Southeast Fisheries Science Center Reference Document MMTD-2025-09

Rice's Whale (*Balaenoptera ricei*) Passive Acoustic Detections Report: July 2023 – August 2024

Amanda J. Debich[1,2], Ashley Cook[2], Kaitlin E. Frasier[3], Héloïse Frouin-Muoy[1,2], Lance P. Garrison[1], John A. Hildebrand[3], Ludovic Tenorio-Hallé[4], Melissa S. Soldevilla[1*]

[1] NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL33149
[2] Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, FL
[3] Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA
[4] Marine Conservation Research, Kelvedon, Essex, C05 9AA, UK
[*] Corresponding Author

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
Miami, Florida

May 2025

Southeast Fisheries Science Center (SEFSC)
Reference Documents

This series is a secondary scientific series designed to assure the long-term documentation of and to enable the timely transmission of research results by Center and/or non-Center researchers, where such results bear upon the research mission of the Center (see the outside back cover for the mission statement). These documents receive internal scientific review, and most receive copyediting. The National Marine Fisheries Service does not endorse any proprietary material, process, or product mentioned in these documents.

If you do not have internet access, you may obtain a paper copy of a document by contacting the senior Center author of the desired document. Refer to the title page of the document for the senior Center author's name and mailing address. If there is no Center author, or if there is corporate authorship, contact the Center's Miami Laboratory Library (75 Virginia Beach Drive, Miami, FL 33149).

Information Quality Act Compliance: In accordance with section 515 of Public Law 106-554, the SEFSC completed both technical and policy reviews for this report. These pre-dissemination reviews are on file at the SEFSC Editorial Office.

This document may be cited as:

Debich, A., Cook, A., Frasier, K., Frouin-Muoy, H., Garrison, L., Hildebrand, J., Tenorio-Hallé, L., & Soldevilla, M. 2025. Rice's Whale (*Balaenoptera ricei*) Passive Acoustic Detections Report: July 2023 – August 2024. US Dept Commer Southeast Fish Sci Cent Ref Doc. 2025-09; 5 p.

NOAA Southeast Fisheries Science Center

Rice's Whale Passive Acoustic Detections Report: July 2023 – August 2024

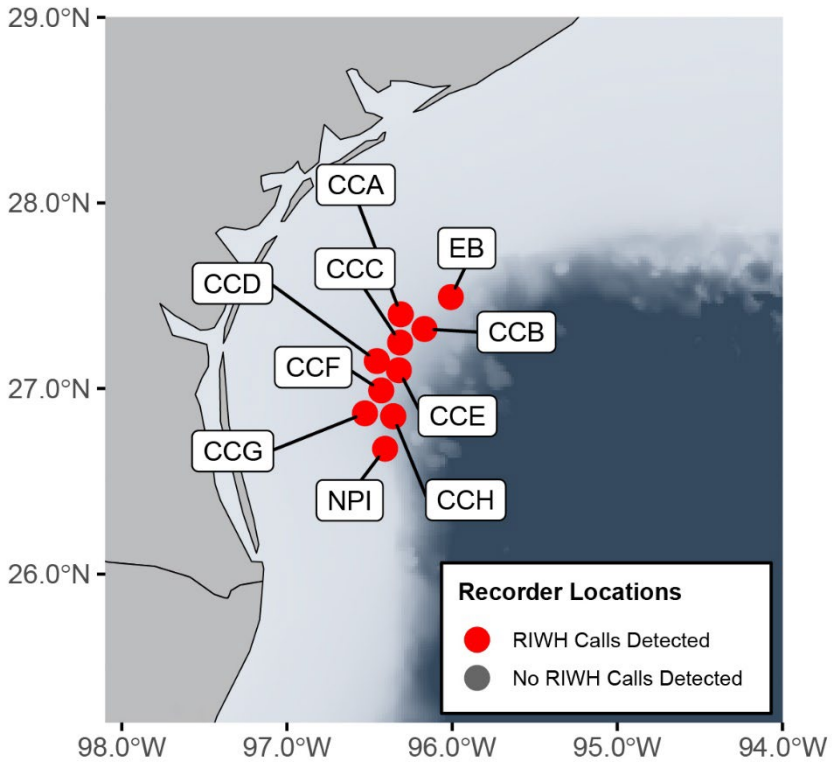

Figure 1. Map of acoustic recorder locations.

INTRODUCTION

The Rice's whale (*Balaenoptera ricei*) is the only year-round baleen whale found in the Gulf of America, and has a population size of fewer than 100 individuals (Garrison et al., 2020). The majority of visual and acoustic detections of this endangered species occur along the northeastern shelf break near the De Soto Canyon, and some visual detections and passive acoustic recordings indicate some whales persistently occur over a broader range in the Gulf than previously thought (Soldevilla, Debich, et al., 2022). Rice's whales produce stereotyped, species-specific calls that are distinct from the calls of all other baleen whales, including pulsed downsweep sequences, tonal long-moans, and constant tonals (Rice et al., 2014; Širović et al., 2014; Soldevilla, Ternus, et al., 2022). Numerous variants of the long-moan call have been detected, with an eastern variant and multiple western variants (Soldevilla, Debich, et al., 2022). To further explore the extent of their distribution and better understand the spatio-temporal occurrence patterns of Rice's whales, we deployed long-term passive acoustic recordings at ten sites in the northwestern Gulf over one year.

