Frank McQuarrie Jr., Ph.D

Oceanographic Engineer & Sound Propagation Modeler

732-616-1659 | mcquarrie@marine.rutgers.edu | https://frankmcq.com | New Brunswick, NJ. USA

PROFESSIONAL SUMMARY

Oceanographic engineer experienced in autonomous underwater vehicle (AUV) pilotage and mission analysis, acoustic propagation modeling, and oceanographic model validation. Comfortable collaborating to solve problems, troubleshooting technology, and presenting the findings. PhD work focused on passive and active acoustics using moorings and underwater robots as monitoring platforms. I am currently a postdoctoral researcher looking for a permanent position.

RELEVANT WORK EXPERIENCE

Model Validation & Data Analysis - Postdoctoral Fellowship **Aug 2025 - Present**

Rutgers University - New Brunswick, NJ

- The National Academies Understanding the Gulf Ocean Systems (UGOS) project. Focused on using AUVs to aid in modeling and understanding the Yucatan Current and the Gulf's Loop Current. Responsible for processing and analyzing AUV-measured current data to validate large-scale oceanographic models, improving hurricane forecasting and stakeholder planning.

Soundscape Analysis **Aug 2021 - Aug 2025**

Gray's Reef National Marine Sanctuary - Savannah, GA

- Modeled sound propagation in underwater environments. Developed MATLAB and Python scripts to quantify transmission loss and attenuation. Utilized both private and public datasets.
- Analyzed low and high frequency recordings: created an algorithm to detect snapping shrimp behavior to quantify the created impulses. Defined the mechanisms driving background noise levels. Collaborated with Gray's Reef National Marine Sanctuary and NOAA's Sanctuary Sound project to improve efficiency of conservation efforts.
    - ***McQuarrie, F.,*** *Jr., Woodson, C. B., & Edwards, C. R. (2025). A Reef's High-Frequency Soundscape and the Effect on Telemetry Efforts: A Biotic and Abiotic Balance. Journal of Marine Science and Engineering, 13(3), 517. https://doi.org/10.3390/jmse13030517*

Autonomous Underwater Vehicle Pilot & Technician **Aug 20219 – Aug 2025**

Skidaway Institute of Oceanography - Savannah, GA

- Responsible for preparing, mission-planning, deploying, piloting, troubleshooting, retrieving, and post-processing the data collected by autonomous underwater vehicles. Strong background in how to handle all kinds of issues having spent hundreds of days as pilot and supervisor for buoyancy-driven gliders.
    - Missions include deep water soundscape analysis, North American Right Whale migration tracking, hurricane forecast intensity prediction, tagged-fish detections, etc.
- Worked as field and shore team for the Task Force Ocean PASSENGERS project, deploying/piloting/retrieving gliders to support sound propagation analysis in the North Atlantic. Supervised graduate students while underway.
- Mentored undergraduates on shore-based vehicle remote piloting and field deployment/retrieval techniques.

Smart & Autonomous Systems Project **June 2020 – Sep 2022**

University of Georgia - Athens, GA

- Developed an automatic workflow for estimating the dynamic detection range of high-frequency signals using AUVs. Modeled variable coastal environments and sound propagation to inform A.I. path planning, allowing for autonomous recognition of fishery hotspots.

Biological Oceanographer **Sep - Dec 2014, Sep 2017 – Apr 2018**

Palmer Station - Antarctica

- Represented Rutgers as Technician then Field Team Lead: collected and processed data as part of a larger decadal dataset along the Western Antarctic Peninsula. Piloted small craft to sample the water column, ran radiation incubation experiments to test primary productivity at penguin foraging sites. Supervised an undergraduate researcher and spent a combined 9 months on ice.
    - *Shown in HBO Vice's "Our Rising Oceans" episode as oceanographer and AUV technician.*

