FLUCTUATIONS IN THE QUAIL POPULATION ON THE VIRGINIA POLYTECHNIC INSTITUTE FARMS, MONTGOMERY COUNTY, VIRGINIA

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Data on the fluctuations and related information of the quail population on the approximately 2,200 acre Virginia Polytechnic Institute Farms have been obtained for six years. These data were collected by various graduate students of the Virginia Cooperative Wildlife Research Unit as follows: for the years 1935 - 36, and 1936 - 37 by Newman (Newman 1937); for the year 1937 - 38 by Phelps (Phelps 1942a and 1942b); for the years 1946 - 47 and 1947 - 48 by Gehrken (Gehrken 1948) and for 1948 - 49 by Overton. These studies were under the supervision of C. O. Handley from 1935 and through June 1947 and were supervised by the senior author from September 1947 to the present time.

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METHODS

In this work, detailed field census of the quail population were made each year beginning in early fall, usually in October, and continuing until the coveys began to break up in the spring, normally about April 1st. These early fall-to-early spring continuous censuses were carred out for six seasons in blocks of three years each, 1935 - 38 and 1946 - 49. The entire area is a research refuge which is closed to public hunting. The VPI Farms are rather intensively cultivated and considerable emphasis is placed upon livestock and dairy production. Thus, cover for all forms of wildlife is normally at a premium on this area, especially during the winter months (Fig. 1). Even under these conditions the six years field work, usually with trained dogs, clearly indicates that keeping an accurate check on the quail population even in such restricted habitat is a difficult job. A tremendous number of hours afield have been devoted to collecting the statistics presented here.

To date, these investigations have been primarily concerned with the over-winter (fall to spring) quail population changes, the possible causes for the observed fluctuations and what, if anything, may be done to minimize or utilize the observed over-winter quail losses. Only a summary of the six years work will be presented here as space will not permit a full discussion of these data.

RESULTS AND DISCUSSION

Table 1 gives the data on the fluctuations in the VPI College Farms quail population for the six years for which these data are available. It will be noted

