

## Zoe Rand Curriculum Vitae

### EDUCATION

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- University of Washington, Seattle, WA** 2020-Present  
*PhD candidate, Quantitative Ecology and Resource Management*  
*Advisor: Trevor A. Branch*  
**Dissertation:** Modeling the effects of whaling on blue whales and other baleen whales  
**Relevant coursework:** Statistical Inference in Biometry, Mathematical Ecology, Decision Analysis, Demographic Estimation, Software Development for Data Scientists, Analysis of Ecological Data, Optimization Techniques, Stochastic Modeling, Ecology of Animal Movement, Modeling Complex Systems, Numerical Computing for Fisheries Assessment and Management
- University of St Andrews, Scotland** 2019- 2020  
*Masters of Science with Distinction, Marine Mammal Science*  
*Advisor: Julie N. Oswald*  
**Thesis:** Effects of duty cycling in passive acoustic monitoring
- Oregon State University, Post-baccalaureate, Fisheries and Wildlife Science** 2018-2019
- Mount Holyoke College, Bachelor of Arts, Summa Cum Laude,** 2012-2016  
*Major: Latin American Studies; Minor: Music*
- Augsburg College Social Change in Central America, Guatemala, Costa Rica, Nicaragua** 2014  
Study abroad program focusing on social justice and change in Central America

### RESEARCH EXPERIENCE

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- PhD Research Associate and Fellow, University of Washington, Seattle, WA** 2020-Present
- Quantitatively analyze historical whaling data to study the population dynamics of whales affected by whaling
  - Used Bayesian integrated population model to estimate movement rates of Antarctic blue whales from historical mark-recovery data, accounting for uncertainties and biases in the data
  - Analyzed fetal sex ratios from whaling data in relation to ecological theories about adaptive sex ratio behavior
  - Conduct population assessment, estimating current population size, levels of historical depletion and rate of recovery for Antarctic blue whales. Updated previous assessment to include additional data sources and modified procedure so assessment runs more than twice as efficiently.
  - Estimate natural survival and age-length relationships for blue whales using biological data from whaling
  - Modeled killer whale distributions in Washington waters using killer whale detections from citizen scientists, whale-watch vessels, biologists, and passive acoustics to understand changes in species distribution over time as well as interactions between types of killer whales.
  - Developed a method for using hidden Markov models to quantify ecological regime shifts using ecosystem indicators from the California current
- MSc Researcher, Sea Mammal Research Unit, University of St Andrews, Scotland** 2019–2020
- Used automatic detector and manual verification to identify Southern resident killer whale calls and whistles in hydrophone data. Subsampled detections to mimic duty cycled recording and

then used generalized linear models to analyze the effect of duty cycling. Analyzed over 200 datasets and used coding techniques to make code run efficiently and quickly.

**Undergraduate Research**, Oregon State University, Corvallis, OR 2018-2019

- Completed acoustic inventory of all acoustically active species in the Cordell Bank National Marine Sanctuary, and collected detailed acoustic data of marine mammal presence

### **PEER-REVIEWED PUBLICATIONS (8 total, 4 first-author)**

- Rand Z. R.**, Branch, T. A. and Converse, S. J. (2025) Battle of the sexes: longer orca whale mothers have more female offspring. *Proceedings of the Royal Society B*. Accepted.
- Branch, T.A., Monnahan, C.C., Leroy, E.C., ..., **Rand Z. R.**, et al. (2025). Separating historical catches among pygmy blue whale populations with the aid of recent song detections. *Marine Mammal Science*. e70003.
- Rand Z.R.**, Branch, T. A. and Jackson J. A. (2024). High historical movement rates of Antarctic blue whales (*Balaenoptera musculus intermedia*) on Southern Ocean feeding grounds estimated from Discovery marks. *Endangered Species Research*. 55: 109-128.
- Rand, Z. R.**, Ward, E. J., Zamon, J. E., Good, T. P., and Harvey, C. J. (2024). Using hidden Markov models to develop ecosystem indicators from non-stationary time series. *Ecological Modelling*, 495:110800. 10.1016/j.ecolmodel.2024.110800
- Battle L., Patil A., Branch T.A., **Rand Z. R.** (2023) Visualizing historical whaling voyages over time. *Interactions* 30:22-23
- Patil A., **Rand, Z.R.**, Branch, T.A., and Battle, L. (2023). WhaleVis: Visualizing the history of commercial whaling. *IEEE Visualization and Analytics (VIS)*, Melbourne, Australia, 96-100.
- Rand Z.R.**, Wood J., Oswald J. (2022). Effects of duty cycles on the passive acoustic monitoring of Southern Resident killer whale (*Orcinus orca*) occurrence and behavior. *Journal of the Acoustical Society of America*, 151(3): 1651-1660.
- Haver S., **Rand Z.R.**, Hatch L. et al. (2020) Seasonal trends and primary contributors to the low frequency soundscape of the Cordell Bank National Marine Sanctuary. *Journal of the Acoustical Society of America*, 148(2):845-858.

