

Surveying Antarctic Predators to Inform Fisheries Management

Duration: 28 months (07/01/19 - 12/01/20)

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Photo: A. Fox

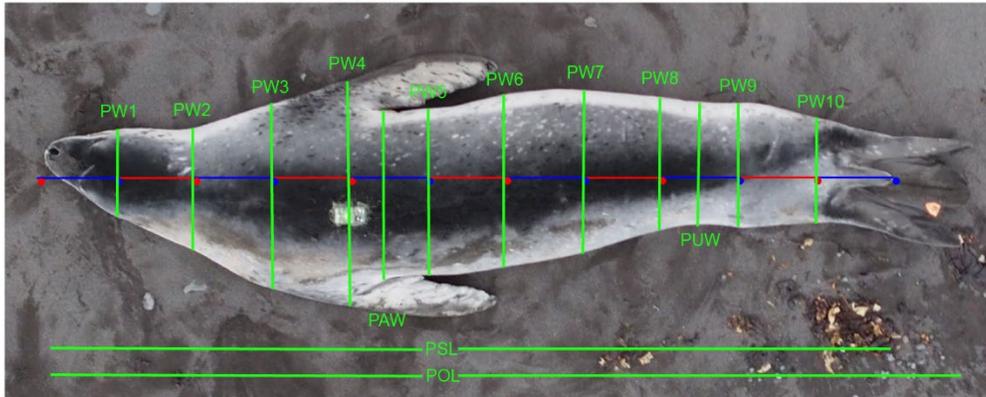
The APH-28 unmanned aerial system (Aerial Imaging Solutions, LLC) surveying Antarctic fur seals near Cape Shirreff, Livingston Island. Payload: downward facing micro 4/3 format digital camera with a laser altimeter.

NOAA Fisheries' Antarctic Ecosystem Research Division (AERD) studies and monitors several species of seals and penguins that are indicators of the health of the regional fishery for Antarctic krill. Krill are the focus of an expanding international fishery in the Antarctic, but are also a fundamental food source for the region's fish, marine mammals, and birds. Accurate census counts and measurements of body condition are fundamental to seal and penguin population management, but can be difficult to obtain in remote polar environments.

Building on Recent Success

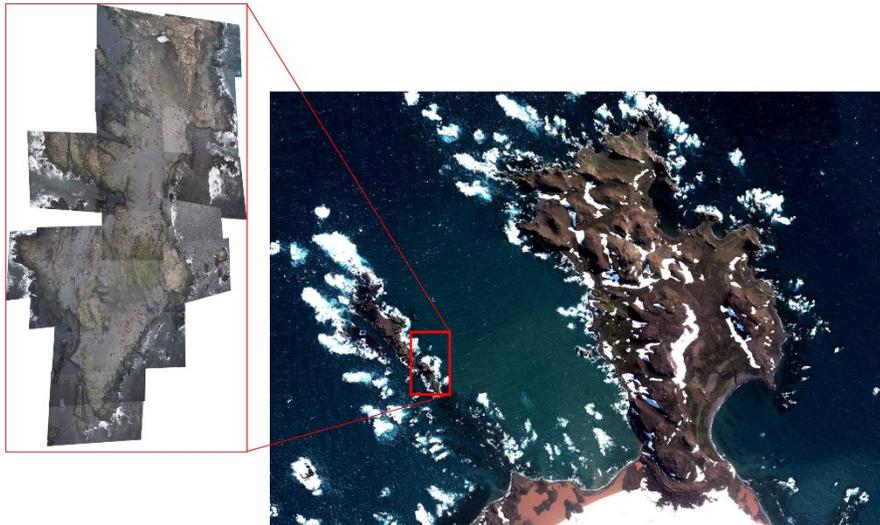
The AERD has a long history of developing unmanned aerial systems (UAS) as tools for scientific monitoring dating back to 2010. Funding from the UAS Program Office partially supported a study on an Antarctic apex predator, the leopard seal, in which scientists were able to measure the size and body condition of seals with extreme accuracy using a single two-dimensional overhead UAS photo. Since developing this technique,

monitoring the body condition of multiple species has been adopted into regular survey protocols.



Photogrammetric measurements. An example measured leopard seal with labeled photogrammetric measurements. <https://doi.org/10.1371/journal.pone.0187465.g003>

During the 2018-19 season UAS Program Office funding supported the development of a medium range vertical take-off and landing UAS, which allowed expansion of survey capabilities to accurately census an off-shore island group that supports approximately 30% of all Antarctic fur seal pup production in the Antarctic Peninsula region. The UAS-derived pup counts were accurate (error rates < 2%) despite the rocky, steep terrain. Like estimates of seal body condition, this project has become operational and will be conducted annually into the future.



Antarctic Ecosystem Research Division Operational Area at Cape Shirreff 2018-19.

Moving Forward

Although error rates for previously-conducted UAS censuses of penguins and seals have been relatively low, some practical problems remain. For example, UAS along with other imagery-based survey technologies (e.g., animal-borne cameras, remote trap cameras) have resulted in a higher volume of images than can be processed effectively using traditional scanned-by-human approaches. Recent advances in Artificial Intelligence (AI), particularly machine learning, show promise to automate many of the photo processing challenges. Over the next two Antarctic field seasons the AERD will be collecting concurrent visual-and-thermal images of seals and penguins. The additional information from the thermal images should improve the performance of automated census and measurement techniques that will reduce costs and improve the accuracy of UAS-derived wildlife management.

In each of these instances the AERD in conjunction with the UAS Program Office have been developing new, less-invasive, cost-effective survey tools that provide crucial information to inform fisheries management.