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RING-NECKED PHEASANT NEST PARASITISM OF SHARP-TAILED GROUSE NESTS IN SOUTHWEST NORTH DAKOTA

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RING-NECKED PHEASANT NEST PARASITISM OF SHARP-TAILED GROUSE NESTS IN SOUTHWEST NORTH DAKOTA—Numerous investigators have reported observations of ring-necked pheasant (RNP; *Phasianus colchicus)* eggs in nests of other gamebirds and waterfowl species (Errington and Hamerstrom 1938, Westemeier et al. 1998, Hagen et al. 2002, Krakauer and Kimball 2009). Previously recorded hosts include wild turkey (*Meleagris gallopavo*; Schmutz 1988), northern bobwhite (*Colinus virginianus;* Westemeier et al. 1989), greater prairie-chickens (*Tympanuchus cupido*; Westemeier et al. 1998), and lesser prairie-chickens (*T. pallidicinctus;* Hagen et al. 2002). The reported occurrence of nest parasitism during these studies has generally been low with the highest reported occurrences found in gray partridge (*Perdix perdix*; Errington and Hamerstrom 1938) with 26% (7 of 26 nests) parasitized and in greater prairie-chickens with 29% (54 of 188 nests) parasitized (Westemeier et al. 1998).

Ring-necked pheasants were introduced into North Dakota around 1910 (Johnson and Knue 1989) and have become well established throughout much of the state. Much of the RNP range in North Dakota overlaps the historical range of native sharp-tailed grouse (STG; *T. phasianellus*). Beginning in the early 2000s, RNP numbers greatly increased in North Dakota, likely resulting in increased interactions between the species (Kohn 2009). Although previous investigations have reported RNP eggs in nests of gamebirds and waterfowl species, we are unaware of any which detail RNPs laying eggs in nests of STG. In this paper we report on the outcome of eight STG nests parasitized by RNPs between 2006 and 2009.

We located and monitored STG nests as part of a RNP project that occurred from 2006 to 2009. A primary objective of the study was to determine the effects of sustainable livestock systems on RNP nest success and density on post-contract Conservation Reserve Program (CRP) lands in southwestern North Dakota. Our research was conducted in Adams County at two study sites which were located approximately 5 km apart. Our original project was initiated using a randomized complete block design and therefore we considered each 257 hectare site as a replicate. Treatments applied to each replicate included: 1) 129 hectare season-long grazing paddock with grazing occurring annually between 2006 and 2009 from early June through early January or until 50% disappearance of standing crop, 2) 32 hectares of one-cutting haying system harvested annually in early July, 3) 32 hectares of no-till barley planted annually and harvested as hay in mid-July and 4) 32 hectares of no-till corn planted annually and grazed by cattle from early January until early April. The control was 32 hectares of non-use representing idle CRP. Vegetation within permanent grass stands consisted of grasses and forbs typical of CRP plantings in the region and included intermediate wheatgrass (*Thinopyrum intermedium*), crested wheatgrass (*Agropyron cristatum*), alfalfa (*Medicago sativa*), and sweetclover (*Melilotus* spp.).

We used chain dragging to locate RNP and STG nests (Higgins et al. 1969). We searched each land use type 4–5 times for nests on a bi-weekly basis between early May and mid July. We placed a stake wired flag 7 m to the north of each located nest and monitored nests every 3–5 days until nest fate was determined. If hens were observed sitting on their nests during monitoring efforts, we did not disturb nests. However, if hens were present on the second consecutive visit, we flushed them to examine eggs. We estimated nest initiation date following Westerkov (1950). We considered both parasitized and unparasitized nests successful if at least one STG or RNP egg hatched. We calculated apparent nest success by dividing the number of successful nests by the total number of nests located, however, we did not use abandoned nests during nest success calculations. We calculated hatching success of eggs within individual nests by dividing the total number of eggs hatched by clutch size. We determined nest parasitism through nest observation and based on egg characteristics (Baicich and Harrison 1997). The Institutional Animal Care and Use Committee at North Dakota State University approved all research protocols (Approval Number A0857).

We located 152 RNP nests and 10 STG nests from 2006 to 2009. We located all STG nests in areas of permanent grassland cover. Four nests (40%) were initiated in the idle CRP while six (60%) initiated in the season-long grazing paddocks. Eight of 10 (80%) STG nests monitored contained one or more RNP eggs and were considered parasitized.

Parasitized nests on average contained 12.6 (range 7–16, SE = 1.1) STG eggs per nest while known unparasitized nests contained 13.5 (range 11–16, SE = 2.5) STG eggs per nest. Parasitized nests on average contained 5 RNP eggs (range 1–10, SE = 1.0) per nest. All 10 nests were located following the completion of egg laying. No new RNP eggs were found in any STG nests following initial location of nests.

Of the 10 nests, 1 parasitized nest was abandoned and not included in calculating apparent nest success. Overall, the 9 remaining nests were 44% (4/9 hatched) successful at hatching at least 1 STG egg. Two unparasitized nests had 50% success with the successful nest hatching 16 of 16 eggs. Seven parasitized nests were 43% (3/7 hatched) successful at hatching at least one STG egg and 57% (4/7 hatched) successful at hatching at least one RNP egg. In successful parasitized nests which hatched at least one RNP or STG chick, 25 of 52 STG eggs (range 0–10 per clutch, SE = 2.25) hatched, while 14 of 16 (range 3–4 per clutch, SE = 0.29) RNP eggs hatched.

Albeit based on a limited number of nests, our observations of reduced apparent nest success rates and decreased hatchability of host eggs in parasitized versus

non-parasitized nests are similar to that reported by Westemeir et al. (1998) and Hagen et al. (2002). On several occasions RNP eggs hatched prior to STG eggs within the same nest bowl. Ehrlich et al. (1988) reported a similar incubation period for STG and RNP of 21–24 days and 23–25 days, respectively. The primary cause for RNP eggs hatching prior to STG eggs is unclear, but has been observed with other species including ruffed grouse (*Bonasa umbellus*; Kenaga et al. 1955) and northern bobwhites (Westemeier et al. 1989). One explanation may be that slightly larger RNP eggs received greater heat energy then nearby STG eggs, resulting in prolonged incubation periods for STG eggs (Kenaga et al. 1955, Johnsgard 2008).

The rate at which STG nests were parasitized by RNPs during our study is higher than previously recorded for any other species which we are aware. Previous authors have suggested the increased occurrence of RNP parasitism of other nesting species was positively correlated with increased RNP densities (Bennett 1936, Carlson and Rollings 1942, Westemeier et al. 1998). A similar occurrence likely happened during our trial as the RNP population greatly increased beginning in the early 2000s and continued through fall of 2008, reaching levels not obtained since the mid 1940s (Kohn 2009). Southwest North Dakota supports among the highest density of RNPs within the state and therefore our findings may not be applicable across the entire state where the species' ranges overlap and RNP densities are lower.

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