

***UAS applications in
conservation of
large whales:
photo-
identification,
photogrammetry,
and monitoring
individual health***

**Michael Moore,
US Marine Mammal
Commission 4/7/17**



Jen Jakush, FWC



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Cape Cod Bay, March 2016*

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Support

- NOAA CINAR
- WHOI Ocean Life Institute
- WHOI Access to the Sea
- Dalio Explore Fund

Permits

- NMFS 17355, 14097, 16163
- WHOI FAA 333 Exemption 12618
- NOAA Flight Authorization

Ongoing Goals

- Assess impact of UAS in comparison to boat approaches, biopsy and tagging methods
- Enhanced photo identification and lesion documentation
- Entanglement Triage
- Serial photogrammetric measures of total body length and length to width ratios to measure growth and overall body condition.
- Blow samples to better understand the basis for any observed variation in body condition.

Unmanned Aerial Systems: APH-22



NMFS Permit 17355

‘UAV noise coupled poorly into the water, and could only be quantified above background noise at 1 m depth when flying at altitudes of 5 and 10 m.’

Christiansen et al. Front. Mar. Sci., 26 December 2016

| <https://doi.org/10.3389/fmars.2016.00277>

PHOTO IDENTIFICATION

<http://rwcatalog.neaq.org/Terms.aspx>
See #'s 1616, 2340, 2740, 3297, 3317, 3705

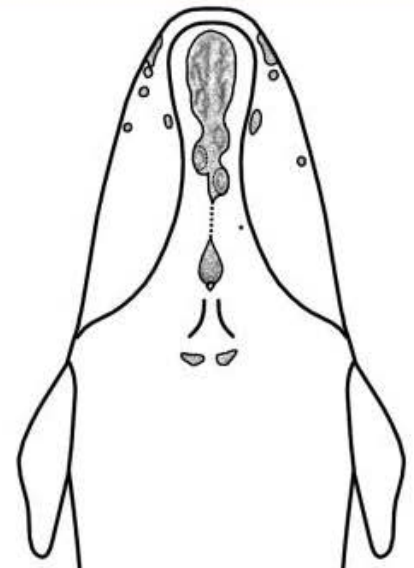
The North Atlantic Right Whale Catalog

[Scroll Through All Whales](#) [Search For Individual Whales](#) [Return to Right Whale Projects](#)

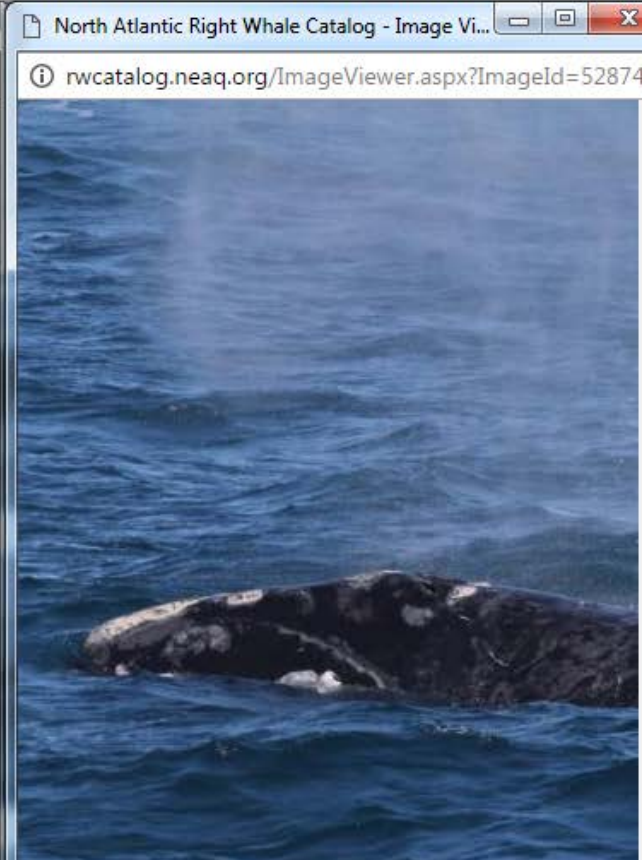
1 of 1 whales that match search criteria

Whale Summary			
Catalog No:	3297	Whale Name:	Sex:
Calving Female:	No	Mother:	Last

