Lekking behavior in the greater prairie chicken *Tympanuchus cupido*

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1. **Overview**

Mating systems are defined by the ratio of males to females that exclusively exchange gametes. For example, monogamy describes the mating system in which each female mates exclusively with one male, and each male mates exclusively with one female. Polygamy describes the condition in which one sex mates exclusively with one partner while the other sex mates with more than one member of the opposite sex. The most common form of polygamy is polygyny, in which females mate once while males may mate with multiple females. There are several forms that polygyny may take, one of which is lek polygyny.

**Lek polygyny**

A lek is a relatively small area where multiple males congregate, defend small territories and perform specific-specific displays to rival males and to females. Females come to the lek to mate. The territory contains nothing of value to the female in terms of food, shelter or nesting and nursery habitat for rearing young. The territory has value to the male as a place to display and mate. Even though the territory itself has no inherent value, central territories receive many more visits from females than peripheral territories do. Consequently, central territories are more vigorously contested leading to the prediction that central territories are more likely than peripheral ones to be won through escalated agonistic behavior.

Objectives: to study lek polygyny on a wild population

Time-frame: one morning of observation followed by in-class discussion of the data and report write-up.

Number of student per group: Each student does their own map or territorial boundaries and does one focal follow on a central and a peripheral male. Within a blind, students consult on the bird counts (counting birds is not as simple as it might sound) until consensus is reached. Class data are pooled for the census and behavioral data for everyone to use in their report.

Type of report: a standard scientific report (sample rubric below)

2. **Materials and methods**

The greater prairie chickens occur in long stem prairie. Because much of this habitat has been converted to crop production, prairie chicken populations now occur only on scattered fragments of remnant prairie. The beach ridges of glacial Lake Agassiz create soil conditions unsuitable for agricultural, hence a swatch
of remnant prairie has been spared development just 20 km east of Moorhead, MN, running through Glyndon, MN. The Nature Conservancy (TNC) owns and manages a parcel of land there and manage two blinds overlooking a lek, or booming ground, where prairie chickens return each spring to display and mate. This lab will be conducted on wild birds in the pre-dawn twilight.

3. Experimental design and analysis

We will collect several types of data.

1. The first is a census of the number of birds on the lek every 15 min. This will generate a graph like the one below (class data from 2006). Each person in each blind will do a count of all the birds they can see at each 15 min, and we’ll take average numbers later.

   ![Graph](image.jpg)

   **Figure 1.** Number of male and female greater prairie chicken on TNC lek in the early morning hours of April 18, 2006.

2. The second type of data we will collect is territory boundaries. Sketch a map of the lek and trace the boundaries of all the territories you can see from your blind, and number them. Discuss with others in your blind which territory is what so you all use the same numbering system. Discuss with each other
which territories appear to be central and which are peripheral. Are all territories similar in size? Do you notice anything about the landscape that might suggest a “hot-spot” or “hot shot” influence on lek location?

3. The third type of data we will collect is male display behaviors. These are the ones we discussed in class:
   a. Raised “ear flap” feathers behind head
   b. Inflation of orange throat sac
   c. Bouts of choking, head bobbing motion
   d. Foot stamping
   e. Claw jump (leaping up so that both feet leave the ground, while directing claws at opponent)

Each person in each blind will do 2, 10-min focal follows. A focal follow is where you focus on one individual and record the frequency with which each behavior is performed by the focal individual during the observation period. Do a focal follow of a central male and a second focal follow on a peripheral male. Coordinate your data recording with others in your blind to avoid recording data from any male more than once. The data will eventually make a graph like the one below (class data from 2006).

Figure 2. Mean (±SE) frequency of male display behaviors on 10-min focal follows on April 18, 2006 at the TNC Glyndon lek.
Knowing what you know about agonistic behavior and escalation of contests that determine resource holding power, do your behavioral data tell you anything about the males’ perception of relative reproductive reward of central versus peripheral territories?

4. When females visit the lek, record which territories they visit. Are some males/territories consistently favored while other males/territories are completely ignored?

4. Questions and problems

These embedded within the text of the assignment.

5. Acknowledgements

We are grateful to funding from NSF CCLI DUE Award No. 0736872 for stimulating the development and publication of this self-directed open-inquiry lab exercise.

7. For instructors

This lab is so great, but of course it is possible only because we have the luxury of having a lek within a 20 min drive of campus.

Although students whine about the early morning, they always like it once they get out there.

Class data from April 8 & 9, 2009

Figure 3. Number of males (M, circles) and females (F, squares) present on the lek on April 8 and 9, 2010. A hawk attack at 0700h on 9 April briefly depressed the number of birds present.
Figure 4. Frequency of male display behaviors on central (solid fill) and peripheral (open fill) territories. Data are from 10-min focal follows on 8, 9 April, 2010 at the Glyndon TNC lek as observed by undergraduate students. *, significantly different by a t-test (P < 0.05).

**Report Rubric – total = 40 points**

In the format of the journal *Animal Behaviour*

Title (1) – descriptive and succinct

Author Name, Institutional Affiliation (1)

Abstract (4) – one paragraph, no stats, no refs, includes a piece of each section of the report

Introduction (8) – frame the research question: What is lek polygyny? Is it unique to prairie chickens? What is known (cite peer-reviewed journal sources) about the reproductive ecology of this species? Why is reproductive activity usually found in the central territories? State our class hypothesis: central territories have higher reproductive value and therefore intrasexual contests should escalate to physical fighting more frequently in central territories than in peripheral territories.

Materials and Methods (3) – describe study site (The Nature Conservancy blue stem prairie, near Glyndon, MN), including latitude and longitude; describe the date and time of the observations; describe the behaviors quantified.

Results (8) – Start with a verbal description of the findings, then cite the figure that contains findings.
Fig 1 = map of territories
Fig 2 = census of bird numbers on the 8th and 9th
Fig 3 = comparison of display behaviors for males in central versus peripheral territories

Figures have legends, and the legends go below the figure.

Discussion (6) – Restate the main findings. Did the data support the hypothesis? Are the data similar to what other studies have found (cite refs)? What is the lek paradox?

References (4) – at least 4 peer-reviewed sources in the format convention used by Animal Behaviour. No more mercy on formatting. If the format is not right – no points!

General readability, flow, grammar and syntax (5) – proofread your work carefully before turning it in.