

High Resolution Aerial Imaging for Surveying of Ocean Use by Humans and Marine Animals

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BOEM Information Need:

- Large scale data on the distribution and abundance of animals as well as humans in the marine environment

Date Information is Required:

- Ongoing information – inform future leasing and siting decisions.

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Tentative Ranking: 1

Background: Relationship with Previous Work/Efforts

- Large body of work with marine animals in Europe. COWRIE (Collaborative Offshore Wind Research into the Environment)
- Pilot Study of Aerial High-Definition Surveys for Seabirds, Marine Mammals and Sea Turtles (evaluate safety, cost and effectiveness)
- Examples of human use of the oceans include Florida Bay boaters¹ and human interactions with Right Whales²

1. Ault et al. 2008. Aerial Survey of Boater Use in Everglades National Park Marine Waters – Florida Bay and Ten Thousand Islands. NOAA Technical Memorandum NMFS-SEFSC-581. 183 pages.

2. High Definition Imagery Analysis as a Method of Assessing Behavior and Human Impacts on the North Atlantic Right Whale. stellwagen.noaa.gov/science/high_def_imagery.html

Pilot Study of Aerial High-Definition Surveys for Seabirds, Marine Mammals and Sea Turtles

Major conclusions:


- Cost equal to or less expensive than traditional surveys
- Safer than aerial visual surveys
- Effectiveness - No repulsion or attraction to vehicle, survey area precisely calculated, permanent record

Aerial imagery very good at sampling:


- Sea turtles (traditional observers missed 75% of observations)
- Birds

Aerial imagery not as good for:

- Difficult to distinguish taxa
- Marine Mammals (long submersion, intermittent cues)