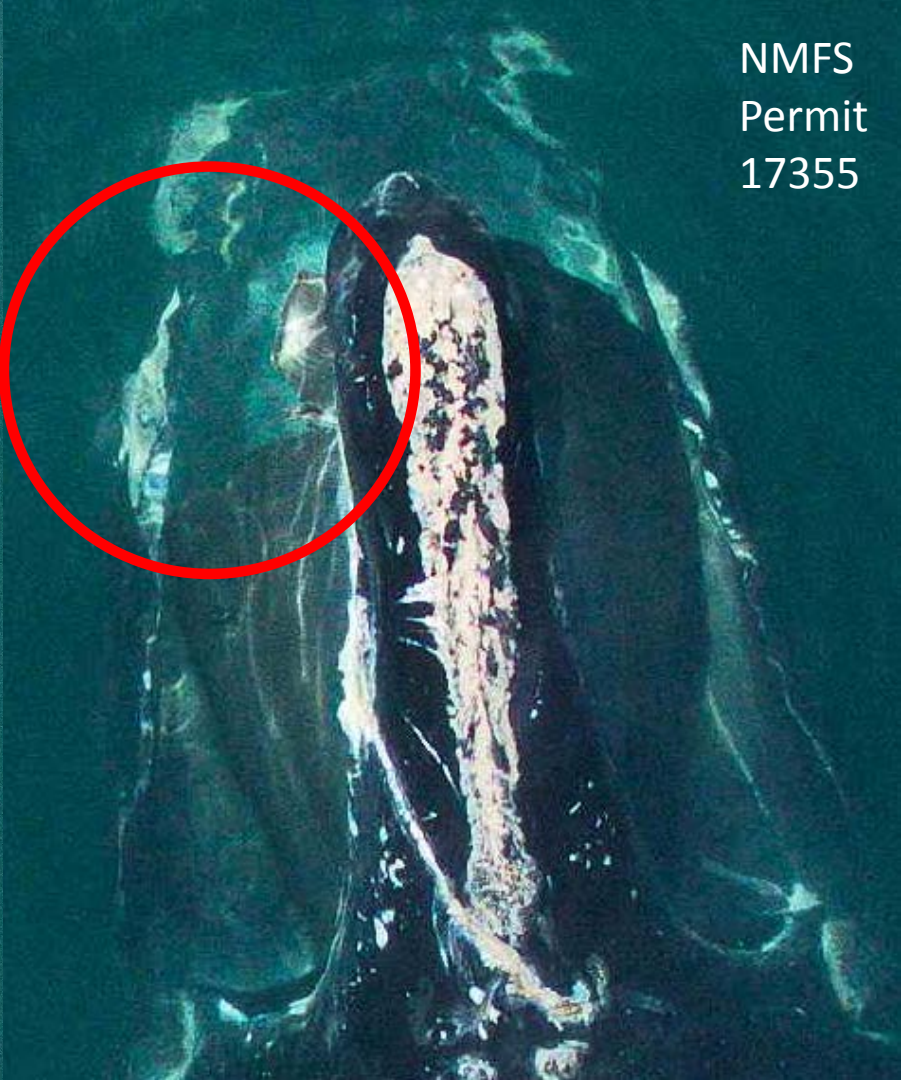
Whale Composite



Drawing created: June
Created by: Y. Guilbault
Drawing edited:
Edited by:



