

# **Passive Acoustic Monitoring for Marine Mammals at Site A in Jacksonville, FL, February – July 2011**

A Summary of Work Performed by Amanda J. Debich, Simone Baumann-Pickering, Ana Širović, Sara M. Kerosky, Lauren K. Roche, Sarah C. Johnson, Rachel S. Gottlieb, Zoe E. Gentes, Sean M. Wiggins, and John A. Hildebrand

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## **Abstract**

A High-frequency Acoustic Recording Package (HARP; Wiggins and Hildebrand 2007) was deployed between February and July 2011 in the Jacksonville, FL, survey area at Site A in 91 m. This HARP sampled at 200 kHz for 5 minutes of every 15 minutes and recorded for 164 days between 1 February 2011 and 14 July 2011. Long-Term Spectral Averages (LTSAs) were created for three frequency bands (10 Hz – 1000 Hz, 500 Hz – 5000 Hz, and 1 kHz – 100 kHz) and scanned for marine mammal vocalizations. Vocalizations of Risso's dolphins and unidentified delphinids were detected in the data. Much of the low- and mid-frequency data were unusable, thus preventing detection of mysticete calls and mid-frequency active sonar.

## Methods

The February – July 2011 Jacksonville Site A HARP (Jacksonville 06A) was deployed at  $30.27818^{\circ}$  N,  $80.22085^{\circ}$  W on 1 February 2011 (recording started on 1 February 2011) and recovered on 14 July 2011 (recording ended on 14 July 2011). The instrument location is shown in Figure 1. Bottom depth at the deployment site was approximately 91 m. A schematic diagram of the Jacksonville 06A HARP is shown in Figure 2.

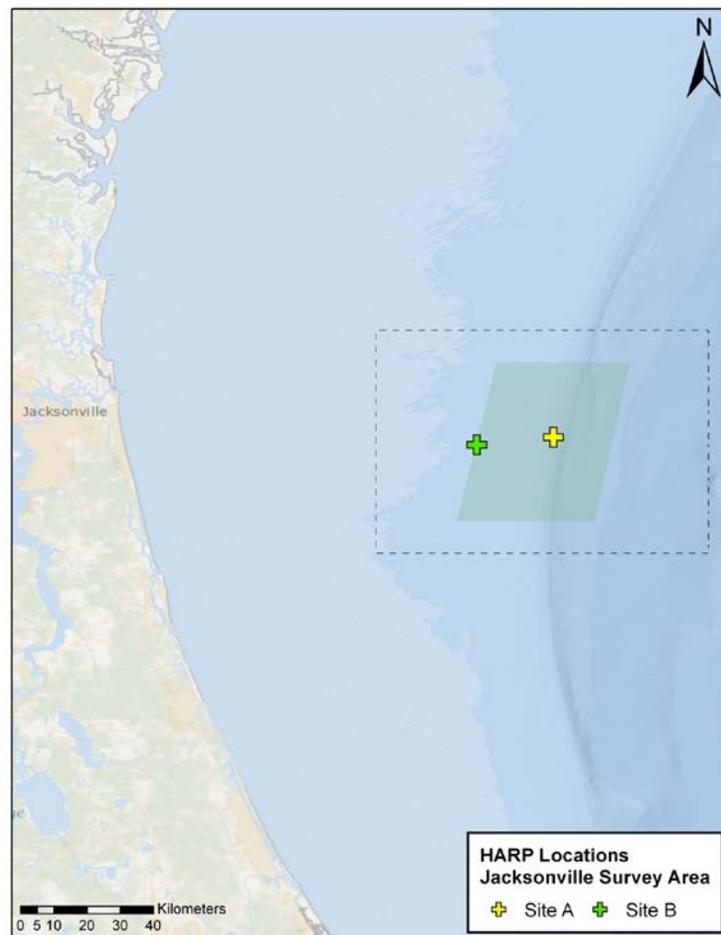


Figure 1. Location of HARP deployment sites in the Jacksonville survey area. The location of the Jacksonville 06A HARP is shown in yellow.

