Year	Total No.	The Nests		The Eggs		Average Fledged		
		No. in which eggs hatched	Per cent	No. in which young were fledged	Per cent	Per total nest	Per successful nest	
1930	61	44	72.1	29	47.5			
1931	36	27	75.0	18	50.0			
1932	50	38	76.0	30	60.0			
Total	147	109	74.1	77	52.4			
Year	No. Laid		Hatched		Fledged		Per total nest	Per successful nest
	Total	Per Nest	No.	Per cent	No.	Per cent		
1930	236	3.9	161	68.2	102	43.2	1.7	3.5
1931	143	4.2	103	72.0	65	45.5	1.8	3.6
1932	206	4.1	125	60.7	76	36.8	1.5	2.5
Total	585	4.0	389	66.5	243	41.5	1.7	3.2

In examining the table it must be remembered that the 1930 nests were found throughout the season, while in the two later years only the earlier nests are involved. This gives a slight advantage to the later years in the numbers of eggs per nest, since third and fourth sets are often smaller than the first two.

If we take the nest as our criterion, we find that the eggs hatched in 72, 75, and 76 per cent respectively, and the young were fledged in 47.5, 50, and 60 per cent of the nests during the three years. This gives a fair representation of affairs during the first two years, but a wholly false one in 1932. If we consider the fate of the eggs, we find a similar picture to that with the nests for the first two years, but an entirely different one in 1932.

The most significant set of figures in this table are the percentages of the young that were fledged—43.2 in 1930, 45.5 in 1931, and 36.8 in 1932. Very striking also are the average numbers of young fledged, both per total nest (1.7 in 1930, 1.8 in 1931, and 1.5 in 1932) and per successful nest (3.5, 3.6 and 2.5 in the three years).

1930 and 1931 are remarkably similar in all the percentages and averages, with a slight advantage for the latter in every respect, due partly to the somewhat larger number of eggs per nest and also a low incidence of Cowbird parasitism during that year.

The season of 1932, however, was markedly different from its predecessors, first in the very high number of nests that "succeeded," second, in the very low number of birds fledged, especially in the number raised per successful nest. The first result seems to have come from a somewhat lessened number of enemies destructive to the eggs and young, and also from the removal in three nests of all but one nestling by these same enemies. The reasons for the small number of young fledged lay in a higher proportion than usual of sterile and addled eggs, a marked increase in Cowbird parasitism, and a disastrous drought in May.

It may be of interest to compare these tables of nesting success of the Song Sparrow with the results of six investigations in other localities in this country and Great Britain. The majority of the species involved have altricial young.

TABLE V
SUCCESS OF NESTS IN SEVEN DIFFERENT INVESTIGATIONS

<i>Author</i>	<i>Locality</i>	<i>Number Species</i>	<i>Number Nests</i>	<i>Number Eggs Laid</i>	<i>Number Hatched</i>	<i>Young Fledged</i>
Nice	Ohio	1	147	585	389	243
Clabaugh ('25)	California	13	38	187	103	76
Clabaugh ('26)	"	17	39	168	104	68
Nicholson ('30)	Scotland	?	156	687	420	300
Pickwell ('31)	Illinois	1	30	102	79	46
Praeger ('21)	Scotland	?	240			In 99 nests
Potter ('15)	Pennsylvania	18	113			In 60 nests
			<i>Per cent</i>	<i>Per cent</i>		<i>Per cent</i>
<i>Author</i>	<i>Locality</i>		<i>Eggs Hatched</i>	<i>Eggs Fledged</i>		<i>Casualties</i>
Nice	Ohio		66.5	41.5		58.5
Clabaugh ('25)	California		55.0	41.0		59.0
Clabaugh ('26)	"		62.0	40.5		59.5
Nicholson ('30)	Scotland		61.1	43.7		56.3
Pickwell ('31)	Illinois		77.4	45.1		54.9
Praeger ('21)	Scotland			41.2 (nests)		58.8 (nests)
Potter ('15)	Pennsylvania			53.1 (nests)		46.9 (nests)

The percentage of eggs hatched runs in the sixties in three cases, but as low as 55 in one instance and as high as 77 in another (the number of nests involved being rather few in both cases). But the percentage of fledging is closely similar, ranging from 40.5 to 45.1. Potter has a higher percentage—53.1—but this was of nests, not eggs, which in all probability was somewhere in the forties.

