Some results of two limited hunting seasons on hen pheasants in north central Montana
by Thomas Peter Zapatka

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Fish and Wildlife Management
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Abstract:
The pheasant populations on two irrigated farm areas in north central Montana were studied during the summers of 1961 and 1962 and at various times throughout the year from September 1960 to October 1962 to evaluate the effects of limited hunting seasons on hen pheasants# On one area (experimental area) a hen could be included in the daily bag while on the other area (control area) only cocks were allowed# Sex ratio counts in winter indicated a preponderance of hens in the populations but a higher percentage of cocks was present in the experimental area than on the control area in 1961 and 1962. Spring breeding indices indicated a higher population on the control area than on the experimental area for both years. The hatching chronologies in 1961 and 1962 indicated that nesting started earlier in 1962 than in 1961 but was also terminated earlier. The peak hatch occurred earlier on the experimental area in 1962 than in 1961 but the reverse was true for the. control area.

Summer production data indicated lower indices for adults per mile and broods per mile but higher indices for young per mile and total birds per mile on the experimental area as compared to the control area in both 1961 and 1962. A higher average brood size was also indicated each year for the experimental area. Age ratios of . pheasants checked on the opening day of the hunting season in 1961 and 1962 indicated higher juvenile cock to adult cock ratios for the experimental area than for the control area. Opening day hunter checking station data indicated a greater number of hunters and a greater kill of wild pheasants on the experimental area than on the control area for both years. The higher wild pheasant kill on the experimental area was not only related to higher gun pressures but also to the higher population of vulnerable pheasants. In 1962, after three limited hunting seasons on hen pheasants, the. average hunter on the experimental area, when compared to the average hunter on the control area, expended less time in bagging a pheasant and shot more pheasants. The data indicated that the limited season on hen pheasants provided more pheasants for hunters with no detrimental effects on the effective breeding populations.

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ABSTRACT

The pheasant populations on two irrigated farm areas in north central Montana were studied during the summers of 1961 and 1962 and at various times throughout the year from September 1960 to October 1962 to evaluate the effects of limited hunting seasons on hen pheasants. On one area (experimental area) a hen could be included in the daily bag while on the other area (control area) only cocks were allowed. Sex ratio counts in winter indicated a preponderance of hens in the populations but a higher percentage of cocks was present in the experimental area than on the control area in 1961 and 1962. Spring breeding indices indicated a higher population on the control area than on the experimental area for both years. The hatching chronologies in 1961 and 1962 indicated that nesting started earlier in 1962 than in 1961 but was also terminated earlier. The peak hatch occurred earlier on the experimental area in 1962 than in 1961 but the reverse was true for the control area.

Summer production data indicated lower indices for adults per mile and broods per mile but higher indices for young per mile and total birds per mile on the experimental area as compared to the control area in both 1961 and 1962. A higher average brood size was also indicated each year for the experimental area. Age ratios of pheasants checked on the opening day of the hunting season in 1961 and 1962 indicated higher juvenile cock to adult cock ratios for the experimental area than for the control area. Opening day hunter checking station data indicated a greater number of hunters and a greater kill of wild pheasants on the experimental area than on the control area for both years. The higher wild pheasant kill on the experimental area was not only related to higher gun pressures but also to the higher population of vulnerable pheasants. In 1962, after three limited hunting seasons on hen pheasants, the average hunter on the experimental area, when compared to the average hunter on the control area, expended less time in bagging a pheasant and shot more pheasants. The data indicated that the limited season on hen pheasants provided more pheasants for hunters with no detrimental effects on the effective breeding populations.

INTRODUCTION

The hen ringneck pheasant (Phasianus colchicus) has for the most part been protected from hunting while some other species of upland game birds, as well as some waterfowl, have been subjected to either-sex hunting without any apparent detrimental effects on the populations. A few states have recently investigated the effects of either-sex hunting seasons on pheasants. Harper (1960) reporting on Licensed Pheasant Clubs states: "in California where hen shooting has been permitted for the past 18 years, and where the wild hen kill has exceeded the cock kill, no measurable decrease in the pheasant population has occurred." Harper (1960) in evaluating the results of three limited hen seasons in northern California reported an increase in cock kills with each successive hen season and a cock kill, in the year that followed, which exceeded the kill for any of the previous five years.

