Passive Acoustic Monitoring for Marine Mammals at Site A in Jacksonville, FL, April – May 2009

Lynne Hodge[1], Melissa Soldevilla[1,2], and Andrew Read[1]

[1]Duke University Marine Laboratory
135 Duke Marine Lab Road
Beaufort, NC 28516

[2]NOAA Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, FL 33149

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Individual technical reports of other HARP deployments are available at:
http://www.navymarinespeciesmonitoring.us/reading-room/

Abstract

A High-frequency Acoustic Recording Package (HARP; Wiggins and Hildebrand 2007) was deployed between April and September 2009 in Jacksonville, FL, at Site A in 82 m. This HARP sampled at 200 kHz for 5 minutes of every 15 minutes and recorded usable data for 54 days between 2 April 2009 and 25 May 2009. Long-Term Spectral Averages (LTSAs) were created for one frequency band (1 kHz – 100 kHz) and scanned for odontocete vocalizations. Vocalizations of sperm whales and unidentified delphinids were detected in the data.

Methods

The April – May 2009 Jacksonville Site A HARP (JAX 01A) was deployed at 30.2771^{o} N, 80.1258^{o} W on 30 March 2009 (recording started on 2 April 2009) and recovered on 16 September 2009 (recording of usable data ended on 25 May 2009, earlier than expected due to a bad memory card in the system). The instrument location is shown in Figure 1. Bottom depth at the deployment site was approximately 82 m. A schematic diagram of the JAX 01A HARP is shown in Figure 2.

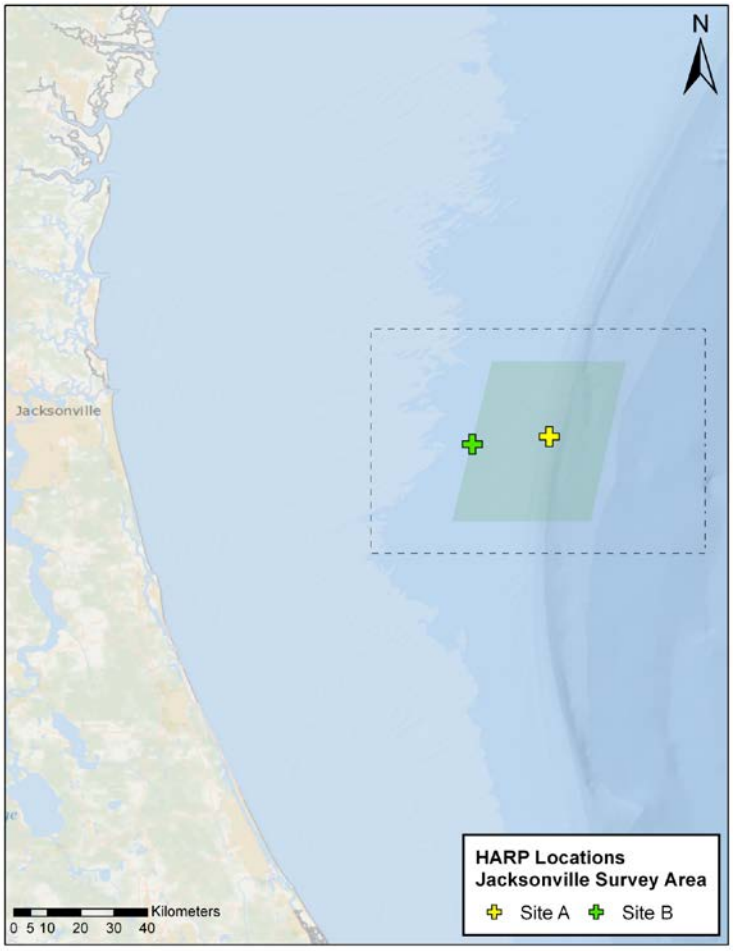

Figure 1. Location of HARP deployment sites in the Jacksonville survey area. The location of the Jacksonville 01A HARP is shown in yellow.

