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John F. May
Iowa State University

Arnold O. Haugen
Iowa State University

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Survival of Pen-Reared Ring-Necked Pheasants Released in Southeastern Iowa¹

JOHN F. MAY² and ARNOLD O. HAUGEN³

MAY, JOHN F. and ARNOLD O. HAUGEN. (Iowa Cooperative Wildlife Research Unit, Iowa State University, Ames, Iowa 50010.) Survival of Pen-Reared Ring-Necked Pheasants Released in Southeastern Iowa. *Proc. Iowa Acad. Sci.* 80(3) 129-132, 1973.

SYNOPSIS: A mass release of 2,465 ring-necked pheasants (*Phasianus colchicus*) at a single site in previously unoccupied range in southeastern Iowa in the fall of 1970 was evaluated by studying mortality, dispersal, reproduction, and population levels. The spring cock population near the release site, sampled by crowing-count surveys, remained at the same level from 1971 to 1972. A 60% drop in the estimated hen population in the same area was accompanied by a drop in winter sex ratios from 4.1 hens/cock in 1971 (first winter after release) to 1.5 in 1972. These changes are thought due to the addition of young-of-the-year (71.2%), with an assumed sex ratio of 1:1. Twenty-three percent of the

nests found in 1971 were successful. Roadside surveys and field observations in August show that 71.4% of the hens had broods in 1971, and that the average brood of age 6 weeks or older had 7.1 ± 1.1 chicks. A few birds dispersed as far as 21.5 miles immediately after release, but most stayed near the release site. Radially diverging crowing-count surveys revealed an area of concentration of birds within 2 miles of the release site in 1971; concentration expanded to 3 miles in 1972. Observed mortality during the 2 months after the release was not excessive. Weight changes of three groups of pheasants from the time of banding to the time of sampling show that birds collected from the field 1 month after release had gained more weight than birds held in captivity for the same time.

INDEX DESCRIPTORS: Pheasant survival; pheasant dispersal; pen-reared pheasant survival; mass pheasant release.

Since the time of the first introduction of ring-necked pheasants into the farmlands of Iowa, Lee County in southeastern Iowa has been noted for its low pheasant populations. In an attempt to establish a self-maintaining population in this area, the Iowa State Conservation Commission stocked a large number of pheasants near Mt. Hamill, in Lee County, by means of a mass release. This study was designed to secure data concerning the survival and spread of the released population. The four main objectives of the study were: (1) to obtain measures of the population existing in the area at various times after the release, (2) to gather data on the reproductive success of the population, (3) to obtain data concerning dispersal of pheasants from the initial point of release, and (4) to determine the nature and extent of mortality during handling operations and after release.

METHODS

On Sept. 30, Oct. 2, 5, 7, and 14 in 1970, 2,465 pheasants (of a total of 2,690 birds banded at Boone, Iowa) with a sex ratio of 4.1 hens/cock were released at a single site near Mt. Hamill. The released birds were 15- to 17-week-old F₁ progeny of wild-trapped pheasants from southwestern Iowa. The pheasants used for this release had been reared in 60x150x8-ft pens containing a dense cover of tall grasses and forbs. The pheasant-hatching and rearing facilities are located near Boone, Iowa, at the Wildlife Research and Exhibit Station of the Iowa State Conservation Commission. On the days of shipment, pheasants were driven to one end of the enclosure and funneled into a small holding chute. They were removed by hand, banded, weighed to the nearest 0.1 lb, and placed in shipping crates that held 20 birds each and

afforded about ½ ft³ space per bird. When approximately 600 birds had been crated, they were transported, without delay, on open flatbed trucks, nonstop, to the Mt. Hamill release site (a 4-hr trip), arriving shortly after noon on each trip. The birds were released from the crates along the roadside where they flew into adjacent fields and creek-bottom cover.

During the 2 months after the release, the senior author searched on foot near the release site to flush birds or find dead ones. Causes of fresh kills were determined by methods outlined by Einarsen (1956).

Winter sex-ratio counts were made by searching for pheasants during extreme winter weather conditions when the birds were congregated in dense cover areas (Klonglan 1962).