In 1959, the Montana Fish and Game Commission authorized an experimental limited hunting season on hen pheasants on the Greenfields Division of the Sun River Irrigation Project in north central Montana. The season was to include eight days of the general season during which one hen could be included in the total daily bag of three pheasants. The experiment was conducted for four hunting seasons, 1959 to 1962. To evaluate the effects of this type of hunting, I studied the pheasant populations on two irrigated farm areas, which were separated by 35 miles of dryland farms. One area, the experimental area, was in that region where hen pheasants were included in the bag, and the other, the control area, was in a region where only cocks were shot.

Full time was spent in the field during the periods June 1 to September 21, 1961 and June 11 to September 18, 1962. In addition, field work, of 2 to 21 days duration, was conducted at various times during the fall, winter, and spring from September 1960 to October 1962. Sex ratios, crowing counts, roadside counts and brood observations were taken at different seasons of the year to evaluate the respective populations. A concentrated effort was made during the summer months to obtain as much brood data as possible. During the fall seasons age ratios and hunting data were obtained from checking stations.

DESCRIPTION OF AREAS

The experimental and control areas are similar with respect to elevation, topography, climate and soils. Elevations range from 3400' to 4000' and the topography varies from level or gently undulating plateaus to rolling and broken land. The climate is semi-arid with an annual precipitation of about 12 inches. The prevalent soils are loam, silt loam, sandy loam, gravelly loam, silty clay and clay (DeYoung 1927 and 1928, and Geiseker 1936).

Experimental Area

The experimental area lies 35 miles northwest of Great Falls, in Teton and Cascade Counties. It is approximately 20 miles long and seven miles wide and is divided into two parts by natural land divisions; the Freezout Lake Waterfowl Management Area, and the Fairfield Bench.

Freezout Lake lies in the most western portion and is separated from the remainder by steep slopes. Descriptions of the Freezout Management Area can be found in Ellig (1955), Knight (1960), and Rothweiler (1960).

The Fairfield Bench which constituted the largest portion is a plateau extending 17 miles east-west and six to seven miles north-south. It has three distinct levels divided by gravelly slopes the highest of which lies to the south and the lowest to the north. The eastern and northern most part is mixed with nonagricultural areas of gravelly, broken land with deep coulees (DeYoung 1927).

The agriculture is almost entirely irrigated. Wheat is the principal crop, followed in order of importance by alfalfa, barley, oats and flax (Bailey 1963). Nonirrigated portions are used for pasturing livestock.

The irrigation system includes 166 miles of canals (watercourse carrying 100 c.f.s. or more) and 440 miles of laterals (watercourse carrying less than 100 c.f.s.). Drainage on individual farms is accomplished by 262 miles of V-shaped ditches usually located at the periphery of the section (Bailey 1963). The entire bench is divided into one square mile sections.

The vegetation on the "bench" is dominated by domestic crops. Native and exotic vegetation occupies noncultivated areas. In almost all instances except for soil banks, grasses occupied the major portion of these areas. The dominant plants in the drier sites were crested wheatgrass (Agropyron cristatum), smooth brome (Bromus inermis), slender wheatgrass (Agropyron trachycaulum), foxtail barley (Hordeum jubateum), wild oat (Avena fatua) and green needlegrass (Stipa viridula).

Moist locations contained timothy (Phleum pratense), kentucky bluegrass (Poa pratensis), canada wild-rye (Elymus canadensis), orchard grass (Dactylis glomerata), redtop (Agrostis alba) and Poa spp. as the dominant grasses. Associated with these were common sunflower (Helianthus annuus), prickly sowthistle (Sonchus asper), lettuce (Lactuca serriola) and spotted knapweed (Centaurea maculosa). Swampy sites contained common cattail (Typha latifolia).

Control Area

The control area, located in Pondera County, lies approximately 50 miles northwest of Great Falls and 35 miles northeast of the experimental area. It is irregular in shape and includes approximately 150,000 acres of land. At least 70 percent of the control area is located in the Valier Irrigation Project.

The agriculture is approximately 35 percent irrigated and is interwoven with dryland. The principal crop is wheat, followed by barley, alfalfa and oats.

According to DeYoung (1928) and Gibson (1963) the Valier Irrigation Project includes 43 miles of main canals, 134 miles of laterals and 192 miles of distributing ditches. Deep drainage ditches observed on the Fairfield Bench are not present on the Valier Project. The area is divided into one square mile sections.