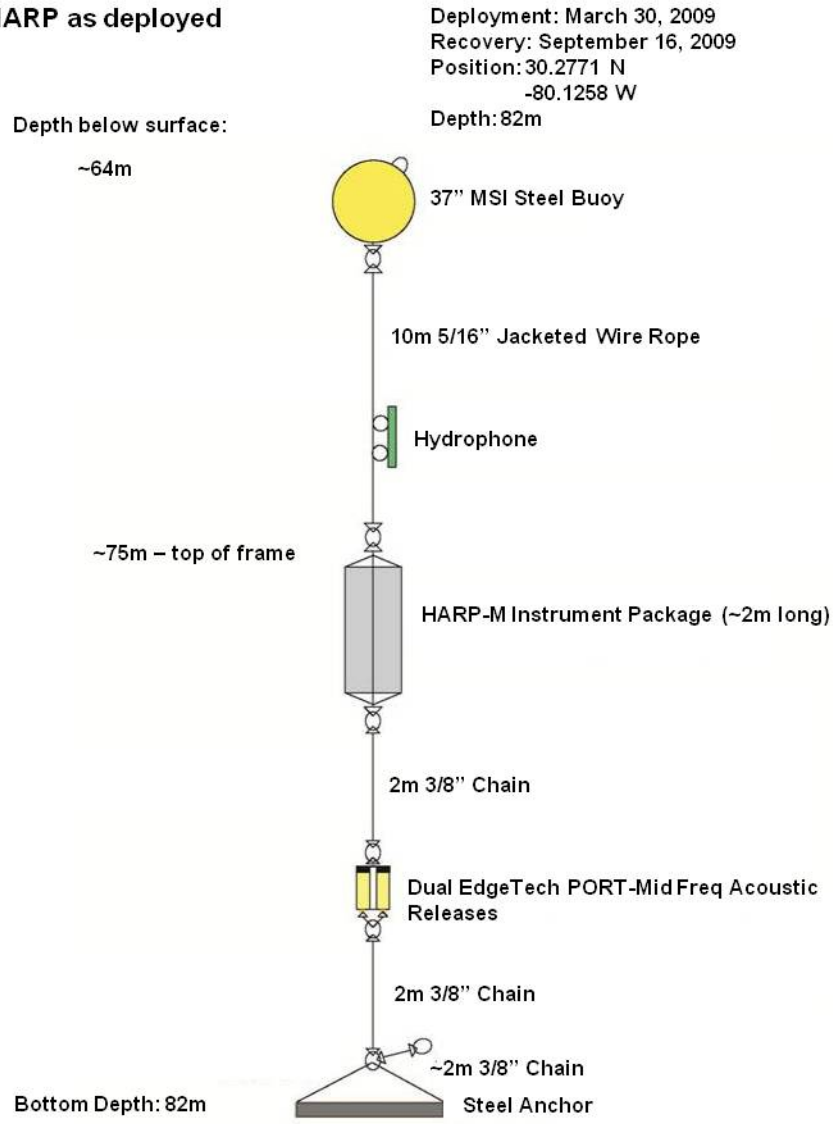

Figure 2. Schematic diagram showing details of the JAX 01A HARP. Note that diagram is not drawn to scale.

Data were acquired at a 200 kHz sampling rate for 5 minutes every 15 minutes during the JAX 01A deployment. Once the unit was retrieved, it was determined that the JAX01A HARP had a bad chip on the RAM board, which resulted in timing errors and some failures in writing the data. These errors became progressively worse during the course of the deployment. Prior to

analysis, the timing errors were corrected, resulting in approximately 424 hours of usable data over 54 days, between 2 April 2009 and 25 May 2009, despite the writing errors. The data collected that were deemed usable were manually scanned for marine mammal vocalizations using *Triton* (Hildebrand Lab at Scripps Institution of Oceanography, La Jolla, CA). The Long-Term Spectral Averages (LTSAs) for the 1-100 kHz frequency band had resolutions of 5 s in time and 100 Hz in frequency. These LTSAs were inspected for odontocete whistles and clicks as well as mid-frequency active sonar. The presence of vocalizations and mid-frequency active sonar was determined in one-minute bins, and vocalizations were assigned to species when possible. This dataset was not analyzed for mysticete calls as the low-frequency data could not be effectively analyzed for marine mammal sounds due to high levels of ambient noise (in large part caused by instrument strumming and fluid flow at the hydrophone due to the shallow water environment). Such high levels of ambient noise decrease the detection ability for low-frequency sounds.