### JAX 06A HARP as deployed

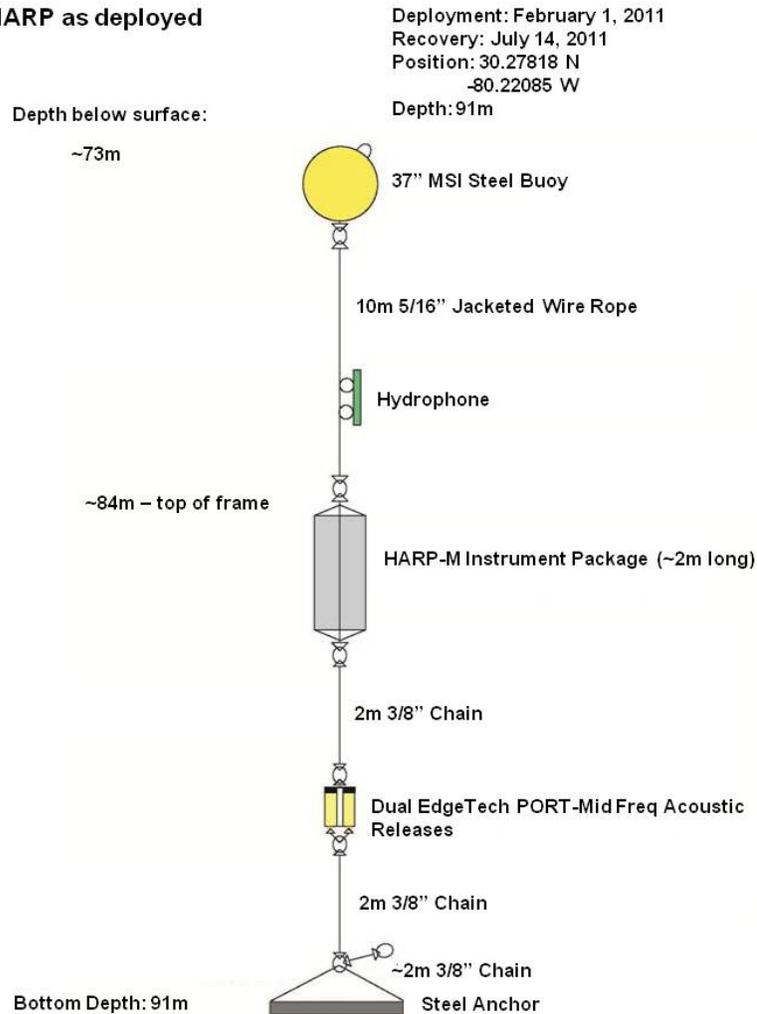


Figure 2. Schematic diagram showing details of the Jacksonville 06A HARP. Note that diagram is not drawn to scale.

Data were acquired at a 200 kHz sampling rate for 5 minutes every 15 minutes during the Jacksonville 06A deployment. This deployment provided a total of 1303 hours of data over the 164 days of recording.

The following methods are a summary of Debich *et al.* (2013). Members of the Scripps Whale Acoustics Lab manually scanned the data from the Jacksonville 06A HARP deployment for

marine mammal vocalizations and anthropogenic sounds (sonar, explosions, and shipping) using LTSAs. As a first pass for data analysis, segments of data that did not allow for further analysis due to disk malfunctions or strumming noise were identified. For Jacksonville 06A, there were gaps in the high-frequency data between 12 February 2011 07:02 and 22 February 2011 05:16 that could not be analyzed. Also for Jacksonville 06A, the low- and mid-frequency data starting on 12 February 2011 09:16 and continuing through to the end of the recording could not be analyzed. For effective analysis of marine mammal and anthropogenic sounds, the usable data were divided into three frequency bands ((1) low frequencies, between 10 – 1000 Hz, (2) mid frequencies, between 500 – 5000 Hz, and (3) high frequencies, between 1 – 100 kHz). The resulting LTSAs had resolutions of 5 s in time and 1 Hz in frequency (for the data decimated by a factor of 100: 10-1000 Hz band), 5 s in time and 10 Hz in frequency (for the data decimated by a factor of 20: 500-5000 Hz band), and 5 s in time and 100 Hz in frequency (for the data not decimated: 1-100 kHz). Each LTSA was analyzed for the sounds of an appropriate subset of species or sources. Blue, fin, sei, Bryde's, and North Atlantic right whale and a subset of minke sounds were classified as low frequency; humpback, minke, shipping, explosions, and mid-frequency active sonar were classified as mid-frequency; and the remaining odontocete and sonar sounds were considered high-frequency. Low- and mid-frequency sounds were analyzed in hourly bins; high-frequency vocalizations were analyzed in one-minute bins. Vocalizations were assigned to species when possible.

## Results

Table 1 summarizes the detected and identified marine mammal vocalizations for the Jacksonville 06A HARP deployment. Note that most of the low- and mid-frequency data could not be analyzed. Figures 3-4 show the daily occurrence patterns for the different marine mammal groups (classified to species when possible).

Detected odontocete vocalizations included clicks and whistles (Figures 3-4). Most of these detections (99%) were assigned to the unidentified odontocete category (Figure 3), with clicks being divided into five main groups based on spectral patterns (see Debich *et al.* 2013 for more details). In comparison to the Jacksonville 06B deployment which occurred during the same time period, rates of unidentified odontocete detections were higher during the Jacksonville 06A deployment. Only one detection at the beginning of March was assigned to Risso's dolphins (Figure 4).

Table 1. Summary of detections of marine mammal vocalizations at Jacksonville Site A for February – July 2011 (Jacksonville 06A).

