



Insights into Foraging Behavior from Multi-day Sound Recording Tag Deployments on Cuvier's Beaked Whales (*Ziphius cavirostris*) in the Southern California Bight



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Key Personnel

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- Wildlife Computers
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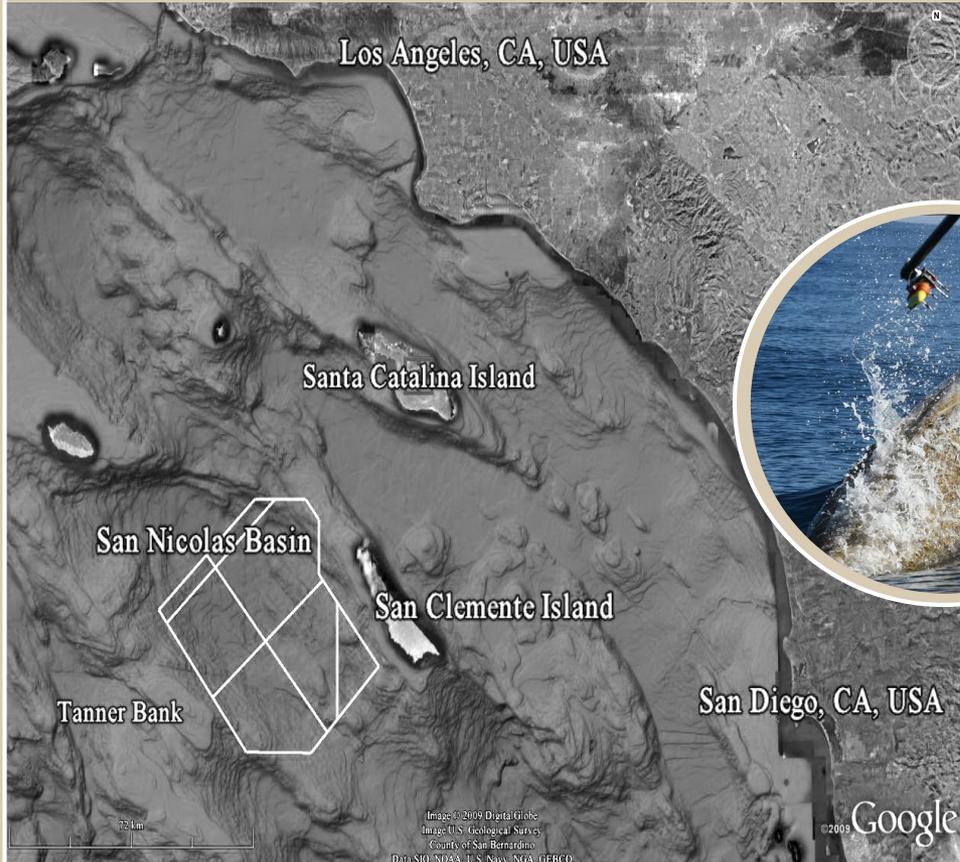
Leveraged Projects

- Pacific Fleet:
 - Beaked whale demographics through photo-ID and biopsy.
- ONR:
 - SMRT tag development
 - Zc comparative site assessment/Isla Guadalupe
 - Zc PCoD
- ESTCP:
 - Sonar detector/GPS LIMPET
- Calvin University:
 - Open-source tag calibration and analysis tools



BACKGROUND-METHODS

WHERE:



HOW:

- Hi-res, multi-day, dart-attached archival ‘Sound and Motion, Recording and Transmitting’ tags (**SMRT**) recorded continuous acoustic data (96 kHz)
- Manual review of wav files from Cuvier’s beaked whales using PAMGuard:
 - Foraging bouts
 - Total number of clicks from tagged individual
 - Presence of conspecifics
 - Anthropogenic noise

WHY:

Fine scale foraging behavior across multiple days to help inform acoustic density estimations, inter-and intra-individual variation in foraging behavior and responses to sonar