ANALYSIS OF THE LOSS OF EGGS AND YOUNG

In Table VI the loss of eggs and young is analyzed for each of the three seasons, the total number of eggs laid being used as the basis for all the percentages. This total number is not quite certain, since some nests were found with Cowbird eggs or young and only a small quota of Song Sparrow eggs or young, and it was not possible to be sure how many Song Sparrow eggs had originally been laid. In these cases I added the smallest number of Song Sparrow eggs that was consistent with my experience in these matters.

TABLE VI
ANALYSIS OF LOSS OF EGGS AND YOUNG
IN 147 SONG SPARROW NESTS

<i>Total</i>		1930			1931		
		<i>Eggs</i> 236	<i>Young</i> 161	<i>Both</i>	<i>Eggs</i> 143	<i>Young</i> 103	<i>Both</i>
Destroyed by Enemy	Nos.	48	49	97	23	29	52
	%	20.3	20.7	41.0	16.1	20.2	36.3
Eggs Sterile or addled	Nos.	5	..	5	9	..	9
	%	2.2	..	2.2	6.3	..	6.3
Cowbird Direct Action	Nos.	4	3	7	2	..	2
	%	1.7	1.2	2.9	1.4	..	1.4
Parental Failures	Nos.	1	5	6	3	3	6
	%	0.4	2.2	2.6	2.1	2.1	4.2
Man-Cultivation, Robbery	Nos.	12	0	12	0	0	0
	%	5.0	0	5.0	0	0	0
Parents Killed, Nest undisturbed	Nos.	5	0	5	3	5	8
	%	2.2	0	2.2	2.1	3.5	5.6
Young Starved	Nos.	..	2	2	..	1	1
	%	..	0.9	0.9	..	0.7	0.7
Total	Nos.	75	59	134	40	38	78
		31.8	25.0	56.8	28.0	26.5	54.5

<i>Total</i>		1932			<i>Total</i>		
		<i>Eggs</i> 206	<i>Young</i> 125	<i>Both</i>	<i>Eggs</i> 585	<i>Young</i> 390	<i>Both</i>
Destroyed by Enemy	Nos. %	36 17.5	26 12.5	62 30.0	107 18.3	104 17.8	211 36.0
Eggs Sterile or addled	Nos. %	18 8.9	18 8.9	32 5.6	32 5.6
Cowbird Direct Action	Nos. %	8 3.9	1 0.5	9 4.4	14 2.4	4 0.7	18 3.1
Parental Failures	Nos. %	2 0.9	4 1.9	6 2.8	6 1.0	12 2.1	18 3.1
Man-Cultivation, Robbery	Nos. %	10 4.8	0 0	10 4.8	22 3.7	0 0	22 3.7
Parents Killed, Nest undisturbed	Nos. %	7 3.4	0 0	7 3.4	15 2.5	5 0.8	20 3.3
Young Starved	Nos. %	18 8.9	18 8.9	21 3.6	21 3.6
<i>Total</i>	Nos. %	81 39.4	49 23.8	130 63.2	196 33.5	146 25.0	342 58.5

In this table under the title "Cowbird—Direct Action" come only those cases where eggs were surely eaten or removed, or when a young Song Sparrow was crushed or crowded out by a young Cowbird. Under "Miscellaneous Parental Failures" come the occasional disappearance of eggs (6 cases), young carried off while hatching (6 cases), young pulled out of the nest (3 cases), or the last young deserted in the nest (3 cases); all of these instances being attributable to parental errors, except, perhaps, the occasional disappearance of the eggs, which is a difficult matter to explain. Under "Man" come two cases of destruction of nests through cultivation, two nests that were robbed, and one that I thought might have been deserted because of my daily visits, although no other such case has occurred. When parents were killed and the nest undisturbed, boys were probably responsible in some instances, other enemies in others.

One other factor, destruction by rain, was involved in 1929, causing the death of two nestlings, but did no harm during the three following years in the nests under my observation. However, on May 11th and 13th, 1933, there were floods that destroyed the majority of the ground nests in the river-valleys in central and southern Ohio, affecting five of the thirteen

Song Sparrow nests I had found on Interpont. The birds will have to have a long and successful season during the rest of the summer, if their losses from this major disaster are to be made good.