Results

Table 1 summarizes the detected and identified marine mammal vocalizations for the JAX 01A HARP deployment. Figures 3-4 show the daily occurrence patterns for the different marine mammal groups (classified to species when possible). Figure 5 shows the occurrence of mid-frequency active sonar. Underwater ambient noise during this deployment is shown in Figure 6.

Detected odontocete vocalizations included clicks and whistles (Figures 3-4). Most of these detections were assigned to the unidentified odontocete category (Figure 3). Sperm whales were detected on only five days, mainly at night (Figure 4).

Table 1. Summary of detections of marine mammal vocalizations at Jacksonville, FL, Site A for April – May 2009 (JAX 01A).

Species	**Call type**	**Total duration of vocalizations (hours)**	**Percent of recording duration**	**Days with vocalizations**	**Percent of recording days**
Unidentified odontocete	clicks	103.23	20.97	49	90.74
Unidentified odontocete	whistles	11.62	2.36	32	59.26
Sperm whale	clicks	4.13	0.84	5	9.26

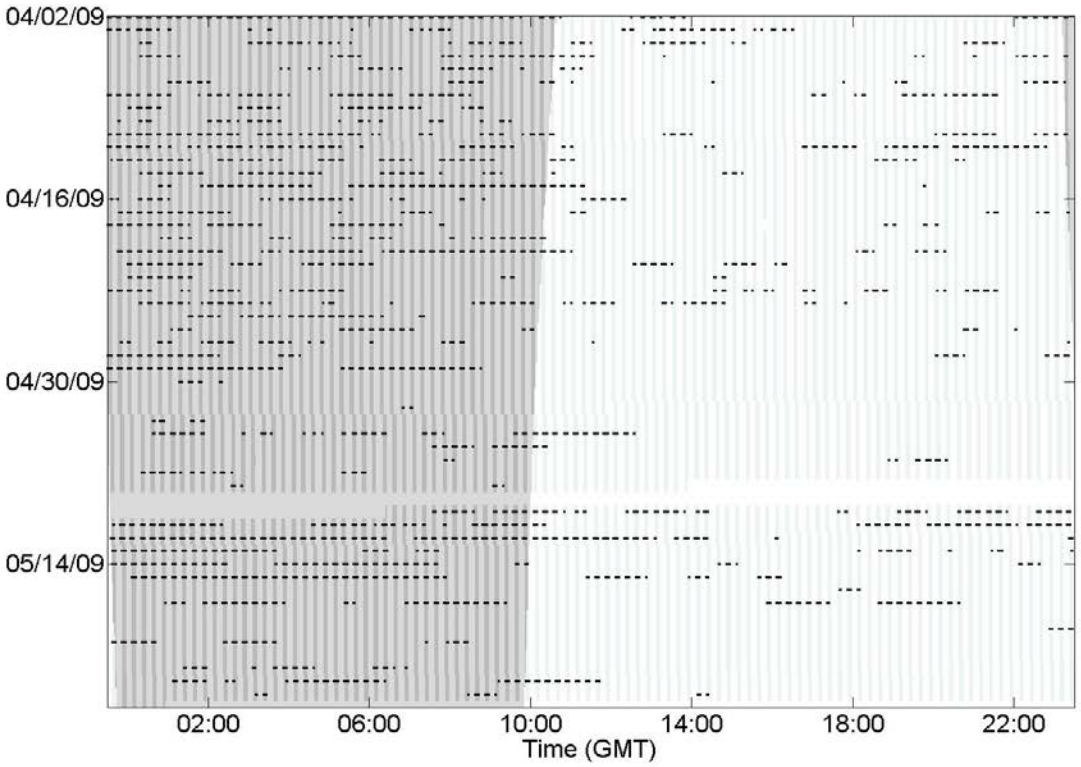

Figure 3. Unidentified odontocete vocalization detections (black bars) for the JAX 01A deployment. Dark gray shading indicates periods of darkness, determined from the U.S. Naval Observatory (http://aa.usno.navy.mil). Lighter shading indicates recording/analysis effort.

