CORINNA BREUSING, Ph.D.

University of Rhode Island
Graduate School of Oceanography
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EDUCATION

Kiel University / GEOMAR Helmholtz Center for Ocean Research — Kiel, Germany
Ph.D. Biological Oceanography, *summa cum laude* — 2016

Kiel University / GEOMAR Helmholtz Center for Ocean Research — Kiel, Germany
M.Sc. Biological Oceanography — 2012

Kiel University — Kiel, Germany
B.Sc. Biology — 2010

RESEARCH EXPERIENCE

Marine Research Associate — Narragansett, RI
University of Rhode Island; Mentor: Roxanne Beinart — Since 2022

Postdoctoral Researcher — Narragansett, RI
University of Rhode Island; Mentor: Roxanne Beinart — 2018 – 2021
Project: Chemosynthetic symbioses in deep-sea hydrothermal vent snails
Molecular biology and next-generation sequencing:

- Preparation of Illumina shotgun metagenomic libraries
- Nanopore long-read sequencing
- DNA/RNA extraction, PCR and Sanger sequencing

Bioinformatic data analyses, bioinformatic programming and work with high-performance computing clusters/servers:

- Metagenome assembly, binning and annotation
- Mitogenome assembly and annotation
- Pangenome generation and phylogenomic reconstruction
- Genetic marker design for population genomic analyses
- Metatranscriptome assembly and annotation, differential gene expression analyses
- 16S rRNA amplicon variant analyses
- Programming in Perl/Python/Bash

German Research Foundation Postdoctoral Fellow — Moss Landing, CA
Monterey Bay Aquarium Research Institute; Mentor: Robert Vrijenhoek — 2016 – 2018
Project: Chemosynthetic symbioses in deep-sea clams and tubeworms
Molecular biology and next-generation sequencing:

- Preparation of 16S rRNA amplicon sequencing libraries
- Preparation of RAD tag sequencing libraries
- Preparation of HiC/Chicago proximity ligation sequencing libraries
- Nanopore long-read sequencing
- DNA extraction, PCR and Sanger sequencing

Bioinformatic data analyses, bioinformatic programming and work with high-performance computing clusters/servers:

- SNP marker design for population genomic analyses
- 16S rRNA amplicon variant analyses
- High-contiguity metagenome assembly and binning
- Programming in Perl/Bash

Research Assistant Bremen, Germany
Max Planck Institute for Marine Microbiology; Mentor: Nicole Dubilier 2016
Project: Chemosynthetic symbioses in deep-sea hydrothermal vent mussels

Bioinformatic data analyses, bioinformatic programming and work with high-performance computing clusters/servers:

- SNP marker design for population genomic analyses
- Programming in Perl/Python/Bash

Graduate Researcher Kiel, Germany
GEOMAR Helmholtz Center for Ocean Research; Mentor: Thorsten Reusch 2012 – 2016
Project: Population genomics of deep-sea hydrothermal vent mussels

Molecular biology:

- DNA/RNA extraction, PCR and Sanger sequencing
- Fluidigm SNP type assay preparation and analysis

Bioinformatic data analyses, bioinformatic programming and work with high-performance computing clusters/servers:

- Transcriptome assembly and annotation
- SNP and microsatellite marker design for population genomic analyses
- Larval dispersal modelling
- Programming in Perl/Python/Bash

Summer Intern Moss Landing, CA
Monterey Bay Aquarium Research Institute; Mentor: Robert Vrijenhoek 2014
Project: Population genetics of Western Pacific hydrothermal vent mussels

Molecular biology:

- DNA/RNA extraction, PCR and Sanger sequencing

Bioinformatic data analyses and bioinformatic programming:

- Sequence analyses and genetic marker design
- Programming in Perl/Bash

PUBLICATIONS

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*Peer-reviewed Articles (*Authors contributed equally)*

Tunnicliffe V and **Breusing C**. (2022) Redescription of *Bathymodiolus septemdierum* Hashimoto and Okutani, 1994 (Bivalvia, Mytilida, Mytilidae), a mussel broadly distributed across hydrothermal vent locations in the western Pacific and Indian Oceans. *Zootaxa*, 5214(3), 337–364.

