Assessing habitat selection and breeding success of the Cuban Snowy Plover (*Charadrius alexandrinus tenuirostris*) using spatial scale influences

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Constraints to Coastal Habitats

- Year 2020 predicted global population 7.1 Billion (United Nations 1998)
- 75% estimated to live within 60km of the coast (Roberts and Hawkins 1999)
- Increases in direct pressure to coastal environments and coastal-dependant species (Burger 2000)
- 700km of Florida coastline threatened with erosion due to the use of jetties, groins, and seawalls (Finkl 1996)

Results:

1. Disruption of the natural transport of sand
2. Increases in beach stabilization projects
3. Increases in human-wildlife interactions
4. Increases in mesopredators

Habitat Selection

- Habitat Selection: is the disproportionate use of habitats and/or resources to improve survival and fitness of individuals (Thomas and Taylor 1990, Block and Brennan 1993, Thomas 2006).

- Selection processes:
    food availability
    predator avoidance
    competition
    human disturbance avoidance

- Habitat quality: which is defined as the ability of the habitat to sustain life and support population growth (Garshelis 2000).

Movement in Landscapes

What are the problems with increases anthropogenic alteration of coastal landscapes?

- <u>Landscape structure must provide</u>:

1. Nesting   2. Foraging
2. Roosting   4. Cover
3. Brood-rearing

- <u>Precocial chicks:</u>

1. Energy requirements are poorly known
2. Must have a reliable food supply for successful development
3. Must have access to brood-rearing habitat

Predicting impacts to snowy plovers:

Question: How can we predict the potential impacts of future environmental change (beach stabilization, erosion, human disturbance or rising sea levels due to global warming) on a broad landscape-scale?

Answer: It requires an understanding of how habitat selection affects local reproduction, survival, and dispersal

Study Design

Overall Objective: To expand current understanding of snowy plover brood ecology and the relationship between habitat quality and snowy plover breeding success

Specific Objectives: (**1**) quantify the role of brood-rearing habitat and other landscape-scale features in nest-site selection, (**2**) determine factors affecting brood habitat quality and success, (**3**) determine distribution and movement of broods in the landscape, and (**4**) assess the impacts of human disturbance on brood foraging behavior.

3 approaches: habitat modelling, modelling brood survival, and behavioral observations.

Site Location

- Tyndall Air Force Base

  Crooked Island West

  Crooked Island East

- Palm Point

- St. Joseph State Park

Objective 1: Quantify the role of brood-rearing habitat and other landscape-scale features in nest-site selection

Hypothesis: Habitat selection is determined by habitat structure

Testable Predictions:

- **1:** breeding habitat must have nesting and brood-rearing microhabitats in close proximity; nesting sites will be congregated in and around high quality brood-rearing patches

- **2:** snowy plovers will be absent or in lower numbers where human disturbance is high

- **3:** resource richness (prey availability) will be higher at used sites, when compared to those chosen at random.

--Hypothesis is comparative between used habitat and available (habitat selected at random).

--Habitat will be measured at 3 spatial scales (Microhabitat, Macrohabitat, and Landscape-scale)

Objective 2: **Determine factors affecting brood habitat quality and success**

Hypothesis: snowy plover brood success is tied to habitat features of the landscape

--I am comparing the relative influence of habitat selection and behavioral factors on brood success by modeling brood survival as a function of habitat features and external environmental features

Predictions: (1) broods with nesting locations closer to brood-rearing habitat will have greater success, (2) broods with fewer disturbances and higher foraging efficiency will have greater success, and (3) broods foraging in location with higher prey abundance will have higher success.

Objective 3 Determine distribution and movement of broods in the landscape

Observational data for success models:

- Adult snowy plovers and chicks will be banded on hatch-day to allow for mapping of habitat use and movement between patches.

- Observations will primarily focus on movements from nesting habitat patches to brood-rearing habitat patches.

- Distance moved and density of use will be measured.

Objective 4 Assess the impacts of human disturbance on brood foraging behavior

Hypothesis: human presence affects feeding efficiency

--I am comparing foraging behavioral changes and habitat use in response to human disturbance

Measurements: people load, forage rates, prey abundance, and brood behavior (move, seek cover, watch, or use anti-predator displays)

Predictions: (1) after disturbance events, snowy plovers will not return readily to foraging areas despite quality of foraging materials, (2) displacement while foraging will be more frequent with high human disturbance, (3) feeding rates will be lower in the presence of people, and (4) effects of disturbance should be greater with increase in the number of visitors and decrease with distance from brood.

this may not be included as a testing hypothesis… just observational data

Assumptions:

- (1) All individuals are equally detectable.

- (2) Individuals have free and equal access to available locations.

- (3) Samples are independent.

- (4) Habitat selection and locations do not change during the study period.

Alternative Hypothesis

- Potential predators (Page et al. 1995)
- Density-dependent predation (Page et al. 1983)
- Proximity to forested habitats (Yasue 2006)
- Conspecific attraction (Nelson 2007)
- High site-fidelity (Warriner et al. 1986)
- Natural processes (i.e. Hurricanes) (Lamonte et al. 2006)

Answerable unknowns through banding:

- Site fidelity/Emigration
- Natal dispersal
- Dispersal during breeding season
- Home-range size

- Territory switching
- Mating system
- Accuracy of FWC state-wide surveys

Questions or suggestions…??