Immature Northern Gannet
1000 meters, 3cm resolution

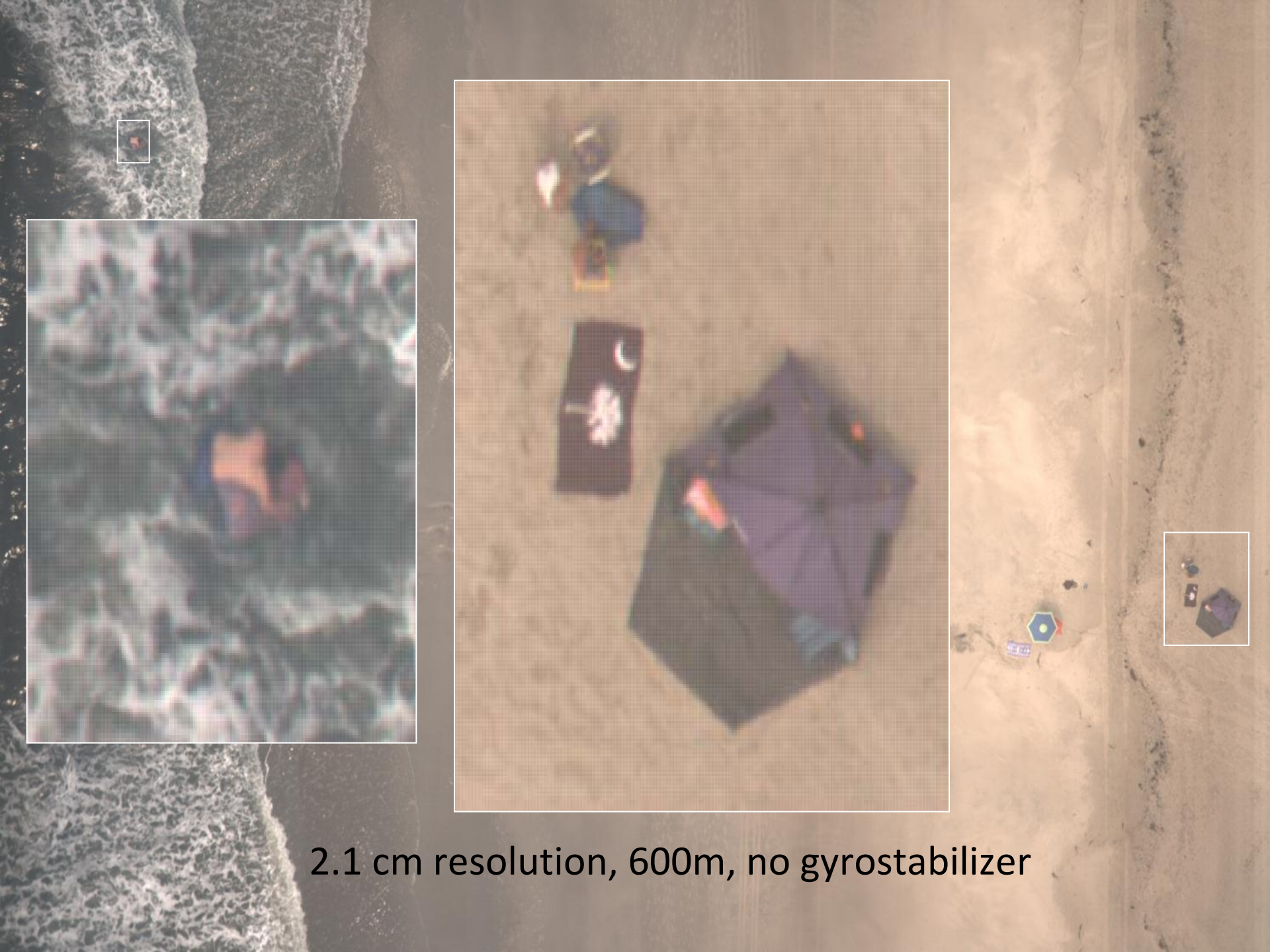


Loggerhead Sea Turtle
450 meters 1cm resolution

Background: Relationship with Previous Work/Efforts

Potential for Human Use

- Traditional methods for examining human use include onsite surveys, participatory GIS/group mapping (examples: BOEM Space Use Conflict Study, NOAA's Ocean Use Atlas)
- Problems include human recall and accuracy, informant bias/gaming, inter-observer variability, observer swamping
- Aerial Imagery has some distinct advantages
 - Does not rely on human recall and mitigates human preference/bias
 - Permanent record allows for repeated analysis by multiple observers
 - Survey area and location of humans can be precisely determined



2.1 cm resolution, 600m, no gyrostabilizer

Background: Relationship with Concurrent/Future Efforts

- *Detection of Marine Species from High Resolution Aerial Vertical Photography using Automated Anomaly Detection Software (Page 319 SDP)*
- *Mid-Atlantic Baseline Studies Project (Biodiversity Research Institute, Funded by DOE)*
- *Atlantic Marine Assessment Program for Protected Species (NOAA, USFWS, Navy)*

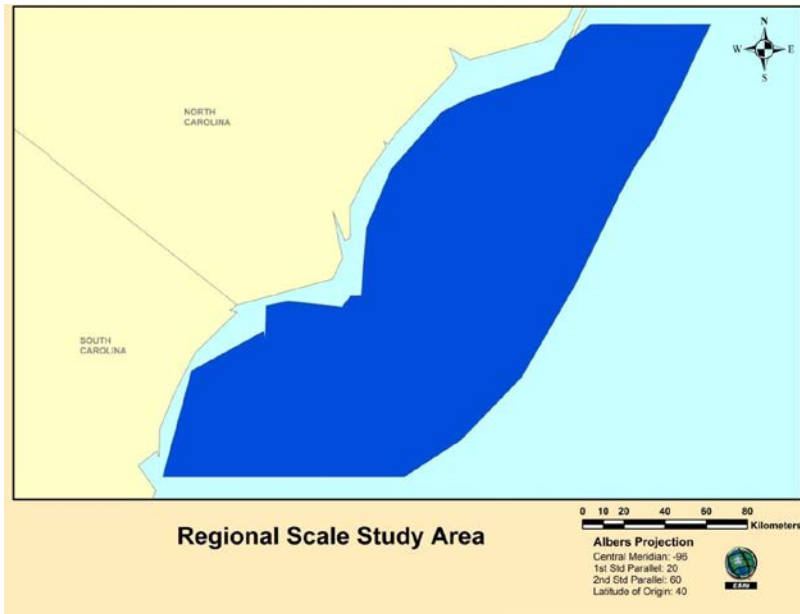
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Tentative Ranking: 1

Study Objectives:

- To operationalize high resolution aerial imagery on the outer continental shelf to map spatial distribution and density of marine animals with a focus on sea turtles and marine birds.
- To test the efficacy of using high resolution aerial imagery for mapping human uses of the ocean.

Study's Methods: Sampling



- Survey of a planning area-sized region (25,000 km²) would include quarterly surveys, 10% sub-sampling, and 1-cm image resolution.
- Planning areas will be chosen based on information needs and ability to compliment existing research.
- South Atlantic, relatively limited baseline information and interest in renewable energy

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Tentative Ranking: 1

Study's Methods: Data Analysis

- Software will be used to identify targets
- Target identification will be made by human visual interpretation
- Observations will be categorized and converted into a geographic layer.
- Spatial statistics used to create distribution and abundance maps