KEY HIGHLIGHTS



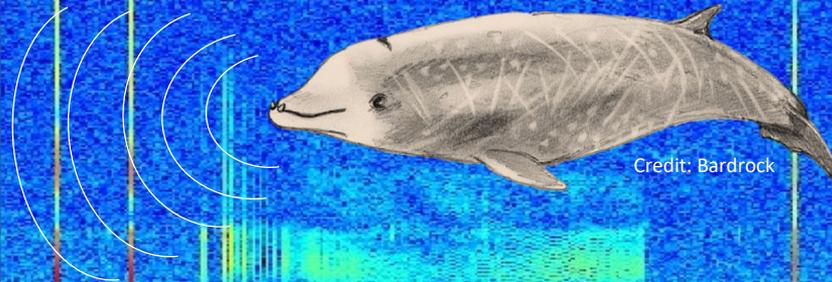
- Analyzed deployments from **6** individual Zc
- **400+** Hours of Recordings

- Dive pattern consistent with previous studies

- 99 Foraging events without anthropogenic activity
- 258,522 clicks manually identified and extracted
- 2,412 buzzes manually identified and extracted

- **52 Daytime Dives:**
 - Duration = 67.5 min (10.1)
 - Clicking = 32.7 min (6.7)
 - # of clicks = 2,837 (529)
- **35 Nighttime Dives:**
 - Duration = 72.8 min (11.8)
 - Clicking = 28.9 min (9.6)
 - # of clicks = 2,390 (682)

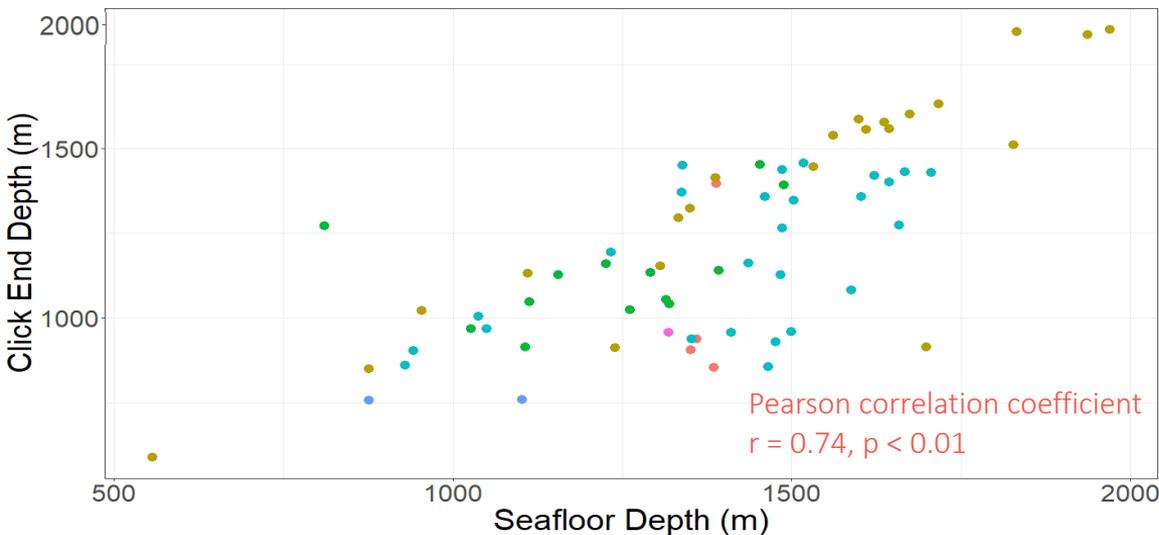
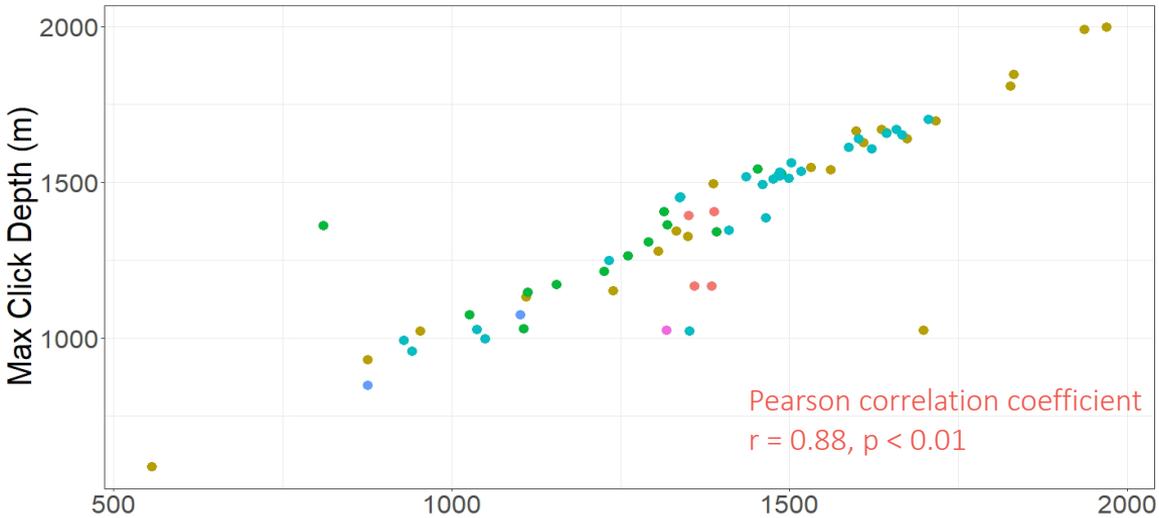
Mean and SD (in parentheses)