Spring crowing-count surveys (Kimball 1949) were conducted during the peak of the crowing season on four 10-stop, survey routes diverging radially from the release site and also on a 10-stop, rectangular route around the point of release. The routes used in 1971 also were used in 1972. Crowing-count surveys were begun approximately 40 min before sunrise and completed at sunrise or shortly thereafter; the number of calls heard per 2-min stop was recorded.

During the summer of 1971, the senior author searched for nests in fields in the study area by scanning 8½-ft swaths at 35-ft intervals. Alternate 0.1 mile segments of roadside ditches and adjacent fencerows also were searched, and the number of eggs present, number hatched, nest location and nest fate all were recorded.

During August, roadside counts of pheasants (Bennett and Hendrickson 1938) were made on a 23- and a 25½-mile route around the release site. The routes were driven at 20 mph, and the number and sex were recorded of all pheasants seen (both in roadside ditches and adjacent fields). The senior author estimated the ages of broods (to the nearest week) by using criteria of feathering and size established by Trautman (1950) and used these estimates to calculate approximate dates of hatch.

Fifty-three pheasants were field-collected with shotguns in four outings about 1 month after the last release. Fifty-two other pheasants, which were transported to Mt. Hamill, were

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² Graduate Assistant, Iowa State University, Ames, Iowa 50010.

³ Leader, Iowa Cooperative Wildlife Research Unit, and Professor, Iowa State University, Ames, Iowa 50010.

returned to Boone and were held in pens, and 49 birds, which remained in pens at Boone at all times, were killed and weighed at about the same time that field collections were made. Weight changes of the three concurrently sampled groups were compared for evidence of possible stress or dietary deficiency.

RESULTS AND DISCUSSION

Populations

The sex ratio of the population upon release was 4.1 hens per cock. Approximately 1 month after the releases were made, a total of 54 birds (21 M, 33 F) were collected from the field. Five additional birds (1 M, 4 F) had died accidentally at the time of release and were removed at that time. These collections were made in conjunction with another study concerning detection of any physiological stress in the pheasants handled. The net number of pheasants supposedly remaining in the field after these collections was therefore 2,406, with a sex ratio of 4.2 hens per cock.

Cover areas near the release site were searched during extreme winter weather conditions in January 1971 following the release and again in 1972. The observed sex ratio changed from 4.1 hens per cock in 1971 to 1.5, in 1972.

Spring crowing-count surveys were made in April of 1971 and 1972, with the same 10-stop, rectangular survey route around the release site operated each year. The average number of calls heard per 2-min stop on this route was 22.7 in 1971, and 24.6 in 1972. Since the crowing count is only an index to the population in the area sampled, an attempt was made to estimate the actual number of pheasants sampled per crowing-count stop.

Kimball (1949) found an interval of 2 min 54 sec between successive calls by individual cocks. His figure was determined from several different pheasant populations. This interval was used to convert the Mt. Hamill cock pheasant index (average number calls/2-min stop) into a population estimate in the following manner: calls heard/2-min stop x 2.9-min/2.0-min = number of cocks/listening area. The converted figures indicate an average listening-area population of 33 cocks in 1971 and 36 cocks in 1972.

The estimated average number of cocks per listening area was multiplied by the corresponding winter sex ratio to approximate the number of hens per listening area. In 1971, this figure indicated 135 hens and, in 1972, 54 hens—a decrease of about 60%. Assuming that 71.2% of the 1972 population consisted of locally hatched young-of-the-year with a sex ratio of about 1:1, "new" hens made up 35.6% of the 1972 population. If the original sex distribution of 80% hens was maintained by the old birds, 23.0% of the 1972 population would be composed of old hens. Thus, 58.6% (35.6% new hens plus 23.0% old hens) of the 1972 population would be hens; this is close to the observed 60% hens (i.e., 1.5 hens/cock). Therefore, the addition of first-year broods with a higher proportion of cocks may have accounted for the seeming decrease in the hen population. This would be particularly true if the population dispersed somewhat from its concentration near the release site, allowing the crowing cock index to remain about the same.

