Habitat use and movement patterns of the American alligator (*Alligator mississippiensis*) in the Florida Coastal Everglades

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Abstract

American alligators (*Alligator mississippiensis*) are top predators in the Florida Coastal Everglades (FCE), but their movement patterns and role in the ecosystem are largely unknown. Proposed restoration and management efforts in the Everglades are likely to influence both alligator movements and the spatiotemporal patterns of their effects on ecosystem and community dynamics, making studies of the factors influencing alligator movements important at this time. In October 2007, we initiated a study of alligators in the Shark River Slough of Everglades National Park using two tracking techniques that have yet to be used on crocodilians: GPS tracking and passive acoustic telemetry. GPS units attached to two alligators have provided 120 positions over a two month period while acoustic transmitters attached to 12 alligators have been detected 34,000 times on an array of 8 monitoring stations within the river system. GPS positions are more accurate than acoustic monitoring and can provide data over the entire range an alligator might move, but acoustic transmitters provide more temporally detailed information on movements within a monitoring array and over a longer duration (potentially years rather than months). Our preliminary results show that alligators may remain in localized areas for weeks at a time, but make long-distance moves from the mouth of the river system to the marsh-mangrove ecotone and likely into the marsh. In general, most alligators moved upstream as freshwater inputs decreased, but some individuals remained near the river mouth even when salinities were high. Ultimately, by characterizing alligator movements in relation to spatiotemporal variation in environmental factors we will be able to predict how alligator distributions and populations will respond to planned increases in freshwater flow. Furthermore, movement data combined with dietary and stable isotopic studies may shed light on the possible role of alligators in the redistribution of nutrients throughout the Shark River system.

Background and Objectives

- The ecological role and movements of alligators in coastal estuaries are poorly known
- Due to their sensitivity to high salinities, proposed increases in freshwater flow are predicted to impact alligator movements
- To predict the effects of Everglades restoration on alligators, we assessed movement patterns using two novel technologies

Fig. 1 – Left to right: an alligator being caught, measured, and having an acoustic transmitter attached.

Methods

- Alligators captured using snare technique, then measured, tagged (Fig. 1), and outfitted with either a GPS (n=2) transmitter (H.A.B.I.T. Research, Osprey HR2600DLT) attached to the nuchal scutes or an acoustic (n=10) transmitter (VEMCO, V16) attached to the tail scutes (Fig. 2)
- Logged GPS data downloaded manually using VHF telemetry
- Acoustic data logged by underwater array of 8 monitoring stations (VEMCO, VR2W)(Fig. 3) and then wirelessly downloaded to a personal computer

Fig. 2 – Left to right: an alligator with its mouth taped shut, with a GPS transmitter attached, and with an acoustic transmitter attached.

Results

- GPS units provided ~1 position per individual per day over 2 months
- Acoustic units provided ~20 positions per individual per day over 4 months
- Alligators showed prolonged periods of residency but generally moved upstream as salinities increased
- Some alligators made regular movements to higher salinity waters

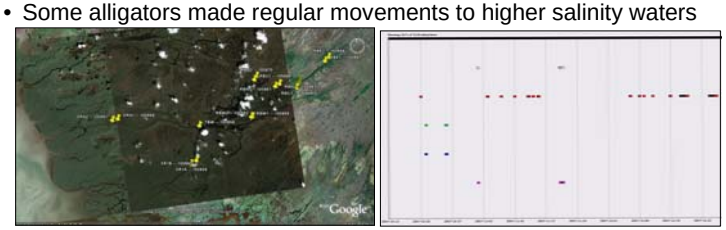

Fig. 3 – Left: a map of our array of underwater listening devices (positions marked in yellow). Right: a screenshot of the VUE program that stores and plots our acoustic movement data.

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Discussion

- GPS tags provided few wide-ranging positions (Fig. 4) while acoustic tags provided many tightly packed positions (Fig. 3)
- As expected the majority (80%) of tracked alligators have moved away from high salinity areas as the dry season has progressed, suggesting that increased freshwater inputs planned for Everglades restoration may move alligator habitat seaward, which may have community and ecosystem level impacts

Fig. 4 – Left: a typical movement pattern of an acoustically tracked alligator from Nov. '07-Feb. '08. Right: a map showing the wide-ranging movements of a GPS tagged alligator over 2 months (positions marked in yellow, green, orange, and red).

- Regular movements up- and downstream by several individuals, including to the river mouth and high salinity waters, suggests that alligators could play a role in upstream nutrient transport in the coastal Everglades. However, future studies of alligator diets and stable isotopic signatures are required to evaluate this possibility
- Movements appear to be directed into the marsh as salinity rises, which may result in alligators bringing marsh nutrients down into the river at the onset of the wet season