

# Small-boat surveys and satellite tagging of odontocetes on the Pacific Missile Range Facility, Kaua'i, in August 2021



**Robin W. Baird<sup>1</sup>, Colin J. Cornforth<sup>1</sup>, Kimberly A. Wood<sup>1</sup>, Shannon E. Vasquez<sup>1</sup>,  
Brijonnay C. Madrigal<sup>2</sup>, Annette E. Harnish<sup>1</sup>, and Michaela A. Kratofil<sup>1</sup>**

<sup>1</sup>Cascadia Research Collective, Olympia, Washington (rwbaire@cascadiaresearch.org)

<sup>1</sup> Marine Mammal Research Program, University of Hawai'i

Presentation at the U.S. Navy Marine Species Monitoring Program Annual Meeting, 7 April 2022



Project web page



Field report

# Acknowledgements

**Funding** – Pacific Fleet, Pacific Islands Fisheries Science Center

**Contract admin** – Jessica Chen (NAVFAC), Kristen Ampela, Mark Deakos (HDR)

**Range support** – Capt. Young, Commanding Officer, Pacific Missile Range Facility

**Acoustic support** – Nancy DiMarzio, Susan Jarvis, Alex Muniz, Stephanie Watwood (NUWC), Elizabeth Henderson, Steve Martin (NIWC Pacific)

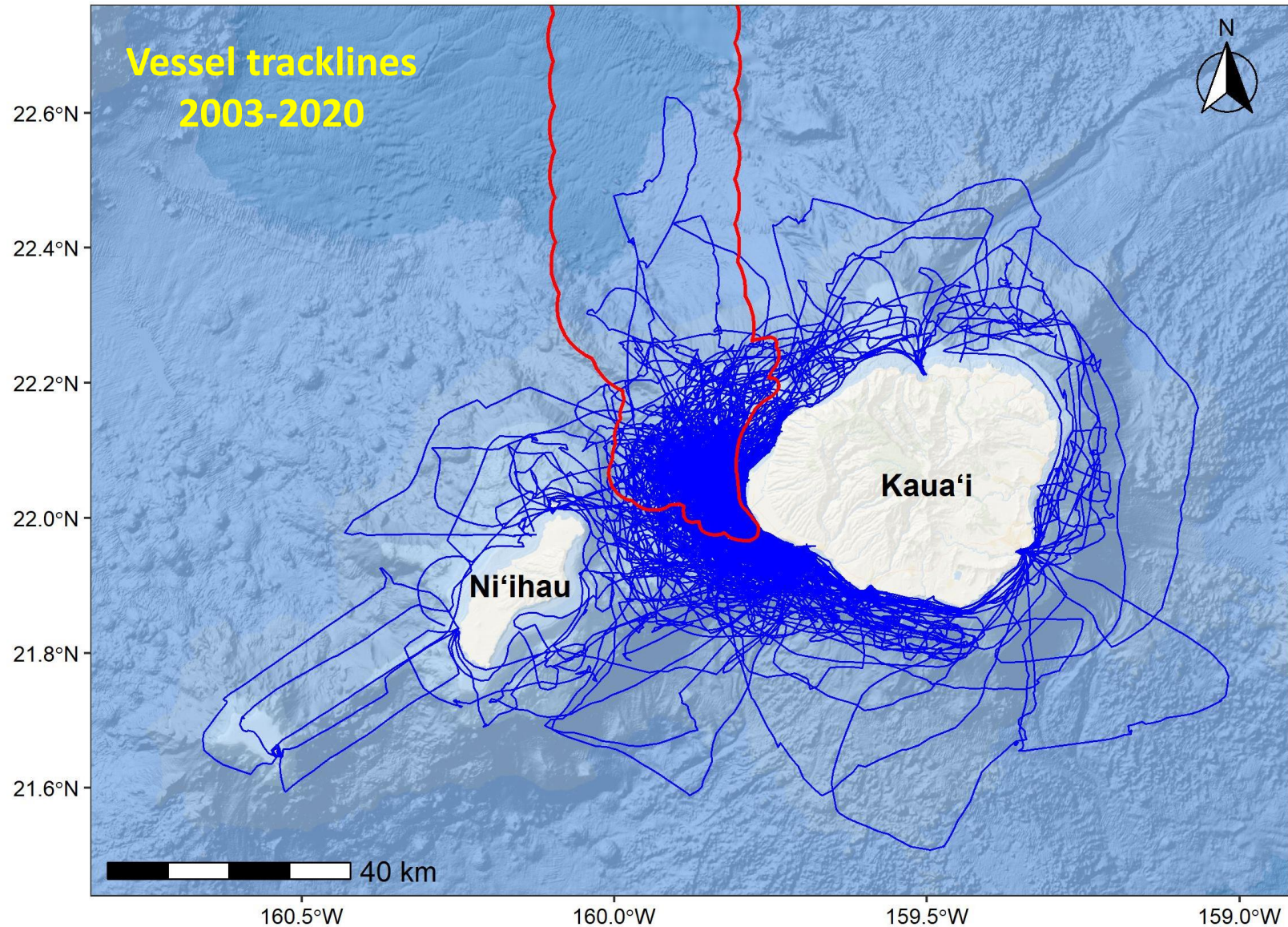
**Logistics** – Jessie Abirached, Nick Croft, Lynn Opritoiu, Jamie Thomton, Myles Togioka, Holo Holo Charters, Waimea Plantation Cottages

**Sighting reports** – Christian Hatfield (Holo Holo Charters), Anthony Kuntz (Fathom Five), Ryan Leibach

**Help on the water** - Liz Barnes, Jenna Budke, Andrew Ellis, Tara del Fierro Duran, Katie Finney, Kiirsten Flynn, Julie Gardner, Celeste Hanley, Samantha Jetzer, Francisco Licea, Mia Maleded, Adisson McGill, Alex Muniz, Jamie Neill, Lynn Opritoiu, Alyssa Piauwasdy, Andre Raine, Jess Rickard, Jen Rothe, Jonny Shepherd, Marc Travers, Vinnie Vandyle, Bryn Webber, Hannah Weipert, Heather Ylitalo-Ward, Kat Young

# Prior CRC Kaua'i & Ni'ihau small-boat efforts

- 12 years (1,367 hours, 22,968 km effort), with PAM in 8 years
- 622 odontocete sightings, 14 species
- Photo-ID catalogs of 16 species (including community science photos)
- 82 satellite tag deployments (8 species/10 populations)
- 393 biopsy samples (9 species)



← General small boat methods

Summary of results to date →



# Primary goals

- Tagging Navy-priority species before Submarine Command Courses to assess exposure and response to MFAS (see Henderson et al. 2021) →
- Obtain information on spatial use, diving behavior, and abundance

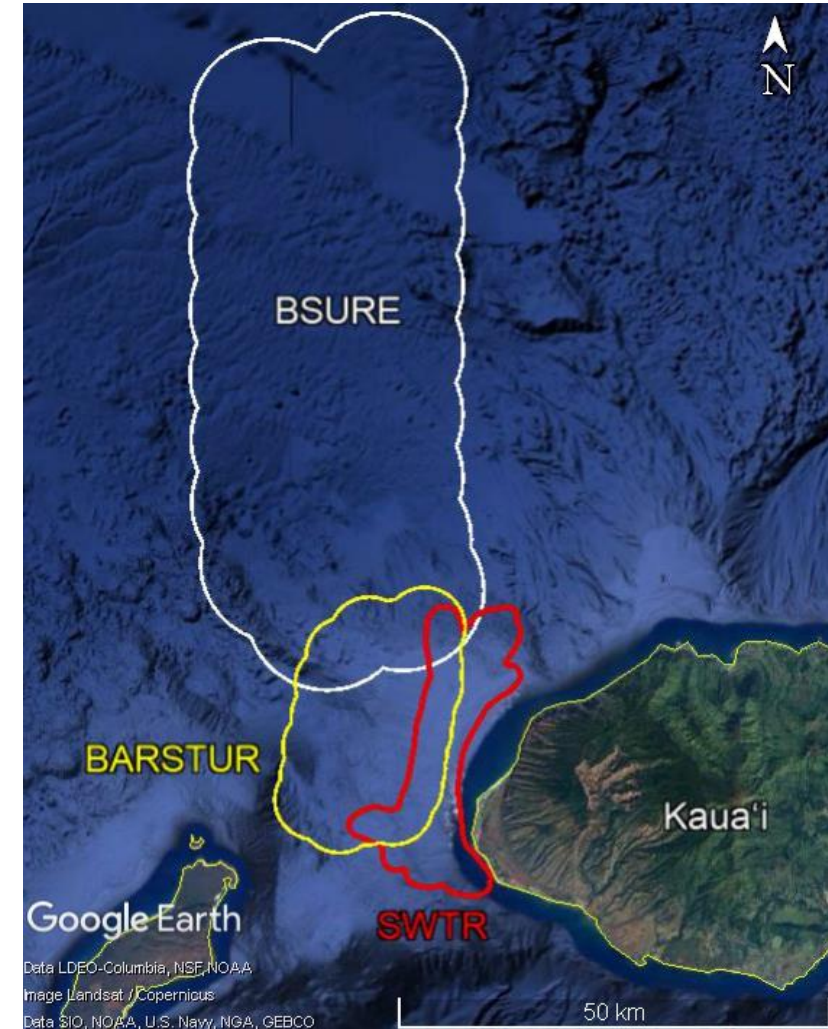


## Limiting factors:

- Strong winds and small lee
- Low density

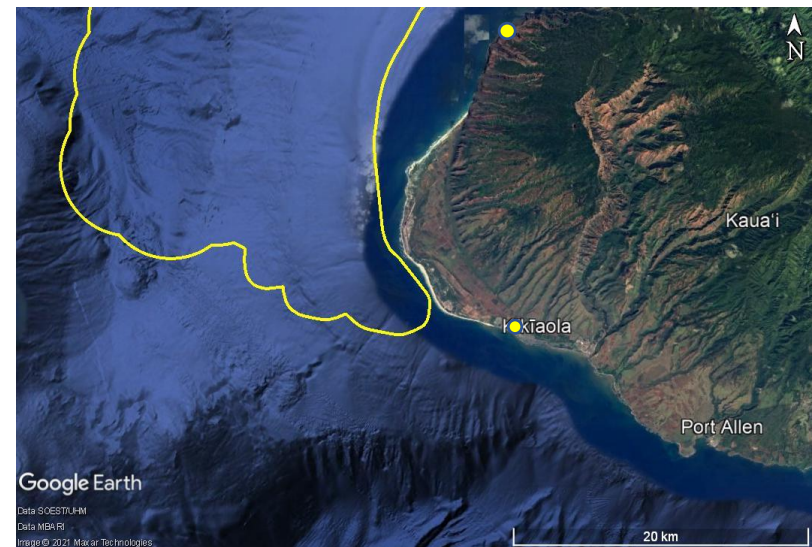
## Approach:

- Leave prior to sunrise to take advantage of calm seas
- Work with multiple species
- Work on range when acoustic detections indicate target species present
- Work in areas with best sea conditions otherwise
- Network of local tour operators reporting sightings of high priority species

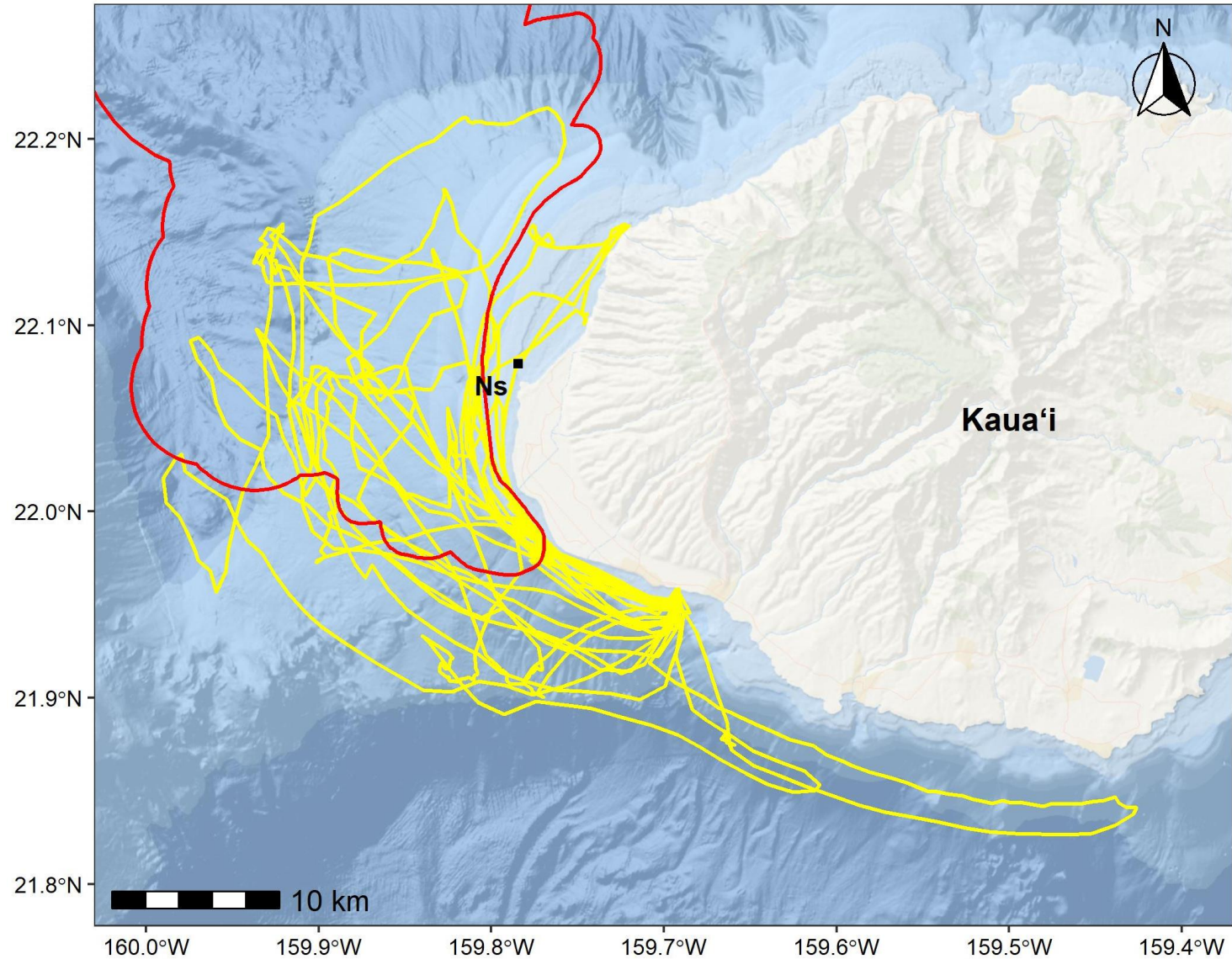


# August 2021 Kaua'i effort

- 13 field days funded by PACFLT, 1 day funded by PIFSC, no funding for photo-matching or tag data analyses
- Tagging with SPLASH10-F (Fastloc<sup>®</sup>GPS) satellite tags for high-priority species (programmed to obtain up to two Fastloc<sup>®</sup>GPS locations/hour, behavior data lower priority, recording Fastloc<sup>®</sup>GPS and behavior up to 3 days past end of SCC)
- Tagging with SPLASH10 or SPOT6 tags on lower-priority species during latter half of effort
- MOTES on Kaua'i and Ni'ihau and Argos Goniometer on board to increase data capture