The vegetation is dominated by domestic crops. Vegetation in non-cultivated areas consists of native and exotic plants. Broad-leaved plants occupied the major portion of these areas, whereas grasses were more abundant on the experimental area.

The most common broad-leaved species in drier locations were as follows: lamb's quarter (*Chenopodium album*), russian thistle (*Salsola kali*), canada thistle (*Cirsium arvense*) prairie sunflower (*Helianthus petiolaris*), curlcup gumweed (*Grindelia squarrosa*), silver sagebrush *Artemesia cana*), prairie rose (*Rosa arkansana*), and kochia (*Kochia scoparia*). Smooth brome (*Bromus inermis*), slender wheatgrass (*Agropyron trachycaulum*), crested wheatgrass (*Agropyron cristatum*) and foxtail barley (*Hordeum jubatum*) were the dominant grasses. Smooth brome was seeded in some road ditches.

The vegetation in the more moist locations consisted mainly of broad-leaved plants and a few grasses. These were as follows: white sweetclover (*Melilotus albus*), redroot pigweed (*Amaranthus retroflexus*), kochia (*Kochia scoparia*), alfalfa (*Medicago sativa*), lamb's quarter (*Chenopodium alba*), western aster (*Aster occidentalis*) charlock (*Brassica kaber*), lettuce (*Lactuca serriola*), goldenrod (*Solidago gigantea*), chickory (*Cichorium intybus*) and showy milkweed (*Asclepias speciosa*). Grass species were: timothy (*Phleum pratense*), kentucky bluegrass (*Poa pratensis*) smooth brome (*Bromus inermis*), and canada wild-rye (*Elymus* *canadensis*). Showy milkweed is more or less the dominant species along canal and irrigation ditches. Common cattail (*Typha latifolia*), was present in swampy locations.

SEX RATIOS

Sex ratios were obtained in December and March during two winters on each study area (Table I). Many authors have recognized the value of obtaining pheasant sex ratios in winter. These include Kimball (1949), Erickson *et al.* (1951), Weston (1954), and Stokes (1954). The presence of snow as a key factor in obtaining accurate ratios was emphasized by Trautman (cited in Seubert, 1960).

Sex ratio counts were made with the assistance of at least one other man and the criteria described by Seubert (1960) for the road counts and flush counts. In addition to "sexing" pheasants observed along roads, areas with dense cover where pheasants congregated were systematically searched. All birds flushed were counted and "sexed" with the aid of binoculars and tally counters. Emphasis was placed on making complete counts.

During counts, snow cover varied from none to complete. The counts made on each of the study areas in December of 1960 and 1961 were conducted during periods of cold weather and "complete" snow cover. Those made in March of 1962 were conducted during mild weather with partial snow cover. The experimental area counts in March of 1961 were made during warm weather and with no snow cover.

Table I. Winter sex ratios on the experimental and control areas; 1960-61, 1961-62.

Experimental Area - Fairfield

Dates	Males	Females	Totals	Males per Females	Males per 100 Females
3/21-24/61	43	143	186	1:3.3	30:100
12/20-22/61	178	752	930	1:4.2	24:100
3/15-16/62	49	367	416	1:7.5	13:100
Total:	227	1119	1346	1:4.9	20:100

Control Area - Conrad

Dates	Males	Females	Totals	Males per Females	Males per 100 Females
12/28-30/60	129	642	771	1:5.0	20:100
12/19-20/61	101	680	781	1:6.7	15:100
3/17-18/62	34	275	309	1:8.1	12:100
Total:	135	955	1090	1:7.1	14:100

The observed sex ratios on each of the areas for the two years indicated a preponderance of hens in the populations but the experimental area exhibited a higher percentage of cocks than did the control area (Table I). More hens than cocks is characteristic of populations subjected to selective hunting of cocks (Schick, 1947; Dale, 1951). The inclusion of one hen in the bag for the experimental area could possibly have accounted for the greater percentage of cocks on the experimental area. However, the sex ratio counts by Reuel Janson during the winter following the first limited hunting season on hens in 1959, suggested that differential hunting pressure influenced the cock/hen ratios more than did the inclusion of one hen in the bag. His counts likewise indicated a preponderance of hens for each area but the control area exhibited a greater percentage of cocks than did the experimental area (Table II). In 1959 hunting pressure was at a maximum on the experimental

Table II. Cocks per 100 hens on the experimental and control areas for 1957-1959 (from Janson, 1961).

