

### **Fair Use of NOAA's Passive Acoustic Data, Algorithms and Documentation:**

The development of passive acoustic data (PAD) - including recordings, computer algorithms, metadata and documentation - is typically a painstaking process involving multiple scientists working over many years. These scientists rely on the fair use and proper acknowledgment of the PAD to sustain their professional reputations and careers.

We, the National Marine Fisheries Service scientists at NOAA, encourage responsible use of these PAD, including the use of the data citation to ensure data provenance and attribution [1]. Each PAD project within the NOAA National Centers for Environmental Information (NCEI) PAD archive will be attributed with a specific data citation. Please take note of this citation when requesting data. When possible, we will identify relevant reports and potential citations related to the PAD. The National Academy of Sciences has issued guidance for credit allocation in scientific work [2]. In cases where NOAA PAD becomes a fundamental part of a study, publication, presentation or proposal, we encourages users to offer co-authorship status to the original PAD point of contact (POC).

### **Acknowledgement Example:**

The passive acoustic data used in this study were acquired from NOAA's National Centers for Environmental Information (<https://www.ncei.noaa.gov/>; <https://www.ngdc.noaa.gov/mgg/pad/>). These data were originally collected and processed by Shannon Rankin and colleagues at the NOAA Southwest Fisheries Science Center, with funding from NOAA's Ocean Acoustics Program.

### **Literature Citation Examples:**

Rankin, S., Y. Barkley, E. Oleson, and J. Barlow. 2011. Sonobuoy report for Hawaiian Islands Cetacean Ecosystem and Assessment Survey (HICEAS), 2010. Report for U.S. Navy, 8pp.

Rankin, S., R. Swift, D. Risch, B. Taylor, L. Rojas-Bracho, A. Jaramillo-Legorreta, J. Gordon, T. Akamatsu, and S. Kimura. 2009. Vaquita Expedition 2008: Preliminary results from a towed hydrophone survey of the vaquita from the *Vaquita Express* in the Upper Gulf of California. NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-439. 38p.  
<https://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-439.pdf>

Barlow, J., S. Rankin, E. Zele, and J. Appler. 2004. Marine mammal data collected during the Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) conducted aboard the NOAA ships *McArthur* and *David Starr Jordan*, July-December 2002. NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-362. 39pp.  
<https://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-362.pdf>

### **Data Citation Example:**

NOAA OAR Pacific Marine Environmental Laboratory, National Marine Fisheries Service, NOS Office of National Marine Sanctuaries, and DOI NPS Natural Resource Stewardship and Science Directorate (2014) Passive Acoustic Data Collection (NRS) NOAA National Centers for Environmental Information [doi:10.7289/V5M32T0D](https://doi.org/10.7289/V5M32T0D) [access date].

### **PAD Open Data Policy:**

NOAA's official distribution point for PAD is NCEI which provides sustained, open access and active data management of the data, metadata, and related information in keeping with the open data policies and practices of the United States as described in President Obama's Memorandum on "Open Data Policy"

(Executive Office of the President, Office of Science and Technology Policy, Memorandum: Increasing Access to the Results of Federally Funded Scientific Research (Feb. 22, 2013)) and pursuant to the Executive Order of May 9, 2013, "Making Open and Machine Readable the New Default for Government Information" (White House, M-13-13: Memorandum on Open Data Policy – Managing Information as an Asset (May 9, 2013)). In line with these policies, the PAD are nonproprietary, publicly available, and with no restrictions placed upon their use.

There is great potential in having access to shared data, but with it comes the responsibility of appropriate use [3]. NOAA would like to encourage responsible use of PAD, minimizing inappropriate or overlapping research efforts. The Acoustical Society of America provides suggested standards for some acoustic studies (<http://asastandards.org/>), such as Towed Array Passive Acoustic Operations for Bioacoustic Applications (S3/SC 1 WG03) and Acoustic Metadata for Passive Acoustic Monitoring (SC3/SC1 WG07). In addition to these standards, we have provided a few examples of appropriate and inappropriate uses of PAD below. We encourage users of these data to reach out to the POC with regards to their intended research efforts so that we may assist in identifying overlapping efforts, coordinating research efforts, or identifying concerns regarding inappropriate use of the data.

