Last Updated: 08/09/2025

Henry Sun (he/him/his) · (301) 728-1010
hs325@duke.edu · github.com/henrysun9074 · henrysun.netlify.app
Duke University Marine Lab, 135 Duke Marine Lab Rd, Beaufort NC, 28516

Research Interests: marine invertebrate zoology, adaptation, population genetics, phenotypic plasticity, AI for science (predictive machine learning, computer vision, generative AI)

EDUCATION

2025- **Duke University**
Ph.D., Marine Science and Conservation, advised by Dr. Juliet Wong

2021-2025 **Duke University**
B.S Marine Science and Conservation, B.S Biology (Evolutionary Biology concentration), Minor in Computer Science
GPA**:** 4.0, *summa cum laude*
Senior Thesis: *Generative diffusion models for dataset augmentation and cetacean detection*

RESEARCH EXPERIENCE

2025 **Seasonal Technician,** Haskin Shellfish Research Laboratory, Cape Shore, NJ
Advised by Dr. Ximing Guo
- Spawn oysters and maintain larval cultures for oyster breeding program
- Train, tune, and cross-validate machine and deep learning models for genomic selection for Dermo resistance in oysters

2023-2025 **Undergraduate Researcher**, Duke University Marine Lab, Beaufort, NC
Advised by Dr. David Johnston
- Fine-tuned diffusion-based generative AI models and developed a pipeline for large-scale, high-quality cetacean image generation
- Awarded $8,000 NC Space Grant over 2024-2025 school year to create AI-generated images to improve cetacean detection models
- Founded and mentored the “Smartwhales” team, five undergraduates using AI-generated imagery for ecology and conservation projects

2024 **NSF REU**, Rutgers University, New Brunswick, NJ
Advised by Dr. Josh Kohut
- Used machine learning models to predict fish community structures using environmental DNA and oceanographic data from New Jersey
- Assessed nonlinear machine learning and deep learning methods for eDNA data dimensionality reduction; open-sourced all code on GitHub

2024 **Research Assistant**, Duke University Marine Lab, Beaufort, NC
Advised by Dr. Dan Rittschof
- Extracted DNA and sequenced 7 Sardinian blue crabs to investigate geographic origins of invasive Mediterranean crabs using COI haplotypes

- Integrated sequences with haplotypes from across blue crabs' native range to elucidate population structure and potential sympatric speciation

2024 **Research Assistant**, Duke University Marine Lab, Beaufort, NC
Advised by Dr. Tom Schultz
- Collected and genotyped local oyster species and farmed *C. virginica* at the Duke Aquafarm using COI barcoding and Nanopore sequencing
- Used variational autoencoders to identify three genetically distinct bottlenose dolphin populations in the Western North Atlantic
- Created video tutorials to assist independent study students with remote computing and bioinformatics

2023 **Bonaventura Fellow**, Duke University Marine Lab, Beaufort, NC
Advised by Dr. Tom Schultz
- Identified over 32,000 structural variants in Atlantic bottlenose dolphins belonging to three separate populations, culminating in oral presentation
- Filtered variants based on size and read quality for individual genotyping and analysis of population-level differentiation

2022-2023 **Bass Connections Team Member**, Duke University, Durham, NC
Advised by Dr. Zackary Johnson
- Assisted with building a waterproof plankton microscope to photograph plankton species off the dock at the Duke Marine Lab
- Led installation of Raspberry Pi and modification of an image segmentation pipeline for plankton identification

2022-2023 **Plant Growth Assistant,** Donohue Lab at Duke University, Durham, NC
Advised by Brandie Quarles and Dr. Kathleen Donohue
- Raised *Arabidopsis thaliana* and extracted DNA from tissue to measure traits in populations with and without evolved seed dormancy
- Led paper discussions in lab meetings relating to plant epigenetics, maternal effects, and thermal tolerance

2022 **Data+ and Climate+ Project Member**, Duke University, Durham, NC
Advised by Audrey Thellman
- Developed a data pipeline to process raw camera trap stream images and classify snow and ice cover using image masking and machine learning
- Demonstrated pipeline functionality with user interface in R Bookdown, presented applications to USGS researchers for quantifying ice melt

PUBLICATIONS

1. B Hays, M Malinowski, T Sarira, M Burak, **Sun, H.**, C Rowley, E White, H Houliston, V Fong, D Johnston, et al. "Technology in elephant conservation - a review of current methods and future potentials." *in prep*.
2. **Sun, H.**, H Houliston, D Johnston. "Diffusion-based generative AI advances automated wildlife detection in remote sensing." *in prep.* Target Journal: *Methods in Ecology and Evolution*. Anticipated Submission: **September 2025.**

