

Marine Mammal Acoustic Survey Findings from Pagan Island, Commonwealth of the Northern Mariana Islands (CNMI)

Shannon Coates¹, Thomas F. Norris¹, Ann Zoidis², Jeff Jacobsen¹, and Sean Hanser³

¹ Bio-Waves, Inc., 364 2nd Street, Suite 3, Encinitas, CA 92024

² Tetra Tech, 1999 Harrison Street, Suite 500, Oakland, CA, 94612

³ Naval Facilities Engineering Command, Pacific, 258 Makalapa Drive, Suite 100, Pearl Harbor, HI 96860

Corresponding author: shannon.coates@bio-waves.net



Background

- ❖ First systematic visual and acoustic marine mammal survey conducted around Pagan Island. (for other results, see Poster # 3, Bay 13, Session B. Zoidis et al.).
- ❖ Pagan Island is a remote volcanic island located in deep waters of the Western North Pacific (**Figure 1**).
- ❖ **Objective: to collect baseline data** in support of the CNMI Joint Military Training Environmental Impact Statement (EIS) because the U.S. Dept. of Defense is considering military training in the vicinity of Pagan Island. (<http://www.cnmijointmilitarytrainingeis.com>)



Figure 1. Map of study area.

Methods

- ❖ Line-transect sampling using a towed hydrophone array system to monitor during daylight hours (concurrent with visual effort).
- ❖ Real-time acoustic monitoring, localization and recording using Ishmael and PAMGuard software.
- ❖ Sonobuoys moored and recorded each night in depths of 30-50m at 2 nearshore sites off sand beaches.
- ❖ Post-processing of all acoustic data conducted using Triton & PAMGuard.

Results

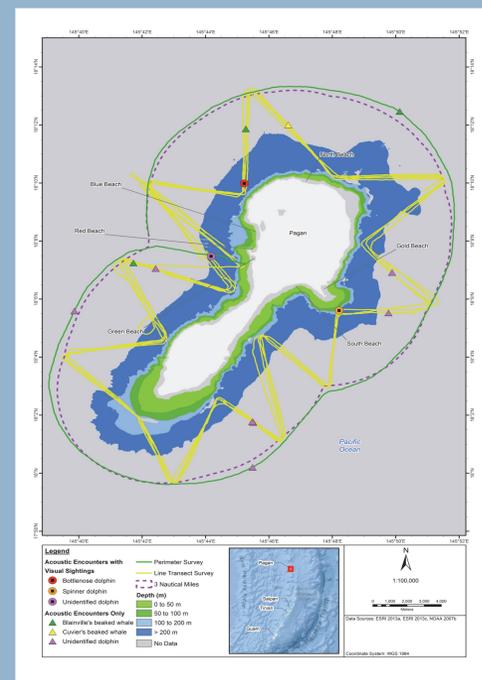


Figure 2. Acoustic encounters during survey.

Cuvier's Beaked Whale

Blainville's Beaked Whale

Unidentified Dolphin

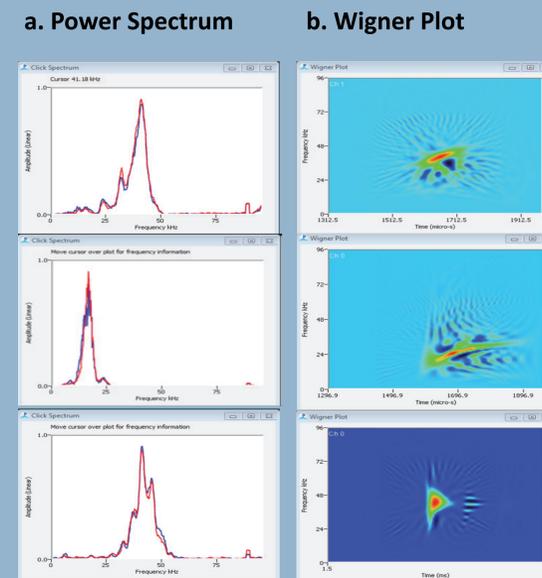


Figure 3. Examples of cetacean click characteristics in PAMGuard software. Panels represent (a) the power spectrum, and (b) the Wigner plot, for a representative click for each species/species group. These plots are used in real-time and post-processing by bioacousticians to identify clicks to species.