Breusing C, Osborn KJ, Girguis PR, Reese AT. (2022) Composition and metabolic potential of microbiomes associated with mesopelagic animals from Monterey Canyon. *ISME Commun.*, 2(1), 1–14.

Breusing C, Klobusnik NH, Hauer MA, Beinart RA. (2022) Genome assembly of the chemosynthetic endosymbiont of the hydrothermal vent snail *Alviniconcha adamantis* from the Mariana Arc. *G3 Genes|Genomes|Genetics*, jkac220.

Castel J, Hourdez S, Pradillon F, Daguin-Thiébaut C, Ballenghien M, Ruault S, Corre E, Tran Lu Y A, Mary J, Gagnaire P-A, Bonhomme F, **Breusing C**, Broquet T, Jollivet D. (2022) Inter-specific genetic exchange despite strong divergence in deep-sea hydrothermal vent gastropods of the genus *Alviniconcha*. *Genes*, 13(6), 985.

Breusing C, Genetti M, Russell SL, Corbett-Detig RB, Beinart RA. (2022) Horizontal transmission enables flexible associations with locally adapted symbiont strains in deep-sea hydrothermal vent symbioses. *PNAS*, 119(14), e2115608119.

Breusing C, Castel J, Yang Y, Broquet T, Sun J, Jollivet D, et al. (2022) Global 16S rRNA diversity of provannid snail endosymbionts from Indo-Pacific deep-sea hydrothermal vents. *Environ. Microbiol. Rep.*, 14(2), 299–307.

Perez M*, **Breusing C***, Angers B, Beinart RA, Won YJ, Young CR. (2022) Divergent paths in the evolutionary history of maternally transmitted clam symbionts. *Proc. R. Soc. B*, 289, 20212137.

Breusing C*, Johnson SB*, Mitarai S, Beinart RA, Tunnicliffe V. (2021) Differential patterns of connectivity in Western Pacific hydrothermal vent metapopulations: A comparison of biophysical and genetic models. *Evol. Appl.*, doi: 10.1111/eva.13326.

Ücker M, Ansorge R, Sato Y, Sayavedra L, **Breusing C**, Dubilier N. (2021) Deep-sea mussels from a hybrid zone on the Mid-Atlantic Ridge host genetically indistinguishable symbionts. *ISME J.*, 15, 3076–3083.

Breusing C*, Johnson SB*, Tunnicliffe V, Clague D, Vrijenhoek RC, Beinart RA. (2020) Allopatric and sympatric drivers of speciation in *Alviniconcha* hydrothermal vent snails. *Mol. Biol. Evol.*, 37(12), 3469–3484.

Breusing C, Schultz DT, Sudek S, Worden AZ, Young CR. (2020) High-contiguity genome assembly of the chemosynthetic gammaproteobacterial endosymbiont of the cold seep tubeworm *Lamellibrachia barhami*. *Mol. Ecol. Resour.*, 20(5), 1432–1444.

Breusing C, Mitchell J, Delaney J, Sylva SP, Seewald JS, Girguis PR, Beinart RA. (2020) Physiological dynamics of chemosynthetic symbionts in hydrothermal vent snails. *ISME J.*, 14(10), 2568–2579.

Breusing C, Franke M, Young CR. (2020) Intra-host symbiont diversity in eastern Pacific cold seep tubeworms identified by the *16S-V6* region, but undetected by the *16S-V4* region. *PLoS ONE*, 15(1), e0227053.

Knöbel L, **Breusing C**, Bayer T, Sharma V, Hiller M, Melzner F, Stuckas H. (2020) Comparative de novo assembly and annotation of mantle tissue transcriptomes from the *Mytilus edulis* species complex (*M. edulis*, *M. galloprovincialis*, *M. trossulus*). *Mar. Genomics,* 51, 100700.

Hinzke T, Kleiner M, **Breusing C**, Felbeck H, Häsler R, Sievert SM, et al. (2019) Host-microbe interactions in the chemosynthetic *Riftia pachyptila* symbiosis. *mBio*, 10(6), e02243-19.