LESIONS

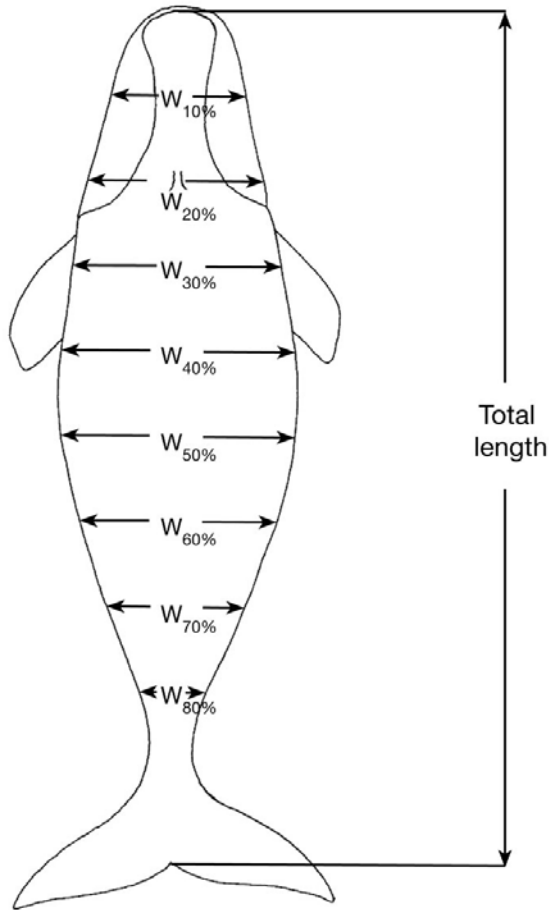


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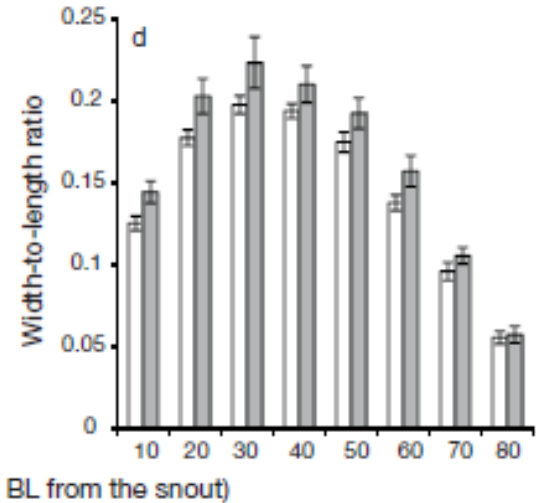
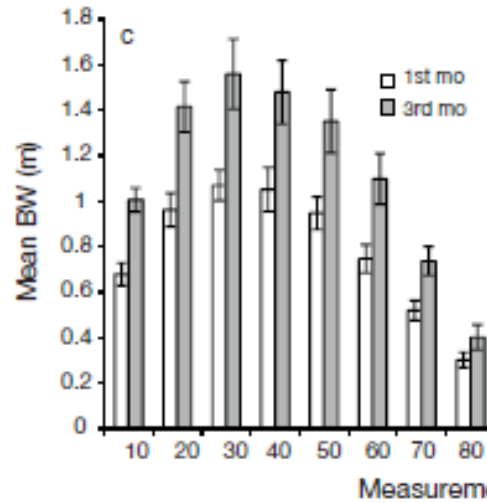
Potential for disentanglement triage, drug dose estimation, and targeting boat approaches



Credit: Wildlife Trust/ Georgia DNR
Under NMFS Permit 932-1905-00/MA-009526



- Widths of *E. australis* thinned during lactation, while their calves' widths and width to-length ratios increased.
- Photogrammetric measurements of body width, particularly at 60% of body length from the snout, are an effective way to quantitatively and remotely assess nutritional condition of living right whales



