Trends in Relative Density and Body Condition of Alligators in the Everglades

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Why Alligators?
What are our questions?

Relative Density (2-3 yrs)
How many alligators are we observing?
What are the local and regional trends?
What factors influence number of observed alligators?

Body Condition (1 yr)
Are Everglades alligators healthy?
What are the local and regional trends?
What factors influence the health of alligators?
Sampling Regime

- Each route is surveyed twice in both spring and fall – alligators/km

- Capture 15 alligators adjacent to survey route in spring and fall – Fulton’s K (mass and SVL)
Loxahatchee NWR currently meets restoration targets, BUT has a significantly (p<0.000) declining trend.
Significant declining trends in Frog City (p=0.003) and the estuary (p=0.038).
Alligator Abundance Responses to Environment

Generalized hierarchical $N$-mixture model

Covariates
- Temp
- Stage
- Marsh or canal
- Dry or wet year
- Water Year

Yes, alligators showed population responses to hydrologic conditions
- Declines after dry years.
- Increases in subsequent years
Body Condition

N = 2100, marsh gators, Total Length > 1.25 m

Significant declining trend across the Greater Everglades
Body Condition at current sampling locations

The graph shows the body condition of alligators at current sampling locations from 2000 to 2014. The y-axis represents Alligator Body Condition, ranging from 1.5 to 2.7. The x-axis represents Water Year, ranging from 2000 to 2014.

The lines on the graph represent different sampling locations:
- ENP - EST
- BICY
- ENP - FC
- ENP - SS
- LOX

The data points indicate variations in body condition across the years, with some years showing higher condition values than others.
Body Condition at Loxahatchee NWR
ENP Frog City significantly lower body condition than WCA Holiday and WCA Tower
What hydrologic factors influence body condition?

17 biologically significant models

Generalized linear mixed effect models

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<thead>
<tr>
<th>Response Variable</th>
<th>Random Effects</th>
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<tbody>
<tr>
<td>Average Body Condition</td>
<td>Water Year</td>
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<tr>
<td></td>
<td>Area (i.e. Lox, ENP-SS)</td>
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<table>
<thead>
<tr>
<th>Fixed Effects</th>
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<tbody>
<tr>
<td>Amplitude</td>
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<tr>
<td>Average Spring &amp; Fall Water Depth</td>
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<tr>
<td>Hydroperiod</td>
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<td>Days since last dry &amp; days in last dry</td>
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<td>Parameters</td>
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<td>(Intercept)</td>
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<tr>
<td>Average Spring Depth</td>
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<td>Average Fall Depth</td>
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<tr>
<td>Amplitude</td>
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<td>Fall Depth*Amplitude</td>
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Summary

• We have documented both temporal and spatial patterns in relative density and body condition of alligators

• Using long-term data we have been able to link responses in body condition and relative density to Everglades hydrology

• Now beginning to investigate relationship between relative density, body condition, and individual health, as well as link with trophic hypothesis
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In memory of Rafael G. Crespo, Jr