	1957	1958	1959
Experimental	16.0	18.0	12.0
Control	30.0	30.0	17.8

area. Further evidence that hunting pressure was responsible for the reduced cock percentages more than was the one hen in the bag is provided by the 1957 and 1958 ratios when only cocks were hunted on each area. For both years the cock percentage was lower on the experimental area (Table II).

Hunting pressure was higher on the experimental area. Areas receiving high gun pressure on cocks have been associated with low cock/hen ratios (Dale, 1951; Seubert, 1960).

BREEDING POPULATION INDICES

Crowing Counts

Crowing counts were conducted in the spring on each study area by myself and other personnel of the Montana Fish and Game Department using the procedure of Kimball (1949). The starting time varied from 40 to 30 minutes prior to sunrise. According to various authors the peak of crowing is reached at 20 to 30 minutes (Nomsen, 1953), 35 minutes (Kozicky, 1952), and 40 minutes (Kimball, 1949), before sunrise. Counts were usually made at weekly intervals on regular 20 mile routes and the highest average count recorded for each route during the censusing period was used as the census index for that year. In 1962, counts were taken at irregular intervals in each area because of persistently strong winds, overcast skies, and precipitation. It is generally agreed that periods of unsettled weather affect the accuracy of counts (Kimball, 1949, and Nomsen, 1953).

The crowing count index was consistently higher in all years for the control area as compared to the experimental area (Table III). However, the indices for 1962 are probably much too low and not representative of the cock populations on either area because of weather conditions during crowing counts.

Table III. Breeding population indices - 1960 - 1962 (mostly from Janson 1960-61).

	Crowing Counts			Male Roadside Counts		Derived Indices	
Number of Counts	Dates of Counts	Date Highest Count	Calls per 2 min.	Date Highest Counts	Males per Mile	Spring Hen Index	Total Spring Pop. Index
Experimental Area - Fairfield							
7	4/21-6/24	4/27/61	18.8	4/27/61	1.00	62	81
3	4/25-6/25	5/12/62	5.6	5/12/62	0.35	27	33
Control Area - Conrad							
5	4/20-6/27	5/1/61	30.0	5/1/61	1.15	150	180
4	4/12-6/22	5/18/62	18.8	5/18/62	0.65	133	152

Male Roadside Count

A modification of the method described by Kozicky (1952) was used to obtain spring male roadside counts. At the conclusion of each crowing count, the observer reversed his direction of travel and counted all pheasants observed along the route. The maximum count obtained for any one route, each year, was used as the index for that year (Table III). The spring male roadside counts showed a higher index for the control area as did the crowing counts. Although the relationship between crowing counts and male roadside counts was not linear, both indices showed similar trends from year to year.

Derived Indices

Crowing counts used in conjunction with winter sex ratios provide indices of the spring hen population and the total spring population (Kimball, 1949 and Nomsen, 1953). The hen index is obtained by multiplying the crowing count index by the number of hens per cock in the winter sex ratio. The total spring population index is attained by adding the crowing count index to the hen index (Table III).

The spring hen indices and the total spring population indices were generally higher for the control area than for the experimental area. However, I do not believe there was as great a difference in the respective populations indicated by the indices for 1961 and 1962. The lack of confidence in these indices resulted from the questionable crowing count index for 1962 and the small sample obtained in March 1961, for the experimental area sex ratios which were taken under adverse conditions.

HATCH CHRONOLOGY

Hatching dates were determined for each study area in 1961 and 1962 by visually "aging" broods observed in the field to the nearest week according to size and plumage characteristics (Trautman 1950) (Table IV). The hatching dates in 1961 ranged from May 22-28 to August 14-20 and May 29-June 4 to July 31-August 6 for the experimental and control area, respectively. The data indicated generally later hatching dates for the experimental area. About 85 percent of the broods were hatched on the control area between June 5 and July 9 while only about 76 percent of the broods were hatched on the experimental area during this period. Peak hatch for the control area occurred during the week of June 12-18 while the peak hatch on the experimental area occurred one week later.

