

## CHARLES A. MUIRHEAD

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**Synopsis:** 13 years of experience in marine bioacoustics research including field work, data collection and analysis, authorship of grants, peer reviewed publications, and technical reports to state and federal governments. 1½ years of administrative experience as Projects Coordinator for the Center for Conservation Bioacoustics at Cornell University reviewing grant and contract proposals, tracking project budgets, and coordinating the efforts of software, hardware, field deployment, and analysis teams.

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### **EDUCATION**

Duke University – Ph.D. Marine Science and Conservation (2025)

University of Massachusetts at Boston – M.S. Environmental Science (2018)

State University of New York at Cortland – B.S. Biology (2006)

### **PROFESSIONAL EXPERIENCE**

#### **Research Analyst (Technician V)**

Center for Conservation Bioacoustics (CCB): Cornell University

**Mar 2009 – Feb 2012**

**&**

**Sept 2014 – July 2017**

1. Designed and implemented passive acoustic monitoring projects
2. Conducted fieldwork
3. Analyzed and interpreted data results
4. Authored technical reports to state and federal governments
5. Authored manuscripts for peer reviewed publication
6. Authored grant and contract proposals

#### **Projects Coordinator (Project Associate II)**

Center for Conservation Bioacoustics (CCB): Cornell University

**Feb 2012 – Sept 2014**

1. Reviewed and edited grant and contract proposals
2. Planned and tracked project budgets, personnel, equipment, and facilities
3. Assisted in accounting awarded budgets and project resources
4. Scheduled and tracked contract deliverables
5. Coordinated the efforts of software, hardware, field, and data analysis teams
6. Developed program policies

#### **Research Analyst (Technician IV)**

Center for Conservation Bioacoustics (CCB): Cornell University

**Jun 2007 – Mar 2009**

1. Transported, assembled, calibrated, deployed, and maintained field equipment
2. Formatted, distributed, and archived acoustic and geospatial data
3. Developed analysis protocols
4. Analyzed data
5. Developed figures, maps, and visuals of data results
6. Trained and instructed interns and research analysts

## **PUBLICATIONS (In Review)**

**Muirhead, C. A.**, (In Review) Passive acoustic monitoring of river dolphin (*Inia g. geoffrensis* & *Sotalia fluviatilis*) presence: A comparison between waters near the city of Iquitos and within the Pacaya-Samiria National Reserve. *Latin American Journal of Aquatic Mammals*.

Cerchio, S., Willson, A., Leroy, E., **Muirhead, C.**, Al Harthi, S., Baldwin, R., Cholewiak, D., Collins, T., Minton, G., Rasoloarijao, T., Rogers, T. and Willson, M. (In Review) A new blue whale song-type described for the Arabian Sea and Western Indian Ocean. *Endangered Species Research*.

Morano, J. L., Tielens, J. T., **Muirhead, C. A.**, Estabrook, B. J., Sullivan, P. J., Dugan, P. J., Clark, C. W. and Rice, A. N. (In Review) Seasonal movements and lack of baseline data impede impact assessments of Gulf of Mexico sperm whales following the Deepwater Horizon oil spill. *Marine Pollution Bulletin*.

## **PUBLICATIONS (Authored)**

Charif, R. A., Shiu, Y., **Muirhead, C. A.**, Clark, C. W., Parks, S. E. and Rice, A. N. (2019) Phenological changes in North Atlantic right whale habitat use in Massachusetts Bay. *Global Change Biology*.

Clark, C. W., Charif, R. A., Hawthorne, D., Rahaman, A., Givens, G. H., George, J. C. and **Muirhead, C. A.**, (2018) Acoustic data from the spring 2011 bowhead whale census at Point Barrow, Alaska. *J. Cetacean Res. Manage.* 19: 31-42.

**Muirhead, C. A.**, Warde, A. M., Biedron, I. S., Clark, C. W., Rice, A. N., (2018) Seasonal acoustic occurrence of baleen whales in the New York Bight. *Aquatic Conservation: Marine and Freshwater Ecosystems*, Published Online: February 2<sup>nd</sup>, 2018

Cerchio, S., Willson, A., **Muirhead, C.**, Al Harthi, S., Baldwin, R., Bonato, M., Collins, T., Di Clemente, J., Dulau, V., Estrade, V., Latha, G., Minton, G., Sarrouf Willson, M., (2018) Geographic variation in song indicates both isolation of Arabian Sea humpback whales and presence of Southern Hemisphere whales off Oman. *International Whaling Commission, SC/66B/SH/32*.