Breusing C, Johnson SB, Vrijenhoek RC, Young CR. (2019) Host hybridization as a potential mechanism of lateral symbiont transfer in deep-sea vesicomyid clams. *Mol. Ecol.*, 28, 4697–4708. **Selected as cover article.**

Manel S, Loiseau N, Andrello M, Fietz K, Díaz D, Forcada A, …, **Breusing C**, et al. (2019) Long-distance benefits of Marine Reserves: myth or reality? *Trends Ecol. Evol.*, 34, 342–354.

Utermann C, Parrot D, **Breusing C**, Stuckas H, Staufenberger T, Blümel M, et al. (2018) Combined genotyping, microbial diversity and metabolite profiling studies on farmed *Mytilus* spp. from Kiel Fjord. *Sci, Rep.*, 8, 7983.

Breusing C, Vrijenhoek RC, Reusch TBH. (2017) Widespread introgression in deep-sea hydrothermal vent mussels. *BMC Evol. Biol.*, 17, 13.

Stuckas H, Knöbel L, Schade H, **Breusing C**, Hinrichsen H-H, Bartel M, et al. (2017) Combining hydrodynamic modelling with genetics: can passive larval drift shape the genetic structure of Baltic *Mytilus* populations? *Mol. Ecol.*, 26, 2765–2782.

Breusing C, Biastoch A, Drews A, Metaxas A, Jollivet D, Vrijenhoek RC, et al. (2016) Biophysical and population genetic models predict the presence of "phantom" stepping stones connecting Mid-Atlantic Ridge vent ecosystems. *Curr. Biol.*, 26, 2257–2267.

Breusing C, Johnson SB, Tunnicliffe V, Vrijenhoek RC. (2015) Population structure and connectivity in Indo-Pacific deep-sea mussels of the *Bathymodiolus septemdierum* complex. *Conserv. Genet.*, 16, 1415–1430.

Sayavedra L, Kleiner M, Ponnudurai R, Wetzel S, Pelletier E, Barbe V, …, **Breusing C**, et al. (2015) Abundant toxin-related genes in the genomes of beneficial symbionts from deep-sea hydrothermal vent mussels. *eLife*, 4, e07966.

Preprints

Breusing C, Xiao Y, Russell SL, Corbett-Detig RB, Li S, Sun J, Chen C, Lan Y, Qian PY, Beinart RA. (2022) Host mixotrophy, habitat stability and recombination may all decrease geographic differentiation between symbiont populations in Western Pacific deep-sea mussels. *bioRxiv*, doi: 10.1101/2022.08.30.505939.

Hauer MA, **Breusing C**, Trembath-Reichert E, Huber JA, Beinart RA. (2022) Geography, not lifestyle, explains the population structure of free-living and host-associated deep-sea hydrothermal vent snail symbionts. *bioRxiv*, doi: 10.1101/2022.08.18.504305.

PRESENTATIONS

Breusing C, Xiao Y, Russell SL, Corbett-Detig RB, Li S, Sun J, Chen C, Lan Y, Qian PY, Beinart RA. Symbiont populations of western Pacific deep-sea mussels are only weakly structured by

geography. *Invited talk at the International Symposium on Marine Science and Engineering for Young Scientists and Postgraduates (Hong Kong, China), July 2022 (remote)*

Breusing C. Evolutionary ecology of animal-bacteria symbioses at deep-sea hydrothermal vents. *Invited talk at the Division of Microbial Ecology Seminar, University of Vienna, May 2022 (remote)*

Breusing C, Genetti M, Russell SL, Corbett-Detig RB, Beinart RA. Host-symbiont population genomics provide insights into partner fidelity and habitat adaptation at deep-sea hydrothermal vents. *Invited talk at the Wellcome Sanger Institute / Aquatic Genomics Project (Hinxton, UK), October 2021 (remote)*

Breusing C, Genetti M, Russell SL, Corbett-Detig RB, Beinart RA. Host-symbiont population genomics provide insights into transmission mode and habitat adaptation in deep-sea hydrothermal vent snails. *Invited talk at the International Symposium on Marine Science and Engineering for Young Scientists and Postgraduates (Hong Kong, China), July 2021 (remote)*

Breusing C, Mitchell J, Delaney J, Sylva SP, Seewald JS, Girguis PR, Beinart RA. High-pressure shipboard experiments provide insights into the physiological dynamics of chemosynthetic vent snail symbionts. *Talk at the Rhode Island Microbiome Symposium (Kingston, RI, USA), January 2020*