The hatching dates for 1962 on the experimental and control areas ranged from May 15-21 to July 24-30 and May 15-21 to July 31-August 6, respectively. The peak hatch was three weeks earlier on the experimental area but 97 or 84 percent of the nests on the experimental area and 99 or 82 percent of the nests on the control area hatched between June 5 to July 9.

A comparison of the data for both areas for the two years indicated that nesting started earlier in 1962 than in 1961 but was also terminated earlier. The peak hatch occurred earlier on the experimental area in 1962 than in 1961 but the reverse was true for the control area. In 1961,

Table IV. Dates of hatching for broods on the experimental and control areas as determined by visually "aged" broods, 1961 and 1962.

1961

Dates		Experimental Area		Control Area	
		No. Broods	Percent	No. Broods	Percent
May	1-7	0	0.00	0	0.00
	8-14	0	0.00	0	0.00
	15-21	0	0.00	0	0.00
	22-28	2	1.34	0	0.00
May-June	29-4	6	4.03	1	1.41
	5-11	12	8.05	8	11.27
	12-18	23	15.44	17	23.94
	19-25	27	18.12	16	22.54
June-July	26-2	27	18.12	10	14.08
	3-9	24	16.11	9	12.68
	10-16	10	6.71	2	2.82
	17-23	9	6.04	3	4.23
	24-30	6	4.03	2	2.82
July-Aug.	31-6	2	1.34	3	4.23
	7-13	0	0.00	0	0.00
	14-20	1	0.67	0	0.00
Totals		149	100.00	71	100.02

1962

Dates		Experimental Area		Control Area	
		No. Broods	Percent	No. Broods	Percent
May	1-7	0	0.00	0	0.00
	8-14	0	0.00	0	0.00
	15-21	1	0.86	2	1.65
	22-28	3	2.59	1	0.83
May-June	29-4	6	5.17	6	4.96
	5-11	30	25.86	17	14.05
	12-18	20	17.24	21	17.36
	19-25	23	19.83	23	19.01
June-July	26-2	14	12.07	24	19.83
	3-9	10	8.62	14	11.57
	10-16	5	4.31	10	8.26
	17-23	1	0.86	2	1.65
	24-30	3	2.59	0	0.00
July-Aug.	31-6	0	0.00	1	0.83
	7-13	0	0.00	0	0.00
	14-20	0	0.00	0	0.00
Totals		116	100.00	121	100.00

a greater percentage of the total hatch occurred during the principal five-week hatching period on the control area than on the experimental area, whereas, in 1962 the percentages for this period were quite similar.

PRODUCTION

Summer production data were obtained in 1961 and 1962 from 20-mile trend routes on each study area. The methods used were based on a modification of the techniques of Klonglan (1955) and Seubert(1960). The routes, traveled at 10-12 miles per hour, were begun one-half hour after sunrise and completed within two and one-half hours. Counts of "undisturbed" broods were made with the aid of 7X35 binoculars and 20X spotting scope and then a flush count was attempted by tramping the immediate area. Each brood observation was recorded as "complete" or "incomplete" and only broods for which reasonably complete counts were obtained were included in the results. Additional brood data were obtained upon completion of each trend route, during mornings when no trend routes were conducted and during late afternoon observational periods.

Trend data indicated a higher index for adults on the control area than on the experimental area in both 1961 and 1962 (Table V), but the indices for young per mile and total birds per mile were greater for the experimental area. The lower index of adults per mile on the experimental area each year was accompanied by a lower brood per mile index but a higher average brood size as compared to the control area. Errington, et al.

Table V. Summer production indices for the experimental and control areas as determined from data taken on 20-mile trend routes in 1961 and 1962.

Observational Period	Total Miles	Pheasants Observed: Unclassified	Pheasants Observed: Males	Pheasants Observed: Females	Pheasants Observed: Young	Pheasants Observed: Young per Hen	Birds per Mile: Total	Birds per Mile: Adult	Birds per Mile: Young	Broods: Observed not Counted	Broods: Observed and Counted	Broods: Young, Counted Broods	Broods: Average Brood Size[1]	Broods: Total Broods per Mile
1961														
Experimental Area														
July-August	160	1	13	65	386	5.9	2.9	.49	2.4	4	63	382	6.1	.42
Control Area														
July-August	100	0	9	54	203	3.8	2.7	.63	2.0	1	47	201	4.3	.48
1962														
Experimental Area														
August	80	0	4	29	193	6.7	2.8	.41	2.4	1	30	189	6.3	.39
Control Area														
August	80	1	7	36	175	4.9	2.7	.54	2.2	1	38	174	4.6	.49

[1] Includes only young from broods that were observed and counted.

