Overview

- Background
- Breeding Biology
- Green Heron study
  - Factors affecting nest success
  - Field methods
  - Nest camera photos
  - Data analysis
  - Results
Green Heron (*Butorides virescens*)

- Understudied wading bird
- Smallest “heron” in North America
- Secretive
Green Heron

• Habitat
  – Swamps
  – Ponds
  – Lakes
  – Streams
  – Marshes
Green Heron

• Foraging
  – Mainly from vegetation
Green Heron

- Diet:
Green Heron

- **Fishing with bait**
Green Heron

- Migratory
- Breeding season: April-August
Population Declines

- Declining 1.73%/year (1966-2013)
  >50% decline in last 50 years
- Low conservation concern
- Habitat loss/alteration greatest threat
Breeding Biology

• Semisocial
  – Solitary
  – Loose aggregations
  – Colonies
• Monogamous
• Bi-parental care
• Similar plumage in males and females
Breeding Biology

- Twig nest (thick, overhanging vegetation)
- Clutch of 3-5 eggs
- 19-21 days incubation
- Many pairs lay a second clutch.
Breeding Biology

- Semialtricial chicks
Breeding Biology

- 21 days to fledging
Breeding Biology

- 21 days to fledging
Breeding Biology

- 21 days to fledging
Variation in Green Heron Nesting Success in Coastal Louisiana Marshes
Study Objective

Determine factors influencing Green Heron nest success
Audubon’s Paul J. Rainey Wildlife Sanctuary
Vermilion Parish, Louisiana
26,000 acres
Intermediate and brackish coastal marsh
Rainey Conservation Alliance = 185,000 acres
Potential factors affecting nest success

1. Level of nest aggregation
   - Conspecific Attraction Hypothesis
     • Birds nest near successful conspecifics.
   - Commodity Selection Hypothesis
     • Birds aggregate around a limited resource.
   - Antipredator Hypothesis
     • Safety in numbers
   - Density-dependent effects
     • Predator attraction, or more agonistic interactions
Potential factors affecting nest success

2. Foraging Pond Proximity
   – Flight distance = energetic constraint
Potential factors affecting nest success

Foraging pond proximity

Suitable nesting vegetation

Marsh (foraging sites)
Potential factors affecting nest success

3. Water level fluctuations
   – Depth determines feeding behavior
   – Fluctuations concentrate prey
   – Depth may affect predator access to nests
   – Rise may cause nest abandonment
Potential factors affecting nest success

4. Nest tree size, nest exposure
   – concealment
Potential factors affecting nest success

5. Presence/absence of thorns

Thorns: Honey Locust (*Gleditsia triocanthos*)
No thorns: Hackberry (*Celtis laevigata*)
Potential factors affecting nest success

6. Canals vs. bayous
   – Navigation canals:
     • Manmade
     • Linear
     • High bank, levee
     • Abrupt habitat “edge”
   – Natural bayous
     • Naturally occurring
     • Irregular
     • Lower bank
     • Gradual “edge”
Potential factors affecting nest success

Natural Bayous vs. Navigation canals
Methods

• Nest surveys conducted during breeding seasons of 2013-2015 (Apr-Aug)
Methods

• Locating nests
  – By boat
  – Shrubs overhanging water
  – Look for adults flushing from nests
Methods

• Determining nest status
  – Leaf litter or stray material, old dried twigs → old nest
  – Newly broken twigs → new nest
Methods

• Determining nest status
  – Evidence of depredation
Methods

• Determining nest status
  – Defecation in and around nest
Methods

- Destroyed nests
Methods

• Eggs
  – Color/brightness
Methods

• Retrieving chicks
Methods

• Retrieving chicks
Methods

• Chick weights, measurements
  – Useful for backdating
Methods

• Banding chicks
  – 1 USGS aluminum band
  – 1 alphanumerical color band
Methods
Methods

• Banded chick resightings/recoveries
  – Did chicks from a nest fledge?
Methods

• Banded chick resightings/recoveries
  – Did chicks from a nest fledge?
  – Do chicks return to the same sight the next year?
Methods

• Banded chick resightings/recoveries
  – Did chicks from a nest fledge?
  – Do chicks return to the same sight the next year?
  – Where do chicks travel during non-breeding season?
Results

- Chick resightings/recoveries
  - Sighting banded chicks helped to verify that their nest was successful
  - No chicks returned from previous years
  - One dead chick found in Jennings, LA, north of the sanctuary (2015)
Plumage differences

• Chicks
  – Early season vs. late season plumage
Plumage differences

- Chicks
  - Early season vs. late season plumage
Predation
Avian Nest Success

• Nest success: \[
\frac{\text{# successful nests}}{\text{# total nests located}}
\]

• Daily nest survival rate
  – probability a nest will survive to the next day
  – mortality rate: \[
\frac{\text{# failure events}}{\text{total # of nests - days}}
\]
Data Analysis

• Program MARK
  – Estimate daily nest survival rate (DSR)
  – Determine sources of variation in nest survival/“predictors” of nest success
    • Individual covariates

• Nest histories
  1. Day nest found
  2. Day nest last checked alive
  3. Last day checked
  4. Fate of nest
Data Analysis

- Individual covariates: “predictors of nest success”
  1. Distance to nearest neighboring nests
  2. Nest to pond distance
  3. Water level fluctuation
  4. Canal vs. bayou habitat
  5. Thorny vs. non-thorny nest tree
  6. Nest tree volume/exposure
  7. Year
  8. Date
# Results

<table>
<thead>
<tr>
<th>Year</th>
<th>Active nests monitored</th>
<th>Chicks banded</th>
<th>Daily survival rate</th>
<th>Nest success</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>206</td>
<td>142</td>
<td>0.962</td>
<td>17.5%</td>
</tr>
<tr>
<td>2014</td>
<td>244</td>
<td>139</td>
<td>0.956</td>
<td>13.2%</td>
</tr>
<tr>
<td>2015</td>
<td>180</td>
<td>220</td>
<td>0.982</td>
<td>44.1%</td>
</tr>
</tbody>
</table>
Results

• Nests found in 13 tree/shrub species
  – *Acacia farnesiana* (huisache)
  – *Iva frutescens* (marsh elder)
Results

- Nests were solitary or in small, loose aggregations
Results

• Program MARK: nest survival models
  – Trends (not statistically significant)
    • Negative relationship between nearest neighbor distance and nest survival
    • Negative relationship between pond distance and nest survival
Results

- Program MARK: nest survival models
  - Top model:
    
    Nest survival as a function of year and canal type
Results: Canals vs. Bayous

<table>
<thead>
<tr>
<th>Navigation canals (n=486)</th>
<th>Natural bayous (n=60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.1%</td>
<td>38.5%</td>
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</tbody>
</table>

Daily nest survival: canals vs. bayous
## Results: Presence of thorns

<table>
<thead>
<tr>
<th></th>
<th>Non thorny (n=252)</th>
<th>Thorny (n=294)</th>
</tr>
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<tbody>
<tr>
<td>Presence of thorns</td>
<td>26.6%</td>
<td>19.2%</td>
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### Daily nest survival: presence of thorns

![Graph showing daily nest survival rate for non-thorny and thorny environments]
Results: Summary

• Best predictors of nest success:
  – Yearly variation
  – Natural bayous vs. navigation canals

• Support for higher survival in natural bayous as opposed to canals
  – Important conservation implications
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The End