SKILLS

Data Analysis and Coding - Very confident writing and refining Matlab, R, and Python scripts. Comfortable packaging and sharing them with collaborators and stakeholders using GitHub.
AI Path Planning - Experience leveraging artificial intelligence to plan pathways for glider missions and find fish hotspots. Worked with the NSF Smart & Autonomous Systems program.
Slocum Glider Pilotage - 100s of hours spent preparing, deploying, piloting, troubleshooting, retrieving, and analyzing data from autonomous vehicles. Completed formal training from Teledyne in Feb. 2019 and have since worked with them daily.
Model Validation - Compared modeled ocean currents to measured data, validating large scale models.
Teaching & Outreach - Comfortable teaching all levels, teaching experience from K12 to graduate courses.
Acoustic Technology - Work daily with low and high frequency hydrophones and transceivers. Integrated passive and active acoustic receivers into gliders for whale-calling and fish-tagging monitoring missions.
Marine Technology Society (MTS) Member - Presented at MTS conferences and am an active member.
AAUS Scientific Diver - NAUI Master Diver and AAUS scientific diver, 100+ cold water dives & rescue/CPR certified.

EDUCATION

PhD, Oceanographic Engineering, University of Georgia Savannah, GA **July 2025**
Coastal and Oceanographic Engineering Certificate, University of Georgia
Co-advised by Drs. C. Brock Woodson and Catherine R. Edwards.
Dissertation research aimed at understanding acoustic propagation and telemetry success in complex reef environments using moored and autonomous underwater vehicles based platforms. Work with local non-profits, fishing organizations, engineering groups, etc.

B.S., Biological Oceanography, Rutgers University New Brunswick, NJ **May 2016**
Research included Western Antarctic Peninsula sampling at penguin foraging sites. Completed a follow-up REU research project at Georgia Tech in 2015 focused on high resolution optical sensors tracking copepod escape mechanisms.

PUBLICATIONS & PROCEEDINGS

McQuarrie, F., Jr., *Woodson, C. B., & Edwards, C. R. (2025). A Reef's High-Frequency Soundscape and the Effect on Telemetry Efforts: A Biotic and Abiotic Balance. Journal of Marine Science and Engineering, 13(3), 517. https://doi.org/10.3390/jmse13030517*

McQuarrie, F., Jr., *& Woodson, C. B. & Edwards, C. R. (2023). Analyzing Tidal, Diurnal, Synoptic, and Seasonal Drivers of Acoustic Telemetry Efficiency on a Coastal Reef. MTS Oceans Conference Proceedings, 1-8. 10.23919/OCEANS52994.2023.10337065.*

McQuarrie, F., Jr., *Woodson, C.B.; Edwards, C. (2021). Modeling Acoustic Telemetry Detection Ranges in a Shallow Coastal Environment. 15th ACM International Conference on Underwater Networks and Systems. https://doi.org/10.1145/3491315.3491331.*

Kondrakunta, S., Gogineni, V.R., Cox, M.T., Coleman, D., Tan, X., Lin, T., Hou, M., Zhang, F., ***McQuarrie, F.*** *and Edwards, C.R., (2021). The Rational Selection of Goal Operations and the Integration of Search Strategies with Goal-Driven Autonomy. Proceedings of the Ninth Annual Conference on Advances in Cognitive Systems. https://doi.org/10.48550/arXiv.2201.08883*

SCIENCE COMMUNICATION & MENTORSHIP

SENIOR DESIGN CAPSTONE PROJECT **2023-2024**
Advisor

- Mentored a group of undergraduate engineers creating a commercial acoustic transmitter for residential pools; modeled sound to predict propagation and sound coverage.
    - *Top prize winners at the UGA Entrepreneurship Program's Venture Prize, $10,000*

FORMAL COURSES: FLUID MECHANICS, HYDROLOGY, PHYSICAL OCEANOGRAPHY **2019-2023**
Teaching Assistant, Lab Instructor

- Worked alongside professor to teach the science and math behind fluid motion and geophysical flows. Assisted in grading, answering questions, lab setup, and study prep. Supervised experiments and data collection with a focus on understanding the physical processes.