### **ASSESSMENT DOCUMENTS (6 total, 4 first-author)**

- Rand Z. R.**, Branch, T. A. (2024). Updated historical catch series for Antarctic blue whales. *IWC Paper SC/69B/IA/01*.
- Rand Z. R.**, Branch, T. A. (2024). Preliminary results from an updated population assessment of Antarctic blue whales. *IWC Paper SC/69B/IA/05*.
- Branch, T.A., Monnahan, C.C., Leroy, E.C., Shabangu, ..., **Rand, Z.R.**, et al., (2023). Further revisions to the historical catch separation of pygmy blue whale populations using contemporary song detections. *IWC Paper SC/69A/SH/09*.
- Patil, A., **Rand, Z.R.**, Branch, T.A., Battle, L., (2023). WhaleVis: A new visualization tool for the IWC catch database. *IWC Paper SC/69A/GDR/04*.
- Rand, Z.R.**, Branch, T.A., (2023). Fetal sex misidentification and adaptive sex ratio behavior in large whales. *IWC Paper SC/69A/SH/06*.
- Rand Z.R.**, Branch, T., Jackson, J. (2022) Movement rates of Antarctic blue whales from Discovery marks. *IWC Paper 68D/SH/13*.

### **PRESENTATIONS (8 total)**

- Rand Z. R.**, Branch, T., (2025). Bayesian models reveal endangered Antarctic blue whale population is increasing but still far from pre-whaling levels. Seminar Presentation. *SAFS Quantitative Seminar*, University of Washington, Seattle, WA. February 21, 2025.

- Rand Z. R.**, Koehn, L., Morrigan, A., Hanson, B. (2024). Spatiotemporal modeling of killer whale presence in the Salish Sea. Workshop presentation. *Orca Occupancy Indicator Workshop*, Seattle, WA. December 4, 2024.
- Rand Z. R.**, Branch, T., Converse, S. (2024). Longer mothers tend to have more female calves: evidence for adaptive sex ratio behavior in orca whales. Poster presentation. *25<sup>th</sup> Biennial Conference on the Biology of Marine Mammals*, Perth, WA, Australia.
- Rand Z. R.**, Ward, E. J., Zamon, J. E., Good, T. P., Harvey, C. J. (2024). Hidden Markov models identify regime shift from seabird at-sea-density in the Northern California Current. Poster presentation. *Pacific Seabird Group Annual Meeting*, Seattle, WA.
- Rand Z.R.**, Branch T., Jackson J. (2023) High movement rates of Antarctic blue whales (*Balaenoptera musculus intermedia*) on Southern Ocean feeding grounds estimated from historic mark-recovery data. Contributed oral presentation, *Ecological Society of America Annual Meeting*, Portland, OR.
- Rand Z.R.**, Branch T., Jackson J. (2022) Movement rates of Antarctic blue whales from historical data using Bayesian models. Seminar Presentation. *SAFS Quantitative Seminar*, University of Washington, Seattle, WA. October 21, 2022.
- Rand Z.R.**, Wood J. A., Oswald, J.N. (2022). Effects of Duty Cycles on the Passive Acoustic Monitoring of Southern Resident Killer Whale (*Orcinus orca*) Occurrence and Behavior. Poster presentation. *Society for Marine Mammalogy Biennial Conference*, Palm Beach, FL.
- Rand Z.R.** and Haver S. (2018). Identification of marine mammal species in the Cordell Bank National Marine Sanctuary using passive acoustic data. Conference Presentation. *Research and Advances in Fisheries, Wildlife and Ecology*, Corvallis, OR. April, 2018.