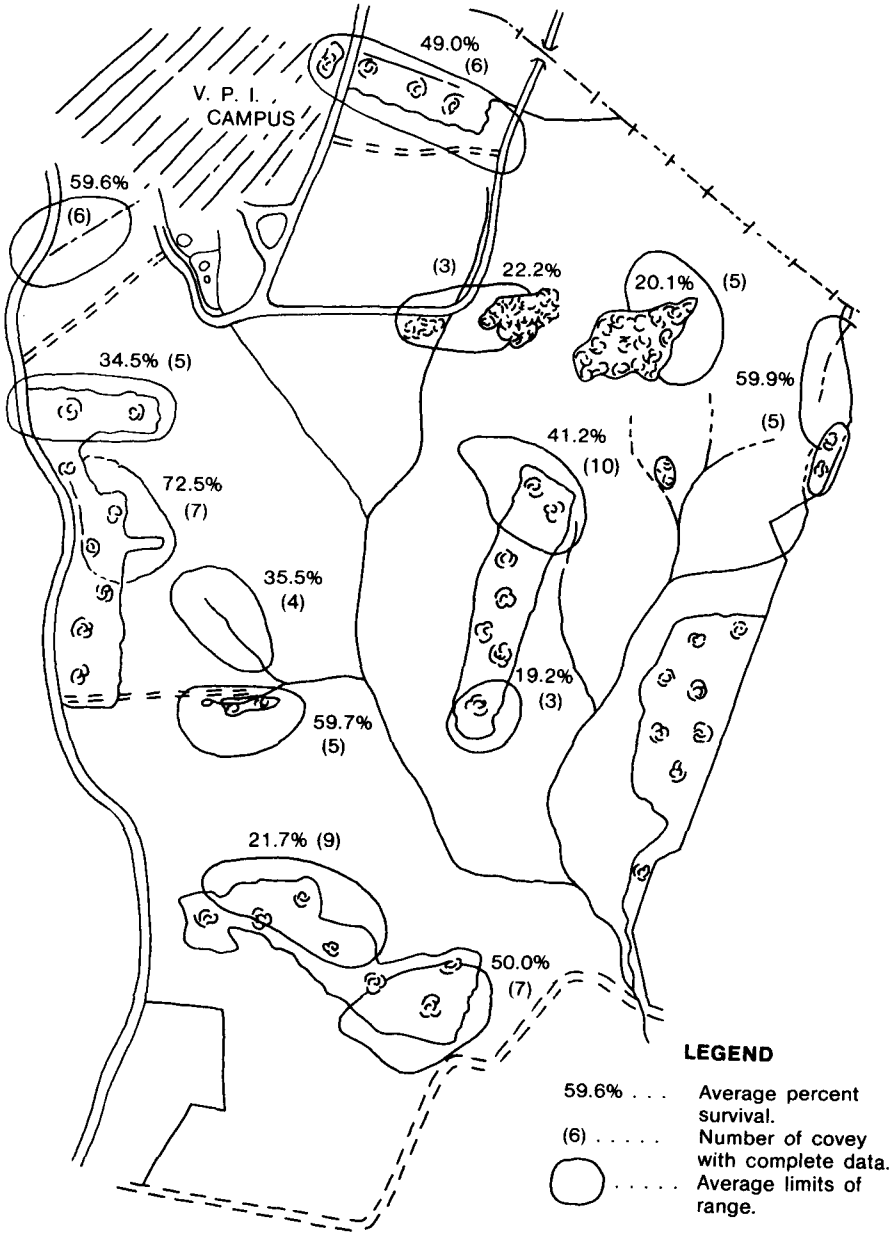

Fig. 1. Variations in the average overwinter survival on thirteen ranges utilized by quail for the six years, 1935 - 38 and 1946 - 49 at the VPI College Farms, Blacksburg, Virginia.

Table 1. Fluctuations in the quail population from early fall to early spring for the six year period 1935 - 38 and 1946 - 49 on the approximately 2,200 acre Virginia Polytechnic Institute Farms, Blacksburg, Virginia.

Year	November 1 Fall Population		April 1 Spring Population		Per Cent Over-winter Survival
	Quail	Coveys	Quail	Coveys	
1935-36	195	13	88	8	45.0
1936-37	146	10	99	10	67.0
1937-38	293	21	176	20	60.0
1946-47	204	14	63	8	31.9
1947-48	232	17	41	8	17.6
1948-49	247	20	118	13	48.0
Average	220	16	98	11	44.5

from this table that the average fall quail population is 220 birds, or about 1 quail per ten acres. This early fall population decresed to 98 quail, on the average, by the following spring; thus the average over-winter survival for this six year period is 44.5 per cent. Another interesting fact shown by these data is that the over-winter survival varied rather widely, fluctuating from a minimum of only 17.6 per cent in 1947 - 48 to a maximum of 67 per cent in 1936 - 37. This and other evidence has convinced the various workers engaged in these studies that any such population studies must be continued over a period of years before conclusions may be drawn that are reasonably valid.

Various workers have attempted to determine the cause of the observed fluctuations of the quail population from year to year (Errington and Hammerstrom 1936, Errington 1945 , Shultz 1949). Using the data presented in Table 1 as a base, the only correlation which has been observed is between the number of days that snow covers the ground to a depth of one inch or more during the winter and the over-winter losses in the quail population. As shown in Table 2, these two factors show an inverse relationship; the greater the number of days during which snow covers the ground to a depth of one inch or more, the smaller is the per cent of survival of the VPI College Farms quail population.

Table 2. Spring population, number of days of snow on the ground to the depth of one inch or more, and percentage survival for the six years of the quail study, V.P.I. College Farms.

Year	No. Quail	No. Coveys	Days of Snow	Over-winter Survival (%)
1937-38	176	20	0	60
1948-49	118	13	8	48
1936-37	99	10	12	67
1935-36	88	8	13	45
1946-47	63	8	24	32
1947-48	41	8	26	18

Our data would not indicate that the fall population is dependent upon the preceding spring population except for an unknown minimum brood stock. This

minimum brood stock appears to be less than 40 quail (or an average of one quail per 55 acres as of April 1st) for the VPI Farms. We can find no correlation between the size of the spring quail population and the resulting fall population; thus it is assumed that the conditions of the nesting and rearing season largely limit the following fall quail population.

Considerable effort has been devoted to trapping and banding quail during the six years of this study. The success in capturing quail has varied widely and has been dependent largely upon weather conditions. Successful trapping of quail in any numbers appears to be dependent upon the severity of the weather; periods in which the snow remains on the ground for as much as a week or more give the best trapping results. Thus, since weather conditions largely determine our success in capturing quail, the numbers trapped for banding purposes during the several years has varied accordingly.

It is interesting to note that of the 47 quail banded in the winter of 1946 - 47, only 5 or 10.6 per cent, were recovered the following year 1947 - 48. Of these five quail, two were recovered during the 1947 - 48 banding operation (in which 60 quail were trapped and banded), one was killed on the VPI College Farms and the remaining two were killed during the hunting season off the VPI Farms. These latter two quail were taken by hunters at a distance of more than two miles from the point of banding. Hence, only three (6.3 per cent) of the 47 quail banded in 1946 - 47 were recovered on the 2,200 acre area the following year. This and similar field data would indicate that the quail, including whole coveys, may move a distance of one or more miles either in fall or spring "shuffles" in habitat such as is found in southwestern Virginia.

