WHISTLING-COCK COUNTS OF BOBWHITE QUAIL ON AREAS TREATED WITH INSECTICIDE AND ON UNTREATED AREAS, DECATUR COUNTY, GEORGIA *

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As part of a program to control the imported fire ant, heptachlor and dieldrin were applied to various areas in Decatur County, Georgia, during the winter of 1957-58. The applications were made from November through March under the supervision of the Plant Pest Control Division of the U. S. Department of Agriculture. Heptachlor was used for most applications, dieldrin for a smaller number. Both chemicals were applied in the granular form and were distributed primarily from airplanes. The reported rate of application was 20 pounds of 10 percent heptachlor or dieldrin per acre. This is equivalent to 2 pounds per acre of the undiluted technical-grade chemical.

The effects that these chemical applications had on bobwhite quail were studied by making counts of calling males on selected areas where heptachlor or dieldrin had been distributed and comparing them with counts that were made on untreated areas.

STUDY AREAS

The study areas that were treated with insecticide consisted of 9,901 acres of land near Climax, in Decatur County, Georgia. Within the treated area, there was an additional 700 acres of land that was not treated. The control areas consisted of 10,826 acres of land that extended from an area south and southwest of Fowltown to an area southeast of Faceville.

Quail were counted on 5.5 to 6-mile transects that were established along roads that ran through the study areas. Land use, soil types, vegetative cover, and agricultural practices were essentially the same on treated and untreated areas. Native vegetation also was similar. As positions for the transects were selected at random, individual transects probably included areas that were treated at different dates and that differed also in soil types and in minor vegetative characteristics. The time of rainfall in relation to the time of application of insecticide varied from area to area and so may have been different in different parts of the same transect.

In the vicinity of the study areas, elevation varies from 200 to 300 feet; the lower streams are from 100 to 200 feet above sea level. Soils are Lower Coastal Plain types. The gray sandy loams are primarily Norfolk, Bowie, Tifton, and Marlboro. The brown to reddish-brown sandy loams are Red Bay, Orangeburg, Magnolia, Ruston, Faceville, and Americus. Some of the best farm areas of the Coastal Plain are found on these soils. Under good management they produce high yields of cotton, corn, peanuts, and tobacco. They are easy to cultivate. Both surface and internal drainage are good.

METHODS

The relative numbers of quail that were present in the study areas were measured by standardized roadside counts of calling males, as described by Rosene (1957). Prior research in several different regions indicates that a summer whistling-cock count of this type is useful as a basis for estimating or predicting quail populations. Bennitt (1951), found a close correlation between a summer whistling-cock call-index and hunting success the following fall. From his summer data, he predicted the hunting success in various regions of Missouri. Reeves (1951) used a similar method in Indiana. Rosene (1957), working in Alabama and South Carolina, found a high degree of correlation between numbers of whistling cocks in summer and numbers of coveys in the subsequent

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hunting season. In several southeastern states, private plantation owners and state game departments regularly use summer call counts to predict quail numbers.

In the present study, roadside counts were made along 12 transect routes, 6 in treated areas and 6 in control areas. Stops were made every half mile. Each route was 5.5 or 6 miles long, so that either 11 or 12 stops were made. At each stop, all birds that were calling within one-quarter mile were plotted; each transect therefore was considered to be one-half mile wide—one-quarter mile on each side of the road. The audible range for a bobwhite call in this area possibly was more than one-quarter mile, so extreme care was exercised to avoid duplication in counting. Locations of birds that were calling on the periphery of the audible range of a particular stop were triangulated with the locations from adjacent stops in order to make the plotting more accurate. Eight minutes were allowed for listening at each stop and 2 minutes for driving to the next stop.

To increase the validity of the comparisons, individual census routes were paired, one from a treated area with one from a control area. The routes in a pair were the same length; they were run on alternate days, at the same time of day. Counts were made in morning or evening, beginning either at sunrise or two hours before sunset.

The first census was made on the morning of May 22, 1958 and the last on July 12, 1958. In this summer interval, quail breeding activities are intense. No attempt was made to complete the entire study at the particular time within this period when calling was most frequent. It was believed that the procedure of pairing the routes and censusing them alternately eliminated the effect of differences in calling that might have occurred as the season advanced.

CENSUS RESULTS

Thirty-seven whistling cocks were heard on the 9,901 acres of the treated study area where chemicals actually were applied. This is an average of 3.74 birds per 1,000 acres. On the additional 700 acres of untreated land that was included in the treated area, nine additional birds were heard, an average of 12.86 birds per 1,000 acres (Table I).

On the control areas, 297 birds were heard, an average of 27.43 per 1,000 acres (Table II).

The significance of the difference in numbers of birds on treated and control areas was tested by an analysis of variance. This procedure was possible because the treated and control transacts were studied in pairs. As shown in Table IV, the F value was 90.33, which is significant at the one percent level. As the census areas were similar in all respects except chemical treatment, it may be presumed that the difference in quail population was due to the effects of the insecticide.