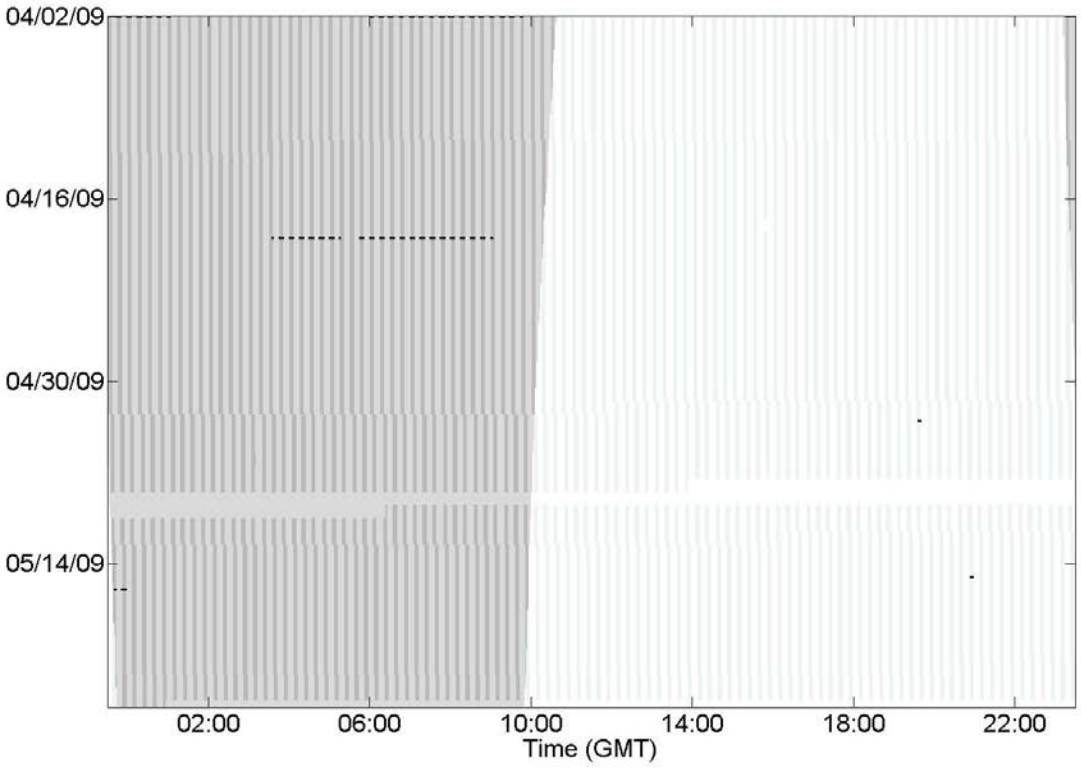

Figure 4. Sperm whale click detections (black bars) for the JAX 01A deployment. Dark gray shading indicates periods of darkness, determined from the U.S. Naval Observatory (http://aa.usno.navy.mil). Lighter shading indicates recording/analysis effort.