(1937) noted a decline in the breeding population in Iowa in 1936 but during the summer observed consistently larger broods in the Ruthven area. The significance of the present data is that the control area, with more adults and more broods of a smaller average size produced fewer young than did the experimental area. The experimental area with fewer adults and fewer broods of a larger average size produced more young than did the control area. This superiority in production of young accounted for the higher total population index for the experimental area.

All of the brood data, other than that obtained on the trend routes for each area, were analyzed by weekly periods and by similar age-classes (Tables VI and VII). At least 80 percent of the hatch had been completed prior to the time in which the data represented in these tables were collected (Table IV). Since broods under four weeks of age tend to use concealment for protection (Baskett 1947) and grouping of older broods and adults will cause unreliable counts (Errington, et al. 1937) only brood data obtained from pheasants four to nine weeks of age were presented in Table VII. The data of these samples corroborate the data from the trend routes that the average brood size for the experimental area was larger than for the control area in both 1961 and 1962.

Further evidence that more young were produced on the experimental area than control area was provided by opening day hunter check station data (Table VIII). Feet were removed from a portion of the cocks examined at checking stations and were later "aged" according to spur characteristics

Table VI. Sizes of broods for the experimental and control areas as determined by broods for which "complete" data were available, 1961 and 1962.

	1961				1962			
	Experimental		Control		Experimental		Control	
Weekly Obs. Period	No. Broods Obs.[1]	Ave. Brood Size	No. Broods Obs.[1]	Ave. Brood Size	No. Broods Obs.[1]	Ave. Brood Size	No. Broods Obs.[1]	Ave. Brood Size
July 17-23	1(1)	11.0	8(7)	6.6	5(1)	5.0	3(2)	3.5
July 24-30	19(5)	8.8	10(5)	5.6	13(7)	7.7	29(18)	6.8
July 31-Aug. 6	4(1)	4.0	0	---	18(9)	7.6	22(7)	4.6
Aug. 7-13	3(1)	10.0	25(10)	5.8	25(11)	8.5	24(12)	6.4
Aug. 14-20	20(4)	9.5	0	---	15(8)	8.9	41(18)	6.9
Aug. 21-27	5(3)	8.6	0	---	34(9)	7.0	16(4)	4.3
Totals:	52(15)	8.9	43(22)	6.0	110(45)	7.9	135(61)	6.2

[1]Figure in parenthesis indicates the number of broods for which "complete" counts were obtained and only these were used to calculate average brood size.

Table VII. Size of different age classes of broods for the experimental and control areas as determined by broods for which "complete" data were available, 1961 and 1962.

Age Class in Weeks	1961 Experimental No.[1] Broods Obs.	1961 Experimental Ave. Brood Size	1961 Control No.[1] Broods Obs.	1961 Control Ave. Brood Size	1962 Experimental No.[1] Broods Obs.	1962 Experimental Ave. Brood Size	1962 Control No.[1] Broods Obs.	1962 Control Ave. Brood Size
4-5	8(3)	9.0	9(7)	5.6	20(11)	8.5	23(13)	6.2
6-7	17(6)	7.3	8(5)	4.8	38(18)	6.8	39(24)	5.8
8-9	6(2)	10.5	6(5)	7.8	28(12)	8.8	26(12)	6.2
Totals:	31(11)	8.4	23(17)	6.0	86(41)	7.9	88(49)	6.0

[1]Figure in parenthesis indicates the number of broods for which "complete" counts were obtained and only these were used to calculate average brood size.

(Linduska, 1943). In 1961 and 1962, the ratio of juvenile to adult cocks was higher for the experimental area.

Table VIII. The ratio of juvenile to adult cocks for pheasants from the experimental and control areas checked at hunter checking stations on opening day, 1961 and 1962.

Location	Adult	Juvenile	Juvenile Per Adult
		1961	
Experimental Area	48	593	12.4
Control Area	39	258	6.6
		1962	
Experimental Area	46	580	12.6
Control[1] Area	21	209	10.0

[1] A few feet were collected from hunters hunting off the study area but could not be deleted since the feet were placed in one container at the checking station.