Reproduction

During the summer of 1971, fields and roadsides in the release area were searched for nests and broods. Twenty-six nests were found, 6 (23%) of which were successful. A total of 219 eggs was in the 26 nests, an average of 8.4 ± 1.9 eggs per nest. Forty-eight eggs were in the six successful nests (8.0 ± 2.2 per nest), 43 (89.6%) of which hatched. Ten of the 20 observed nest failures resulted from hay mowing and windrowing operations, four failures were caused by predators, two by flooding, three by nest abandonment, and one nest failed from undetermined causes.

Peaks in the 1971 pheasant hatch at Mt. Hamill occurred during the weeks of May 24 and July 5. Data from roadside counts and from field observations during August showed that 71.4% of the hens seen had broods (Table 1). These roadside counts and field observations also revealed: the number of young per hen (all observed hens counted) was 5.3 for young of all ages and 3.9 for young 6 weeks old or older; the number of young per adult was 3.4 for all ages and 2.5 for 6 weeks old or older; the percentage of young-of-the-year was 77.2 for all ages and 71.2 for 6 weeks old or older; the average brood size for chicks 6 weeks old or older was 7.1 ± 1.1 (Table 1).

TABLE 1. INDEXES OF REPRODUCTIVE SUCCESS FOR THE MT. HAMILL PHEASANT POPULATION, 1971.

Index	Age of young used in computation	
	all ages	6 wks +
Percentage of hens with broods	71.4	
Number of young per hen ^a	5.3	3.9
Number of young per adult	3.4	2.5
Percentage young-of-the-year	77.2	71.2
Average brood size		7.1 ± 1.1

^a All hens (with or without broods) were counted.

Dispersal

Leg-band returns, sightings by farmers, and field observations by the senior author for 2 months after the release indicated a quick dispersal of some of the birds. Six days after the first release, 4 hens were reported 3.5 miles west of the release site, and about 3 weeks later, 40 hens were seen at the same place. Leg bands were recovered from a cock killed 10.5 miles west-southwest of the release site 43 days after release, and from a hen killed 16.8 miles north of the release site 57 days after release. The 25 sections in the release area were searched during this 2-month post-release period, but most of the birds were seen within 2 miles of the release site. Locations of sightings by the senior author and farmers in the area indicated that the birds initially dispersed along waterways.

Year-to-year dispersal patterns of the released pheasants were sampled by spring crowing-count surveys made on four survey routes diverging radially from the release site. The average number of calls per stop at various radial distances from the release site (Table 2) reveals a marked drop in calling frequency in 1971 from 11.75 ± 2.25 calls per stop for a radius of 1 mile to 5.60 ± 1.54 for a radius of 2 miles. A similar drop in frequency occurred in 1972, but was from radii of 2 to 3 miles (23.20 ± 1.85 to 12.60 ± 1.91 calls per stop, respectively), indicating that the area of greatest density had expanded by about 1 mile. Although the radially projecting surveys for 1971 were made in June, a call

count survey, using a rectangular route around the release site, was made on April 17, 1971. If each stop on this route is assigned to the nearest 1-mile radius line, a drop from an average of 28.20 ± 4.74 calls per stop at 1 mile to 17.20 ± 3.67 calls per stop at 2 miles also is evident here.

TABLE 2. AVERAGE NUMBER OF CALLS HEARD PER STOP ON RADIALLY PROJECTING ROUTES AT VARIOUS DISTANCES FROM THE RELEASE SITE DURING THE CROWING SEASON IN 1971 AND 1972

Radius (miles)	Number stops	Average calls/stop	
		1971	1972
0	4	9.25 ± 4.07	24.25 ± 4.87
1	4	11.75 ± 2.25	26.00 ± 1.22
2	5	5.60 ± 1.54	23.20 ± 1.85
3	5	2.60 ± 0.93	12.60 ± 1.91
4	4	0.50 ± 0.29	6.25 ± 2.56
5	4	0.25 ± 0.25	2.00 ± 0.96
6	7	0	0.57 ± 0.30
7	4	0	0.50 ± 0.29
8	3	0	0
9	0	0	0
10	1	0	0

Although calls were heard at greater distances from the release site in 1972 than in 1971, the degree of dispersal is not known because the 1971 surveys were made in June, when crowing activity had decreased from the peak in April. The expansion of the area of concentration in 1972 probably resulted from both reproduction by the released pheasants, with subsequent dispersal of young, and from dispersal of released birds from the area of concentration.

