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HUNTER SUCCESS AND CRIPPLING LOSSES FOR BOBWHITE QUAIL[1]

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Abstract: During a two-week period each February from 1972 through 1981, bobwhite quail (Colinus virginianus) were collected on two study sites consisting of 202 and 210 hectares (505 and 524 acres, respectively). Bobwhites were collected by conventional sport hunting techniques, and records were maintained on several criteria concerning hunter success and crippling loss. During the 10-year study, 108 different hunters using 112 different dogs hunted a total of 3,089 man hours, flushed 15,576 bobwhites, fired 6,820 shots, bagged 2,245 bobwhites, shot down and lost 230 bobwhites, and feathered an additional 385 bobwhites. Bobwhite density ranged from 0.6 to 7.6 bobwhites per ha (0.3 to 3.1/acre). Crippling loss ranged from 15 percent to 29 percent ($\bar{x}$ = 22 percent) of the total annual kill but did not correlate with fluctuations in bobwhite density.

Long-term studies on management and diseases of bobwhite quail (Colinus virginianus) have been underway at Tall Timbers Research Station in Leon County, Florida, since 1969. Part of this research has involved the annual harvest of approximately 25 percent of the bobwhites present on each of two study sites consisting of 202 and 210 ha (505 and 524 acres, respectively). Bobwhites were collected by conventional sport hunting techniques, and records were maintained on a number of criteria, including hunting success and crippling loss. Kellogg and Doster (1971) reported the results of the first three years of this aspect of the study. This report provides information from an additional 10 years' data and compares results at different quail density levels.

METHODS

Study site descriptions and collection methods were generally the same as described by Kellogg and Doster (1971). In the present study, however, hunting records were maintained separately for the two study sites. Further description of the study sites, collection techniques, and bobwhite densities is available elsewhere (Kellogg et al. 1970, Kellogg et al. 1972, Smith 1980).

Data for this study were collected during a two-week period each February from 1972 through 1981. Each study site was divided into sections that could be covered thoroughly by a hunting party in two to four hours. All sections of each study site were hunted a minimum of three times during the two-week period. In order to distribute the collection of bobwhites over each study site, hunting parties usually were restricted to killing only two to four birds from each covey found during a hunt. A hunting party normally consisted of two to three hunters using two dogs. During the 10-year investigation, 108 different hunters using 112 different dogs participated. Hunters ranged from novices to well-seasoned veterans, and dogs ranged from puppies in training to older, well-trained dogs. Most hunters used 12 or 20 gauge shotguns, but a few used 16 gauge guns. Many of the same hunters

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and dogs participated in both this and the earlier study (Kellogg and Doster 1971).

During each hunt, records were kept pertaining to man-hours hunted, number of bobwhites flushed, shots fired, bobwhites retrieved, birds shot down but lost, and birds feathered that kept flying. Crippling loss was the sum of birds shot down but lost plus birds that lost feathers but kept flying after being shot. These birds, added to those actually retrieved, comprised the total kill.

Pertinent data were encoded, entered on computer punch cards, and analyzed using statistical procedures from the Statistical Analysis System (Helwig and Council 1979). Variables were compared using linear regression analyses and correlation coefficients except for testing of trends over time (i.e., in succeeding years of the study) in which case the runs test (Remington and Schork 1970) was used.

RESULTS AND DISCUSSION

Information from both study sites for each year is given in Table 1. Also included in Table 1 for comparative purposes are data from the earlier study by Kellogg and Doster (1971). Results of the two studies are similar, i.e., about three shots were fired for each bird bagged, and one bird was lost to crippling for every three to four bagged.

In addition to the basic question of obtaining a reference value for crippling loss, data obtained during this study afforded insight on several other related questions. First, does the percentage of total crippling loss or either of its components (i.e., percentage down and lost or percentage feathered) vary in relation to bobwhite population density? Analyses did not indicate any relationship between bobwhite density and total crippling loss ($r = -0.08$; $P = 0.74$), birds shot down but lost ($r = 0.13$; $P = 0.58$), or birds feathered ($r = -0.29$; $P = 0.21$). Second, did hunters expend more effort (i.e., were they more successful) at locating downed birds when their chances of finding new coveys were less (i.e., when flushes per hour were low)? Analysis revealed that the percentage of birds down and lost was not related to the number of flushes per hour ($r = 0.18$; $P = 0.45$). Third, with accrued experience (i.e., in succeeding years) were hunters able to reduce the total percentage crippling loss or either of its components? Analyses indicated that the percentage of birds down and lost had a decreasing trend over succeeding years ($P < 0.05$); however, the total percentage crippling loss and percentage feathered did not exhibit trends over time ($P > 0.05$). Fourth, did hunters have variable rates of shooting success (i.e., number of shots per bird retrieved) at different bobwhite densities or at different hunting difficulties (i.e., flushes per hour)? Analyses disclosed that the number of shots fired per retrieved bird was not related to bobwhite density ($r = 0.25$; $P = 0.29$) or flushes per hour ($r = 0.21$; $P = 0.38$).