- **Click rate**
= 1.43 clicks/sec (0.2)
- **Click Start Depth**
= 438 m (NA)
- **Click End Depth**
= 1,224 m (NA)

Mean and SD (in parentheses)





Foraging depth was strongly correlated with bottom depth

Tag ID

- Zica-20190113-151361
- Zica-20191012-144029
- Zica-20191012-145101
- Zica-20191111-94810
- Zica-20191117-195993
- Zica-20200106-195994



WHY THIS WORK IS IMPORTANT

- Use of SMRT tags provides **finer detail of foraging behavior** than we get from typical satellite tags
- Better **understanding of baseline behavior**
- Individual variation **demonstrates value of longer duration acoustic recordings**
- Ensures **future models are robust**
- Aids in understanding **responses to anthropogenic noise**



Additional Presentations to Check Out

- **Falcone et al.** “Scratching at the Surfacings: Exploring Extended Surface Intervals in Cuvier’s Beaked Whales”.
Conference Presentation – Grand Ballroom
Behavior IV (J1), Friday, 11:30 – 11:45
- **Keene et al.** “Re-sighting Histories of Dart- Attached Tags in Cuvier’s Beaked Whales (*Ziphius cavirostris*) and Fin Whales (*Balaenoptera physalus*) in the Eastern Pacific Ocean”.
Conference Speed Talk –
Ecology - Abundance, Distribution, Occurrence- oh my! (B1), Monday, 13:30 – 15:30
- **Schorr et al.** “Context Matters: Multi-day to Multi-week Sound and Movement Tag Recordings Reveal Individual Variation in Responses of Cuvier’s Beaked Whales to Navy Sonar”.
Conference Presentation – Room 2ABC
Behavior – Human Impacts II (D3), Tuesday, 17:00 – 17:15
- **Sweeney et al.** “Cuvier’s Beaked Whale Behavioral Responses Persist After Conclusion of Some Navy Sonar Exposures”.
Conference Poster – Exhibit Hall
Behavior Group A, Tuesday, 10:30 - 12:00
- **Watwood et al.** “Probability of detection of beaked whale clicks on a distributed bottom-mounted hydrophone array based on data from acoustic recording animal-borne tags”.