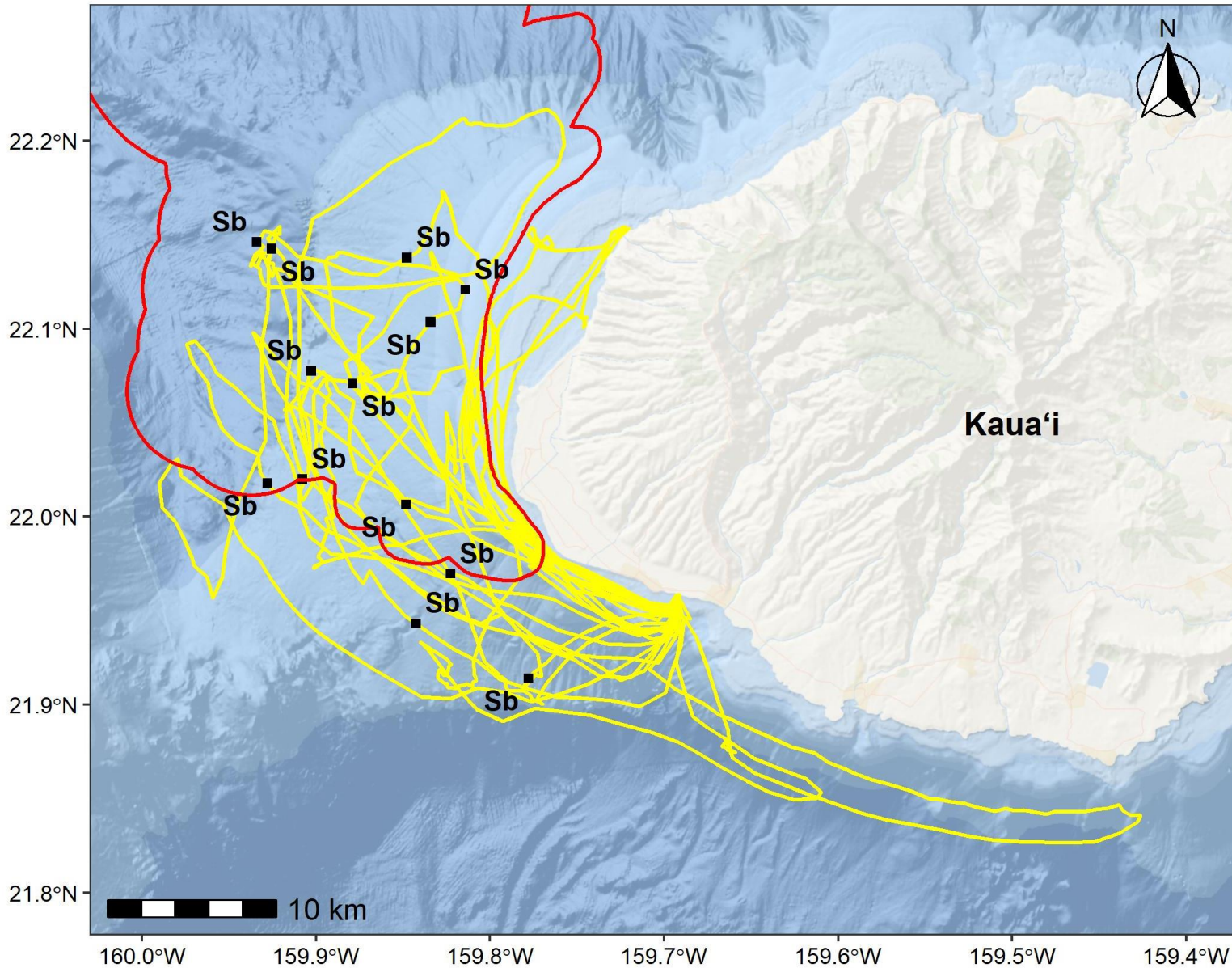


- Access to PMRF limited on 3 of 14 days due to live-fire exercises
- 1,252 km (82.2 hours) of on-water effort
- 35 encounters with 9 species of marine mammals (1 Hawaiian monk seal, 8 species of odontocetes)
- 4 genetic samples (1 Blainville's beaked whale, 1 melon-headed whale, 2 false killer whales)
- 14 satellite tags deployed (12 SPLASH10-F, 1 SPLASH10, 1 SPOT6), data from 13 of 14



Hawaiian monk seal (*Neomonachus schauinslandi*)

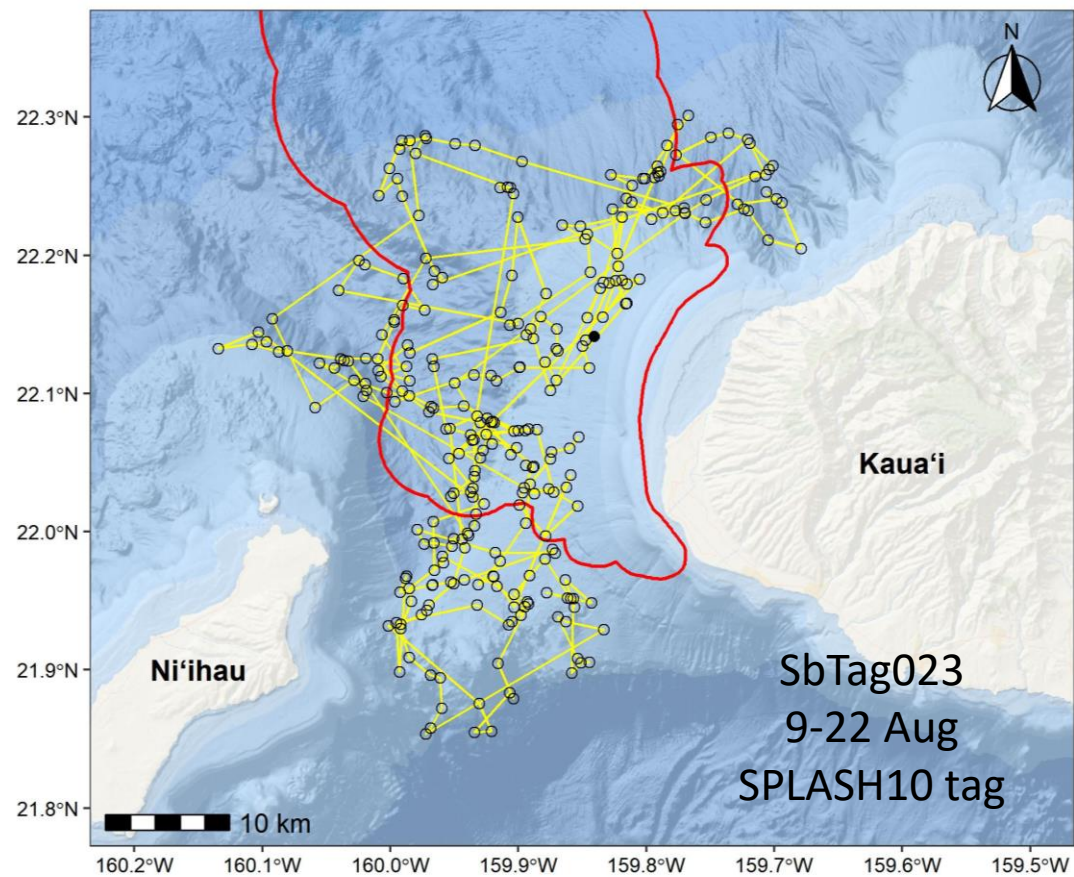
# Rough-toothed dolphins (*Steno bredanensis*)



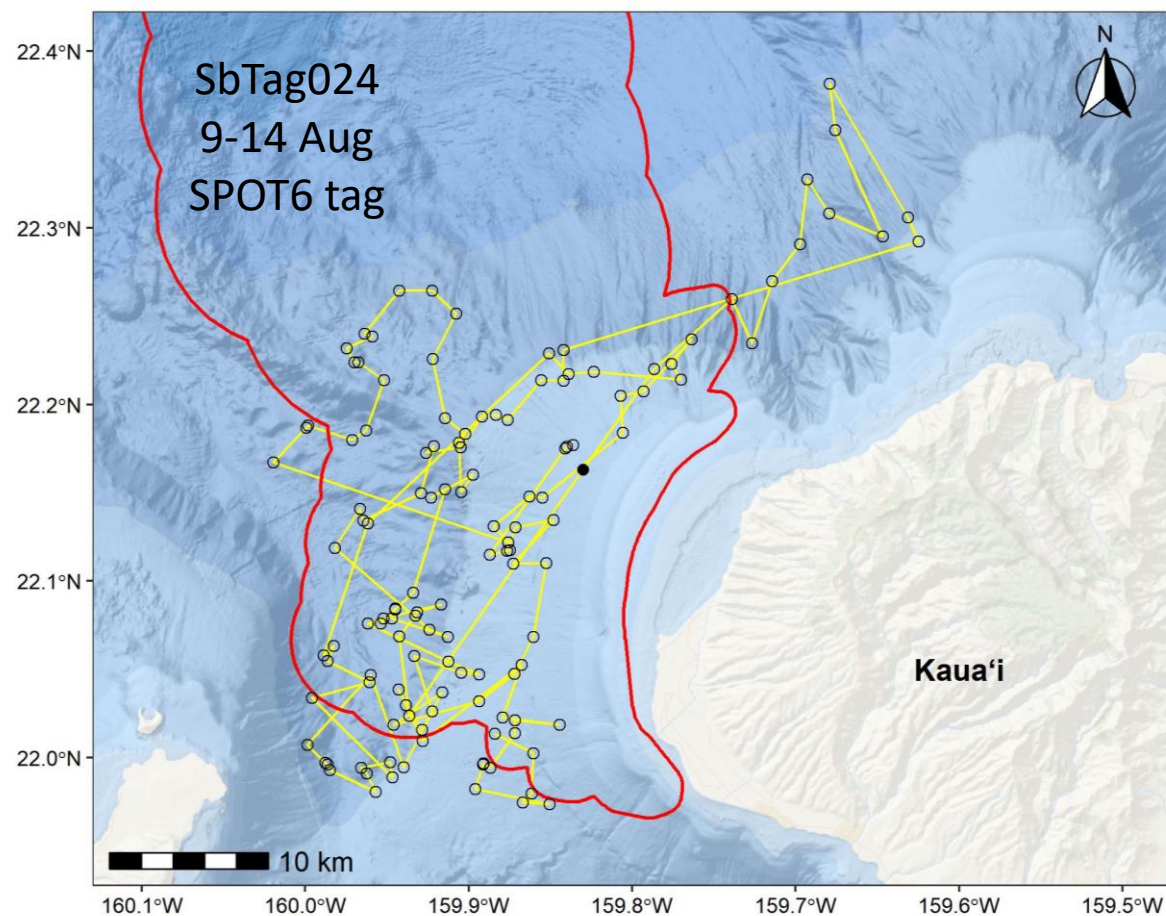
- Low-priority species for Navy
- Most frequently-encountered odontocete (13 sightings - 34% of all odontocete sightings)
- Took 8,059 photos
- Deployed one SPOT6 tag and one SPLASH10 tag



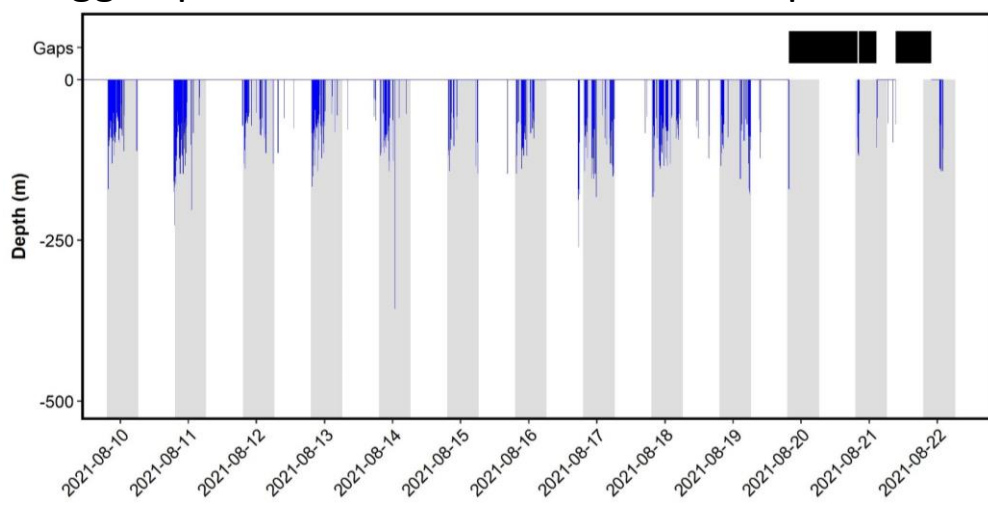
Diving  
behavior  
paper from  
prior Kaua'i  
tagging