Comparative Loss to Eggs and Young. Each year there has been more loss of eggs than of young, the average of the three years giving a loss of one third of the original eggs as eggs, and one fourth as young. The percentage of the young that hatched that left the nest in safety was 63.3, 63.1, and 60.8 in the three years respectively—an average of 62.5, slightly less than the average percentage of the total eggs that hatched, 66.5.

Is it more dangerous to be an egg or a nestling? The egg is in the nest from 12 to 18 days, the young from 9 to 10. If we divide the average loss of the eggs as eggs—33.5 per cent—by 15 (days), we find a daily loss of 2.1 eggs in every hundred. But if we divide the average loss of the original eggs when they are nestlings—25 per cent—by 10, we find a daily loss of 2.5 individuals. If we consider only the first two years, which were probably more typical than was 1932, we divide 30.4 by 15 and get a 2 per cent daily loss of eggs, but with 25.5 divided by 10 we find the same high loss of young. It is evidently, day for day, somewhat more dangerous to be a nestling than an egg.

It is significant that practically as many young as eggs were destroyed by enemies. It is probable that some animals (cats for instance) prefer young to eggs. Several times some enemy has carried off the Song Sparrow eggs, leaving the Cowbird egg, yet the Cowbird nestling is taken as readily as the Song Sparrow. Some predators may be attracted to the nest by the begging note of the young during the last few days of nest life. Yet at this same time they must be immune from the attacks of the smaller of their enemies, such as little snakes that would eat the eggs.

The factor that effects only the eggs is that of sterile and addled eggs; that affecting only the young is starvation. It happens that human interference has effected only the eggs, but it is perfectly possible for this element to destroy the young too. The greater damage to eggs than to young through the killing of parents would seem to have been a matter of chance. The Cowbird parent accounts for more individual Song Sparrows by disposing of eggs than does the young by crushing or crowding.

In these three seasons the greater loss of eggs than young was due to the sterile and addled eggs, the activities of the adult Cowbird, and the activities of man.

"*Enemies.*" The largest category of destruction of both eggs and young is that comprehensive term "enemy," including all animal predators that destroy the eggs or young. Here it is probable that the native creatures—snakes, weasels, skunks, opossums, and Blue Jays (*Cyanocitta cristata*)—and the much worse introduced predators Ring-necked Pheasants (*Phasianus colchicus torquatus*), dog, rat, and cat—all take toll, but it is impossible for me to apportion the blame. It is interesting to note the steady diminution in the loss due to enemies from year to year. This may be due to a real decrease in predators; opossums and weasels have become very rare, dogs were less troublesome in 1932 than in 1931, snakes are constantly warred upon by the boys of the neighborhood, while we have been able to reduce the cat population to some extent.

Sterile and Addled Eggs and Other Parental Failures. The real proportion of sterile and addled eggs must be higher than the figures show, because it is only in those nests that survive through hatching that this matter can well be checked in a study with wild birds. Such eggs were a negligible factor in 1930, only two of the former and three of the latter being found in a total of 236 eggs. The next year the percentage is abnormally high, because five of the seven sterile eggs occurred in two nests in which there was some defect in the male (one had had half of his right leg shot off). In 1932 there were 10 sterile and 8 addled eggs, amounting to almost 9 per cent of the 206 eggs.

It is natural to attribute the high incidence of unhatchability in 1932 to the cold spring—the sterile eggs to the decreased sexual excitement, the addled eggs to chilling during the irregular incubation of the first few days. Yet these eggs were laid after the cold weather was past. More observations are needed before we can decide upon a normal percentage of unhatchable eggs with these birds.

Song Sparrow parents are efficient, only 3.1 per cent loss being directly attributable to failures on their part, quite in contrast to Mourning Doves (*Zenaidura macroura*) for instance, where one sixth of the nestlings in "successful" nests have been lost through frailty of the nests (Nice, '23; Gates, '09) If sterile and addled eggs are added to "parental failures," we find 8.7 per cent loss of all the eggs laid due to adult inefficiency. If we also add the three starved young during the first two years, we get a percentage of 9.2.