METHODS

Two High-frequency Acoustic Recording Packages (HARPs) were deployed in the western Gulf of America from July 2023 to August 2024 (Figure 1, Table 1). The HARP at site EB was deployed July 16, 2023 – August 21, 2024 in a water depth of 213 m, while the HARP at site NPI was deployed July 16, 2023 – August 20, 2024 in a water depth of 221 m. HARPs are moored to the seafloor and consist of a calibrated hydrophone tethered ~10 m above a data logger, batteries, floatation, acoustic release, and weight system (Wiggins & Hildebrand, 2007). Each HARP had a sensitivity of about -200 dB re V/µPa ± 3 dB over the 10 Hz to 60 kHz range. Both HARPs recorded continuously at a sample rate of 200 kHz. Upon recovery, the broadband recordings were decimated by a factor of 100 to provide an effective frequency bandwidth of 10 Hz – 1 kHz.

A sparse array of 8 SoundTrap (ST600 STD) recorders (Ocean Instruments New Zealand) was also deployed in the western Gulf of America over two deployment periods from August 2023 to August 2024 (Figure 1, Table 1). The first deployment started on August 5, with recordings ending between mid-January and early February. The second deployment started over March 3-4, 2024 and recorded until early August. Site depths ranged from 125 m to 400 m. The SoundTraps are factory calibrated at 250 Hz, and were deployed in a small mooring configuration including a hydrophone suspended 3 m above the seafloor, floatation, a Vemco VR2AR acoustic release, and ballast weights. These recorders have a sensitivity of around -177 dB re 1 V/µPa ± 3 dB over the 20 Hz to 20 kHz range. Each SoundTrap recorded at a sample rate of 24 kHz. Upon recovery, the broadband recordings were decimated by a factor of 12 to provide an effective bandwidth of 10 Hz – 1 kHz.

Spectrogram cross-correlation detectors were developed and tested in Ishmael 3.0 (Mellinger & Clark, 2000) for Rice's whale long-moan and downsweep sequence calls. When constant tonal calls are produced, they always follow long-moans, so no detector was developed for these calls. The cross-correlation contour kernel for the long-moan call focused on the 150 Hz tone and upper slope of the call, and was defined by a 1.1 s tone from 146 Hz to 145 Hz followed by a 3.7 s downsweep from 145 Hz to 112 Hz, each with a 14 Hz contour bandwidth (Soldevilla, Debich, et al., 2022). The cross-correlation contour kernel for the downsweep sequence was defined as a single 4 s downsweep from 120 Hz to 80 Hz, with a 20 Hz contour bandwidth. A regular sequence algorithm was applied, with the minimum and maximum repetition period between individual pulse detections set to 0.9 s and 1.1 s, respectively, and an 11 s window with 75% overlap used. Both detectors were run on the decimated recordings from the two HARPs and both deployments of 8 SoundTraps, and detections were manually verified to remove false detections.

RESULTS

Rice's whale daily presence by month and number of true Rice's whale call detections are summarized for the ten sites over the year (Table 1). A total of 56,636 western long-moan calls were detected across the 10 sites, with Rice's whales acoustically present from 20 to 55% of days

per recording site. Rice's whale calls are highly distinctive (Soldevilla, Ternus, et al., 2022), therefore the verified detection of either the downsweep sequence or long-moan call is indicative of Rice's whale presence. Rice's whales are considered present at a site if at least one downsweep sequence or long-moan call is found in one day. These results indicate minimum Rice's whale presence. A specific date range may contain few or no detections; this does not mean Rice's whales were not present. Passive acoustic monitoring can only determine presence of vocally-active individuals calling within detection range of a recorder. Silent animals, or those calling beyond the range of the recorders, are not represented.

The results presented here represent preliminary analyses. More detailed analyses of call types and total calls per day are in progress. Call detections of low-frequency calls such as those from baleen whales are highly dependent on sound propagation conditions and noise. Additional analyses are in progress to characterize soundscapes and transmission loss to better understand detection ranges. The data used for this study will be archived at NOAA National Centers for Environmental Information (NCEI).

Table 1. Deployment details and number of days with Rice's whale acoustic presence/number of total recording days for the given month.

