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Use of Cover Types and Survival of Ring-necked Pheasant Broods

Abstract

Survival of young ring-necked pheasants (*Phasianus colchicus*) depends in part upon the habitat they use. However, little was known about the relation between habitat use and brood survival. Cover types used by broods of ring-necked pheasants were compared between broods that survived and those that perished for three time periods (hatching, 1-7 days of age, and 8-44 days of age). Survival of broods was related to cover types and, in some cover types, survival was a function of the age of the brood. Among five cover types, grains fields provided the most secure hatching and early brooding (1-7 days) cover. Strip vegetation was the least secure cover for hatching but was used frequently by broods that survived during days 8-44. Although pheasant broods used an array of cover types, survival was related to the frequency of use and timing of when these cover types were used.

Introduction

Deficiencies in nesting habitat often have been described as limiting factors to pheasant populations (Trautman 1960, Leite 1971, Guthery *et al.* 1980). However, as Warner (1984) suggested, mortality of young may contribute equally as a limiting factor. Although habitats used by pheasant broods have been described for areas throughout their range (Hanson and Labisky 1964, Hanson and Progulske 1973, Gates and Hale 1974, Warner 1979), little information is available regarding the relationship between brood survival and habitat use. In this study we tested for differences in the use of cover types by broods that survived and those that perished during three periods of brooding.

Methods

Two areas, representative of the land-use practices and crops grown in the Willamette Valley with similar proportions of cover types, were used for this study. The Baskett Slough area, 1049 ha, included portions of the Baskett Slough National Wildlife Refuge and adjacent private land and was located 20 km north of Monmouth, Polk County, Oregon. The Luckiamute area, 1514 ha, was located along the Luckiamute River, 8 km south of Monmouth, Polk County, Oregon.

During April and May of four consecutive years (1980-83), 468 captively propogated hen pheasants were equipped with radio transmitters and released on the study areas to evaluate their survival, reproduction, and habitat use (Meyers 1983, Castillo *et al.* 1984, Haensly 1984, Haensly *et al.* 1985). Types of propagated pheasants, rearing techniques, radio equipment used, and release methods were described in Haensly *et al.* (1985).

Although the study areas supported only low densities of wild pheasants, nesting and brooding cover were abundantly available. Likely, wild pheasant populations were not limited by availability of breeding habitat but by winter cover as suggested by Jarvis and Simpson (1978). Consequently, there was a surplus of breeding habitat available for pheasants as crops and natural vegetation matured in the spring.

The 468 hens released in this study initiated 224 nests from which 97 broods hatched (mid-May to early-August). For the purpose of this study it was assumed that the relative influence of cover types on brood survival determined for broods which were produced from captively

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propagated hens was similar for broods of wild hens, although actual survival rates may differ between broods of wild and captively reared hens. Previous work (Meyers 1983) indicated that similar numbers of broods hatched and survived on Baskett Slough and on Luckiamute and that similar cover types were available for brooding on the two areas throughout the study period. Consequently, brood data from the two study areas for the 4 years were combined to provide a statistically reliable sample. Broods were monitored biweekly (719 locations) from hatching until all chicks were lost or until hens were captured and transmitters were removed (predetermined date based on the expected longevity of batteries used in the transmitting units). We found it difficult to obtain accurate counts of chicks during the first several weeks after hatching without excessive disturbance of birds, and mixing of individuals among older broods further impeded accurate counts. Other researchers reported similar difficulties in obtaining accurate brood counts (Baskett 1941, Gates and Hale 1975). Therefore, we addressed survival (at least 1 chick alive) and loss of broods rather than of individuals.

Broods were monitored randomly during the day. Previous work on these study areas (Meyers 1983) indicated there were no differences in cover types used by broods among three day-time periods (morning, mid-day, and afternoon). Hatching cover was defined as the cover in which nests were located (determined by locating hens with radio-telemetry prior to hatching). Other brood locations were determined initially by triangulation to prevent observer influences on habitat use by broods; we then verified (sight or sound) that at least one chick accompanied the hen. If a brood was suspected of being lost or abandoned the monitoring continued for at least 2 weeks to verify that all chicks were gone.

When broods were located, the habitat in which they occurred was classified into one of the following cover types (percentages shown in parentheses):

1) Grain fields (37% of total): wheat (26%), oats (7%), barley (4%).
2) Strip vegetation (3% of total): fence rows, roadsides, and ditch banks.
3) Seed grass (26% of total): fescue (21%), ryegrass (3%), and sudan (2%).
4) Grassland (13% of total): pastures (9%) and uncultivated grasslands (4%).
5) Miscellaneous (21% of total): legumes (5%), mint (3%), vegetable crops (2%), tree/shrubs (2%), orchards (1%), and other (8%).

Comparisons of relative frequencies of cover types used by broods that survived and those that perished were made for three time periods:

1) Hatching—Cover types in which broods hatched were compared between broods that survived the first week and those that perished within 7 days after hatching.
2) Days 1-7—Cover types used by broods during the first week after hatching were compared between broods that survived this time and those that perished.
3) Days 8-44—Cover types used by broods during days 8-44 were compared between broods that survived through this period (i.e. >45 days) and those broods that perished during this time.

These time intervals were selected because results of Gates and Hale (1975) indicated that highest chick loss occurred during the first week after hatching and preliminary results from the present study revealed that among all broods that were lost ($n=52$), one-half perished within the first 7 days after hatching and the remainder were lost from days 8-44. All broods that survived >45 days ($n=28$) were alive when monitoring ended (mean age = 66 days). The remaining 17 broods were alive but were <40 days of age when the study was terminated for radio recovery. Other researchers have also documented that broods reached a minimum size at about 6 to 8 weeks of age (Baskett 1941, Gates and Hale 1975).

