Estuarine and Coastal Wildlife Research at Cape Canaveral
Kennedy Space Center Ecological Program (December 2015)
Kennedy Space Center

- Primary US Space Launch Site
- Merritt Island NWR
- Canaveral National Seashore

- 140,000 Acres
- 30 Federal or State-Listed Species
- NASA Culture of Stewardship
Kennedy Space Center Ecological Program

- ~15 Staff Including:
  - Ornithologists
  - Herpetologists
  - Marine Biologists
  - Botanists
  - Statisticians
  - GIS

- Focus on Conservation of Habitat & Managed Species

- Work with MINWR, CANA & CCAFS
Habitat Assessments
Kennedy Space Center Ecological Program

- Emphasis on Question-Driven Research
- Focus on Publishing and Internal Reports
- Recognized Need For More Public Outreach

Objectives

- Describe Our IRL & Coastal Research Efforts
  - Identify Products (if any) Useful to Aquarium Project
  - Identify Areas of Future Collaboration
- Provide a Tour of KSC Reserve
Seagrass and Wetlands Research
Aerial Manatee Surveys
Estuarine Sea Turtle Monitoring

Loggerhead (*Caretta caretta*)

Green turtle (*Chelonia mydas*)
Impacts of Rocket Launches and Facility Lighting on Sea Turtle Nesting Success

- **Goal:** Identify and eliminate lighting that impacts sea turtle nesting and hatchling emergence behavior
- **Collaboration with MINWR, USFWS, and FWC**
- **Provide NASA with lighting assessments for best ROI modifications and managing future construction**
Methods

- Ongoing monitoring during turtle nesting & hatching seasons
- Night lighting surveys (helicopter, beach, road)
- Sky quality logger
- Emergence surveys (disorientations)
- Mitigation (shields, dune restoration)
Findings

- 20+ year database of sea turtle nesting & disorientation
- Tracking effect of launches as well as dune and vegetation loss with sea turtle orientation behavior
- Future: Dark Sky Initiative - opportunity to quantitatively analyze light. Impact of climate change on habitat and resource availability
Impact of Green Turtles and Herbivorous Fishes on the Macroalgal Community in Port Canaveral

- Goal: Describe macroalgal resources for herbivorous fishes and juvenile green turtles
- Collaboration with CCAFS, Florida Atlantic University
- Provide data for environmental assessments of Port ecological resources and guidance for construction mitigation
Methods

- Two-Year Study (2008-2010)
- Quarterly sampling of macroalgae from rock rubble
- Foraging analyses of green turtles (lavage) and herbivorous fishes (stomach content)
- UW video and boat transects for fish and turtle distribution
Findings

- Identified 9 fish species foraging as herbivores (> 50% of diet = algae). Most abundant = 4 species
- Green turtles predominantly consumed red algae (*Gelidium crinale, Grateloupia filicina, Hypnea spinella*)
- Green turtle and sheepshead foraged as generalist. Other 3 fishes, predominantly specialist on green algae
East Coast Diamondback Terrapin Surveys

Goal: Develop Sampling Procedure to Estimate Population Size & Status

Model-based sampling strategy accounting for detection probability & availability
Methods

Focus on open-water & known populations, Mar-Nov

- Occupancy Sampling
- Density Sampling
  - Distance Sampling
  - Time to Detection
- R or Winbugs programming
- Population Viability Analyses
Findings

- More widely distributed than previously thought
- Low numbers, probably critically endangered subspecies
- Prefer deeper water?

Next Steps

- Complete analyses
- Prepare manuscript(s) rare-species sampling focus
- Sample one more year using a similar but different approach
- Define extent for estimating population size
Goal 1: Establish Local Life History

Baseline
- Reproductive Success
- Comparisons with other FL Populations
- Movement Patterns
- Population Structure
- Nest Temperature Dynamics

Goal 2: Determine Population Health

- Blood and Tissue Chemistry
- Hormones, Gene Expression
- Toxicology and Heavy metals

Health Assessment of the American Alligator at Kennedy Space Center
Nesting
Health Assessments
Findings

- 62 Nests incubated since 2006. 38 additional nests with thermisters.
- Nest success ~75% (generally higher than other Florida populations)
- Mean nest temperature = 31.6°C resulting in 50/50 sex ratio
- 1453 alligators collected, processed, released. Largest 3.8 m (12.4 ft)
- Adult KSC population generally healthy
Managed Fish Survey of Canaveral Nearshore Waters

- Goal: Resolve Seasonal Abundance and Habitat Preferences of Coastal Fishes
- Collaboration with BOEM and US Navy
- Helps Guide Dredge and Renourishment Projects
Five Year Study (2012-2017)
16 Monthly Longline Sets
Sites Randomly Selected
Most Fish Tagged
Findings

- 2010 Fishes Sampled
- 34 Species
- Catch >90% Coastal Sharks (Sharpnose, Blacknose, Blacktip, Finetooth) and Rays
Passive Acoustic Telemetry to Resolve Fish Migration and Behavior
Florida Atlantic Coast Telemetry Array

- 22 Partner Groups
- FL, GA, SC, Bahamas
- 488 Receivers (Vemco)
- 2900 Tags/63 Species
KSC Reserve

- de facto Marine Reserve
- Est. 1962
- 40 km²
- Minimal Disturbance

Launch Pads

Indian River Lagoon
Red drum
(*Sciaenops ocellatus*)
Black drum
(Pogonias cromis)
Spotted Seatrout

(Cynoscion nebulosus)
Common Snook (*Centropomus undecimalis*)

Sheepshead (*Archosargus probatocephalus*)
Lemon Sharks in Surf Zone
Natural Habitat Associations and Effects of Dredging on Fish of the Canaveral Shoals
BOEM Wave Glider Project
Wave Glider Project

- Powered by Wave Energy and Solar
- Support Varied Scientific Payloads
- Can Stay at Sea for Months
- Operates in High Sea States
- Runs Pre-Defined Transects
- Controlled Via Web Browser
- Real-Time Data Streaming
Questions?