DISTRIBUTION OF BIRDS ON CENSUS AREAS

Quail were well distributed throughout the control area, since birds were heard at all 59 stops on five of the control transects and at 10 of the 12 stops on the remaining transect. In contrast, birds were heard on treated soil at only 27 of the 71 stops in the treated area. Locations of calling birds were near untreated areas, with one exception. The distribution of birds on the treated areas is discussed in detail below and is summarized in Table III.

Transect 1

On this transect 11 stops were made. At four stops no quail were heard on treated land. At five stops quail were plotted as calling on treated land. Distances of six quail from untreated land, were 100, 300, 900, 1,320, 1,320, and 1,650 feet (Table III).

At one stop in this transect, 135 acres of untreated land was in hearing range. Three birds were heard at this stop, all within the untreated portion. At another stop, one bird was heard calling in a 116-acre block of untreated land but no birds were heard in three other small untreated portions of 15, 21, and 6 acres.

Each bird that was heard calling from treated land on this transect was close to untreated soil.

Transect 2

On three stops of this 12-stop transect, no quail were heard. At four stops birds were heard calling from untreated land and at one of these stops a quail called from treated land.

At one stop two birds were heard, one was 100 feet and another 330 feet from untreated soil. One bird was heard at each of four other stops. They were 1,650, 2,970, 4,000, and 4,000 feet from untreated soil. The three stops where birds were heard at the greatest distance from untreated land were near one stop at Transect 4 where two quail were heard at a great distance (4,620 feet) from an area mapped as untreated. These were the only quail found on treated soil not close to untreated lands. A large area of woodland lies between these three stops on Transect 2 and the one stop on Transect 4.

Transect 3

The 12 stops on this transect were a greater average distance from untreated lands than were any of the other transects (Table III). Only one quail was heard on the transect; it was 1,980 feet from the closest untreated soil, which began at the north edge of the transect. Another untreated area was approximately the same distance to the south.

Transect 4

No quail were heard at eight stops on this transect. One stop is discussed above with Transect 2. At one stop a bird called from an area that was 330 feet from untreated land and at another stop others called from an area that was 1,650 feet from untreated land. At another stop one quail was heard calling from a place 1,056 feet from untreated land. These four birds were heard calling from areas west of the stop, where untreated soil was closest.

Transect 5

No quail were heard at eight stops in this transect. At one stop, 990 feet from untreated soil, three birds were heard. They were 660, 990, and 1,320 feet from untreated land. One bird was heard at each of three other stops, at distances from untreated soil of 400, 1,650, and 1,980 feet.

Transect 6

This transect lay directly west of the Grady County line, which runs due north and south. Land in Grady County had not been treated for fire ant eradication. The transect was established near the line in order to determine the locations of whistling-cock quail in relation to a large area of untreated land. At one stop, 990 feet from the county line, four birds were heard. One bird was 330 feet, two were 660 feet, and one was 2,640 feet from the large block of untreated land. Single birds were heard at each of 5 other stops. They were 2,970, 200, 1,320, 990, and 1,848 feet from the untreated area. At one stop, 2,970 feet from the untreated block, two birds were heard; one was 2,640 feet and the other 2,970 feet from the untreated area. At five stops no birds were heard. These stops were 1,650, 3,630, 1,580, 3,036, and 1,980 feet from the untreated land.

TABLE I

WHISTLING-COCK QUAIL HEARD ON CENSUS TRANSECTS THROUGH AREAS TREATED WITH HEPTACHLOR OR DIELDRIN

Transect Number	Total Acres In Transect	Portion of Transect Untreated Whistling Cocks Heard			Portion of Transect Treated Whistling Cocks Heard		
		Acres	No.	Per 1M Ac.	Acres	No.	Per 1M Ac.
1	1,639	293	4	13.65	1,346	6	4.46
2	1,720	272	5	18.38	1,448	7	4.83
3	1,770	65	0	....	1,705	1	.59
4	1,764	34	0	....	1,730	6	3.47
5	1,920	36	0	....	1,884	6	3.18
6	1,788	0	0	....	1,788	11	6.15
TOTAL	10,601	700	9	12.86	9,901	37	3.74

TABLE II

WHISTLING-COCK QUAIL HEARD ON CENSUS TRANSECTS THROUGH UNTREATED AREAS

Transect Number	*Total Acres in Transect*	*Whistling Cocks Heard*	
		Number	*Per 1,000 Acres*
1A	1,860	68	36.56
2A	1,772	53	29.91
3A	1,768	45	25.45
4A	1,856	41	22.09
5A	1,758	52	29.58
6A	1,812	38	20.97
TOTAL	10,826	297	27.43