Site Name	Recording Dates	Depth (m)	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Aug 2024	# Calls
EB	7/16/2023 - 8/21/2024	213	14/16	24/31	3/30	1/31	4/30	2/31	5/31	5/29	11/31	12/30	7/31	17/30	6/31	2/21*	5319
CCA	8/5/2023 - 8/2/2024	125	--	10/27*	3/30	0/31	4/30	2/31	3/18*	--	15/29*	7/30	6/31	10/30	5/31	0/2*	794
CCB	8/5/2023 - 8/2/2024	254	--	24/27*	4/30	1/31	7/30	7/31	6/13*	--	20/29*	10/30	12/31	19/30	12/31	1/2*	5821
CCC	3/3/2024 - 8/2/2024	179	--	--	--	--	--	--	--	--	24/29*	11/30	14/31	19/30	15/31	1/2*	4295
CCD	8/5/2023 - 8/2/2024	132	--	10/27*	4/30	1/31	5/30	12/31	17/19*	--	26/29*	7/30	19/31	19/30	14/31	1/2*	3707
CCE	8/5/2023 - 8/2/2024	268	--	14/27*	4/30	1/31	6/30	13/31	30/30*	--	28/29*	12/30	24/31	24/30	19/31	1/2*	9507
CCF	8/5/2023 - 8/2/2024	198	--	10/27*	4/30	1/31	5/30	13/31	22/23*	--	28/29*	13/30	23/31	29/30	19/31	2/2*	9902
CCG	8/5/2023 - 8/2/2024	128	--	4/27*	3/30	3/31	2/30	13/31	20/31	0/4*	26/28*	11/30	19/31	28/30	14/31	2/2*	4280
CCH	8/5/2023 - 8/3/2024	400	--	8/27*	5/30	2/31	4/30	15/31	15/16*	--	26/28*	12/30	23/31	30/30	18/31	2/3*	7618
NPI	7/16/2023 - 8/20/2024	221	1/16	4/31	3/30	2/31	3/30	11/31	13/31	10/29	23/31	11/30	21/31	22/30	12/31	9/20*	5393

* *Partial recording days. There is a gap in time between two SoundTrap array deployments. SoundTrap deployment 1 end dates varied among sites.*

FUNDING and ACKNOWLEDGEMENTS

Funding for these passive acoustic deployments was provided by NOAA Fisheries' Southeast Regional Office, and Office of Protected Resources, and SEFSC's Ecosystems, Climate and Stock Assessment Improvement and QUEST programs. Support for some vessel time was opportunistically supplied by the RESTORE Science Program, the *Deepwater Horizon* Restoration Marine Mammal Open Ocean Trustee Implementation Group, and the Office of Naval Research Task Force Ocean during LISTEN GoMex HARP servicing cruises. We thank Gabrielle Arrietta, Isabel Catalina Barrera Díaz, Shelby Bloom, Kasey Costello, Kieran Lenssen, Diego Majewski, Erin O'Neill, Itzel Pérez Carballo, Natalie Posdaljian, John Stewart, Bruce Thayre, Sean Wiggins, Vanessa ZoBell, and the crews of the R/V/ Pelican, R/V Trident, and NOAA Ship Gordon Gunter for their assistance with instrument building, deployment, and recoveries and project logistics.

REFERENCES

Garrison, L. P., Ortega-Ortiz, J., & Rappucci, G. (2020). Abundance of Marine Mammals in Waters of the U.S. Gulf of Mexico During the Summers of 2017 and 2018. *Southeast Fisheries Science Center Reference Document PRBD-2020-07 (Miami, FL), p.56*.

Mellinger, D. K., & Clark, C. W. (2000). Recognizing transient low-frequency whale sounds by spectrogram correlation. *Journal of the Acoustical Society of America, 107*(6), 12.

Rice, A. N., Palmer, K. J., Tielens, J. T., Muirhead, C. A., & Clark, C. W. (2014). Potential Bryde's whale (*Balaenoptera edeni*) calls recorded in the northern Gulf of Mexico. *Journal of the Acoustical Society of America, 135*(5), 11. https://doi.org/10.1121/1.4870057

Širović, A., Bassett, H. R., Johnson, S. C., Wiggins, S. M., & Hildebrand, J. A. (2014). Bryde's whale calls recorded in the Gulf of Mexico. *Marine Mammal Science, 30*(1), 399-409. https://doi.org/10.1111/mms.12036

Soldevilla, M. S., Debich, A. J., Garrison, L. P., Hildebrand, J. A., & Wiggins, S. M. (2022). Rice's whales in the northwestern Gulf of Mexico: call variation and occurrence beyond the known core habitat. *Endangered Species Research, 48*, 10. https://doi.org/10.3354/esr01196

Soldevilla, M. S., Ternus, K., Cook, A., Hildebrand, J. A., Frasier, K. E., Martinez, A., & Garrison, L. P. (2022). Acoustic localization, validation, and characterization of Rice's whale calls. *Journal of the Acoustical Society of America, 151*(6), 15. https://doi.org/10.1121/10.0011677

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