The ratio between adult and young quail is often taken as a measure of the productivity of quail for a given area. The trapping, harvesting and banding experiments carried out on the VPI quail population during the six years of investigations have given detailed sex and age data during the winter on some 280 birds. These data show that the adult:immature ratio is 20 adults to 80 immatures, a ratio that would indicate reasonably high productivity for the area. Further, the sex ratio of the immature quail is about normal (138:100) for mid-to-late winter whereas the sex ratio of the adult appears to be abnormally high in favor of the males, 249:100. We are at a loss to explain the abnormal adult sex ratio unless our method of trapping operated selectively in capturing males. It is recognized that the winter sex ratio normally favors the male (Leopold 1945 and Stoddard 1931) but not to the extent indicated by our meager data.

Using the data on the quail population of the VPI Farms as a base, several experiments are in progress to determine 1) the influence of a conservative harvest on the over-winter survival and 2) the influence of permanent types of food and cover improvements in reducing severe over-winter losses on individual quail ranges of the investigational area. To date, we have two years experience with the influence of a controlled harvest, but have not as yet had time to test the effects of permanent habitat improvements upon the quail population.

Only one, the 1947 - 48 season, of our two years work with the conservative harvesting of the quail population was successful. In 1947 - 48, the VPI College Farms were divided into two approximately equal areas, each having about the same quail population and acreage. All quail in excess of 8 per covey were removed on Area "A" and Area "B" was used as a check. Each of the two areas contained about 1,000 acres and Area "A" supported 85 quail whereas Area "B"

had 71 quail. On Area "A," 33 quail, or about 38 per cent of the existing population, were removed. As of April 1, 1948 each of the two areas supported exactly the same number of quail, 21 on Area "A" and 21 on Area "B." Our experiments in 1948 - 49 were not entirely successful due to conditions beyond our control which did not permit us to make a complete harvest of all quail on Area "A" in excess of 8 per covey. However, our limited data would seem to substantiate the work done by others (Errington and Hammerstrom 1935, and Baumgartner 1944); namely conservative harvesting of the quail population merely utilizes a portion of the quail population which would be lost over-winter due to normal causes.

Detailed and complete over-winter survival data have been obtained on some 75 of the total of 95 coveys which used essentially the same 13 habitats during a majority of the six years of work here reported. When these data were plotted on a map certain interesting facts are apparent (Fig. 1). First the habitat used by these 75 coveys consituted no more than 25 per cent of the total 2,200 acre area. This fact graphically points out the importance of cover as one of the most important factors controlling the distribution of the quail on this area. Second, the average over-winter survival of these 75 coveys of quail has varied widely, from a maximum of 72.5 per cent survival to a minimum of 19.2 per cent survival for various sections of the Farms. Here again, cover would seem to be the most apparent reason for these wide variations. Where the quail coveys have ungrazed woodlots or other similar cover, the survival per cent is higher. If grazed woodlots are the only cover available, the quail either move from the area (and were considered lost) or suffered severe over-winter decimation.

SUMMARY

Six years investigations, during 2 three year periods 1935 - 38 and 1946 - 49, of the quail population on the 2,200 acre VPI College Farms showed an average over-winter survival of 44.5 per cent. This survival varied during this period from a minimum of 17.6 per cent (in 1947 - 48) to a maximum of 67 per cent (in 1936 - 37). The percent of the early fall population which survived until the following spring appears to be in inverse ratio to the number of days in which snow to a depth of one inch or more remained on the ground.

Our data would indicate that the fall population is directly dependent upon the quail population present on the area the preceding spring.

Trapping and banding work on this area indicates that a 10 per cent retake of banded quail the following year may be normal. The age and sex of 280 quail handled shows a ratio of 20 adult quail to 80 immature birds, but an abnormal sex ratio (249:100) for adult birds. This abnormal adult sex ratio is unexplained.

Limited experience to test the effect of harvesting about 40 per cent of the quail population in early fall and its influence upon the over-winter survival indicates that such a harvest merely removes a portion of the quail population which would be lost over-winter to natural causes.

Cover appears to be one of the greatest limiting factors operating against the quail population on this area. This is indicated by the wide discrepancies observed in the per cent of fall quail which survive over-winter in various sections of the 2,200 acre area.

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