Towed Hydrophone Array Surveys

- ❖ Data was monitored in real-time for ~23 hrs. over 190 km during standard line transects (LT).
- ❖ An additional 10 hrs. and 63 km of acoustic data were recorded to hard drive for post-processing.
- ❖ 14 acoustic encounters of marine mammals occurred within 3 nm of shore during LT surveys.
- ❖ Acoustic encounter rate was 0.48/hr (7.4/100km).
- ❖ 10 dolphin groups detected acoustically (**Figure 2**)
 - 2 identified to species by visual team.
 - 3 identified during post-processing.
 - Detection rate = 0.35/hr (5.2/100km)
- ❖ 4 beaked whale groups detected (**Figures 2 & 3**).
 - 3 Blainville's beaked whale groups.
 - Detection rate = 0.09/hr (1.5/100km).
 - 1 Cuvier's beaked whale group.
- ❖ Localization ranges (perpendicular to trackline) were between 1.5 and 1.9 km for Blainville's beaked whales and 0.4 and 0.7 km for dolphins.

Moored Sonobuoy Monitoring

- ❖ Sonobuoys were deployed for 9 nights and recorded for approximately 7 hrs. each night.
- ❖ Approximately 37 hrs. of recordings were made at each of the two beach sites.
- ❖ Dolphins detected on 7 out of 9 nights
- ❖ Sperm whales detected on 1 out of 9 nights

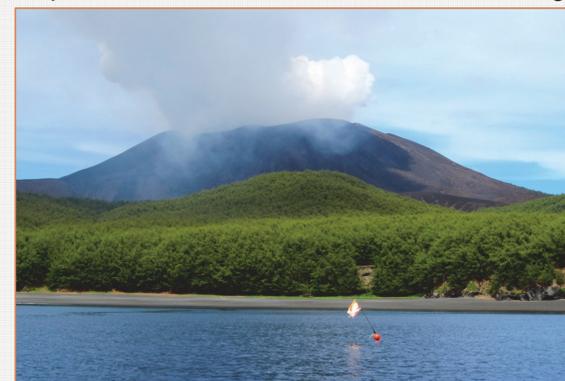


Figure 4. Pagan Island is an active volcanic island that erupted as recently as 2012. Note moored sonobuoy in foreground.

Conclusions

- ❖ Four species/species groups were acoustically detected, two of which (sperm whales, Blainville's beaked whales) were not visually encountered.
- ❖ The sperm whales and beaked whales encountered are considered deep-water species and were not expected to be detected near the island. These detections may be explained by the existence of deep-water habitat very close to shore around this volcanic island.
- ❖ Detection rates of beaked whale species were moderately high, possibly indicating important habitat.
- ❖ Sperm whales detected from nighttime moored sonobuoys, indicate their occurrence near the island.
- ❖ Passive acoustic methods combined with visual methods provided important information that could not have been obtained otherwise.
- ❖ Several species of marine mammals were documented for the first time at this remote and active volcanic island.
- ❖ These findings will allow improved resource management decisions.

Acknowledgements

We acknowledge Marine Corps Forces Pacific for funding the survey effort and Naval Facilities Engineering Command Pacific for technical guidance. Contracting was through AECOM Technical Services, Inc. and Sea Engineering, Inc. We acknowledge and thank the Captain and crew of the *Thorfinn*, Marlon F. Punzalan of Ambyth Shipping Micronesia, Inc., and Paul Stanko, NWS for project support. And finally Erin Oleson PIFSC, NOAA for the research permit.