Frank McQuarrie Jr., Ph.D

Oceanographic Engineer & Sound Propagation Modeler

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EDUCATION

PhD, Oceanographic Engineering, University of Georgia Savannah, GA **July 2025**
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

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. 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*

WORK EXPERIENCE

National Academies Postdoctoral Fellowship **Aug 2025 - Present**
Rutgers University - New Brunswick, NJ

- The National Academies Understanding the Gulf Ocean Systems (UGOS) project. Focused on using gliders to aid in modeling and understanding the Gulf's loop current and the gyres that form.

Soundscape Analysis **Aug 2021 - Aug 2025**
Gray's Reef National Marine Sanctuary - Savannah, GA

- Modeled sound propagation in underwater environments. Used a combination of MATLAB, Python, and Fortran scripts to quantify transmission loss and attenuation. Utilized both private and public datasets.
    - ***McQuarrie, F****.; Woodson, C.B.; Edwards, C. Modeling Acoustic Telemetry Detection Ranges in a Shallow Coastal Environment. 15th ACM International Conference on Underwater Networks and Systems 2021. https://doi.org/10.1145/3491315.3491331.*
- Analyzed low and high frequency recordings: created an algorithm to detect snapping shrimp behavior to quantify the created impulses. Analyzed the timeseries to define the mechanisms driving background noise levels. Collaborated with Gray's Reef National Marine Sanctuary and NOAA's Sanctuary Sound project.
    - ***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****., & Woodson, C. B. & Edwards, C. R. (2023). Analyzing Tidal, Diurnal, Synoptic, and Seasonal Drivers of Acoustic Telemetry Efficiency on a Coastal Reef. 1-8. 10.23919/OCEANS52994.2023.10337065.*

Slocum Glider Pilot & Technician **Aug 20219 – Aug 2025**
University of Georgia - Athens, GA

- Responsible for preparing, mission-planning, deploying, piloting, troubleshooting, retrieving, and post-processing autonomous underwater vehicles. Strong background in how to handle all kinds of issues having spent hundreds of days as pilot and supervisor during these missions. Experienced with processing, analyzing, presenting and publishing data from these missions.
    - Missions include deep water soundscape analysis, North American Right Whale migration tracking, hurricane forecast intensity prediction, tagged-fish detections, etc.
- Analyzed and performed quality assurance on years worth of mission data to understand the South Atlantic Bight. Helped teach the Physical Oceanography course using glider data for examples.

Smart & Autonomous Systems Project **June 2020 – Sep 2022**
University of Georgia - Athens, GA

- Developed an automatic system 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.
- Data Pipeline: AUV surfaces and transmits water-column data, sound propagation is modeled through a calculated sound speed profile, and the probability of detection is defined for the next interval.
    - *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

Teaching Assistant, Lab Development **Sep 2020 – Dec 2022**
University of Georgia - Athens, GA

- Assisted in teaching UGA's courses: Physical Oceanography (grad.), Fluid Mechanics (undergrad.), and Hydrology Lab course.
- Ensured competence and retention on complex topics. Mentored undergraduate engineers in acoustic analysis while completing my dissertation.

Environmental Educator, Curriculum Development **Sep 2018 – May 2019**
Christodora - New York City, NY

- Developed a curriculum based on Marine Science for grade school programs, meeting local science standards.
- Spent the fall and spring months working in the Berkshire mountains, Manice education center, and winter in NYC classrooms. Similar school groups but very different teaching skills required.

Marine Science Instructor, Program Coordinator **May 2016 – Aug 2017, Summer 2018**
Catalina Island Marine Institute - Catalina, CA

- Taught K-12 school groups about oceanography, marine biology, ocean physics, physical and behavioral adaptations, etc. Returned for a summer after completing a research deployment and mentored new educators.
- Continual education was key. The hard part was over: the kids are in a beautiful place snorkeling in an ocean that others can only dream about, now make sure they learn about it!

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

- Represented Rutgers and the Schofield lab's interests, sampling and processing data as part of a larger decadal dataset. Piloted small craft to sample the water column a few times a week, irradiating and incubating samples for further analysis. Mentored undergraduate researchers and spent a combined 9 months on ice.
    - *Shown in HBO Vice's "Our Rising Oceans" episode as oceanographer and AUV technician.*

Residential Networking Specialist, IT Consultant **Aug 2013 – May 2016**
Rutgers University - New Brunswick, NJ

- Supported campus and residential IT needs, doing everything from fixing printers and projectors to cleaning viruses off student laptops. Helped translate what the professor said was wrong with their computer to what was actually wrong with their computer.