## **FUNDED RESEARCH SUPPORT**

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- University of Washington Graduate School student travel grant, \$500, Fall 2024
- College of the Environment student travel grant, \$1,500, Fall 2024
- NMFS-Sea Grant Population Dynamics Fellowship, \$174,670, September 2023-Present
- FINS graduate student travel awards, \$1,400, Summer 2021, Summer 2022, Winter 2023
- Quantitative Ecology and Resource Management fellowship, 9 months of PhD salary and benefits, September 2020
- R&A Ransome Scholar, \$56,000, University of St Andrews, September 2019

## **HONORS AND AWARDS**

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- College of the Environment Graduate Dean's Medalist for outstanding academic achievement, leadership, and service, University of Washington, May, 2025
- Best student presentation in North America, 25<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Perth, 2024
- Best student poster presentation, Pacific Seabird Group Annual Meeting, Seattle, 2024
- Fritzell Diversity Award, Oregon State University, June 2018

## **TECHNICAL SKILLS**

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- *Population modeling*: integrated population models, assessments of endangered species, matrix population models, mark-recapture models, estimating demographic rates
- *Statistics*: Bayesian statistical methods, maximum likelihood methods, generalized linear and generalized linear mixed models (GLM, GLMM), generalized additive models (GAM), species

distribution models, hidden Markov models; model fitting, diagnostics, selection, validation, and predictive skills testing; simulation testing

- *Programming languages*: R (including ggplot and tidyverse), Julia, Python, TMB (C++) Stan, JAGS, NIMBLE
- GitHub workflow and version control. Code for selected projects can be found at <https://github.com/zoer27>
- Technical writing and communicating to technical and non-technical audiences

## **TEACHING AND MENTORING**

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**Guest lecture and lab**, Population effects of whaling and estimating marine mammal abundance 2025  
 Evolution and Ecology of Marine Mammals, 12 students, University of Washington

**Guest lecture**, Whaling and the IWC, 2025  
 Conservation and Management of Aquatic Resources, 90 students, University of Washington

**Guest lecture**, Plotting techniques using ggplot2, 2024  
 Beautiful Graphics in R, 25 students, University of Washington

**Guest lecture**, Adaptive sex ratio behavior in marine mammals 2024  
 Evolution and Ecology of Marine Mammals, 25 students, University of Washington

**Mentor**, Identity Belonging and Inquiry in Science, University of Washington 2023-2024

- Mentored an undergraduate student in developing and executing a research project, providing guidance and supervision throughout the process.
- Completed mentorship training sessions focused on enhancing communication skills, adopting mentorship best practices, and integrating diversity, equity, and inclusion principles into mentorship approaches.
- Implemented knowledge gained from mentorship training to foster an inclusive and supportive environment for mentee, ensuring diverse perspectives are valued and included.
- This research resulted in two poster presentations by my mentee, one at the University of Washington undergraduate research symposium and the other at the SACNAS conference in Phoenix, AZ in 2024.

**Reader/Grader**, Q SCI 458 Advanced Ecological Modeling, University of Washington 2022 & 2023

- Delivered timely and helpful feedback to ~15 students each quarter on written assignments and code in R

**Workshop facilitator**, Using GitHub for Research, University of Washington 2021

- Developed and led workshop for 20 graduate students that introduced GitHub and version control and provided hands-on experience with using it for ecological research

**Educator**, Oregon Coast Aquarium, Newport OR 2018-2019

- Presented publicly about species in the aquarium with relevant conservation messaging.
- Interpreted exhibits for guests and taught principles of biology and ecology.
- Engaged guests and community stakeholders with entertaining and informational activities that inspired love for ocean life and fostered understanding about the need for ocean conservation.

**Undergraduate Writing Consultant**, Oregon State University, 2018-2019

- Taught writing skills one-on-one with undergraduate and graduate students, and provided strategies to succeed in college academic writing.
- Maintained the writing studio as an inclusive space and collaborated with coworkers to meet each student's individual needs.

**Speaking Arguing and Writing Center Mentor, Mount Holyoke College** 2013-2016

- Taught strategies such as brainstorming, outlining, and revising, while working with students one-on-one as well as led writing and public speaking workshops for large groups of students.
- Collaborated with professors to support the writing progress of their students in first-year seminars

**ACADEMIC SERVICE AND OUTREACH**

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- Reviewer:
  - Proceedings of the Royal Society B (1 paper, since 2024)
  - PLOS One (1 paper, since 2024)
  - Science Advances (1 paper, since 2025)
- Graduate student representative on the search committee for the Center for Quantitative Science (CQS) director (University of Washington, November 2023 – May 2024).
- Student Advisory Council Representative for the College of the Environment (University of Washington, September 2022-May 2024).
- Curriculum committee graduate student representative for the School of Aquatic and Fisheries Sciences (University of Washington, September 2022 -May 2024).
- Organized the School of Aquatic and Fisheries Sciences Quantitative Seminar (University of Washington, June 2022-June 2023).
- Board Member and Lesson Committee Lead of Students Experience Aquatic Sciences (SEAS), an organization that supports aquatic science outreach events in K-12 classrooms. (University of Washington, September 2021-August 2022).

**MEMBERSHIPS**

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Society For Marine Mammalogy