#### **Appropriate/Inappropriate Uses of PAD:**

PAD may be collected using a wide variety of possible sensors (e.g., HTI-96min, DIFAR sonobuoy, geophone), in a wide variety of configurations (seafloor-mounted, towed, drifting), using a wide variety of recordings devices. It is impossible to identify all the appropriate and inappropriate uses of these data, as each study will have its own strengths and limitations. Nonetheless, we can provide a few examples of what might be considered appropriate, and what might be considered inappropriate. We encourage the user to reach out to the POC to determine if their intended study is appropriate given the data limitations, or if a better approach might be possible. Our intention is to encourage high quality analyses of these publicly available data.

There are many examples of appropriate use of PAD in the current literature (e.g., [4], [5], [6], [7]). The Marine Mammal Commission report on acoustic studies [8] is also an excellent reference for appropriate (as well as inappropriate) uses of PAD. **Areas where a cautious approach should be applied (and the POC should be contacted) include:**

- (1) The use of non-calibrated data for sound level measurements or any noise metrics.
- (2) Calculations of effort that do not incorporate the presence of missing, corrupted, masked, or duty-cycled recordings.
- (3) Noise metric calculations that do not account for self-noise of the recording system or recording platform.
- (4) The use of auto-detection algorithms in areas where several marine mammal species (or other anthropogenic or abiotic sources) are present and produce similar signals.
- (5) The development of auto-detection algorithms from concurrent visual and acoustic data collection may be impacted by unidentified mismatches when multiple groups are present (e.g. animals sighted are not always the same as those recorded).
- (6) The localization of animals from instruments that have not been time-synched.

## **Literature Cited:**

- [1] Duerr, R.E., R.R. Downs, C. Tilmes, B. Barkstrom, W.C. Lenhardt, J. Glassy, L.E. Bermudez, and P. Slaughter. 2011. On the utility of identification schemes for digital earth science data: an assessment and recommendations, *Earth Sci. Inf.* 4(3):139-160 [doi:10.1007/s12145-011-0083-6](https://doi.org/10.1007/s12145-011-0083-6).
- [2] On Being a Scientist: A Guide to Responsible Conduct in Research: 3rd Edition (2009), Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 82 pages, ISBN-10: 0-309-11970-7. Available for download at: [http://www.nap.edu/catalog.php?record\\_id=12192](http://www.nap.edu/catalog.php?record_id=12192).
- [3] Bearzi, G., and O. Gimenez. 2018. Searching for meaning in marine mammal shared data. *Ethics Sci. Environ. Polit.* 18:9-13. [doi:10.3354/esep00180](https://doi.org/10.3354/esep00180).
- [4] Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C.L. Berchok, J.B. Thornton, S. Brault, G. Buchanan, R.A. Charif, D. Cholewiak, and C.W. Clark. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014. *Sci. Rep.* 7(1):13460. [doi:10.1038/s41598-017-13359-3](https://doi.org/10.1038/s41598-017-13359-3).
- [5] Crance, J.L., C.L. Berchok, and J.L. Keating. 2017. Gunshot call production by the North Pacific right whale *Eubalaena japonica* in the southeastern Bering Sea. *Endanger. Species Res.* 34:251-267. [doi:10.3354/esr00848](https://doi.org/10.3354/esr00848).
- [6] Rankin, S., E. Archer, J. Keating, A. Curtis, J. Oswald, M. Oswald, and J. Barlow. 2017. Acoustic classification of delphinids in the California Current using whistles, echolocation clicks, and burst pulses. *Mar. Mamm. Sci.* 33:520-540. [doi:10.1121/1.4978000](https://doi.org/10.1121/1.4978000).
- [7] Soldevilla, M.S., S. Baumann-Pickering, D. Cholewiak, L.E. W. Hodge, E.M. Oleson, S. Rankin. 2017. Geographic variation in Risso's dolphin echolocation click spectra. *J. Acoust. Soc. Am.* 142(2):599-617. [doi:10.1121/1.4996002](https://doi.org/10.1121/1.4996002)
- [8] Heinemann, D., J. Gedamke, E. Oleson, J. Barlow, J. Crance, M. Holt, M. Soldevilla, S. Van Parijs. 2016. Report of the Joint Marine Mammal Commission – National Marine Fisheries Service Passive Acoustic Surveying Workshop, July 2016. NOAA Tech. Memo. NMFS-F/SPO-164, 122pp. <https://swfsc.noaa.gov/publications/CR/2016/2016Heinemann.pdf>