Starvation. In normal seasons there is a very small loss of nestlings from starvation. But in 1932 no less than 18 died from

lack of food. This condition was correlated both with a heavy Cowbird infestation and with a disastrous drought in May, for this month was the driest May in Columbus in the 53 years of the Weather Bureau's records, only .79 of an inch of rain falling. Thirteen of the 18 Song Sparrows had Cowbird nest-mates. There was no loss from starvation in the nestlings fledged before May 20th, but in the next ten days only two broods were entirely successful, while eight suffered loss. In June no parents raised all the young hatched, while in six nests young died from lack of sufficient food. No real rain came until June 27th. Under normal conditions Cowbirds are raised without loss to the Song Sparrow young that are present; hence this early drought must have caused a lack of insect food that resulted in the death of the eighteen young Song Sparrows.

The Cowbird. In 1930 the percentage of nests of the first two broods parasitized by *Molothrus ater ater* was 28; in 1931, 25; but in 1932, 58! Nests with two Cowbird eggs have amounted to one third, one fifth, and one fourth of the total number of nests parasitized in the three years respectively.

In fifty-six successful nests without Cowbirds 3.4 Song Sparrows apiece were raised, while in twenty-one with Cowbirds 2.2 Song Sparrows each were raised, a difference of 1.2 Song Sparrows between the parasitized and non-parasitized nests. Multiplying 1.2 by the 21 nests, we get 25, which happens to be the exact number of Cowbirds raised in these nests. This looks as if each Cowbird were raised at the expense of one Song Sparrow, and this, counting the eggs eaten by the adult, may be near the truth. The Cowbird in my experience has eaten or removed a Song Sparrow egg in one fifth to one fourth of the nests in which she has laid.

Returning to Table VI, if we add 11 starved young to the other sins of *Molothrus*, we get a 29 egg-and-young loss of the 585 eggs, or 5 per cent. Eight of the 13 eaten eggs were in nests that raised young successfully, and the same was true of 14 of the starved and crushed young. If these had survived, the total would have reached twenty-two. If we add either 22 or 25 to the 243 young that were fledged, we get an 8 to 9 per cent loss of fledged young due to Cowbird activity.

In normal seasons the Song Sparrows are able, as a rule, to raise one Cowbird and all of their own young that hatch, one pair even bringing up five of their own besides the boarder. But if there are two Cowbird eggs in one nest, this feat becomes impossible. One Song Sparrow pair raised one of their own young besides the two parasites, and another pair actually raised two of their own under this handicap.

CONCLUSIONS

To return to our opening paragraph: there has been about a 12 per cent net loss of adult males and 20 per cent loss of females each year during the first half of the three nesting seasons; hence four fifths of the birds must raise enough young to replenish the whole population.

The first egg has been laid as early as April 10th; normally it appears the middle of April, but in 1932 it was delayed until the 23d. Although beginning at such different times, only once, so far as I know, has the nesting season been cut short in midsummer, and that was due to the great drought in 1930.

There has been plenty of food available for the young, except in late May and in June, 1932, during an early drought.

Parent Song Sparrows, as a rule, are proficient, even when both birds of a pair have been hatched the previous year.

Heavy rains have caused losses during 1929 and 1933, but not during the three intervening years, while I was here.

As a result of nearly five years' study of the Song Sparrows nesting on Interpont, I find that the loss of the total number of eggs laid can be apportioned somewhat as follows: predators account for about 36 per cent, parental inefficiency (including sterile and addled eggs) 8 per cent; the Cowbird, 5 per cent; man (cultivation, robbery, shooting), 5 per cent; and the weather, either lack of rain or too much of it, 5 per cent.

During the past four years there have been two favorable nesting seasons and two unfavorable ones. 1930 was successful for three months, but apparently four full months of nesting activity are necessary if Song Sparrows are going to raise enough young to offset adult losses. During 1932 the birds, hampered by the disastrous early drought and heavy Cowbird parasitism, raised a fifth fewer young than they should have done during the first half of the season.

In 1930 and 1932 Interpont was full of Song Sparrows, and among the resident males the proportion of young birds in the population was 43 and 50 per cent respectively. But in 1931 and 1933 there were many vacant territories, and the proportion of juvenile resident males was 33 and 38 per cent respectively, while the proportion of juveniles in the total number of breeding males, both resident and summer resident, was only 25 per cent in April, 1933.

Some winters are more favorable than others to Song Sparrow survival, and this factor, of course, influences the numbers of breeding birds present the following spring. But I

believe the nesting seasons are of even greater importance in determining the size of the breeding population year by year.

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