Rice, A. N., Morano, J. L., Hodge, K. B., **Muirhead, C. A.**, (2016) Spatial and Temporal Patterns of Toadfish and Black Drum Chorusing Activity in the South Atlantic Bight. *Environmental Biology of Fishes*, Published Online: August, 31<sup>st</sup> 2016.

Cerchio, S., Willson, A., **Muirhead, C.**, Minton, G., Collins, T., Baldwin, R., Sarrouf Willson, M., Al Harthi, S., (2016) Long-term Detection of Arabian Sea Humpback Whale Vocalizations off Oman. *International Whaling Commission, SC/66B/SH/32*.

Hodge, K. B., **Muirhead, C. A.**, Morano, J. L., Clark, C. W., & Rice, A. N. (2015) North Atlantic right whale occurrence in two wind planning areas along the mid-Atlantic U.S. coast: implications for management. *Endangered Species Research*, 28, 225-234.

Rice, A. N., Tielens, J. T., Estabrook, B. J., **Muirhead, C. A.**, Rahaman, A., Guerra, M., & Clark, C. W. (2014). Variation of ocean acoustic environments along the western North Atlantic coast: A case study in context of the right whale migration route. *Ecological Informatics*, 21, 89-99.

Rice, A. N., Palmer, K., Tielens, J. T., **Muirhead, C. A.**, & Clark, C. W. (2014). Potential Bryde's whale calls (*Balaenoptera edeni*) recorded in the northern Gulf of Mexico. *The Journal of the Acoustical Society of America*, 135(5), 3066-3076.

Charif, R. A., Rahaman, A., **Muirhead, C. A.**, Pitzrick, M. S., Warde, A. M., Hall, J., Pyć, C., & Clark, C. W. (2013). Bowhead whale acoustic activity in the southeast Beaufort Sea during late summer 2008–2010. *The Journal of the Acoustical Society of America*, 134(6), 4323-4334.

## **TECHNICAL REPORTS (Authored)**

**Muirhead, C. A.**, Salisbury, D. P., Diamond, C., & Rice, A. N. 2014. Acoustic and Visual Surveys for Baleen Whales in Virginia's Coastal Waters: November 2012 – October 2013. (2014) BRP Technical Report 14-06. Submitted to the *Virginia Department of Mines, Minerals and Energy (DMME), Commonwealth of Virginia*. Cornell Lab of Ornithology, Cornell University, Ithaca, NY.

Rice, A. N., Morano, J. L., Hodge, K. B., **Muirhead, C. A.**, Salisbury, D. P., & Clark, C. W. (2014). Baseline Biological Monitoring with Passive Acoustics for Future Offshore Alternative Energy Development in North Carolina and Georgia. Submitted to the *US Department of the Interior, Bureau of Ocean Energy Management (BOEM)*. Cornell Lab of Ornithology, Cornell University, Ithaca, NY.

Rice, A. N., Tielens, J. T., Morano, J. L., Estabrook, B. J., Shiu, Y., Popescu, C. M., Palmer, K. J., **Muirhead, C. A.**, Pitzrick, M. S., & Clark, C. W. (2014). Passive Acoustic Monitoring of Marine Mammals in the Northern Gulf of Mexico; June 2010 – March 2012. BRP Technical Report 14-01. Submitted to *BP (British Petroleum) Exploration & Production, Inc. & National Oceanic and Atmospheric Administration (NOAA)*. Cornell Lab of Ornithology, Cornell University, Ithaca, NY.