Tagged pre-Phase A, Phase A, Phase B, post-Phase B



pre-Phase A, Phase A







# Behavioral responses to predatory sounds predict sensitivity of cetaceans to anthropogenic noise within a soundscape of fear


Patrick J. O. Miller<sup>a,1,2</sup> , Saana Isojunno<sup>a,2</sup>, Eilidh Siegal<sup>a</sup>, Frans-Peter A. Lam<sup>b</sup>, Petter H. Kvadsheim<sup>c</sup>, and Charlotte Curé<sup>d</sup>

Edited by Gerardo Ceballos, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico; received August 12, 2021; accepted January 24, 2022

MARINE MAMMAL SCIENCE, (Month 2019)  
© 2019 Society for Marine Mammalogy  
DOI: 10.1111/mms.12580



Acoustic observation of the reaction of rough-toothed dolphin (*Steno bredanensis*) to vocalizations, most likely from killer whales (*Orcinus orca*), off Kaua'i

**SUSAN M. JARVIS** <sup>1</sup>, Ranges, Engineering and Analysis Department, Naval Undersea Warfare Center, 1176 Howell Avenue, Newport, Rhode Island 02841, U.S.A.; **E. ELIZABETH HENDERSON**, Navy Marine Mammal Program, SPAWAR System Center Pacific, 53560 Hull Street, San Diego, California 92152, U.S.A.; **TIFFINI J. BROOKENS**, Marine Mammal Commission, 4340 East West Highway, Bethesda, Maryland 20814, U.S.A.; **DANIEL L. WEBSTER**, Cascadia Research Collective, 218½ 4th Avenue West, Olympia, Washington 89501, U.S.A.

Kaua'i July 2011 chasing rough-toothed dolphins



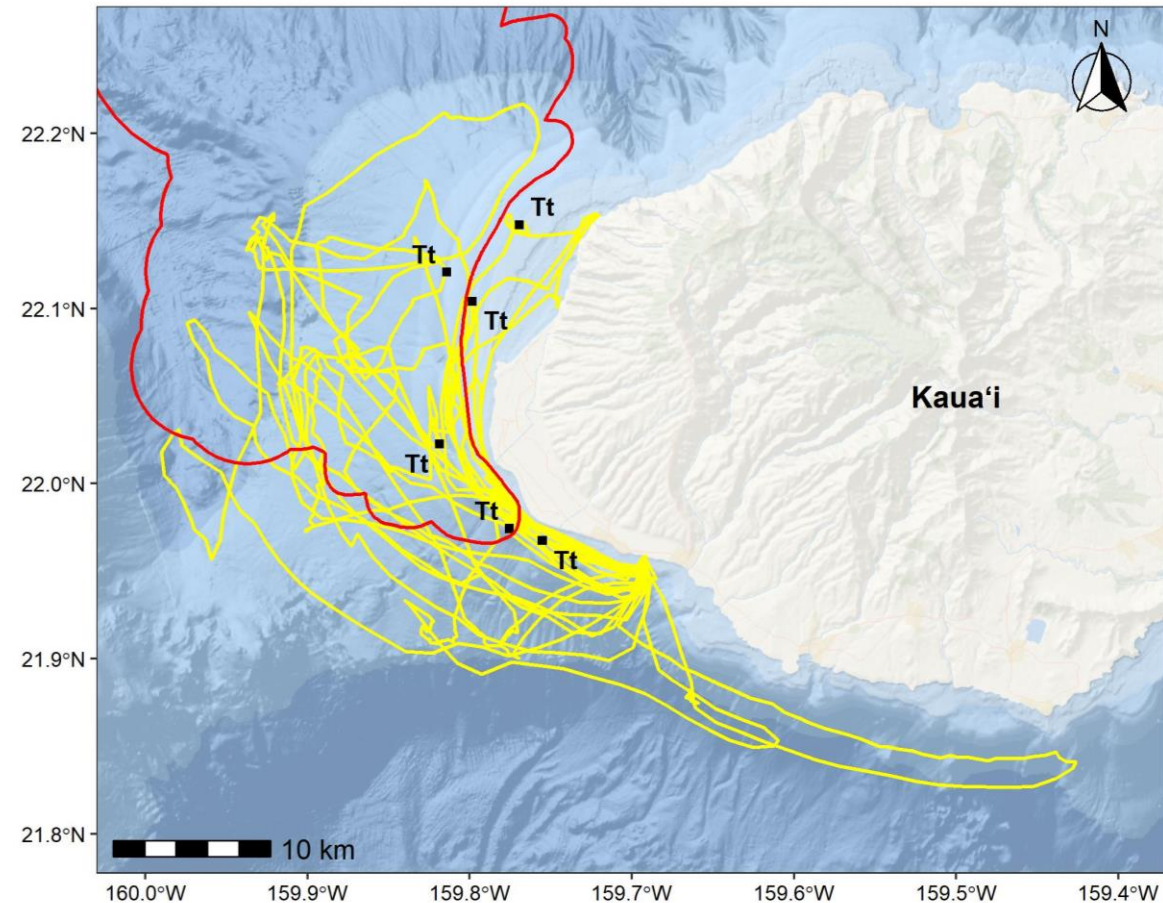
© Robin W. Baird/Cascadia Research

# Common bottlenose dolphins (*Tursiops truncatus*)

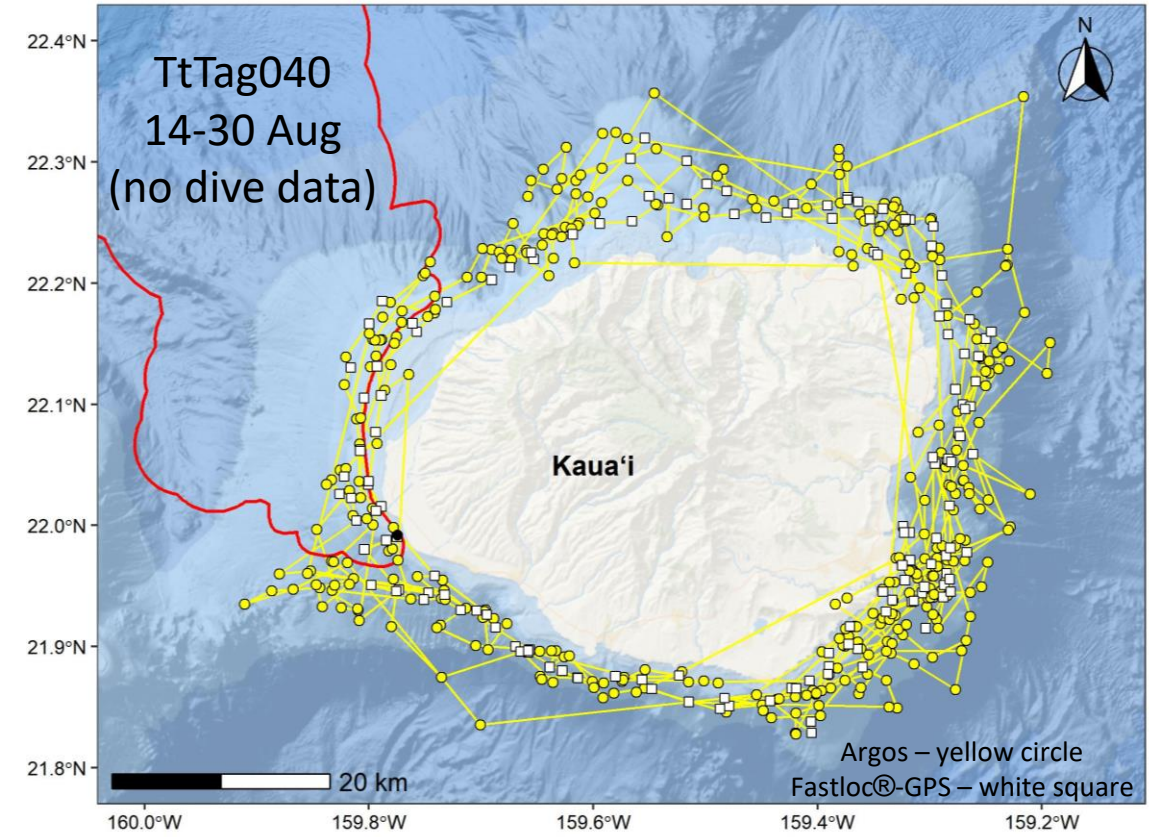
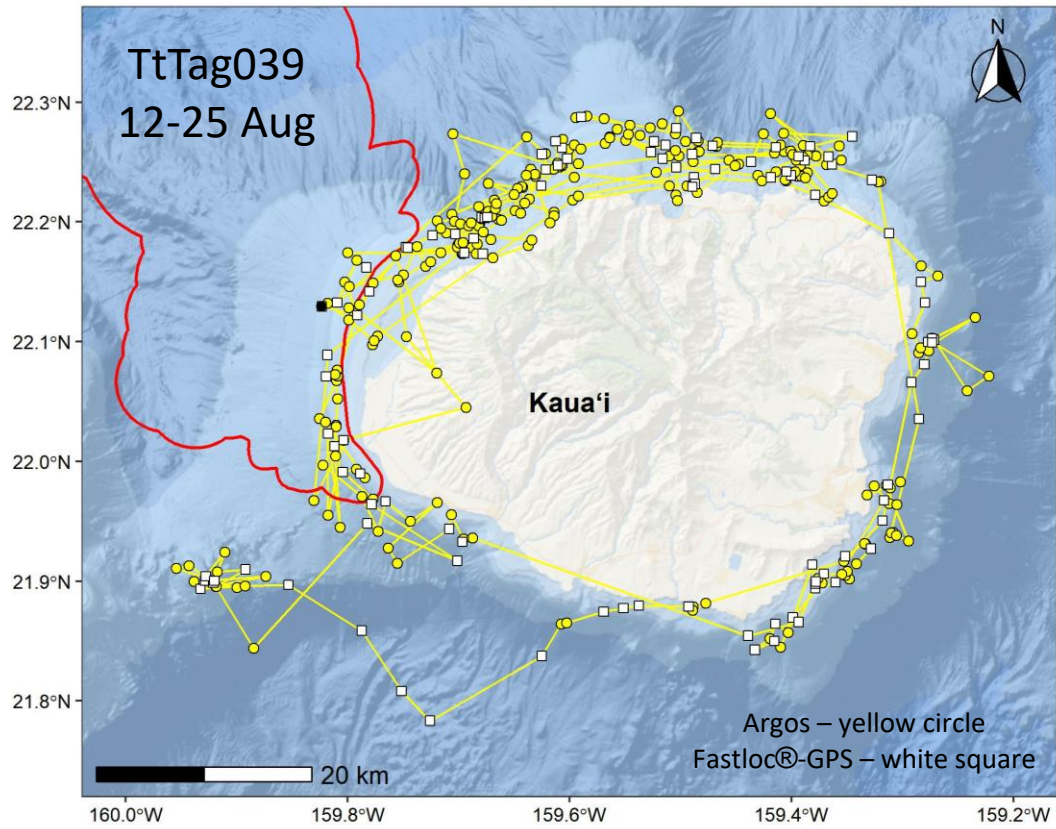
- Six encounters (three on/three adjacent to PMRF), two from acoustic detections
- Took 6,428 photos
- Two individuals tagged (SPLASH10-F) in second half of field effort



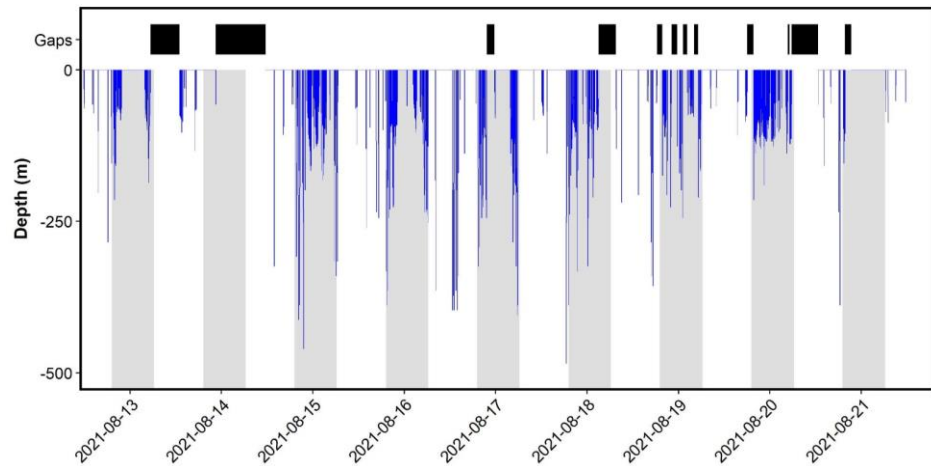
Van Cise et al. 2021  
abundance & trends



