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
Alligator Studies
Coastal Fisheries
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
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**
Methods

- Five Year Study (2012-2017)
- 16 Monthly Longline Sets
- Sites Randomly Selected
- Most Fish Tagged

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