## **GRANTS (Authored)**

Marine Mammal Commission. Understanding Western North Atlantic Coast-wide Distribution Patterns of North Atlantic Right Whales. PI: A. N. Rice. \$42,039 (2014)

Timmons Group. Acoustic Monitoring for Offshore Wildlife in the Virginia Wind Energy Area. PI: A. N. Rice. \$40,480 (2014)

## **ABSTRACTS (Presented)**

**Muirhead, C. A.**, (2017). Monitoring for anthropogenic impacts on river dolphins (*Inia geoffrensis*) and (*Sotalia fluviatilis*) near an urbanized area of the Amazon River. Presented by Muirhead, C. A. at the *UMass Boston 5<sup>th</sup> Annual Marine Science Symposium*, Boston, MA.

**Muirhead, C. A.**, Estabrook, B. J., Rahaman, A., Tielens, J. T., Rice, A. N., & Clark, C. W. (2011). Comparative ambient noise levels across the coastal Western North Atlantic Ocean: Implications for changes in cetacean acoustic ecology and communication space. Presented by Muirhead, C. A. at the *3<sup>rd</sup> International Symposium on Acoustic Communication by Animals*, Ithaca, NY.

**Muirhead, C. A.**, Estabrook, B. J., Rahaman, A., Tielens, J. T., Rice, A. N., & Clark, C. W. (2010). Ambient noise levels and acoustic ecology of North Atlantic Right Whale habitats. Presented by Muirhead, C. A. at the *North Atlantic Right Whale Consortium Annual Meeting*, New Bedford, MA.

## **ABSTRACTS (Authored)**

Salisbury, D. P., **Muirhead, C. A.**, Diamond, C., Barco, S. G., Swingle, M. W., Rice, A. N. (2014). Evaluating whale occurrence in the Virginia offshore wind area using acoustic and aerial surveys. Presented by Rice, A. N. at the *American Wind Energy Association Offshore Wind Power Conference*, Atlantic City, NJ.

Charif, R. A., **Muirhead, C. A.**, Pitzrick, M. S., Warde, A. M., Hall, J., Pyć, C., & Clark, C. W. (2011). Bowhead whale acoustic activity in the Canadian Beaufort Sea, late summer 2008-10. Presented by Charif, R. A. at the *19<sup>th</sup> Biennial Conference on the Biology of Marine Mammals*, Tampa, FL.

Palmer, K. J., **Muirhead, C. A.**, Tielens, J. T., Rice, A. N., & Clark, C. W. (2011). Potential Bryde's whale vocalizations from the Gulf of Mexico. Presented by Palmer, K. J. at the 19<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Tampa, FL

Charif, R., Warde, A., Ponirakis, D., Murray, A., **Muirhead, C.**, Pitzrick, M., Clark, C.W., Wisdom, S., Rae, C. (2010) Results and insights from operational acoustic monitoring networks in the Chukchi Sea, Summer-Fall 2006 and 2008. *Journal of the Acoustical Society of America*. 127:1758.

Biedron, I., Mihnovets, N., Warde, A., Michalec, J., Clark, C., Diamond, C., Estabrook, B., Howard, B., McCarthy, C., Morano, J., **Muirhead, C.**, Murray, A., Nelson, D., Pitzrick, M., Ponirakis, D., Roberts, B., Rowland, E., & Tielens, J. (2009). Determining the seasonal distribution of cetaceans in New York coastal waters using passive acoustic monitoring. Presented by Biedron, I. at the 18<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Québec City, Canada.

Clark, C. W., Tremblay, C., Fowler, M., Diamond, C., Ponirakis, D., McCarthy, C., Morano, J., **Muirhead, C.**, Murray, A., Rowland, L., Vannicola, K., & Warde, A. (2008). Monitoring, measuring and describing ocean noise over ecologically viable scales with applications to impacts on large whales. *Journal of the Acoustical Society of America*, 123(5), 2987.

### **PUBLICATIONS (Acknowledged for Fieldwork, Analyses, and/or Data Processing)**

Soldevilla, M. S., Rice, A. N., Clark, C. W., & Garrison, L. P. (2014). Passive acoustic monitoring on the North Atlantic right whale calving grounds. *Endangered Species Research*, 25(2), 115-140.

Risch, D., Siebert, U., & Van Parijs, S. M. (2014). Individual calling behaviour and movements of North Atlantic minke whales (*Balaenoptera acutorostrata*). *Behavior*, 151(9), 1335-1360.