- First SPLASH10-F tags deployed on bottlenose dolphins



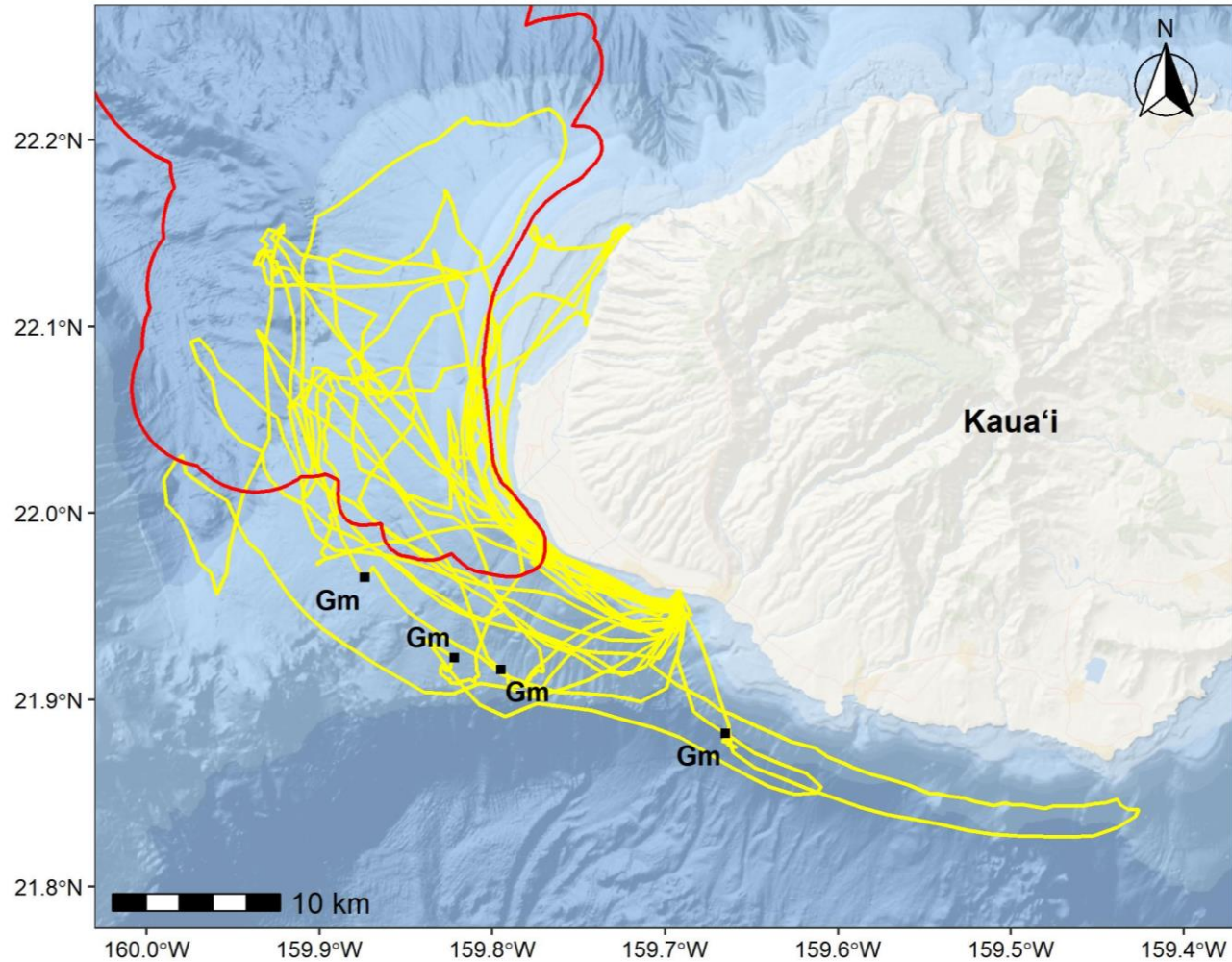
Tagged between Phase A & B, Phase B, post-Phase B

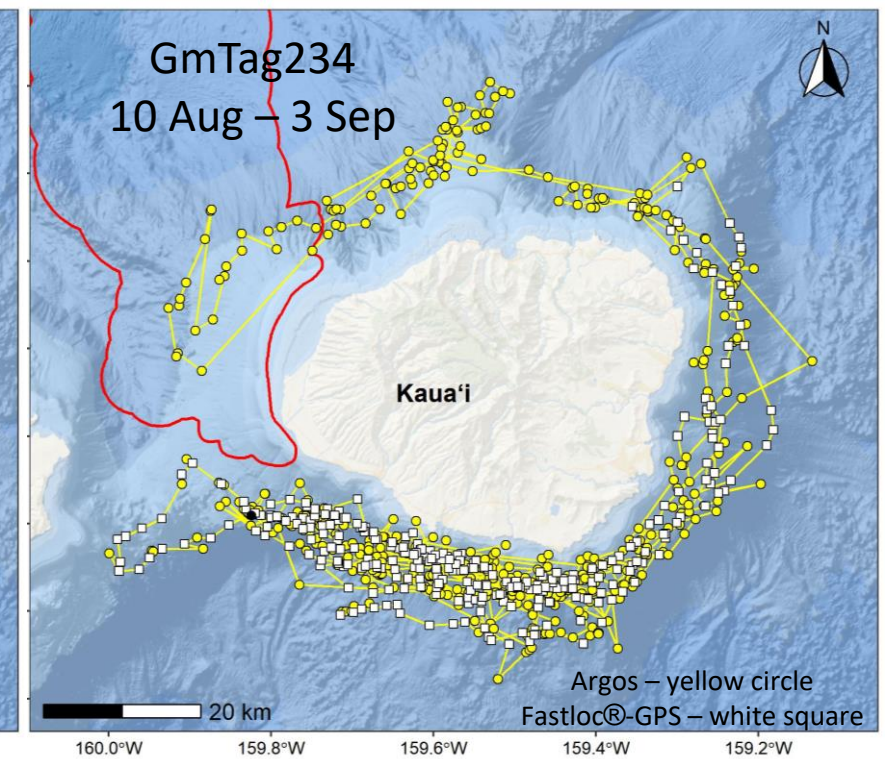
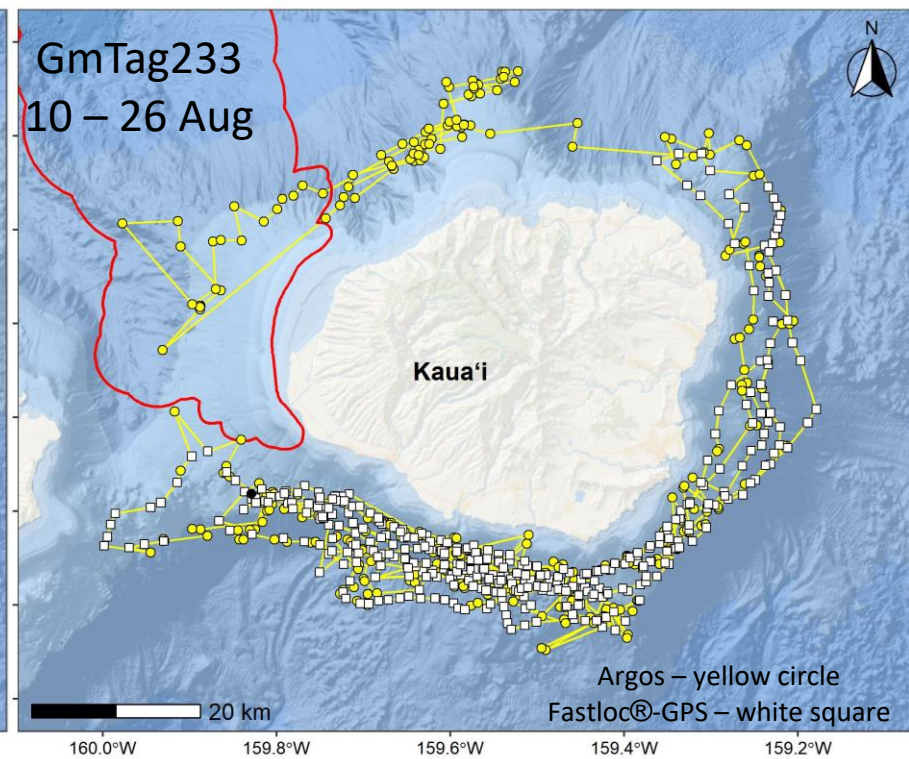
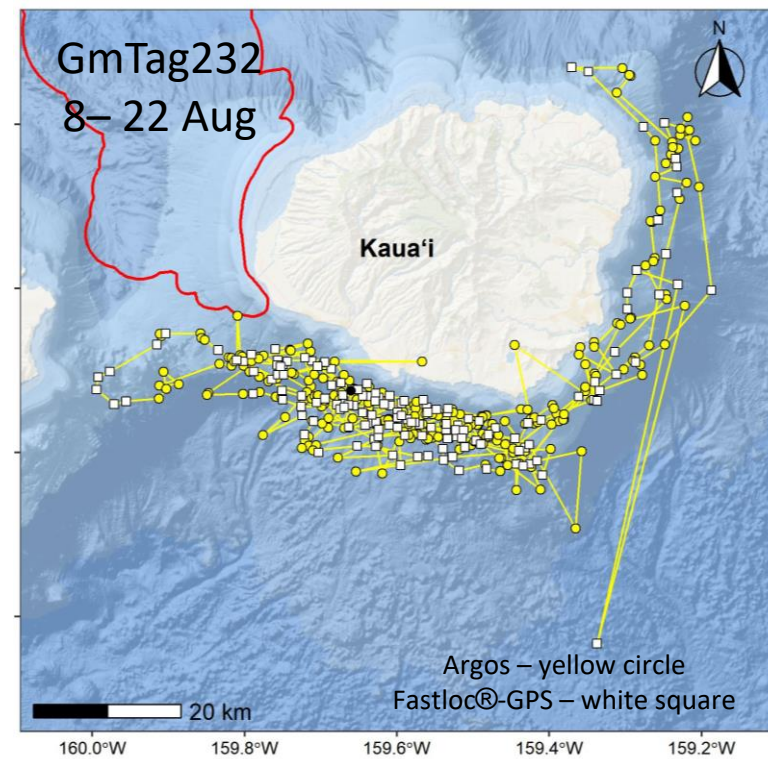


Tagged during Phase A, Phase B, post-Phase B

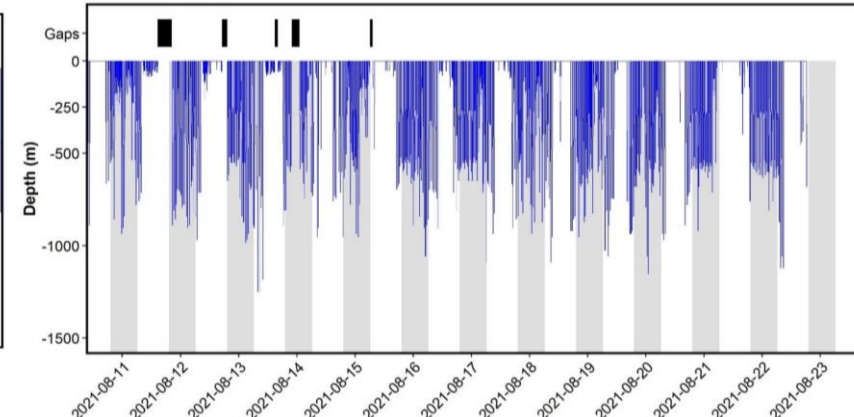
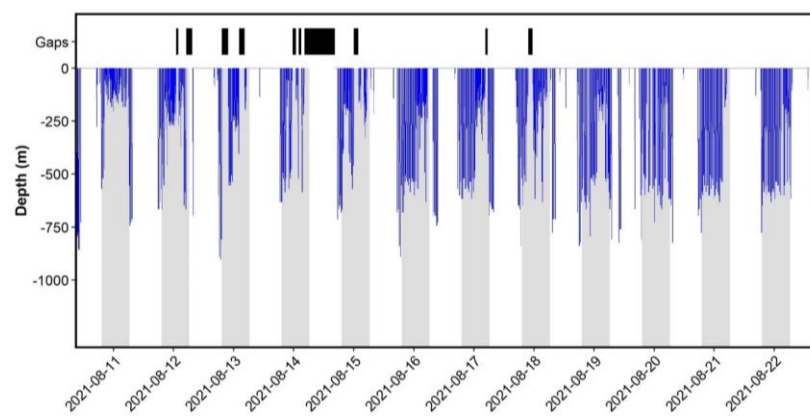
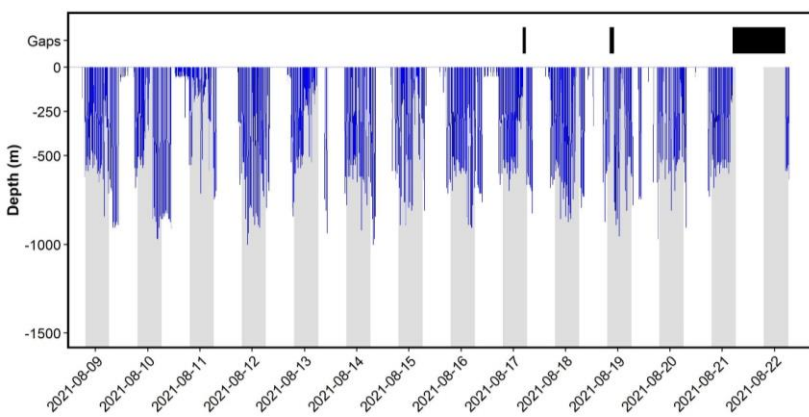
# Short-finned pilot whales (*Globicephala macrorhynchus*)

- Four sightings (groups of 8-35 individuals), one reported by a tour operator
- Took 6,393 photos
- Three SPLASH10-F satellite tags deployed