Breusing C. Evolutionary genetics and physiology of mollusk-bacteria symbioses from deep-sea chemosynthetic environments. *Invited talk at Kiel University (Kiel, Germany), August 2019*

Breusing C, Mitchell J, Delaney J, Girguis PR, Beinart RA. Does symbiont metabolism drive niche differentiation in *Alviniconcha* hydrothermal vent snails? *Poster at the GRS/GRC Animal-Microbe Symbioses (Mt. Snow, VT, USA), June 2019*

Breusing C. Evolution and physiology of mollusk-bacteria symbioses from deep-sea chemosynthetic environments. *Campus talk at the University of Rhode Island (Narragansett, RI, USA), March 2019*

Breusing C, Johnson S, Young CR, Vrijenhoek RC. Which mechanism causes symbiont switches in deep-sea vesicomyid clams? *Poster at the 15th Deep-Sea Biology Symposium (Monterey, CA, USA), September 2018*

Breusing C. Population genetics and connectivity in deep-sea hydrothermal vent mussels. *Campus talk at the Monterey Bay Aquarium Research Institute (Moss Landing, CA, USA), September 2017*

Breusing C, Johnson S, Young CR, Vrijenhoek RC. Symbiont heterogeneity in deep-sea tubeworms from the eastern Pacific Ocean. *Talk at the 6th Chemosynthesis-Based Ecosystems Symposium (Woods Hole, MA, USA), August 2017*

Hinzke T, Kleiner M, **Breusing C**, Schweder T, Markert S. Diving deep into chemosynthesis: Physiological interactions in the *Riftia* symbiosis. *Poster at the 6th Chemosynthesis-Based Ecosystems Symposium (Woods Hole, MA, USA), August 2017*

Breusing C. Cryptic diversity and host-symbiont specificity in Pacific deep-sea tubeworms. *Invited talk at the National Oceanography Center (Southampton, UK), September 2016*

Utermann C, **Breusing C**, Stuckas H, Staufenberger T, Labes A, Tasdemir D. Metabolite profiling of Baltic blue mussel (*Mytilus* sp.) hybrids and their associated microbes. *Poster at the 9th Joint Natural Products Conference (Copenhagen, Denmark), July 2016*

Breusing C. Population connectivity and hybridization of vent mussels from the Mid-Atlantic Ridge. *Invited talk at the Station Biologique de Roscoff (Roscoff, France), November 2015*

Breusing C, Biastoch A, Drews A, Metaxas A, Jollivet D, Sayavedra L, et al. Population connectivity and dispersal of vent mussels from the Mid-Atlantic Ridge. *Talk at the 14th Deep-Sea Biology Symposium (Aveiro, Portugal), September 2015*

Palgan D, Jamieson JW, **Breusing C**, Devey CW. Role of hydrothermal systems in development of the oceans. Where to find them on the seafloor? *Poster at the Sustainable Ocean Development Symposium (New York City, NY, USA), September 2015*

Breusing C. Population connectivity and dispersal of vent mussels from the Mid-Atlantic Ridge. *Invited talk at the Senckenberg Natural History Collections Dresden (Dresden, Germany), August 2015*

Breusing C. Population connectivity and dispersal of vent mussels from the Mid-Atlantic Ridge. *Campus talk at Kiel University (Kiel, Germany), June 2015*

Breusing C, Biastoch A, Metaxas A, Melzner F, Reusch TBH. Population connectivity and speciation of vent mussels from the Mid-Atlantic Ridge: An interdisciplinary approach. *Poster at the World Congress of Malacology (Ponta Delgada, Azores), July 2013*

GRANTS, AWARDS & PROPOSALS

Schmidt Ocean Institute Proposal Track "Ocean Science – *Falkor* 2021" Funded research cruise (estimated value of $1,800,000); PI: C. Breusing, R. Beinart (URI); Co-PIs: J. McDermott (Lehigh), J. Resing (NOAA-PMEL), A. Gartman (USGS), V. Ferrini (LDEO)	2023
German Research Foundation Postdoctoral Fellowship ($91,896); PI: C. Breusing	2016 – 2018
Helmholtz Doctoral Prize for Earth and Environment, one out of six prizes in Germany ($19,330)	2016
Petersen Doctoral Prize, one out of four prizes in Germany ($2,850)	2016
Helmholtz Graduate School for Ocean System Science and Technology Fellowship, one out of three fellowships in the biological sciences ($79,600)	2012 – 2016
Monterey Bay Aquarium Research Institute Summer Intern Scholarship ($6,000)	2014
Best Student Poster Prize at the World Congress for Malacology ($350)	2013
Germany Scholarship, one out of ~100 stipends at Kiel University ($4,100)	2011 – 2012

