Incubation behavior of the Mountain Plover

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Incubation behavior of the Mountain Plover

Abstract
The rapid multi-clutch mating system of the Mountain Plover (Charadrius montanus) is an opportunity to examine sex-specific differences in uniparental care. We monitored nocturnal incubation activity in Phillips County, Montana using video recordings and temperature data-loggers. Possible differences in activity were modeled using the duration of nest departures of incubating adults. We examined the effects of sex, time of departure, nest age, day of season, maximum temperature, precipitation the previous day, and year on nest departures. We recorded 857 hours of video at 25 nests and >10,000 hours of temperature data from 142 nests during the 2006-2008 breeding seasons. Males contributed 1925 nocturnal departures with a mean duration of 0.38 hr (SE = 0.01) while females contributed 2,716 nocturnal departures with a mean duration of 0.36 hr (SE = 0.01). The time of the nocturnal departure was the only factor that had a strong effect on the duration of the departure. Our study furthers knowledge of incubation patterns in an uncommon mating system and helps understand the behavior of this species of conservation concern.

Disciplines
Natural Resources Management and Policy | Ornithology

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Incubation Behavior of the Mountain Plover
(Charadrius montanus)

Paul D. B. Skrade and
Stephen J. Dinsmore
Incubation

- Trade offs
- Off-bout vs development
  - Time
  - Temperature
- Why leave a nest?
  - Self-maintenance
  - Territoriality
  - Mating
  - Predator avoidance/distraction
- Consequences
  - Activity vs depredation
Mountain Plovers

- Uncommon, local shorebird
- Breed in disturbed habitats
  - Black-tailed prairie dog (BTPD) colonies
  - Burns, hardpan flats, agricultural fields
- Rapid multi-clutch mating system
  - Male incubates 1\textsuperscript{st} 3-egg clutch
  - Female tends to 2\textsuperscript{nd}
Mountain Plovers

- Eggs
- Nocturnal activity
- Nest success
  - Sex differences
  - Skutch (1949)
  - Condition
- Nest age
  - Daily nest survival
Study Area

- 3000 km² area in Phillips Co., MT
- Mixed-grass prairie interspersed with BTPD colonies
- ~35 BTPD colonies have plover nests each year
Data Collection

• Searched all BTPD colonies for nests every year
• Recorded GPS coordinates for each nest
• Individually marked
• Nest fate
• Determined gender
Methods – Video Monitoring

• Camera
• Continuously recorded activity onto digital recorder
• Same location
• Camouflage
• Previously-marked individuals
Methods – Temperature

- Data loggers
- 2006
  - Every 30 seconds
  - 1 day 9 hrs
  - Overwriting
- 2007 & 2008
  - 2 hr time-delay
  - Every minute
  - 2 days 18 hrs
Methods – Data Cleaning

• Programs
  – RHYTHM
    • Data files into bioacoustic files
    • Parameters from simultaneous deployments
  – RAVEN - checked for accuracy

• Limitations
  – Missed off-bouts < 3 min
  – Ambient and nest temperatures

• Truncated data
  – Nocturnal departures
  – Sunset and following sunrise
Methods – Validation

![Graph showing temperature changes over time](image)

- **Temperature (°C)**
- **Date and Time**: 22/07/2007 21:57 to 23/07/2007 05:09
- **Temperature**
- **Return**
- **Departure**
Methods – Analyses

• No difference in methods ($P = 0.60$): combined observations
• Modeled duration of nocturnal departures using Proc MIXED in SAS
• Model effects:
  – Sex
  – Linear effect of nest age (day of incubation)
  – Linear effect of season
  – Linear & Quadratic effect of time of departure
  – Ambient temperature
  – Precipitation
Results – Video

• 857 video-hours
  – 24 birds at 25 nests

• Males
  – 1.48 departures video-hour$^{-1}$
    (6 deployments, SE = 0.35)

• Females
  – 1.41 departures video-hour$^{-1}$
    (24 deployments, SE = 0.11)

• Departures at all hours
  – Frequent, short diurnal departures
  – Longer departures when ambient temperatures similar/lower
Results – Data Loggers

• >10,000 hours of temperature data
  – 117 birds at 142 nests

• Mean nocturnal departure durations:
  – 1,925 Males 0.38 hr (SE = 0.01)
  – 2,716 Females 0.36 hr (SE = 0.01)
  – Did not differ ($P = 0.90$)

• No effect of precip., temperature, season, or linear time of departure

• Quadratic effect of time ($P < 0.001$)

• Increasing nest age ($P < 0.01$)
  – Negative effect
Results

[Graph showing the duration of departure (hrs) over time from the middle of the night (hrs) for Day 5, Day 15, and Day 25.]
Discussion

• Time of night
  – Long departures likely feeding
  – Nocturnal insect activity

• Day of incubation
  – Graul (1975)
  – Higher parental investment
  – Other behavioral changes

• Sexes similar
  – Similar responsibilities
  – Delayed female nest initiation
  – Reduced clutch size

• Furthers knowledge of shorebird nesting ecology
• Can be incorporated into future management

Questions?