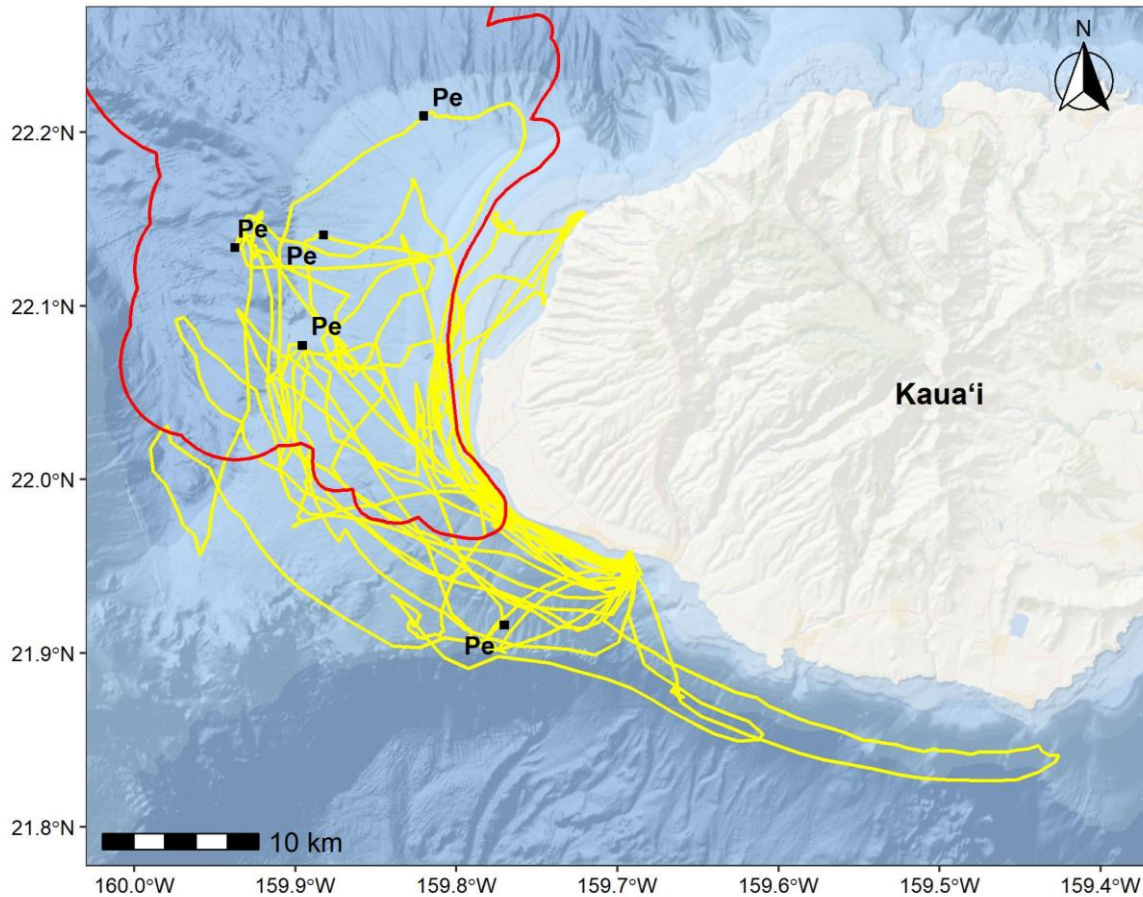


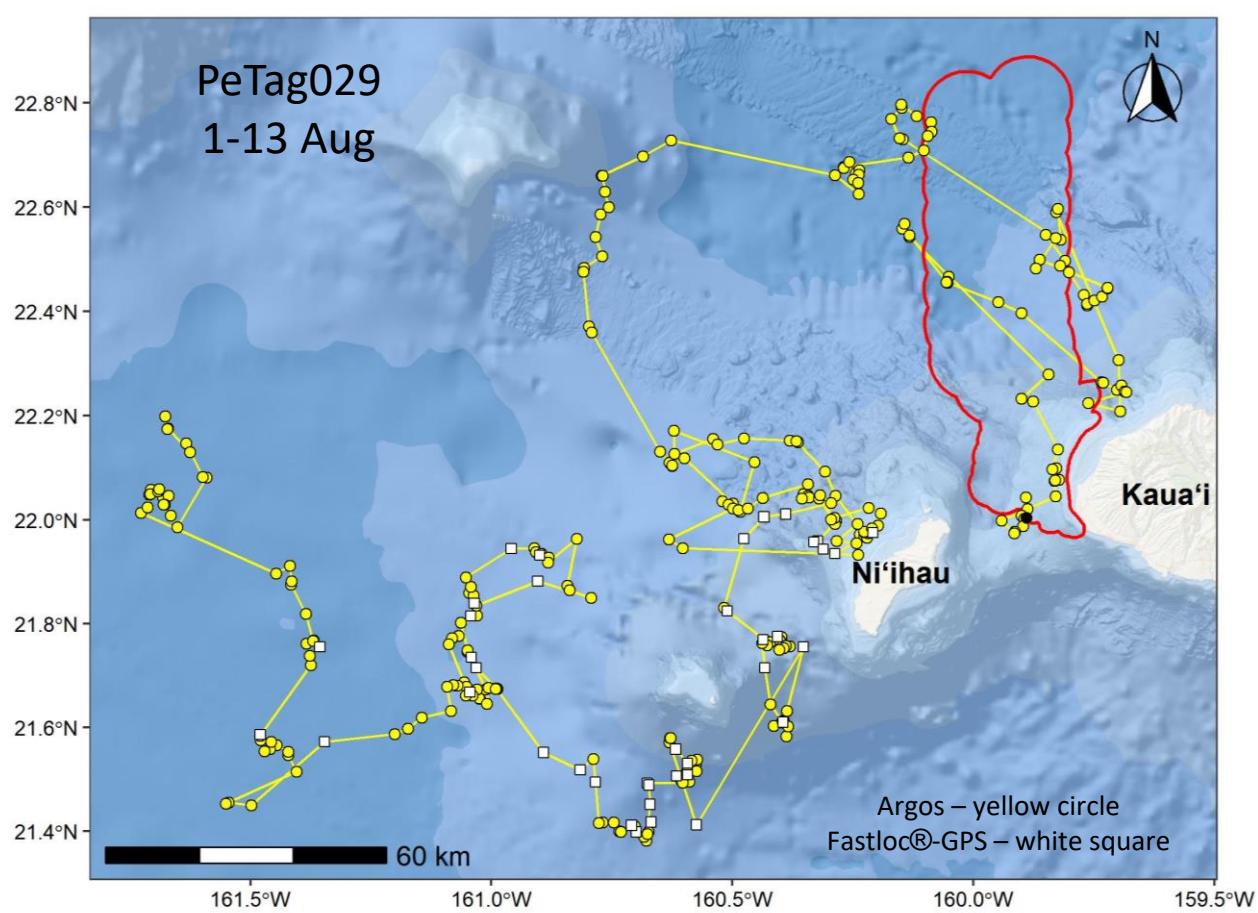
Tagged pre-Phase A, Phase A, Phase B, post-Phase B



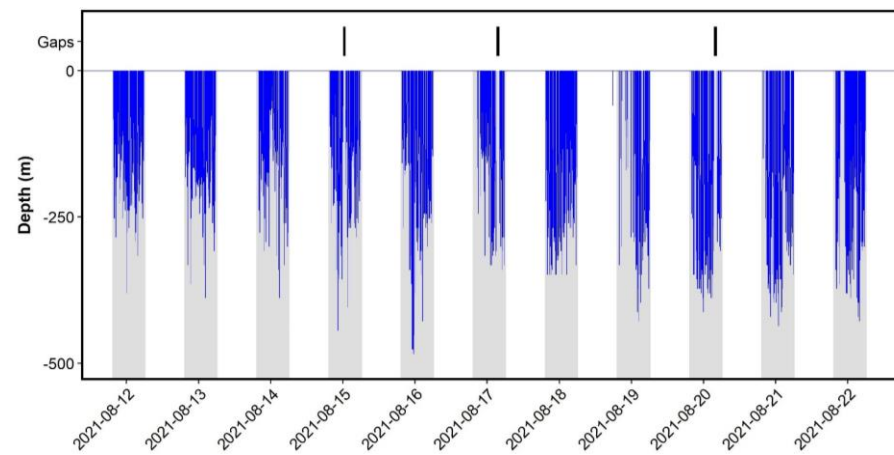
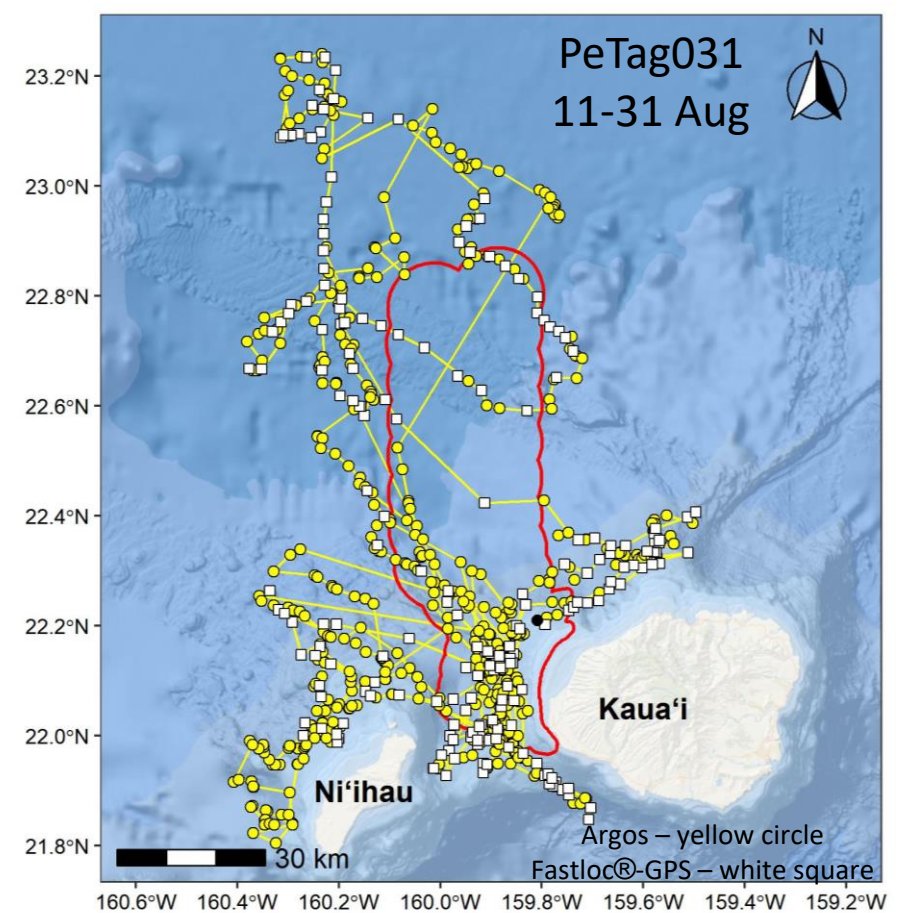
# Melon-headed whales (*Peponocephala electra*)

- Five sightings (group sizes 125 – 250; median=150), four cued by acoustic detections
- Took 11,598 photos
- Four SPLASH10-F tags deployed (one failed)





Tagged pre-Phase A, Phase A

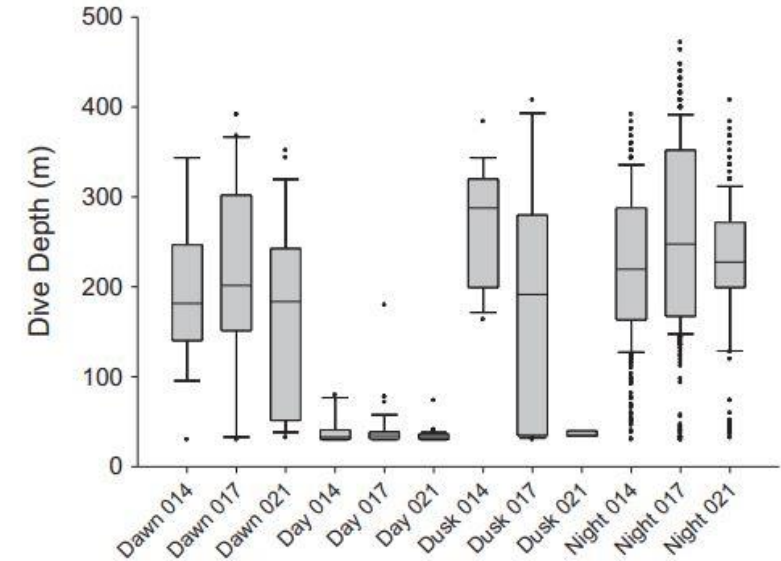
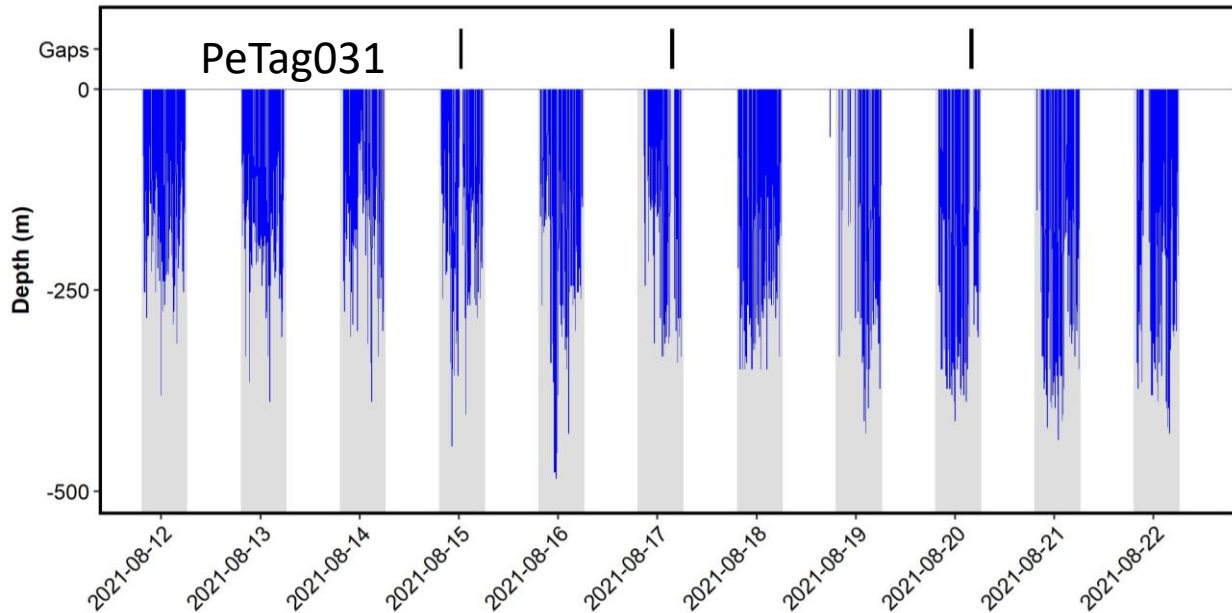


Tagged at start of Phase A, Phase B, post-Phase B



## Stomach contents and diel diving behavior of melon-headed whales (*Peponocephala electra*) in Hawaiian waters

KRISTI L. WEST,<sup>1</sup> Department of Human Nutrition, Food and Animal Science, College of Tropical Agriculture and Human Resources, Agricultural Sciences 216, 1955 East-West Road, University of Hawai'i at Manoa, Honolulu, Hawai'i 96822, U.S.A.; WILLIAM A. WALKER, Marine Mammal Laboratory, National Marine Fisheries Service, NOAA, 7600 Sand Point Way N.E., Seattle, Washington 98115, U.S.A.; ROBIN W. BAIRD, DANIEL L. WEBSTER, and GREGORY S. SCHORR, Cascadia Research Collective, 218 1/2 W. 4th Avenue, Olympia, Washington 98501, U.S.A.



