SYDNEY BIRCH, PHD

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NSF Postdoctoral Research Fellow at the University of North Carolina at Charlotte

PROFILE

Collaborative, detail-oriented researcher with 8+ years of experience in molecular evolution and ecology, offering strong technical, analytical, and leadership skills with expertise in multi-omics sequencing and data analysis, biological data visualization, experimental design, statistical analysis, and communication

EDUCATION

Ph.D. **Molecular and Evolutionary Systems Biology,** *University of New Hampshire* May 2022
Dissertation: *Integrating behavior and genomics to understand sensory integration in Cnidarians*
Minor: College Teaching

BS **Zoology,** *Michigan State University* Dec. 2014
Specializations: Marine Biology and Animal Behavior & Neurobiology

RESEARCH EXPERIENCE

POSTDOCTORAL RESEARCH:

NSF Postdoctoral Research Fellow, UNC Charlotte June 2022 – Present
Advisor: Adam Reitzel

1. **Project: Population variation and microbial and viral diversity in *Nematostella vectensis***
   - Designed, implemented, and led field experiments at estuarine laboratories to collect specimens for comparative genomic analysis
   - Performed RNA extractions, Total-RNA seq Library preparation, and coordinated sequencing with an external provider for comparative virome and host study
   - Developed and executed custom bioinformatic pipelines (python, bash, R) to analyze host transcriptomes and associated viromes in a non-model organism
   - Conducted comparative 16s rRNA analyses using QIIME2 and R to characterize bacterial community composition associated with host genotypes (populations)
   - Generated visualizations using Rstudio (ggplot2, dplyr, tidyverse), Adobe Illustrator, and BioRender of virome, host, and microbial biological data
   - Served on three professional committees, contributing as a representative and advisor
   - Effectively communicated research findings and progress through regular lab meetings, departmental seminars, and presentations at national and international conferences

2. **PRFB Project: Genomics of local adaptation of larval settlement to microbial biofilms**
   - Authored and secured a competitive three-year NSF Postdoctoral Research Fellowship in Biology ($240,00) to investigate genotype – phenotype relationships in a marine cnidarian
   - Designed and conducted a larval settlement field study in collaboration with the University of New Hampshire and public docks to study population dynamics across the Gulf of Maine
   - Collected and processed samples for whole-genome and population genetic sequencing of *E. crocea*, and metagenomic sequencing of biofilm and adult-associated microbes
   - Developing a custom bioinformatic pipeline to analyze population genetic and functional metagenomic data to assess local adaptation
   - Implemented statistical analyses to behavioral settlement data to assess correlations with microbial community composition and host genetic structure

DOCTORAL RESEARCH:

NSF Graduate Research Fellow, UNH, Durham Aug. 2017 – May 2022
Advisor: David Plachetzki

Thesis: ***Integrating behavior and genomics to understand sensory integration in Cnidarians***

- Analyzed large-scale Next-Generation Sequencing (NGS) datasets from three non-model species using a custom bioinformatics pipeline developed in Python, Bash, and Rstudio
- Performed de novo transcriptome assemblies, read quantification, and differential gene expression analyses for developmental transcriptome studies in non-model systems
- Designed and executed behavioral experiments and applied statistical analyses to correlate phenotypic responses with transcriptomic data
- Conducted Immunohistochemistry (IHC) and Fluorescent in situ hybridization (FISH) to spatially map gene expression patterns from key transcriptomic findings
- Authored peer-reviewed manuscripts and presented research at national conferences, earning multiple presentation awards in both academic and ley (public) settings
- Mentored 17 undergraduate students and served on two professional committees supporting departmental and interdisciplinary initiatives

TECHNICAL SKILLS

Programming: Python, R/Rstudio, Bash, Linux/Unix, QIIME2, Slurm command

Applications: Microsoft Office, Geneious, GitHub, SnapGene, NCBI, High-Performance Computing (HPC), Adobe Illustrator, BioRender

Bioinformatic Tools: DESeq2, EdgeR, samtools, BLAST, Spades, Bowtie, OrthoFinder

Laboratory: RNA /DNA extraction, RNA /DNA Library preparation, quantification (nanodrop, Qubit, Tape station), PCR, qPCR, plasmid design, bacterial transformation, dissection, CRISPR cas-9 design

AREAS OF SPECIALIZATION

-omics: RNA-seq, Differential Gene Expression, Gene Ontology, Transcriptome Assembly, Comparative Genomics, Metagenomics, Functional Genomics

Evolutionary Biology: Copy Number Variation (CNV), phylogenetics, population genetics

Sensory Ecology: Sensory transduction pathways (Phot-, Chemo-, Mechanosensory), marine ecology

SELECTED HONORS, GRANTS, AND AWARDS

NSF Postdoctoral Research Fellowship in Biology (PRFB) | $240,000	April 2023
The American Microscopical Society Best Student Presentation | $200	Jan 2022
AAC&U K. Patricia Cross Future Leaders Award Finalist | Honorable Mention	Dec 2021
UNH SMSOE Graduate Student Research Fund Recipient | $3000	May 2021
UNH Marine Biology Graduate Program Research Grant Recipient | $5000	May 2021
NSF (National Science Foundation) Graduate Research Fellowship (GRFP) | $96,000	April 2019

PUBLICATIONS & PRESENTATIONS

3 Scientific Publications

- 2 first Author, 1 Co-Author, 1 *BioRxiv*, 3 in preparation
- *Science Advances*, *Molecular Ecology*, Springer, *BioRxiv*

20 Contributed Talks and Posters, 1 Invited Symposium Talk

- Society for Integrative and Comparative Biology (SICB), Benthic Ecology, Shoals Marine Lab, 3-Minute Thesis, Cnidarian Model Systems Meeting, Evolutionary Immunity, Society for the advancement of Chicanos/Hispanics and Native Americans in STEM (SACNAS)