PRESENTATIONS

1. **Sun, H.**, H Houliston, D Johnston 2025. “Generative diffusion models for dataset augmentation and cetacean detection: prospects and perspectives for ecology.” Duke Nicholas School of the Environment Undergraduate Honors Thesis Defense, Oral and Poster Presentation
2. **Sun, H.**, H Houliston, D Johnston 2025. “Generative diffusion models for dataset augmentation and cetacean detection.” North Carolina Space Symposium, Poster Presentation
3. **Sun, H.**, H Houliston, D Johnston 2025. “Generative diffusion models for dataset augmentation and cetacean detection.” Southeast and Mid-Atlantic Marine Mammal Symposium (SEAMAMMS), Oral Presentation
4. **Sun, H.**, J Kohut, J Adolf 2025. “Machine learning identifies fish communities from environmental DNA (eDNA).” Association for the Sciences of Limnology and Oceanography (ASLO), Poster Presentation
5. **Sun, H.**, D Johnston 2024. “Using generative artificial intelligence (AI) to improve training data for North Atlantic Right Whale detection.” North Carolina Sea Grant Coastal Conference, Lightning Talk
6. **Sun, H.**, S George, D Rittschof, T Schultz, M Moran, Z Darnell, R Bilgin 2024. “Blue crab (*Callinectes sapidus*) COI haplotype analysis of origins of invasives in the Mediterranean.” Western Society of Naturalists (WSN), Poster Presentation
7. **Sun, H.**, J Kohut, J Adolf 2024. “Machine learning identifies fish communities from environmental DNA (eDNA).” Rutgers RIOS NSF REU, Poster Presentation
    a. Selected as 1 of 4 students with exceptional poster and oral presentations to present at the 2025 ASLO Meeting in Charlotte
8. **Sun, H.**, B Garomsa, H Ontiveros, A Thellman, W Slaughter 2022. “River ice phenology in a changing climate: A data pipeline for field camera ice and snow classification.” Duke Plus Programs, Poster Presentation

INVITED TALKS

2025 **Duke Oceans Week**, Durham, NC. “AI and Applying Machine Learning to Oceans Science.”

2024 **Nicholas School of the Environment Board of Visitors**, Durham, NC. “Using generative artificial intelligence (AI) to improve training data for species detection models.”

Guest Lecturer: Drones in Marine Science and Conservation (2025)

GRANTS AND AWARDS

2025 Duke University Marine Science and Conservation Award ($500)
2025 NSF Graduate Research Fellowship ($159,000)
2024 ASLO Multicultural Program (~$2000)
2024 North Carolina Space Grant Undergraduate Research Scholarship ($8,000)
2024 NSF Research Experience for Undergraduates ($7,000)
2022 Duke University Rachel Carson Scholarship ($5,500)

SERVICE AND OUTREACH

2024-Present **Growing Equity in Science and Technology (GEST) Leadership,** Duke University Marine Lab, Beaufort, NC
- Organize and volunteer at an annual outreach event for local middle school students to participate in hands-on STEM activities
- Co-lead website and technology sub-committee, designed an educational scientific newsletter for students

2025 **Technology to Study Marine Animals**, SciREN Coast, Beaufort, NC
- Prepared lesson plans about AI, whale detection, and synthetic imagery for a networking event with local teachers, won runner-up for best booth

2023-2025 **Marine Lab Scholars Program Executive Board,** Duke University, Durham, NC
- Helped plan events such as group dinners and guest speakers, reviewed over 100 applications and interviewed ~15 prospective scholars
- Served as a mentor and/or 'pod parent' for a total of seven new scholars, providing advice regarding research and professional development

2024 **Aquafarm Assistant,** Duke University Marine Lab, Beaufort, NC
- Perform weekly maintenance on the Duke oyster farm, including flipping oyster bags and replacing broken bags and lines
- Coordinate student volunteers for farm trips, manage community oyster roast events, support multiple student research projects using the farm

2024 **Resident Advisor,** Duke University Marine Lab, Beaufort, NC
- Fostered a safe campus environment and led tours and orientation for both 20 undergraduate students and visiting students
- Planned regular community events for residents including aquarium visits, trivia nights, and birthday parties

2021-2023 **Graphics Team Member**, Duke Climate Coalition, Durham, NC
- Designed social media graphics related to various environmental issues both on campus and worldwide

MENTORSHIP

2024-Present **Max Niu**, Duke '28, Smartwhales team undergraduate researcher, Marine Lab Scholars Program mentee, Duke Bonaventura Fellow

2025	**Hope Hauck,** Duke ‘28, Marine Lab Scholars Program mentee
2024-2025	**Sara Norton,** Duke ‘25, Smartwhales team undergraduate researcher
2024-2025	**Sasha Provost,** Duke ‘25, Smartwhales team undergraduate researcher
2024-2025	**Rose Cassidy**, Duke ‘27, Smartwhales team undergraduate researcher
2024-2025	**Ellery Lei**, Duke ‘27, Smartwhales team undergraduate researcher, Marine Lab Scholars Program mentee
2024	**Cat Gamard,** Duke ‘25, Marine Lab Scholars Program mentee
2024	**Porter Porter**, Duke ‘25, Marine Lab Scholars Program mentee
2024	**Dhruv Rungta,** Duke ‘26, Marine Lab Scholars Program mentee
2024	**Thomas Tan,** Duke ‘26, Marine Lab Scholars Program mentee

SKILLS AND INTERESTS

PROGRAMMING LANGUAGES (in order of experience): Python, Bash, R, Java, C/C++, LaTeX, HTML/CSS/JS, MATLAB
LIBRARIES: Git, scikit-learn/PyTorch/TensorFlow, numpy, pandas, matplotlib, OpenCV, Jupyter, Diffusers, xarray/xroms, React, genome bioinformatics (various programs),
LAB WORK: Tissue sampling/DNA extraction, PCR, gel electrophoresis, restriction digestion, Nanopore sequencing
OTHER: Competitive debate, graphic design, Mandarin Chinese (fluent), Spanish (proficient)
HOBBIES: Basketball, Chinese cooking, stargazing, Scrabble, table tennis, acoustic guitar

REFERENCES

Juliet Wong | Assistant Professor of Marine and Coastal Climate Change, Duke University | juliet.wong@duke.edu

David Johnston | Professor of the Practice of Marine Conservation Ecology, Duke University | david.johnston@duke.edu

Meagan Dunphy-Daly | Rachel Carson Scholars Program Director, Duke University | meagan.dunphy-daly@duke.edu