The maximum distance of dispersal of pheasants from the release site is indicated by a leg-band obtained from a location 21.5 miles north-northeast. Leg-band returns showed that other birds traveled 13 miles east, 8.5 miles southeast, 10.5 miles west-southwest, and 9.5 miles west from the release site, but the center of concentration of the birds' distribution did not seem to have shifted from year to year.

Mortality

Observed deaths of pheasants were recorded both during the handling operations and after the release was completed. A total of 28 birds died accidentally during handling operations associated with the release in the fall of 1970. Four cocks and 8 hens died at Boone before shipment; several were found dead or in a "dazed" condition similar to conditions of pheasants dying from handling shock, as described by Burger (1964). Nine hens died during shipment to the release site, but the exact causes of the deaths were undetermined. One cock and 4 hens died at the release site within an hour after arrival, three of which arrived in a "dazed" condition. Two hens died of unknown causes while kept in experimental holding pens at Boone. The ratio of hens to cocks lost during handling operations (4.6:1) compared with the sex ratio of banded birds ($3.5:1; \chi^2 = 0.298, 0.50 < P < 0.750$) and birds transported to Mt. Hamill ($3.8:1; \chi^2 = 0.139, 0.500 < P < 0.750$) indicates no differential mortality between hens and cocks.

The senior author's field observations during the first 2 months after the release accounted for a total of 35 dead pheasants, excluding roadkills and other band returns. Avian

predators caused four deaths, and foxes were responsible for three others. Three of the 35 dead birds showed no indications of injury and could possibly have died from shock or a lingering internal injury associated with handling and release. For 25 of the 35 carcasses found, the cause of death could not be clearly determined because most of the carcasses had been at least partly consumed and were partly decomposed. Although 22 sections of land were searched in the 2-month period after the release, dead pheasants were found only in the two sections into which the birds were released, and fresh carcasses were found only during the first 2 weeks after the initial release. Overcrowding, and, therefore, high vulnerability to predation, caused by the mass release at the single site may have contributed to this pattern of mortality.

In addition to the 35 carcasses found by the senior author, eight roadkills were reported during the initial 2-month period, making a total of 43 known deaths during the first 2 months after release. Since this was only 1.8% of the net number of pheasants released, known post-release mortality was not excessive.

In conjunction with another study concerning physiological indications of stress from handling, three groups of pheasants (totaling 154 birds) banded at Boone for this release were sacrificed. The length of time from banding to sampling for the three groups ranged from 2 to 6 weeks. Approximately equal numbers of birds of the same age and the same time from banding to sampling were sampled from each group. Because the birds were weighed both immediately after banding and also at the time they were sacrificed, weight changes (which might indicate physiological stress or a dietary deficiency) could be determined for the birds in different sampling groups. A comparison was made of the average weight gains for the three groups (Table 3) by Duncan's multiple-range test (Steel and Torrie, 1960).

TABLE 3. AVERAGE WEIGHT CHANGES PER BIRD FOR PHEASANTS SAMPLED IN 1970.

Condition	Average change in weight (gm) ^a	
	males	females
Kept at Boone as controls	+ 90 (25) ^b	+ 90 (24)
Transported to Mt. Hamill but returned to Boone	+ 90 (26)	+ 45 (26)
Collected from field 1 month after release	+ 180 (20) ^c	+ 135 (33) ^c

^a Weight changes were measured to the nearest 0.1 lb. (45 gm), 2 to 6 weeks after release.

^b Sample size indicated in parentheses.

^c Significant difference ($P < .05$).

The test showed that the mean weight gain for field-collected birds differed significantly ($P < .05$) from the means of the two groups held at Boone, but that values for the two control groups were not significantly different. The difference was characteristic of both males and females and suggests that some stress may have accompanied handling and confinement of the birds.

CONCLUSIONS

The outlook for the Mt. Hamill pheasant population seems favorable because of the relatively high population indexes

persisting for the 2 years, an expansion of the population from 1971 to 1972, and favorable reproductive success for the inexperienced hens. Although data suggested that some stress was associated with handling and confinement of the birds, post-release mortality did not seem to greatly influence the survival of the released pheasants.

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