

COMPOSITION AND FLUCTUATIONS OF QUAIL POPULATIONS OF CHARLOTTE COUNTY, FLORIDA WITH PARTICULAR REFERENCE TO SUMMER RAINFALL

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The present paper is based upon studies of the bobwhite quail that have been conducted since January 1946 in Charlotte County, Florida. The material with which this paper is principally concerned was collected from two main sources (1) Annual spring and fall quail census of the 60,000 acre Charlotte Quail Investigation Area. (2) Examination for sex and age of 5,924 quail during the winters of 1946-47 and 1947-48.

METHODS

The census was made with bird dogs using a method developed particularly for use in open flatwoods type of country. In conducting this census dogs were run in pairs or threes by an observer on foot, following an imaginary line by use of a compass. When a covey was located the observer paced the distance from the imaginary line he was following to the pointing dog and flushed and counted the birds. The mean of the distance of the finds from the imaginary line was used as half the width of the strip presumably covered in the census. The acreage for this strip was calculated and the birds found within it totalled. The figure obtained for acreage was then divided into the total acreage of the area being censused and the quotient obtained multiplied by the number of birds on the census strip to arrive at the total population. The figure resulting from such a census will normally be conservative due to the fact that even the best of dogs will occasionally miss birds. In general, it is believed that the error in the census will not exceed 15%.

The birds examined for sex and age classes came from two principal sources: birds trapped from the Investigation Area and birds collected from two hunting clubs. At the hunting clubs, cleaning of birds was done by one man who was paid one cent per bird for saving wings and heads. The bird cleaner was required to place the wings and heads of hens in one container and those of cocks in another to permit the division of age classes — determined by wings, into sex classes — determined by heads.

Juveniles were separated from adults by use of the upper primary wing coverts. This separation is based on the fact that birds of the year (juveniles) normally retained their mottled juvenile coverts until their second fall and can thus be separated their first winter from older birds whose coverts are solidly colored. Due to the fact normally around 30% of the juveniles in Charlotte County molt either their ninth or both their ninth and tenth primaries their first year (contrary to the situation further north) the pointedness or roundness of these primaries is not a valid character for separating adult from juvenile birds in South Florida. Apparently the age of the young bird determines the extent to which it had completed the molt of the ninth and tenth primaries by winter — early hatched birds had molted

these primaries — late hatched birds had not. The results of examinations of birds during the 1946-47 and 1947-48 hunting seasons appear to throw some light on this subject. In the excellent breeding season of 1946 when late hatched birds had a good chance of survival, an average of approximately 50% of the population was made up of birds with unmolted ninth and tenth primaries. In the unfavorable breeding season of 1947 when heavy rainfall in late summer and a hurricane in September reduced the possibility of survival of late hatched broods, only about 20% of the birds had unmolted ninth and tenth primaries. Here is suggested the possibility that the primary wing character can be used in the future to evaluate breeding seasons.

RESULTS AND DISCUSSION

Contrary to the situation that is found in most of the southeast, wherein a heavy spring and summer rainfall is generally accompanied by a good quail crop, it appears that in southern Florida summer rainfall is a definite limiting factor to quail breeding. At the same time there are definite indications that too little spring rainfall is also harmful to quail. Apparently the ideal situation is a moderate to heavy spring rainfall and a light summer rainfall. In Charlotte County there is normally a very light rainfall in the spring and excessive rainfall in the summer. The heavy summer rainfall coupled with the poor drainage typical of Charlotte County flatwoods frequently results in large areas of good quail habitat inundated for periods of several weeks during the summer rainy season.

In Table 1 is presented a comparison of general quail populations and rainfall in inches in Charlotte County during the quail breeding months of 1945, 1946, and

Table 1. Comparison of general quail populations and rainfall in inches at Punta Gorda, Florida, during quail breeding months of 1945, 1946 and 1947.

Month	Year		
	1945	1946	1947
March	0.10	0.71	9.61
April	1.45	0.00	5.36
May	0.67	10.13	3.34
June	12.39	15.39	13.13
July	7.26	4.68	18.27
August	10.79	4.12	10.54
September	8.61	6.10	16.13
Quail Population ^a	Low	High	Very Low

^aFall quail population on Charlotte County quail investigation area was 8,989 birds during high years and 1,577 birds during low years.

1947. The population estimate for 1945 is based on general reports; the population estimates for 1946 and 1947 are based on quail census of the Charlotte County Quail Investigation Area. The table, however, fails to bring out the rainfall factors believed to have been most important in influencing the quail populations. These factors are discussed as follows:

1. In May, 1945, rainfall was only 0.67 inches whereas in May of 1946 it was 10.13 inches but with no day having more than 2.39 inches and no heavy rains on

consecutive days. Thus in May of 1946 the rainfall was sufficient to discourage quail nesting in low areas, to promote good vegetative growth, and to supply ground moisture to insure good hatches, and at the same time there were no drowning rains.

