Unoccupied aircraft systems are transforming marine science and conservation

Patrick Gray for David Johnston
Duke Marine Robotics and Remote Sensing Lab
Outline

- 5 research themes:
  1. Population distribution and abundance
  2. Organismal behavior and body condition/health
  3. Habitat assessment and validation
  4. Biological oceanography
  5. Natural resource management

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<td>4013</td>
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<td>DRONES</td>
<td>BATTERIES</td>
<td>LOCATIONS</td>
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Powered by DroneLogbook
Population Abundance and Distribution
Muskeget Pup Counts

- Colony reaching carrying capacity?
- Other pupping locations are now evident.

Johnston et al. 2017
Organismal behavior and body condition/health
MorphoMetriX: a photogrammetric measurement GUI for morphometric analysis of megafauna

Torres and Bierlich (2020). Journal of Open Source Software
Humpback Body Condition

- Body Area Index
- 2D estimation of animal condition
- Baysian error estimation for all measurements
- Animals imaged along the Western Antarctic Peninsula during austral summer feeding period

Bierlich et al 2021
Habitat Assessments
Computer Vision and Artificial Intelligence
Ridge et al. 2021
Biological Oceanography

- On-demand remote sensing
  - Below clouds
  - Submesoscale features
  - Close to land
- Shed light on satellite remote sensing blindspot

Gray et al 2022
Ocean Color

Determining proper viewing geometry and corrections for drone-based wide field of view radiometers.

Gray et al 2022
Gulf Stream Frontal Surveys

Example of a combined drone and oceanographic vessel survey across the Gulf Stream front.

Gray et al 2022
Gulf Stream Frontal Surveys

Gray et al. 2022
Thanks!!

Questions?