Nest attendance patterns in sharp-tailed grouse in western North Dakota

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Introduction

Sharp-tailed grouse (*Tympanuchus phasianellus*) are an important game species in the upper Great Plains and an indicator species of grassland health. Recent land use changes and habitat fragmentation in the region have sparked an interest in understanding the ecology of these ground-nesting birds. In particular, western North Dakota has experienced a variety of disturbances on the landscape relative to gas and oil development. Such landscape alterations can impact grouse behaviors that affect successful survival and reproduction. Nesting behaviors, such as attendance patterns, are one of the least understood aspects of their ecology. Hens must choose how to allocate their time creating a fitness compromise between the health of the hen and the success of the clutch. Recesses are nesting events in which the bird leaves the nest for self-maintenance such as foraging. The ability to accurately assess recess events has been logistically difficult or impossible to evaluate because of the dense vegetation in which they nest and potential negative impacts of human disturbance. Advancements in video technology and the use of 24-hour surveillance cameras have provided researchers with the ability to monitor ground-nesting birds and classify nesting behaviors. Understanding sharp-tailed grouse ecology and constraints in reproduction are important considerations for effective management relative to impacts of gas and oil development.

Objectives

The objective of this study is to examine the potential impacts of gas and oil development on sharp-tailed grouse nesting behaviors including:

1. Number of recess events per day.
   - Hypothesis: Hens at sites with higher oil well densities will leave more frequently during the day due to inadequate forage.
2. Duration in recess events.
   - Hypothesis: Hens at sites with lower oil well densities have shorter recess periods due to adequate forage within close proximity to the nest.
3. Time of day at which recess events occur.
   - Hypothesis: Hens at sites with higher oil well densities will leave around dawn and dusk, with little to no recesses during the afternoon hours.

Field Methods

- Two field sites were selected in Mountrail County in Western North Dakota (Figure 1).
  - Belden: Area inside intense gas and oil development (0.77 oil wells/ km^2).
  - Blaisdell: Area with low gas and oil development (0.006 oil wells/ km^2).
- Female sharp-tailed grouse were captured at the lek and radio-marked (March – May 2012).
- We monitored radio-marked hens during breeding season (May – July 2012) to locate nests.
- We installed miniature 24-hour infrared surveillance cameras (Figure 2) at 63 grouse nests.
  - We reviewed a subset of 17 (Belden= 5, Blaisdell= 12) nests out of 47 nests monitored with cameras from installation until nest succeeded or failed.
  - We recorded the time, duration, and number of recess events per day.
- Recess events defined as:
  - Departure: hen leaves the nest unattended (completely leaves frame)
  - Return: hen sits back down on nest and continues incubation

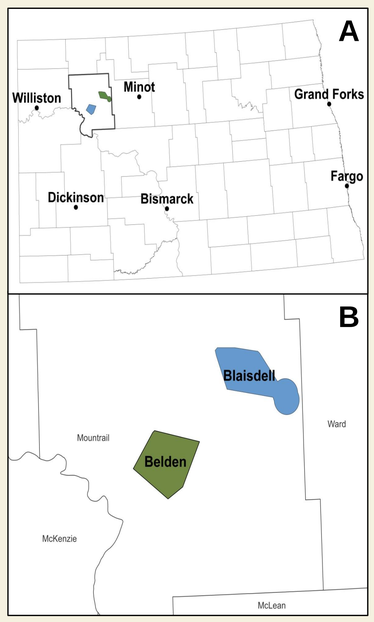

Figure 1: Map of study sites (A) within North Dakota, and (B) within Montrail County. Data courtesy of North Dakota Game and Fish. Created by Rebecca Eckroad.

Figure 2: Image of a technician installing surveillance camera on a sharp-tailed grouse nest.

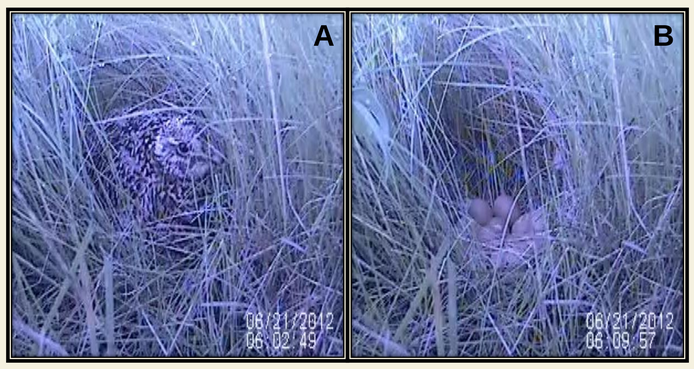

Figure 3: Video images (A) of a sharp-tailed grouse incubating, and (B) of a sharp-tailed grouse nest during a recess event.

Data Analysis

- Summary statistics were calculated for the number of recess events per day and the duration of the event.
- We graphically represent peak times of day in which recess events occurred.

Results

- Grouse most commonly left the nest two to three times per day times per day (Figure 3).
- In general grouse had a median recess duration of about 27 minutes, with Belden hens taking slightly longer recesses and Blaisdell hens taking slightly shorter recesses than the overall median (Table 1).
- Grouse recess events primarily occurred around dawn (between 6:00 and 9:00) and dusk (between 17:00 and 20:00)(Figure 4).