Comparative condition

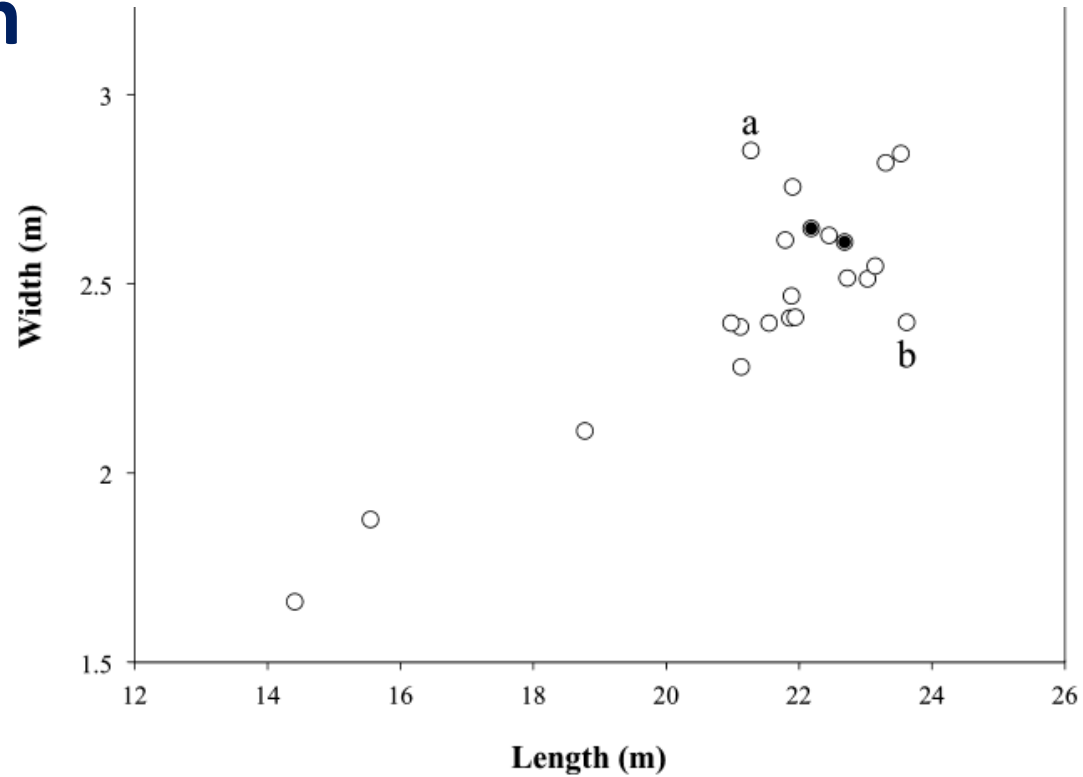
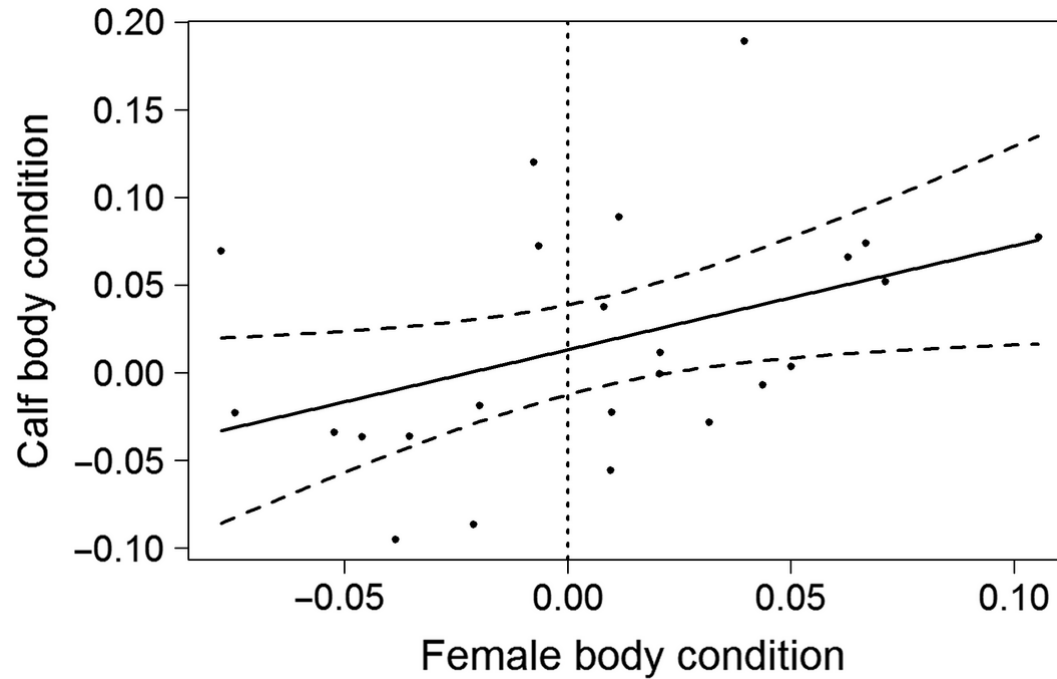


Figure 4. Photogrammetry measurements of body length from rostrum tip to tail notch, and width at 40% of the body length from the rostrum, for 22 individual blue whales. Labels indicate a notably robust (a) and a lean (b) whale, that were outliers from the general trend (see Fig. 3 for photographs of these same whales). Closed circles indicate two presumed adult females, which were accompanied by the two smallest whales that appeared to be dependent calves.