## Diel and lunar patterns in dive behavior of melon-headed whales (*Peponocephala electra*) in the Hawaiian Islands

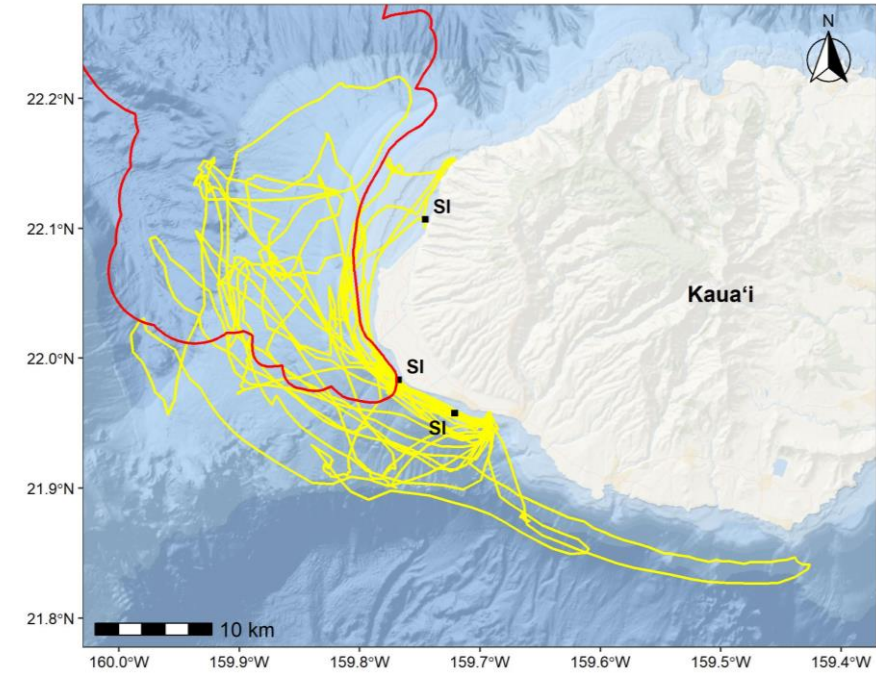
Claire O. Geiman<sup>1\*</sup>; Michaela A. Kratofil<sup>1,2,3</sup>; Robin W. Baird<sup>1</sup>

Submitted to Northwest Student Chapter of the Society for Marine Mammalogy (NWSSMM) conference, April 30, 2022



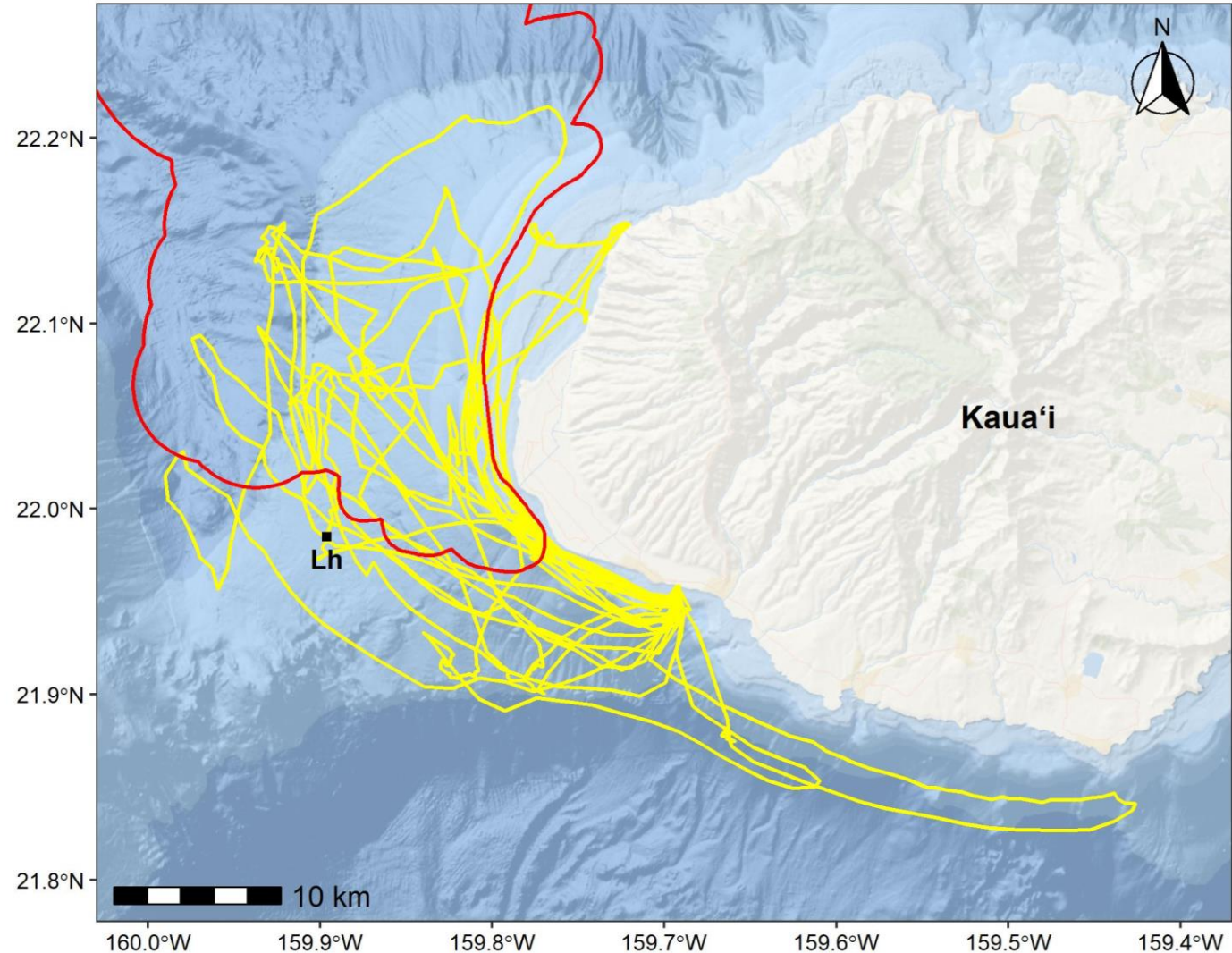
# Spinner dolphin (*Stenella longirostris*)

- Three sightings (groups 45-100 individuals)
- Low priority for Navy (959 photos)



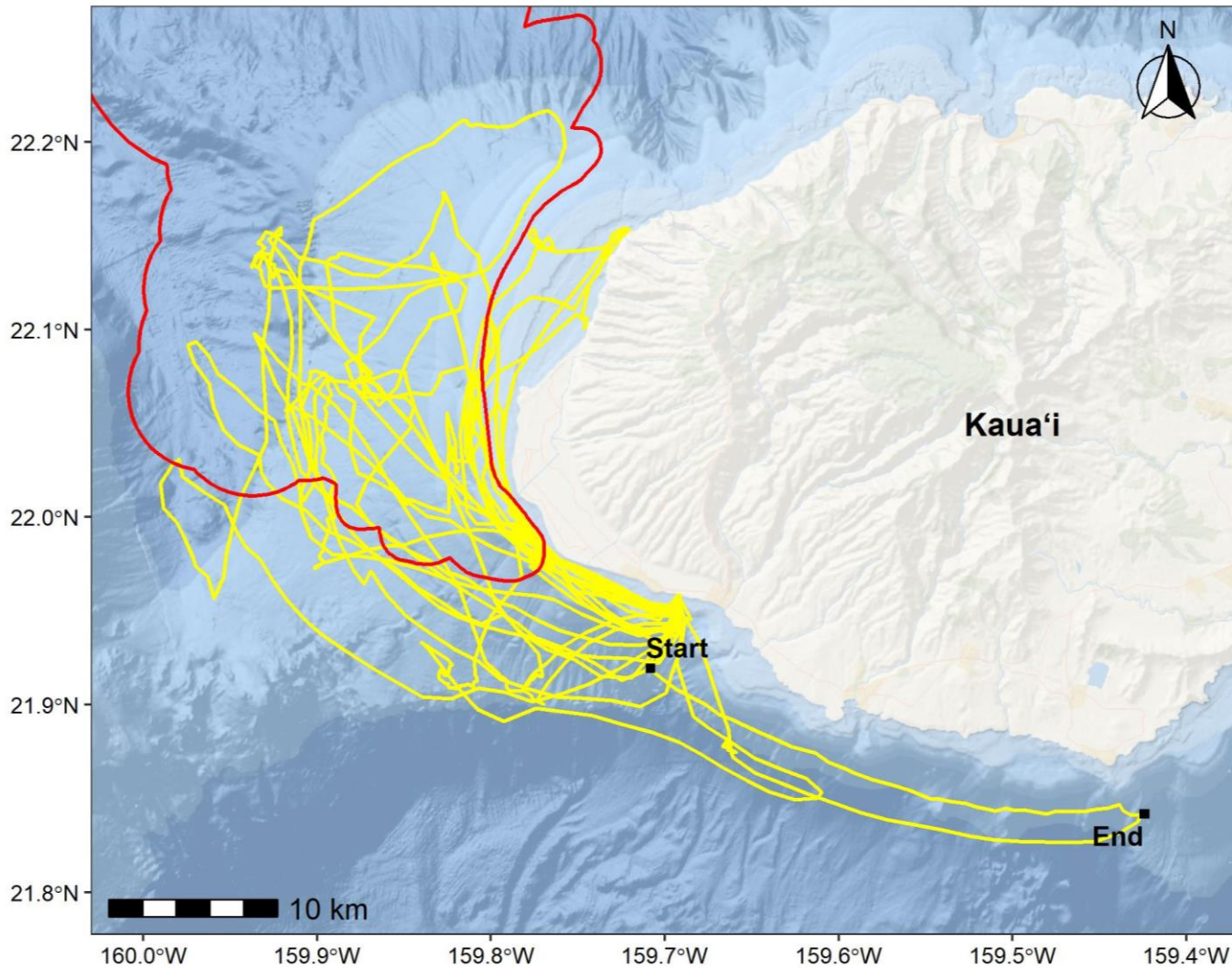
# Fraser's dolphins (*Lagenodelphis hosei*)

- First sighting in CRC's Kaua'i/Ni'ihau effort and likely first sighting off Kaua'i or Ni'ihau
- Only seventh sighting of this species in CRC's Hawai'i-wide effort
- With melon-headed whales just south of PMRF though likely on range