The information presented herein should be useful to game managers in determining crippling loss and total harvest of bobwhites on private and public lands. Further, since the data were collected in a manner that can be considered reasonably representative of bobwhite hunting (e.g., at various bobwhite densities, over a number of years, for harvest levels ranging from 19 to 39 percent, and by sport hunting methods), the findings should be broadly applicable.

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Table 1. Harvest data for bobwhite quail collected on Tall Timbers Research Station, Leon County, Florida, from 1969 through 1981.

Year	Site	Bobwhite Density per ha/ac	Man Hours Hunted	Number Flushed	Shots Fired	Crippling Losses			Bobwhites Collected	= Total Kill	Shots Per Bird Retrieved
						Shot Down But Lost +	Feathered =	Total Crippling Loss +			
1969 1970 1971a	1&2	>2.4/>1.0	572	5,691	2,639	109(10)b	157(14)	266(24)	846(76)	1,112	3.1
1972	1	7.6/3.1	246	2,584	1,013	33(8)	49(12)	82(21)	312(79)	394	3.3
	2	2.9/1.2	169	1,134	450	24(13)	22(12)	46(25)	135(75)	181	3.3
1973	1	3.5/1.4	167	983	519	22(10)	26(12)	48(22)	175(79)	223	3.0
	2	3.5/1.4	183	1,434	563	21(9)	31(13)	52(22)	181(78)	233	3.1
1974	1	2.7/1.1	253	1,018	507	14(7)	31(16)	45(23)	150(77)	195	3.4
	2	2.0/0.8	137	527	302	12(8)	19(13)	31(21)	116(79)	147	2.6
1975	1	2.0/0.8	169	546	253	11(10)	18(16)	29(26)	83(74)	112	3.0
	2	1.7/0.7	165	660	341	15(11)	15(11)	30(22)	109(78)	139	3.1
1976	1	2.3/0.9	191	586	285	5(4)	20(17)	25(22)	91(78)	116	3.1
	2	1.1/0.4	139	333	169	9(14)	10(15)	19(29)	47(71)	66	3.6
1977	1	1.7/0.7	147	476	186	3(4)	15(19)	18(23)	60(77)	78	3.1
	2	0.6/0.3	99	161	87	3(7)	6(15)	9(22)	31(78)	40	2.8
1978	1	1.8/0.7	99	622	222	6(6)	16(16)	22(21)	81(79)	103	2.7
	2	1.0/0.4	74	271	116	1(2)	7(13)	8(15)	44(85)	52	2.6
1979	1	2.4/1.0	145	765	331	9(7)	18(13)	27(20)	108(80)	135	3.1
	2	2.4/1.0	141	737	329	13(9)	18(13)	29(22)	108(78)	139	3.0
1980	1	2.8/1.1	146	752	346	13(8)	24(16)	37(24)	116(76)	153	3.0
	2	2.6/1.1	144	623	255	2(2)	15(14)	17(16)	88(84)	105	2.9
1981	1	3.3/1.3	160	884	321	10(6)	14(9)	24(16)	130(84)	154	2.5
	2	1.8/0.7	115	480	225	4(4)	11(11)	15(15)	82(85)	97	2.7
TOTALS (1972-1981)			3,089	15,576	6,820	230(8) [2-14]c	385(13) [9-19]	615(22) [15-29]	2,245(78) [71-85]	2,860	3.1 [2.5-3.6]
GRAND TOTALS (1969-1981)			3,661	21,267	9,459	339(9)	542(14)	881(22)	3,093(78)	3,974	3.1

aReported by Kellogg & Doster (1971)
bNumber in parentheses is % of total kill
cnumber in brackets equals range

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