Chi-square contingency tables (Snedecor and Cochran 1967) were used to test frequencies of occurrence among the five cover types and to compare use of specific cover types to use of all other cover types combined within a period.

Hatching cover

Cover types in which broods hatched differed ($\chi^2 = 17.6$, 4 d.f., $P < 0.01$) between broods that survived during the first week and those that perished (Table 1). Broods that survived the first week more frequently ($\chi^2 = 11.3$, 1 d.f., $P < 0.01$) hatched in grain fields (55%) than broods that perished (15%). Contrastingly, 35 percent

TABLE 1. Use of cover types by broods that survived and those that perished for three time periods, western Oregon, 1980-1983.

	Cover type used (%)[a]					
	Hatching		Days 1-7		Days 8-44	
	Broods that perished in ≤7 days (n=26;26)[b]	Broods surviving ≥8 days (n=67;67)	Broods that perished in ≤7 days (n=26;27)	Broods surviving ≥8 days (n=70;130)	Broods that perished between 8-44 days (n=26;94)	Broods surviving ≥45 days (n=28;277)
Grain fields	15	55**	15	52**	44	40
Strip vegetation	35	8**	11	4	5	15*
Seed grasses	27	15	19	18	16	7*
Grassland	16	16	37	15*	30	30
Miscellaneous	8	6	19	11	5	8

[a]Distribution of percentages among the 5 cover types were significantly different between those broods that survived and those that did not for each period. Significant individual comparisons within a time period are shown with * ($P < 0.05$) and ** ($P < 0.01$).

[b]Sample size (number of broods; number of locations).

of the broods that perished within the first week hatched in strips, but only 8% of those that survived hatched in strips ($\chi^2 = 8.8$, 1 d.f., $P < 0.01$). In addition, broods that hatched in grain fields survived longer ($\bar{x} = 35.6$ days) than broods hatched in strip vegetation ($\bar{x} = 13.7$ days). There were no differences in use of the other three cover types between broods that perished and those that survived.

Days 1-7

Use of cover types during the first week after hatching differed ($\chi^2 = 16.3$, 4 d.f., $P < 0.01$) between broods that survived and those that perished during this time. Use of grain fields was greater ($\chi^2 = 11.3$, 1 d.f., $P < 0.01$) among broods that survived (52% of locations) than among those that perished (15%) during the first week (Table 1). Broods that survived ($\chi^2 = 5.5$, 1 d.f., $P < 0.05$) were found in grassland cover less frequently than broods that perished (15% and 37% of locations, respectively). Use of other cover types during this period was not different between broods that survived and those that perished.

Relative use of cover types during days 1-7 was virtually identical to proportions of cover types in which broods hatched for those broods that survived the first week. Although broods that perished within the first week seemingly made greater use of grassland and miscellaneous cover types and reduced use of strip cover after hatching, these differences were not statistically significant.

Days 8-44

Cover types were used in different proportions ($\chi^2 = 14.7$, 4 d.f., $P < 0.01$) between broods that survived during days 8-44 and those that were lost during days 8-44. Broods that survived made 3X greater use of strips ($\chi^2 = 5.3$, 1 d.f., $P < 0.5$) than broods that perished during days 8-44 (Table 1). Use of seed grass cover was less ($\chi^2 = 5.9$, 1 d.f., $P < 0.05$) among broods that survived (7%) than among those that were lost (16%).

Broods that survived used the 5 cover types in different proportions ($\chi^2 = 18.4$, 4 d.f., $P < 0.01$) during days 8-44 compared to days 1-7. There was no difference in use of cover types between days 8-44 and days 1-7 for broods that perished during this time.

Discussion

We inferred from the results of this study that survival of broods was related to habitats used, including those cover types in which broods

hatched. Grain fields apparently provided the most secure hatching (also see Haensly *et al.* 1987) and early brooding cover. Use of grain fields was not different, however, during days 8-44 between broods that survived and those that perished; both groups of broods made greatest use of grain fields during this period. Unharvested grain fields provided dense overhead cover and efficient lanes for travel and escape. Harvested fields supplied an abundant source of food and cover because, in many instances, fields were left with approximately 0.5 m of stubble and broods continued to use these fields after harvest. Warner *et al.* (1984) likewise noted that grain fields were "prime pheasant brood habitat."

Strip vegetation, although preferentially selected by hens for nesting (Meyers 1983), seemingly was not secure cover for young broods. Limited capacity of young chicks to escape predators possibly decreased their chances of survival in strips. Haensly (1984) documented high rates of nest loss and hen mortality by predators in strip habitats. Among older broods (days 8-44), those that survived made greater use of strips than broods that perished. Strip cover apparently was beneficial to the survival of poults, which have better abilities to escape predators than do chicks. R. E. Warner (pers. comm.) suggested that the increased use of strip cover with age often resulted from increased mobility and greater use of edge habitats.

Seed grasses after harvest provided little cover for pheasant broods. These crops were harvested by cutting to nearly ground level during June and the fields were burned in late summer. The resultant habitat changes may account for loss of broods that made the greatest use of seed grasses during days 8-44 or mortality may have been induced by birds attempting to move from harvested grass fields. Grassland cover type, although used identically by broods that survived and those that perished for hatching (16%) and during days 8-44 (30%), apparently was not secure cover for broods from days 1-7. We have no explanation for this difference. Lastly, use of the miscellaneous cover types appeared unrelated to survival of broods.

This work and that of others (Hanson and Labisky 1964, Hanson and Progulske 1973, Warner 1984) demonstrated that pheasant broods use an array of cover types, which in western Oregon includes a variety of small grains, grasslands, seed grasses, and strip vegetation. Our results suggested, however, that survival of broods is related to cover types used and, in some cover types, survival is a function of the age of broods.

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