2. In 1945 the rainfall from March 1 to June 21 was only 2.22 inches so that drouth was acute during April, May and the first part of June. Local residents reported finding quail eggs that failed to hatch presumably because of inadequate humidity. This spring drouth was followed by 10.25 inches of rain in three days beginning June 22, which flooded the greater part of the Charlotte County flatwoods and undoubtedly destroyed a large percentage of nests and young quail. Although June 1946 had more rainfall than June 1945 on no day was the rainfall greater than 2.84 inches and no heavy rains occurred on consecutive days.

3. During the important rearing months of July, August and September the rainfall in 1945 was 26.66 inches as compared to 14.90 inches in 1946. This appears to be of particular importance in 1945 in view of the fact that most early reproductive attempts probably failed because of the spring drouth and the 10.25 inch rain in June.

The excellent correlations shown in Table 1 between low quail populations and high summer rainfall appear quite conclusive. Unfortunately, however, due to the estimated heavy direct quail mortality resulting from the hurricane of September 1947, we are unable to determine to what extent the exceptionally low 1947 population is attributable to reduction of breeding success by excessive rainfall during the breeding season or directly to the hurricane, which was estimated to have destroyed $\frac{2}{3}$ of the existing population. Even the excessive rainfall of the summer of 1947 could hardly have caused serious losses among adult birds, and we see that the 1947 fall population was only about $\frac{1}{3}$ of the 1947 spring population — indicating a heavy hurricane loss among adult birds. Nevertheless, even if the estimated $\frac{2}{3}$ of the population had not been destroyed by the hurricane the 1947 fall population would have been appreciably lower than the 1946 population.

In Tables 2 and 3 are presented the results of the examination for sex and age of 5,924 quail from three separate Charlotte County populations during the winters of 1946-47 and 1947-48.

Table 2. Sex ratios among adult and juvenile birds in two Charlotte County quail populations for the winters of 1946-47 and 1947-48.

	Adults				Juveniles			
	1946-47		1947-48		1946-47		1947-48	
	Cocks	Hens	Cocks	Hens	Cocks	Hens	Cocks	Hens
Eagles Nest Club								
No. Birds	107	143	272	225	482	538	338	302
Ratio	74.8	100	121.0	100	89.6	100	111.9	100
Allapatchee Club								
No. Birds	68	69	194	166	324	293	160	140
Ratio	98.5	100	116.9	100	110.6	100	114.3	100

Table 3. Percentage of adults in the Charlotte County quail populations for the Winters of 1946-47 and 1947-48.

	<u>Investigation Area</u>		<u>Eagles Nest Club</u>		<u>Allapatchee Club</u>	
	Cocks	Hens	Cocks	Hens	Cocks	Hens
1946-47						
All Ages	1,023	989	589	681	392	371
Percent of Adults	28.7	26.5	18.2	21.0	17.3	18.6
1947-48						
All Ages	36	44	610	527	354	308
Percent of Adults	80.6	65.9	44.6	42.7	54.8	53.9

Table 2 shows that in both the Eagles Nest and Allapatchee samples the percentage of hens among the adult birds is greater than the percentage of hens among juveniles in the "good" year of 1946, but is less in the "bad" year of 1947. This seems to indicate clearly that the differential mortality favoring cocks is accelerated during times of stress. Also indicative of the same thing is the fact that Table 2 shows that in both juveniles and adults of both populations the percentage of hens is much less in the "bad" year of 1947.

The great superiority of hens in the 1946 Eagles Nest population as shown in Table 2 is unexplainable. It seems unlikely that sampling error could account for such an unusual sex ratio as 92.8 cocks to 100 hens when based on a sample of 2,470 birds.

Of particular significance with regard to the high quail population of 1946 and the low population of 1947 are the enormous differences shown in Table 3 in the percentage of adults for the two years. These differences in the Eagles Nest and Allapatchee populations indicate a rough average of two maturing young for every adult hen in 1947, as opposed to eight maturing young for every adult hen in 1946. (These figures are not meant to suggest these numbers of juveniles as the average numbers produced by each adult hen entering the breeding season.)

A large percentage of the birds figured in the Eagles Nest population for both years came from an area with better drainage than most of the areas from which the Allapatchee birds were taken. Of possible significance with regard to this are the figures in Table 3 which show that in the "good" year of 1946 the Allapatchee population showed a superiority in numbers of juveniles of about 1% whereas in the "bad" year of 1947 the Eagles nest population showed a superiority in number of juveniles of upward to 10%.

The sample upon which the population figures for the Investigation Area in Table 3 are based may be too small to be of detailed significance. Nevertheless, in view of the fact that the Investigation Area is probably more susceptible to excessive rainfall damage than any area from which the hunting club quail were taken, these figures appear quite consistent with other data.

SUMMARY

Information gathered to date indicates that excessive summer rainfall is an important factor limiting quail reproduction in Charlotte County, Florida. Juvenile-

adult ratios combine with actual population counts to support this conclusion. Studies of sex ratios based on examination of 5,924 quail during one "bad" and one "good" year indicate that the normal differential mortality favoring cocks is accelerated during times of stress.