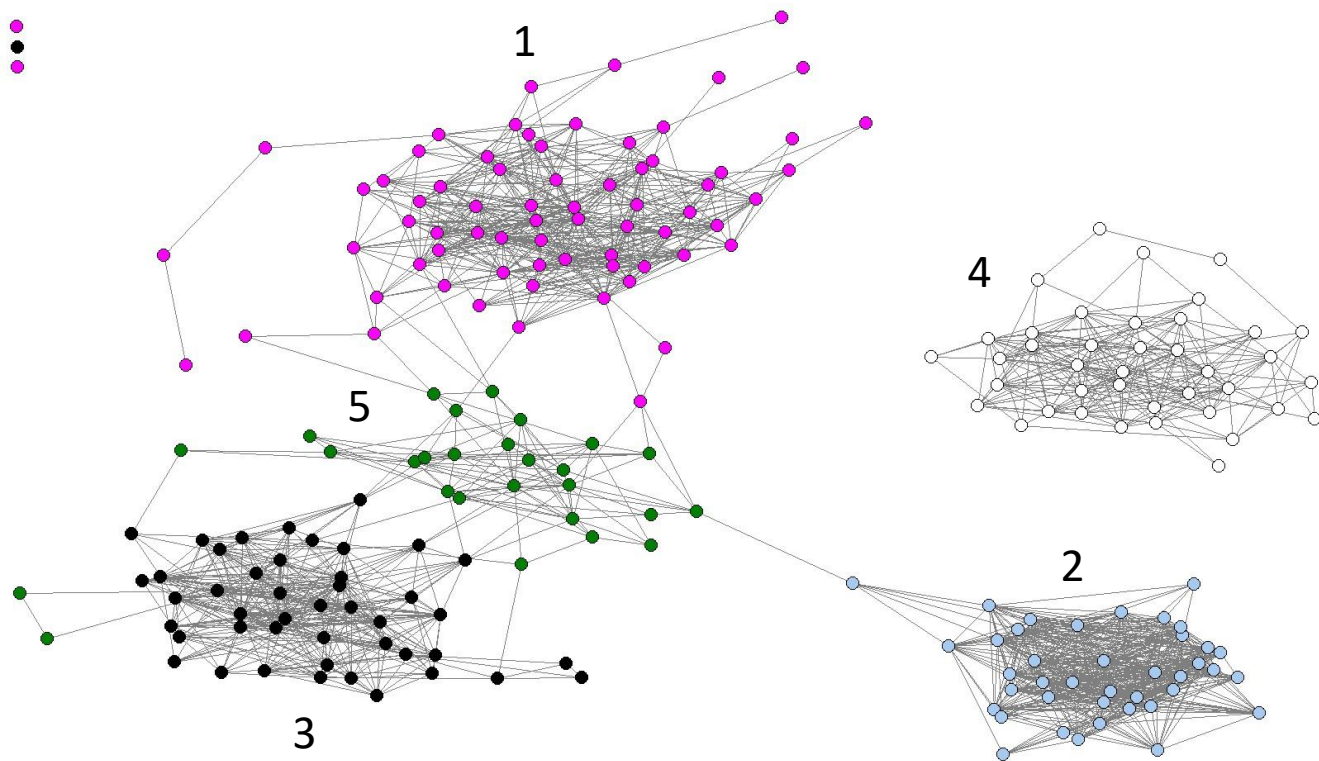
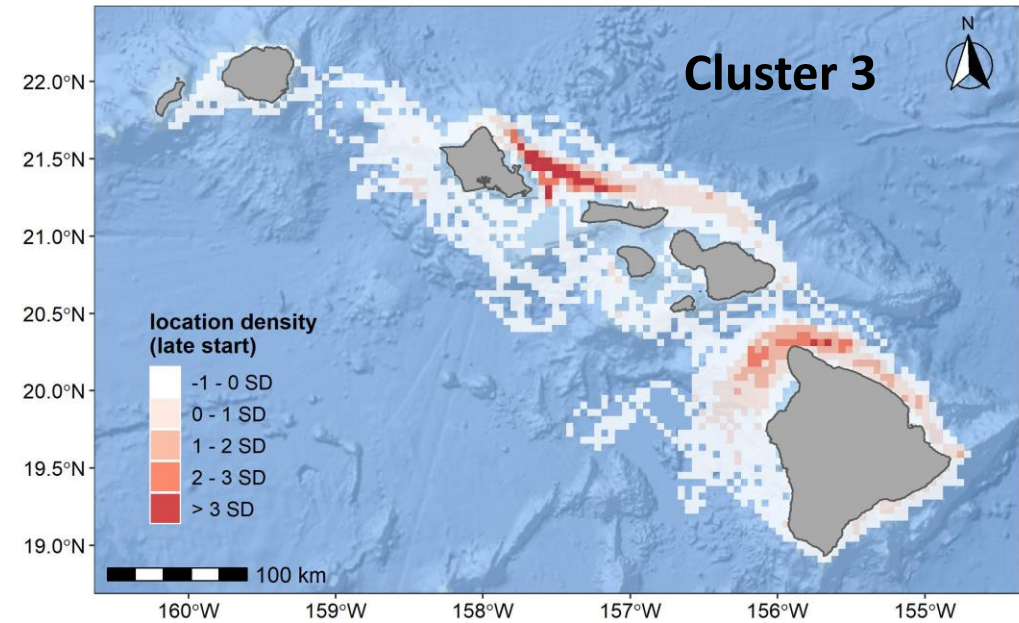
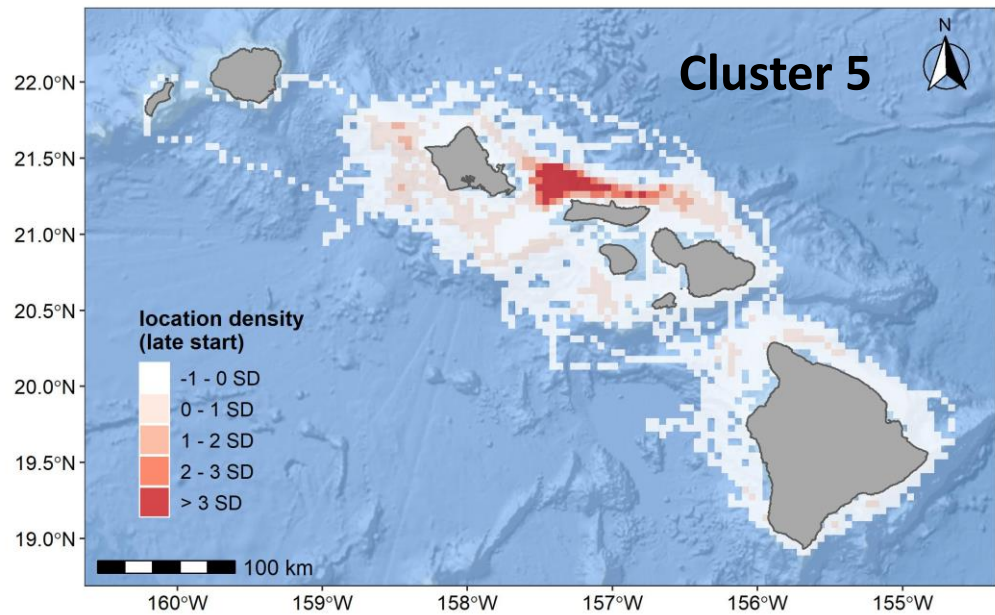
# False killer whales (*Pseudorca crassidens*)

- Only seven previous encounters with this species off Kaua'i/Ni'ihau in CRC effort
- Encounter start time at 0556 (sunrise at 0613), estimated 30 individuals present



- Followed 30.6 km to east
- Obtained 3,631 photos
- Collected two biopsy samples
- Deployed one SPLASH10-F tag (2<sup>nd</sup> SPLASH10-F tag on false killer whale, 9<sup>th</sup> tag with dive data)





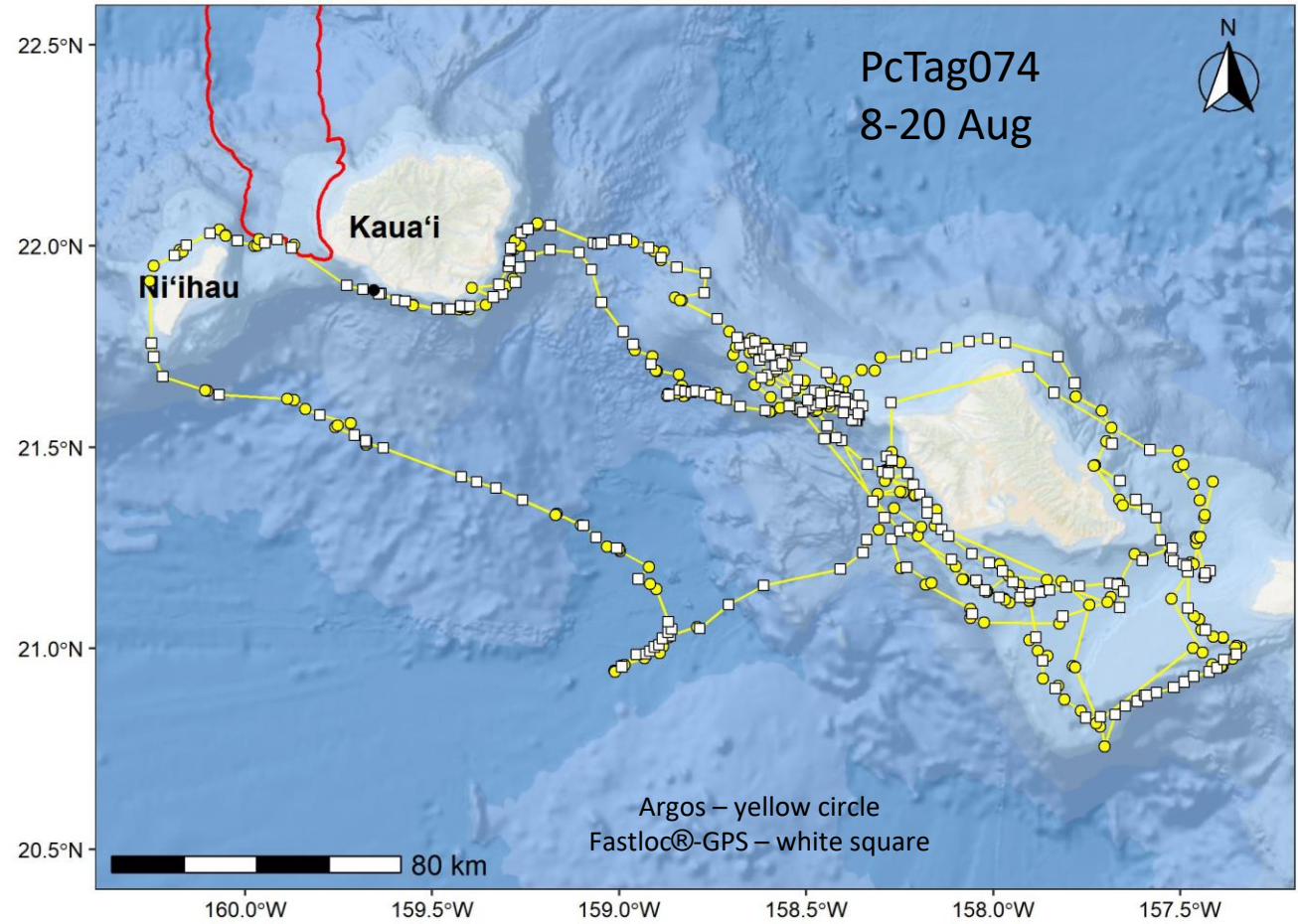
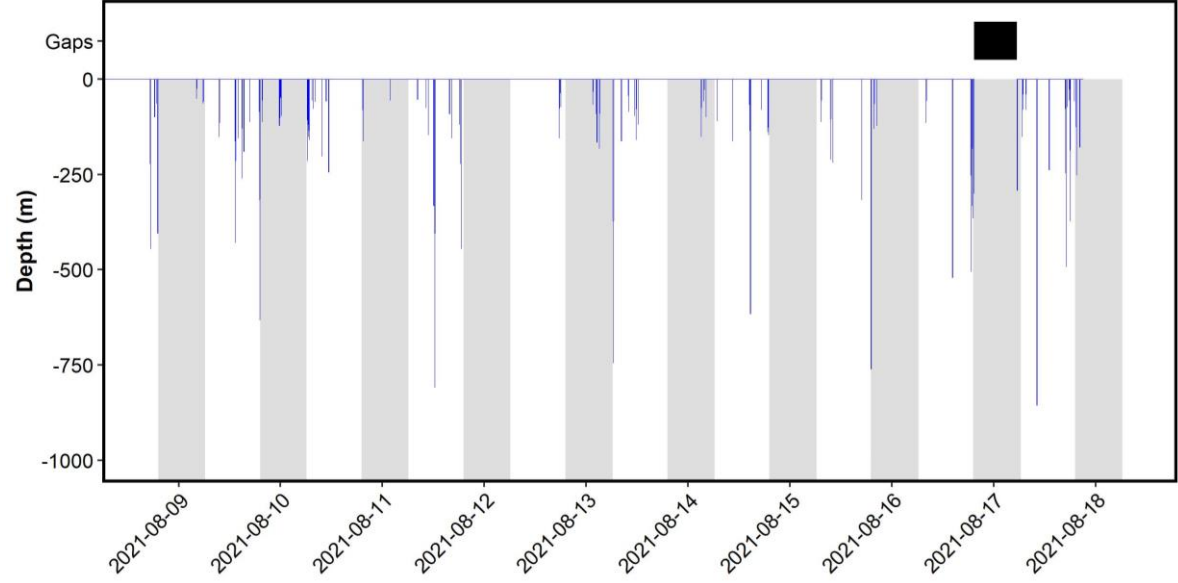
## False killer whale social clusters

Social network using data from 2000 through April 2019, color coded by cluster: 1) pink; 2) light blue; 3) black; 4) white; 5) green.

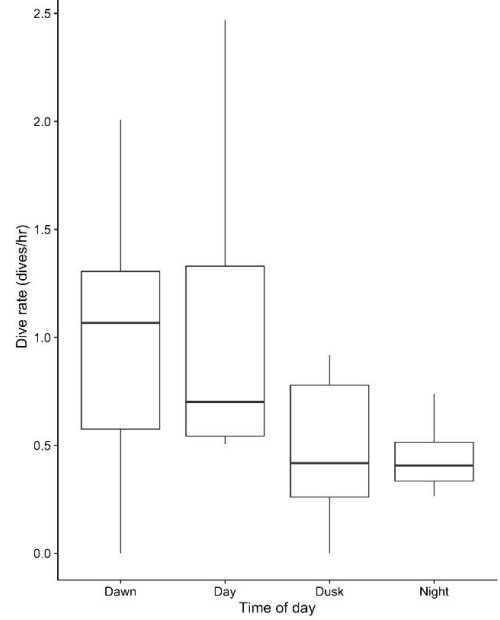
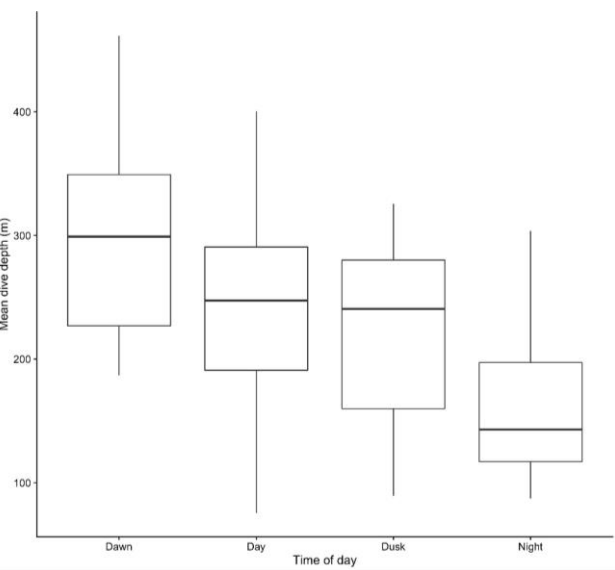
Network restricted to individuals seen on three or more occasions with dyadic association indices (lines) shown of 0.3 or greater.