PRESENTATIONS

DISSERTATION DEFENSE **June 2025**

Research Presentation

- Said in Context: A Coastal Reef Soundscape as a Medium for Acoustic Telemetry
    - *Record number of attendees*

FLORIDA ACOUSTIC TELEMETRY (FACT) NETWORK CONFERENCE **February 2025**

Research Presentation

- A Reef's High-Frequency Soundscape and the Effect on Telemetry Efforts: a Biotic and Abiotic Balance
    - *Student Presentation Award Recipient*

GEORGIA DNR SCIENCE TALK **February 2025**

Invited Speaker

- Variable Telemetry Efficiency and Ranges in Noisy Coastal Environments

GRAY'S REEF SCIENCE SYMPOSIUM **November 2024**

Presenting Researcher

- Wind's Effect on Telemetry Efforts: a Biotic and Abiotic Balance

OCEAN SCIENCES MEETING **February 2024**

Poster Presentation

- Quantifying the Predictable Effect of Physical Processes on a Coastal Reef's Acoustic Environment

GRAY'S REEF SCIENCE SYMPOSIUM **October 2023**

Presenting Researcher

- Physical Processes Changing Effective Detection Range

FORT JOHNSON MARINE SCIENCE SEMINAR **October 2023**

Invited Speaker

- Informing Fisheries and Conservation Efforts Using Active Acoustic Telemetry

MARINE TECHNOLOGY SOCIETY OCEANS CONFERENCE **September 2023**

Research Presentation

- Analyzing Tidal, Diurnal, Synoptic, and Seasonal Drivers of Acoustic Telemetry Efficiency on a Coastal Reef

FLORIDA ACOUSTIC TELEMETRY (FACT) NETWORK CONFERENCE **July 2022**

Research Presentation

- Modeling Detection Ranges using Environmental Context
    - *Student Presentation Award Recipient*

GEORGIA CHAPTER OF AMERICAN FISHERIES SOCIETY MEETING **January 2021**

Research Presentation

- Acoustic Coverage Without the Guitar: Using AUVs to Quantify Marine Protected Area Effectiveness
    - *Outstanding Presentation Award*

UNIVERSITY OF GEORGIA MARINE SCIENCE STUDENT SYMPOSIUM **November 2020**

Research Presentation

- Modeling High-Frequency Transmissions in Shallow Ocean Environments
    - *Best Student Presentation Award*

MENTORSHIP & SCIENCE COMMUNICATION

FORMAL COURSES: FLUID MECHANICS, 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, and study prep. Supervised experiments and data collection with a focus on understanding the physical processes.

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*

MARINE SCIENCE GRADUATE STUDENT ASSOCIATION **2020-2023**
Vice President, President (x2)

- Served as Vice President then President of UGA's MSGSA, supporting students by running events, acting as a liaison between faculty and students, and handling any disputes that came up. Valued clear communication and empathy during a worldwide pandemic.
- Represented our department's students at the university-wide graduate student association, successfully removed the expansive "Student Activity Fee" from our semester fees.

MARINE ADVANCED TECHNOLOGY (MATE) R.O.V. REGIONAL COMPETITION **2021, 2024, 2025**
Engineering Presentation Judge

- Southeast Regional Competition, with the winners moving on to Nationals. Judged team presentations and robots based on structure, operation, teamwork, etc.

SKILLS

Teaching & Outreach - Comfortable teaching to all levels, 4+ years teaching experience ranging from K-12 to post-grad.
Programming - Very confident in Matlab, R, and Python, experience converting from Fortran. Use GitHub to collaborate.
AI Program Planning - Leverages artificial intelligence to plan pathways for glider missions and find fish hotspots.
Slocum Glider Pilotage - 100s of hours spent preparing, deploying, piloting, troubleshooting, retrieving, and analyzing data from gliders. Completed formal training from Teledyne in Feb. 2019 and have since worked with them daily.
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 a few MTS conferences and am an active member.
AAUS Scientific Diver - NAUI Master Diver and AAUS scientific diver, 100+ cold water dives & rescue/CPR certified.
Poker Tournament Director - Experienced dealing and managing all variants of poker games. Annual charity tournament has raised +$1,000 for juvenile diabetes research through BreakthroughT1D.