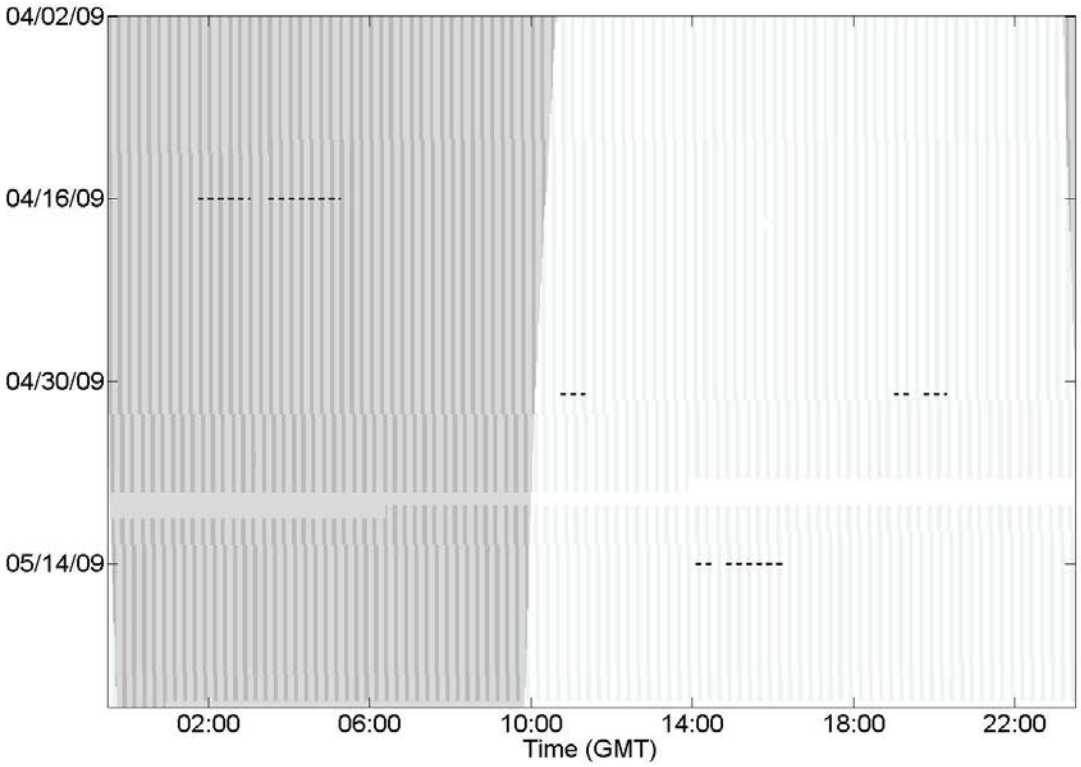

Figure 5. Mid-frequency active sonar (black bars) detected during the JAX 01A deployment. Dark gray shading indicates periods of darkness, determined from the U.S. Naval Observatory (http://aa.usno.navy.mil). Lighter shading indicates recording/analysis effort.

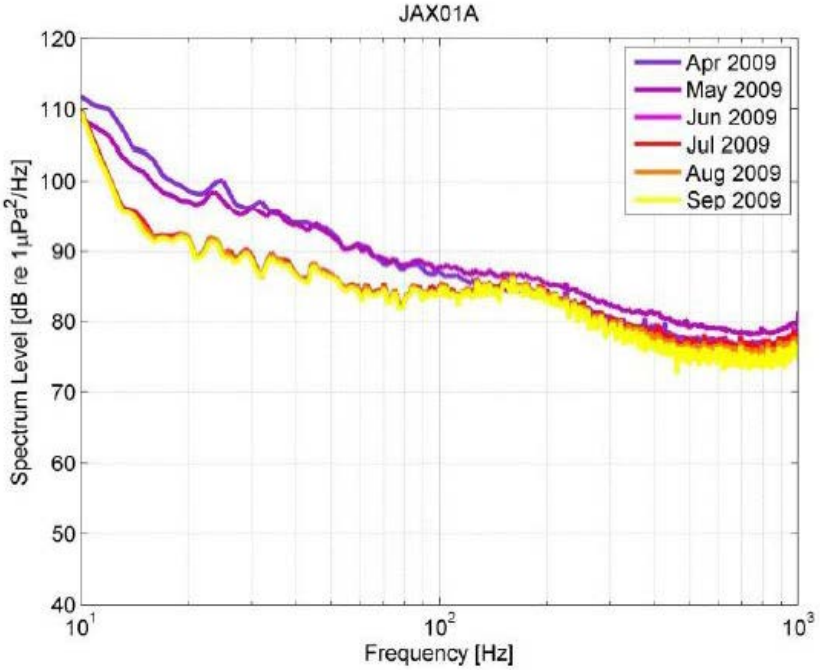

Figure 6. Monthly averages of ambient noise at Jacksonville, FL, Site A for April – May 2009. Figure from Appendix 6 of Wiggins 2015.

References

Wiggins, S.M. 2015. Low-frequency ambient noise offshore of North Carolina and Florida 2007-2014. Final Report. Marine Physical Laboratory Technical Memorandum 556. April 2015. Submitted to Naval Facilities Engineering Command (NAVFAC) Atlantic, Norfolk, Virginia, under Contract No. N62470-10-D-3011- Task Order Number 051 issued to HDR, Inc.

Wiggins, S.M. and J.A. Hildebrand. 2007. High-frequency Acoustic Recording Package (HARP) for broad-band, long-term marine mammal monitoring. In: *International Symposium on Underwater Technology 2007 and International Workshop on Scientific Use of Submarine Cables & Related Technologies 2007*: 551-557. Tokyo, Japan: Institute of Electrical and Electronics Engineers.