Baird et al. 2019. Report to the State of Hawai'i





Tagged pre-Phase A, Phase A, Phase B



**Beneath the surface: Diving behavior of false killer whales from two populations across diel and lunar cycles in Hawaiian waters**

Jacquelyn F. Shaff<sup>1,2</sup>, Michaela A. Kratofil<sup>2,3,4</sup>, Robin W. Baird<sup>2</sup>  
<sup>1</sup>School of Marine and Environmental Affairs, University of Washington, Seattle, WA, USA – jfshaff@uw.edu, <sup>2</sup>Cascadia Research Collective, Olympia, WA, USA, <sup>3</sup>Department of Fisheries, Wildlife, and Conservation Science, Oregon State University, Corvallis, OR, USA, <sup>4</sup>Marine Mammal Institute, Oregon State University, Newport, OR, USA



Cascadia Research Collective  
 non-profit research and education since 1979

UNIVERSITY OF WASHINGTON  
 OREGON STATE UNIVERSITY

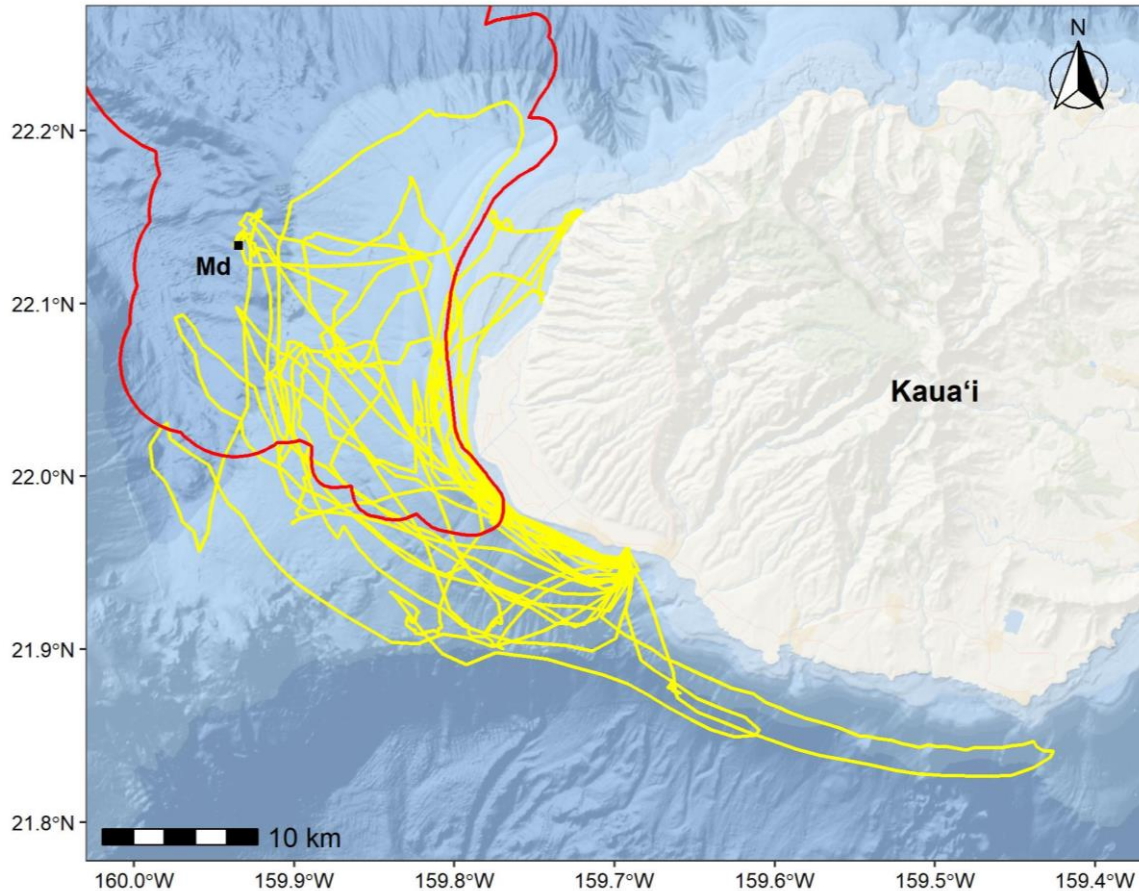
Presented virtually at The 7th International Bio-logging Science Symposium, October 2021

# Blainville's beaked whales (*Mesoplodon densirostris*)

- Directed to group based on acoustic detection
- Seventh CRC encounter off Kaua'i/Ni'i'hau (first since 2014)
- Encounter 11 August 2021, day that Phase A of SCC started
- Seven individuals (one adult male, three female/juvenile pairs)

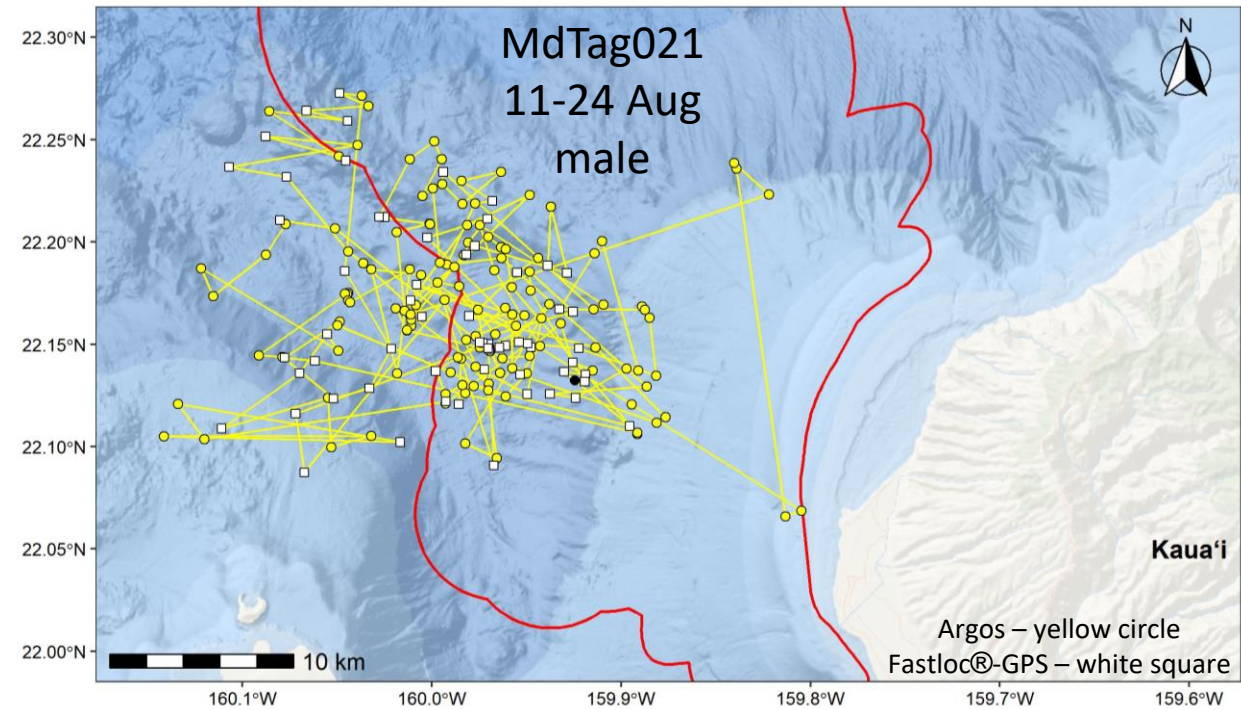
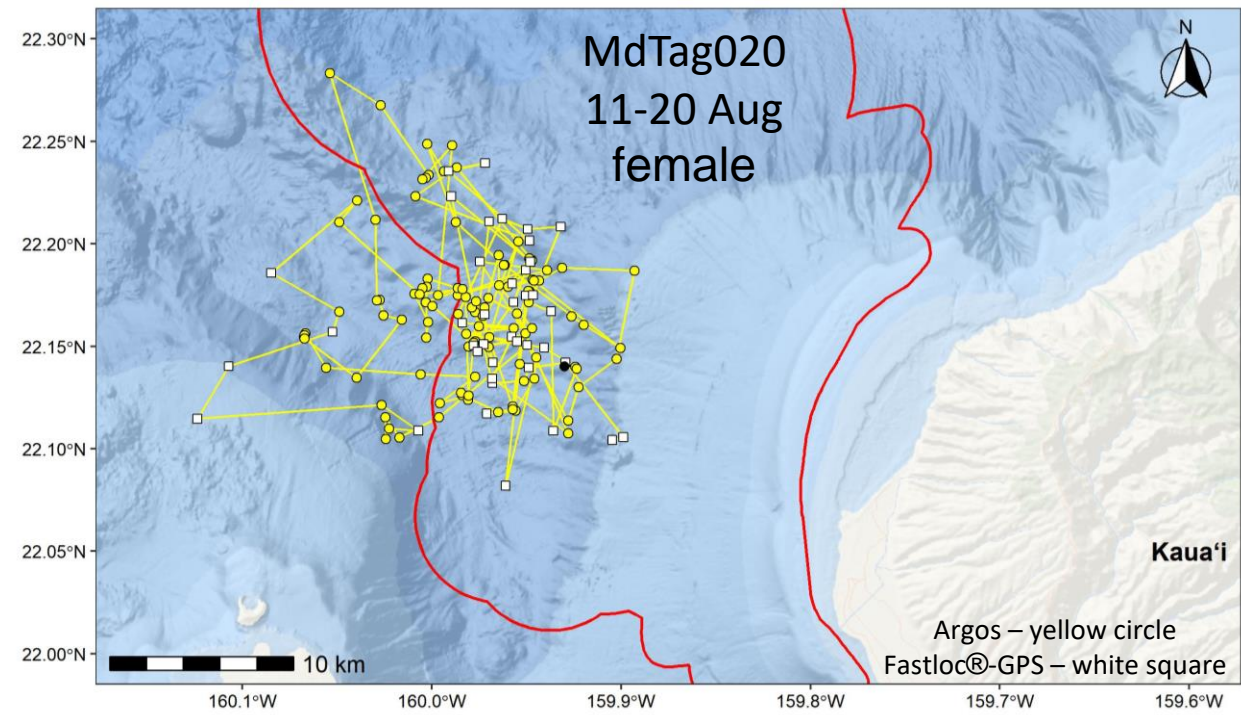
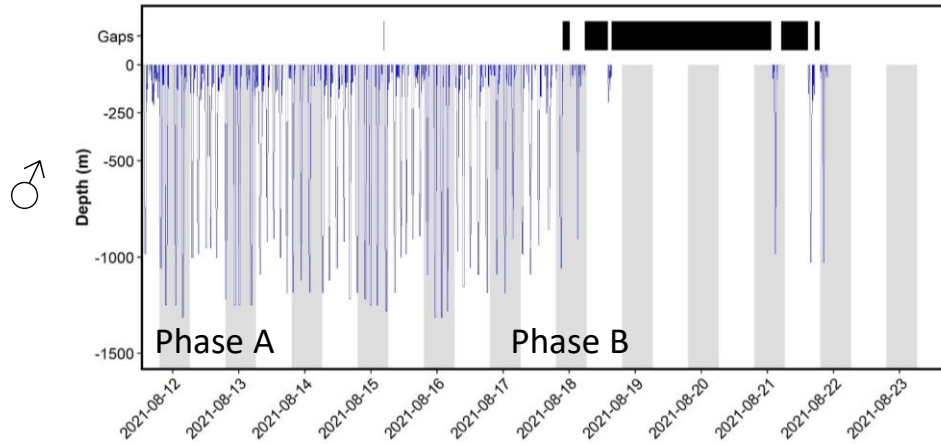
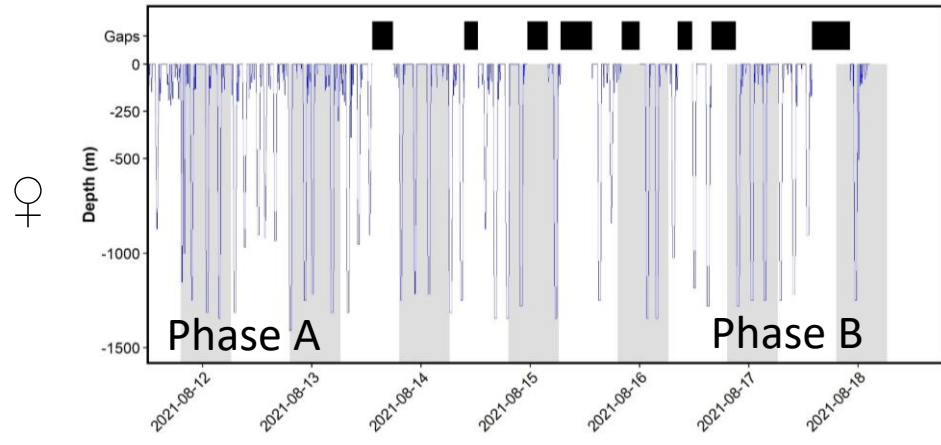


Background  
on beaked  
whales in  
Hawai'i





# Two SPLASH10-F tags deployed





# Summary of accomplishments

- Data from 13 satellite tags from six species (11 with Fastloc<sup>®</sup>GPS and 11 with behavior/dive data)
- Temporal overlap with Phase A of SCC for all, for Phase B for 11 tags
- Dive data contributions to species-specific analyses for melon-headed whales and false killer whales

## Next steps (pending funding)

- Photo-ID matching to determine sighting histories, population identity, and previous tagging or biopsy history
- Assessment of tag location data to determine spatial proximity to MFAS
- Analyses of tag location data to assess spatial use in relation to MFAS exposure
- Analyses of dive data in relation to SCC phases