TABLE III

DISTRIBUTION OF WHISTLING COCKS IN TREATED AREAS IN RELATION TO UNTREATED LAND

Transect Number	*No. of Birds*	*Dist. (in Ft.) of Whistl. Cocks from Untreated Land*			*No. Stops in Route*	*Dist. of Individual Stops from Untreated Land*		
		Min.	*Max.*	*Av.*		*Min.*	*Max.*	*Av.*
1	6	100	1,650	931	11	One in Untreated	2,244	1,066
2	7	100	4,000	2,100	12	"	3,300	1,782
3	1	1,980	1,980	1,980	12	660	6,600	2,205
4	6	330	4,620	2,321	12	330	4,620	2,056
5	6	400	1,980	1,167	12	500	4,480	2,185
6	11	200	2,970	1,566	12	990	3,630	2,185

TABLE IV

ANALYSIS OF VARIANCE FOR SIX TRANSECTS WITH CONTROLS

Source of Variation	*Degrees of Freedom*	*Sum of Squares*	*Mean Square*	*F*
TOTAL	11	1,863.60	....	....
Areas	5	93.24	18.65	....
Treatment	1	1,677.49	1,677.49	90.33
Error	5	92.87	18.57	....

F values required at 0.05 = 6.61
at 0.01 = 16.26

SUMMARY AND CONCLUSIONS

A summer whistling-cock count of bobwhite quail was made on six areas that had been treated with heptachlor or dieldrin, and on six control areas that were untreated. A total of 9,901 acres was censused on treated transects and 10,826 on controls. All areas were in Decatur County, Georgia, a region that is typical of South Georgia and the Coastal Plain. Counts were made from May 22 to July 12, 1958, three to six months after the applications of insecticide.

1. Whistling cock quail averaged 3.74 per 1,000 acres on treated areas, and 27.43 per 1,000 acres on untreated lands.

2. In the three- to six-month period between chemical treatment and the time of the quail census, the birds did not repopulate the treated lands to the level that was found on control areas.

3. Mortality appeared to be uniform in all treated areas regardless of soil type, soil moisture, rainfall, topography, slope, or winter vegetative cover.

4. With one exception birds that were heard on treated areas were close to untreated lands.

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OBSERVATIONS OF EFFECTS OF AN APPLICATION OF HEPTACHLOR OR DIELDRIN ON WILDLIFE *

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Shortly after the inception of the imported fire ant eradication program, some concern developed among wildlife officials as to the possible effects of the program upon wildlife. An outgrowth of this concern was a cooperative study wherein the United States Department of Agriculture Plant Pest Control Division, the Alabama Department of Agriculture and Industry, and the Alabama Polytechnic Institute would work together. The Alabama Department of Conservation, the Bureau of Sport Fisheries and Wildlife (U. S. F. & W. S.) and the Wildlife Management Institute were brought into the study as partners in the Alabama Cooperative Wildlife Research Unit at Alabama Polytechnic Institute. The primary purpose of the cooperative study was to determine the immediate and long-term effects upon bobwhite quail *(Colinus virginianus,* Linnaeus) of the fire ant eradication treatments in use in early 1958, but some observations were also made on other species.

The original plan was to treat 20,000 to 40,000 acres in one block in Wilcox County, Alabama. This did not prove feasible, however, because landowners were reluctant to pay their one-third share of the cost of treatment, except on areas where the ant was a problem to them, and for other reasons. The study area finally agreed upon was located 4 miles northwest of Camden, Wilcox County, Alabama. It included the Lower Coastal Plain Substation of the A. P. I. Agricultural Experiment Station and two contiguous farms used as the test area, and a check area 2 miles away. A total of 4,700 acres in the area was divided as follows:

2,400 acres to be treated with heptachlor
1,200 acres to be treated with dieldrin
600 acres not to be treated and to be used as a check area
500 acres treated the year before by farmers and not a part of the experiment.

PROCEDURES

Description of study areas: About one-third of the treated area was Alabama River flood plain which was poorly drained. Approximately 90 per cent of this bottomland was in good to excellent permanent pasture. The remainder was mostly in cultivation and temporary pasture. Bottomland soils were chiefly Ocklockonee Clay Loam and Leaf Clay Loam. The check area, which was river bottom, had similar soil, cover and game conditions.

The upland part, approximately two-thirds of the treated area, was mostly in mixed pine-hardwood forest. Suitable ridge tops had been cleared and were in cultivation, pasture or in various states of old field succession. Upland soils were Guin Sandy Loam and Wickham Silt Loam, both with adequate to excellent surface drainage.

Game conditions on the areas were average for the vicinity. Bobwhite quail, cottontail rabbits, mourning doves and wild turkeys were present in huntable

* A contribution of the Alabama Cooperative Wildlife Research Unit, the Alabama Polytechnic Institute, the Alabama Department of Conservation, the Wildlife Management Institute and the U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, cooperating.