Risch, D., Clark, C. W., Dugan, P. J., Popescu, M., Siebert, U., & Van Parijs, S. M. (2013). Minke whale acoustic behavior and multi-year seasonal and diel vocalization patterns in Massachusetts Bay, USA. *Marine ecology. Progress series*, 489, 279-295.

Murray, A., Rice, A. N., & Clark, C. W. (2013). Extended seasonal occurrence of humpback whales in Massachusetts Bay. *Journal of the Marine Biological Association of the United Kingdom*, 1-9.

Morano, J. L., Rice, A. N., Tielens, J. T., Estabrook, B. J., Murray, A., Roberts, B. L., & Clark, C. W. (2012). Acoustically Detected Year-Round Presence of Right Whales in an Urbanized Migration Corridor. *Conservation Biology*, 26(4), 698-707.

Morano, J. L., Salisbury, D. P., Rice, A. N., Conklin, K. L., Falk, K. L., & Clark, C. W. (2012). Seasonal and geographical patterns of fin whale song in the western North Atlantic Ocean. *The Journal of the Acoustical Society of America*, 132(2), 1207-1212.

Dugan, P. J., Rice, A. N., Urazghildiiev, I. R., & Clark, C. W. (2010, May). North Atlantic right whale acoustic signal processing: Part I. Comparison of machine learning recognition algorithms. In *Applications and Technology Conference (LISAT), 2010 Long Island Systems* (pp. 1-6). IEEE.

Dugan, P. J., Rice, A. N., Urazghildiiev, I. R., & Clark, C. W. (2010, May). North Atlantic right whale acoustic signal processing: Part II. Improved decision architecture for auto-detection using multi-classifier combination methodology. In *Applications and Technology Conference (LISAT), 2010 Long Island Systems* (pp. 1-6). IEEE.

Klotz, R. L. (2010). Reduction of high nitrate concentrations in a Central New York State stream impounded by beaver. *Northeastern Naturalist*, 17(3), 349-356.

Urazghildiiev, I. R., Clark, C. W., Krein, T. P., & Parks, S. E. (2009). Detection and recognition of North Atlantic right whale contact calls in the presence of ambient noise. *Oceanic Engineering, IEEE Journal of*, 34(3), 358-368.

Urazghildiiev, I. R., Clark, C. W., & Krein, T. P. (2008). Acoustic detection and recognition of fin whale and North Atlantic right whale sounds. In *New Trends for Environmental Monitoring Using Passive Systems, 2008* (pp. 1-6). IEEE.

## **FIELD WORK**

Analyzed real-time acoustic data to track marine mammal locations for the NOAA Behavioral Response Study (BRS) tagging operations at the U.S. Navy Atlantic Undersea Test and Evaluation Center (AUTC) on Andros Island, Bahamas: *July 2008*

Assisted in the deployment of 19 Marine Autonomous Recording Units in Stellwagen Bank National Marine Sanctuary east of Massachusetts: *January 2009*

Assisted in the deployment of five Marine Autonomous Recording Units along the western coast of Alaska near Point Barrow: *April 2010*

Led the deployment of one Autonomous Recording Unit in the Amazon River Basin of northern Peru: *January 2011*

Assisted in the deployment of seven Marine Autonomous Recording Units along the western coast of Alaska near Point Barrow: *April 2011*

Led the deployment of 8 Autonomous Recording Units at 16 sites in the Amazon River Basin of northern Peru: *August 2014*

Led the deployment of 2 Marine Autonomous Recording Units and assisted in the collection of chlorophyll samples from the NOAA-chartered research vessel *Aquila* in the Chukchi Sea: *September 2015*

## **REFERENCES**

- |                                 |  |
|---------------------------------|--|
| <b>Christopher Clark, Ph.D.</b> | <b>Founding Director</b><br>Center for Conservation Bioacoustics (CCB): Cornell University<br>Ithaca, NY 14850                     |
| <b>Scott Kraus, Ph.D.</b>       | <b>Vice President and Senior Science Advisor</b><br>Anderson Cabot Center for Ocean Life: New England Aquarium<br>Boston, MA 02110 |
| <b>Douglas Nowacek, Ph.D.</b>   | <b>Distinguished Professor</b><br>Marine Science and Conservation Division: Duke University<br>Beaufort, NC 28516                  |