HUNTING SUCCESS

Hunting data were collected from each study area at hunter checking stations in both 1961 and 1962 but the only comparable data were those obtained on opening day (Table IX). It has been shown that the heaviest hunting pressure and greatest kills occur on opening day (Harper et al, 1951).

Table IX. Hunting Success of hunters checked on opening day for the experimental and control areas in 1961 and 1962.

Location	Hunting Pressure: Number of Hunters	Hunting Pressure: Hours Hunted	Hunting Pressure: Average Hours Hunted	Wild Pheasants Bagged[1]: ♂♂	Wild Pheasants Bagged[1]: ♀♀	Wild Pheasants Bagged[1]: Total	Wild Pheasants Bagged[1]: ♀♀%	Hunter Success: Gun Hrs. Per Wild Pheasant	Hunter Success: Wild Pheas. Per Hunter
				1961					
Experimental Area	1131	4061[2]	3.7	807	272	1079	25.2	3.8[3]	0.95
Control Area	210	875	4.2	307	---	307	----	2.9	1.46
				1962					
Experimental Area	1290	4523	3.5	794	387	1181	32.8	3.8	0.92
Control Area	246	874	3.6	2.7	---	217	----	4.0	0.88

[1] 27 and 73 game farm pheasants included in the bag for the experimental area in 1961 and 1962 respectively, were not counted.

[2] Based on 1108 hunters.

[3] Based on 1057 pheasants.

The number of hunters checked on the experimental area in 1961 was more than five times greater than the number checked on the control area. The kill of wild cocks and total wild pheasant kill, which included hens for the experimental area only, was two and three times greater respectively, on the experimental area than on the control area. The larger kill on the experimental area was not only related to greater hunting pressure but also the higher population of vulnerable pheasants. Allen (1947) reported that juvenile cock pheasants were more vulnerable than older cocks in the early part of the season, and contributed especially to higher kills during this period. As was previously shown, a higher number of juvenile cocks per adult cock was observed in both years for the experimental area. Allen (1947), and Dale (1951) have indicated that the harvest varies with the supply of cocks but the remnant (cocks remaining after the hunting season) is somewhat constant regardless of hunting pressure. Although the number of hunters on the experimental area was five times greater than the number on the control area, the "average" hunter required only 0.9 hours longer to bag a pheasant. Even though the control area experienced much lower gun pressures the "average" hunter bagged only 0.5 more pheasants than did the "average" hunter on the experimental area.

The 1962 season, which was preceded by three seasons during which "one hen in the bag" was legal on the experimental area only, demonstrated the superiority of the experimental area over the control area. The number of hunters checked on the experimental area was about five times greater than for the control area. The kill of wild cocks and total kill of wild pheasants was three and five times greater respectively, on the experimental area than on the control area. The average hunter on the experimental area when compared to the average hunter on the control area expended less time in bagging a pheasant and shot more pheasants.

DISCUSSION AND CONCLUSIONS

In attempting to evaluate the results of the limited hen seasons all data pertinent to populations and harvests have been included. Some of the data are of higher quality than are others and in addition some population characteristics are more meaningful in the evaluation. I put less reliance on the data concerning sex ratios and breeding indices than that for the hatching chronologies, production and hunting success. Sex ratio counts, crowing counts and male roadside counts were made under less than optimum weather conditions. The crowing of cocks was not observed to "peak" and "level off" prior to conducting the counts used as indices. The counts were made when time permitted, as were male roadside and sex ratio counts. Since the derived indices are functions of the sex ratio and crowing counts, the reliability of these indices are in direct proportion to the quality of these data.

Production data were taken almost every day during both summers thus increasing the sample size and the quality of the data. The comparative data on hunter success for opening day are considered to be representative.

The data on production and hunter success are most pertinent to the evaluation of the effects of limited hen seasons on populations. Since the brood data and the age ratio data clearly indicated that the experimental area was superior in the production of young, which was reflected in the hunting success, I have concluded the hen seasons resulted in more pheasants being harvested at no expense to the effective breeding population. The hunting success data for 1962 appeared especially significant because this season followed three previous limited hen seasons. There were no detrimental effects evident at this time, instead, there was an increase in hunter success on the experimental area over that of the control area.

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