Noninvasive unmanned aerial vehicle provides estimates of the energetic cost of reproduction in humpback whales



Christiansen et al. *Ecosphere*

[Volume 7, Issue 10](#), 5 OCT 2016 DOI: 10.1002/ecs2.1468

<http://onlinelibrary.wiley.com/doi/10.1002/ecs2.1468/full#ecs21468-fig-0005>

Breath Sampling

- Wide range of potential assays to consider – hormones, metabolites, microbiome, cytology
- UAS less intrusive than boat/pole sampling
- Still optimizing UAS breath sampling
- 2016 & 2017 Samples from FL, MA & WA, Argentina and Auckland Islands currently under analysis for microbiome patterns

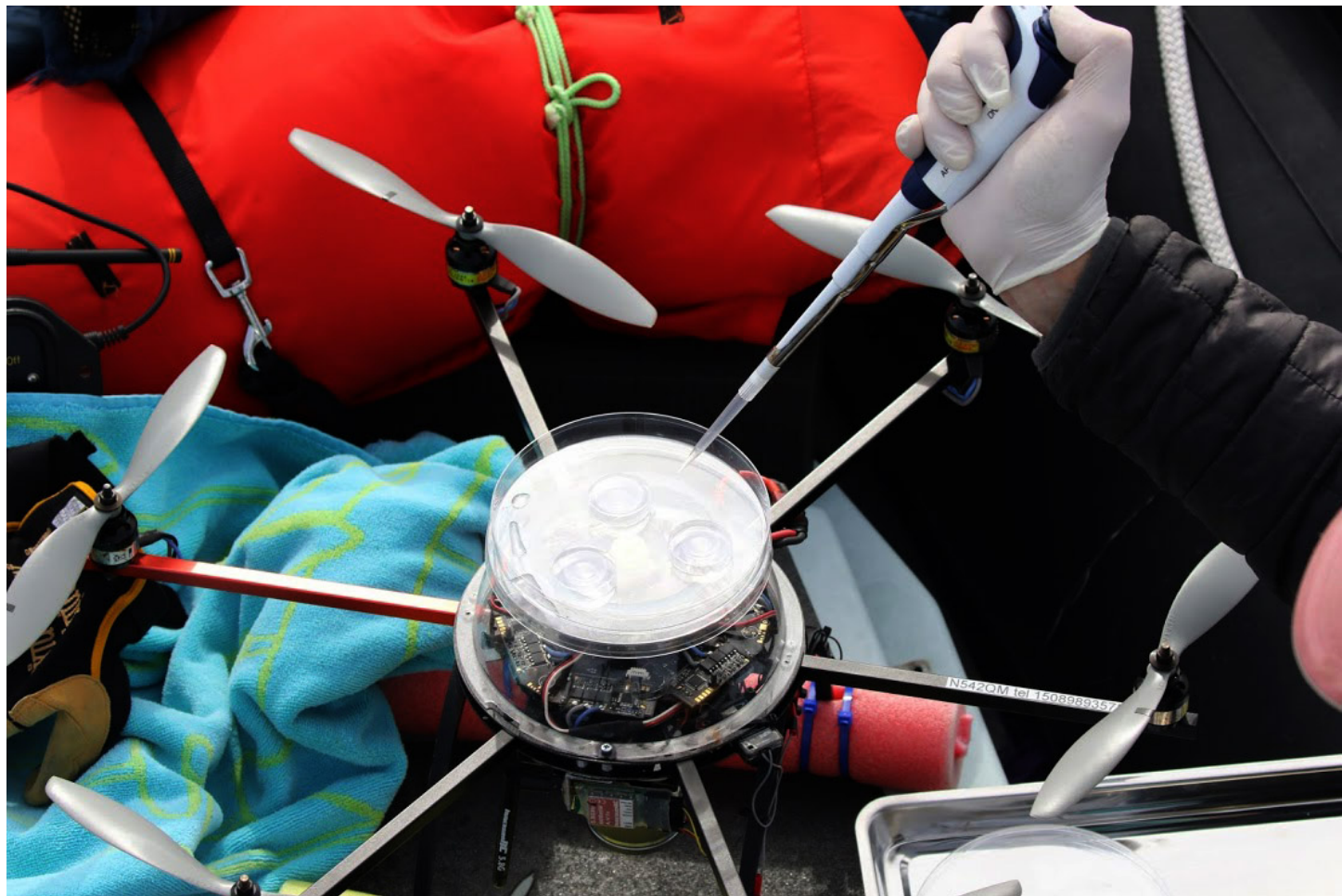


N5420M



Image:
Victoria
Pease

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Questions?



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