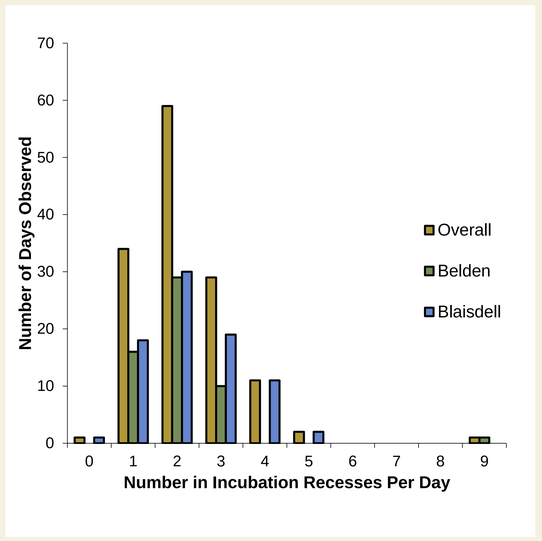

Figure 3: Number of incubation recesses taken per day broken down by site. Overall: median 2, Q_1= 1, Q_3= 3, n= 137 incubation days. Belden: median 2, Q_1= 1, Q_3= 2, n= 56 incubation days. Blaisdell: median 2, Q_1= 2, Q_3= 3, n= 81 incubation days.

Table 1: Median duration of recess events broken down by site (n=number of recess events).

Site	Median	Q_1	Q_3	n
Overall	00:27:21	00:19:31	00:36:11	301
Belden	00:29:51	00:23:46	00:41:19	112
Blaisdell	00:26:01	00:17:44	00:33:49	189

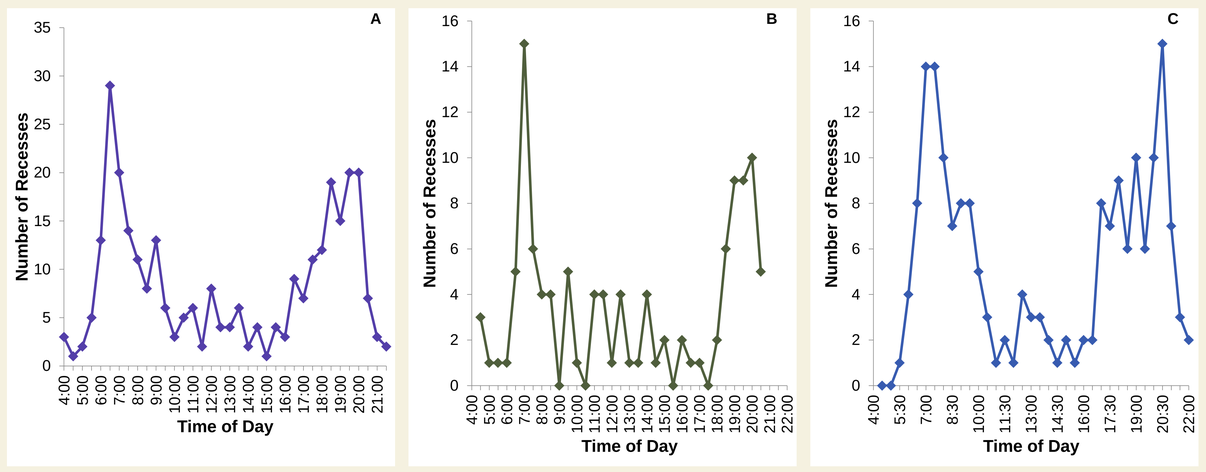

Figure 4: Time of day in which incubation recesses occur for (A) all nests (n=302) (B) Belden nests (intense gas/oil; n=113), and (C) Blaisdell nests (low intensity gas/oil; n=189) (n= number of recess events).

Discussion

- Our data suggest a trend toward shorter duration of recess events at Blaisdell compared to Belden.
  - This may be caused by differences in forage quality or landscape fragmentation of the two sites.
  - Difference may also be a result of increased stress induced by heavy gas and oil development at Belden.
  - Caveat: Due to lack of spatial replication these results may just be caused by differences in site quality; therefore, causation cannot be implied.
- There was a slight difference in the number of recess events taken per day, with Blaisdell hens taking slightly more recess events than Belden hens.
  - Hens at Blaisdell may be taking more recess events per day to compensate for the shorter duration of the individual recess events.
- We did not find any apparent differences in the time of day recesses were taken between the two sites.
  - Extra recess events taken by Blaisdell hens appear to be taken in the evening hours (17:00:00 to 20:00:00); however, this may be due to the unbalanced sample sizes.
- Future directions:
  - Continue data collection to increase sample size and include another field season.
  - Evaluate different attendance patterns based on nest characteristics such as nest attempt and clutch size.
  - Continue evaluation of site-specific factors such as forage quality, predation pressure, landscape composition, and the impact of nest distance to anthropomorphic features (oil wells and pads, roads, etc.)
  - Account for dependence in the data from repeated sampling of a single hen in formal regression analysis, and evaluate potential spatial dependency between the study sites and among the nests.

Acknowledgements

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