<b>Species</b>	<b>Call type</b>	<b>Total duration of vocalizations (hours)</b>	<b>Percent of recording duration</b>	<b>Days with vocalizations</b>	<b>Percent of recording days</b>
Unidentified odontocete	clicks, whistles, burst-pulses	735.65	56.46	151	92.07
Risso's dolphin	clicks	0.65	0.05	1	0.61

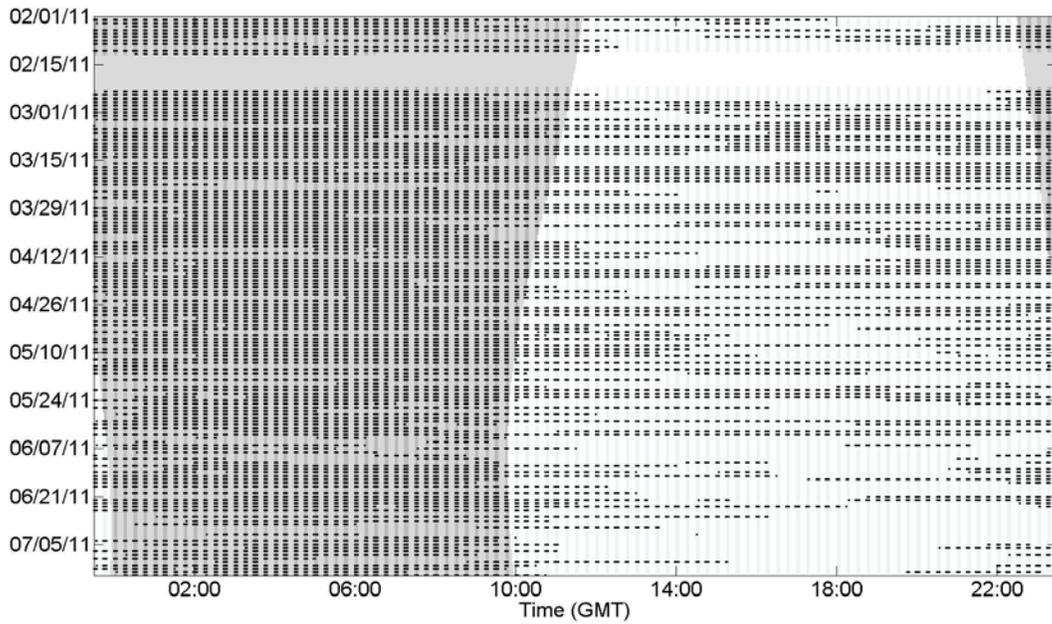


Figure 3. Unidentified odontocete vocalization detections (black bars) in one-minute bins for the Jacksonville 05A deployment. Dark gray shading indicates periods of darkness, determined from the U.S. Naval Observatory (<http://aa.usno.navy.mil>). Lighter shading indicates recording/analysis effort.

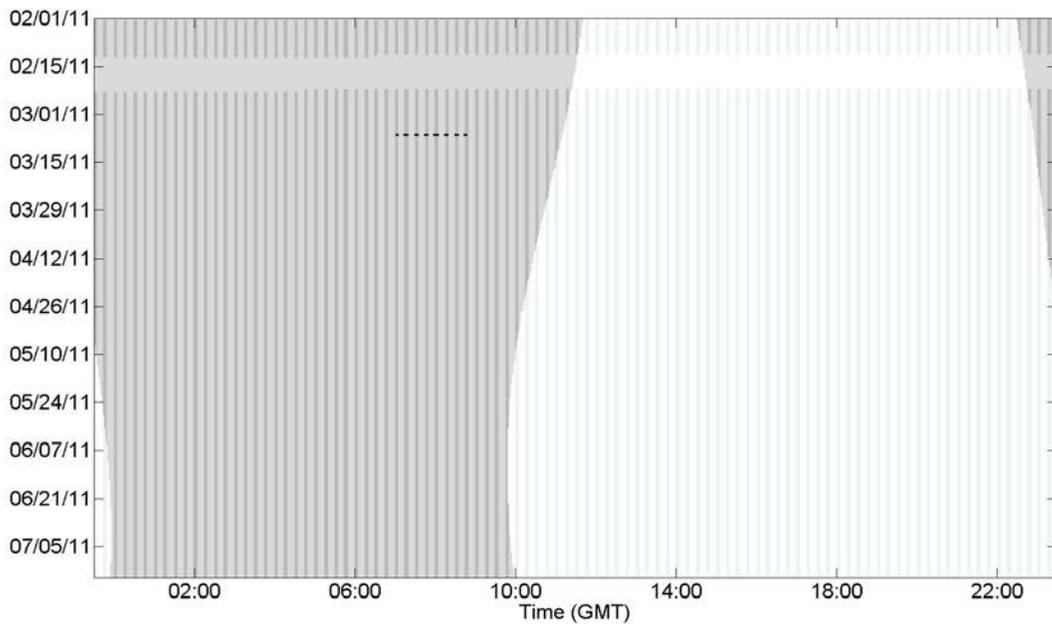


Figure 4. Risso's dolphin click detections (black bars) in one-minute bins for the Jacksonville 05A deployment. Dark gray shading indicates periods of darkness, determined from the U.S. Naval Observatory (<http://aa.usno.navy.mil>). Lighter shading indicates recording/analysis effort.

## References

Debich, A.J., S. Baumann-Pickering, A. Širović, S.M. Kerosky, L.K. Roche, S.C. Johnson, R.S. Gottlieb, Z.E. Gentes, S.M. Wiggins and J.A. Hildebrand. 2013. Passive acoustic monitoring for marine mammals in the Jacksonville range complex 2010-2011. MPL Technical Memorandum #541.

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.