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.
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 boaters\(^1\) and human interactions with Right Whales\(^2\)

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)
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)
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
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