TEACHING & MENTORING

University of Rhode Island	2019 – present

Guest lectures in marine biology, geoscience and scientific writing classes
Co-mentor of two undergraduate and two graduate students

Western Washington University 2021
Paper discussion with biology students (remote)

Deep-Sea Biology Society 2020
Volunteer for graduate/undergraduate student mentoring group (remote)

Harvard Extension School 2020, 2021
Co-instructor "Deep-Sea Biology", spring class (remote)

Boston College 2020
Paper discussion with biology students (remote)

Max Planck Institute for Marine Microbiology 2019, 2020
Member in PhD thesis committee meeting (remote)

Monterey Bay Aquarium Research Institute 2018
Co-mentor of one graduate student

Kiel University 2016
Co-instructor "Computational and Comparative Genomics"

GEOMAR Helmholtz Center for Ocean Research 2015
Co-instructor "Marine Molecular Ecology"

PROFESSIONAL ACTIVITIES & DEVELOPMENT

Laboratory Co-management (2019 – present)
University of Rhode Island

Proposal Reviewer (2016 – present)
National Science Foundation, Research Grants Council of Hong Kong

Participant in Time Management and Leadership Coaching (2015 – 2016)
Kiel University

Participant in Transferrable Skills Course "Career and Leadership" (2015)
Helmholtz Association

Journal Reviewer (2014 – present)
Applied and Environmental Microbiology, BMC Evolutionary Biology, Deep-Sea Research Part I & II, Diversity & Distributions, Environmental Microbiology, Evolutionary Applications, FEMS Microbes, Frontiers in Marine Science, The ISME Journal, ISME Communications, Journal of Experimental Marine Biology and Ecology, Marine Biodiversity, Marine Biology, Molecular Ecology, Molecular Ecology Resources, mSystems, PeerJ, PLoS ONE, Proceedings of the Royal Society B, Science Advances, Scientific Reports

Co-organizer of Graduate Student Symposium "DokMa" (2013)
GEOMAR Helmholtz Center for Ocean Research

CONTRIBUTIONS TO DIVERSITY, EQUITY, INCLUSION & SOCIAL JUSTICE

Narragansett Bay Campus JEDI Committee 2022 – present
Member and co-organizer of professional development JEDI seminar series

URGE (Unlearning Racism in Geoscience) 2021 – present
Member in URI's URGE pod "Making Waves"

Social Justice & Inclusion Microcredential 2020
Training with the Office of Community, Equity and Diversity at the University of Rhode Island to advance anti-oppression in the workplace

URI Society for Women in Marine Science Symposium 2020
Moderator for session "Writing Grants for Private Funding"

University of Rhode Island "Inclusive Course Design Program" 2020
Training in creating an inclusive classroom

University of Rhode Island "Safe Zone Workshop" 2020
Training in issues affecting the LGBTQ+ community

Skype a Scientist 2020 – present
Volunteer to connect with classrooms around the world

University of Rhode Island "Black Lives Matter" Book Club 2020
Discussion of anti-racist literature

Mentorship 2018 – present
Advised and trained PhD students from underrepresented minorities
Volunteer for Deep-Sea Biology Society student mentoring program

Cape Verde Summer School 2015
Worked with West African students to develop environmental management plans for Cape Verde

EXPERIENCE AT SEA

R/V *Falkor*; Chief Scientist: Roxanne Beinart, Corinna Breusing (planned) 2023
Characterization of hydrothermal ecosystems in the Galapagos spreading center 30 days
Deep-sea submergence vehicle: ROV *SuBastian*

R/V *Endeavor*; Chief Scientist: Corinna Breusing 2019
Testing of novel instrumentation for deep-sea research 7 days

R/V *Western Flyer*; Chief Scientist: Sebastian Sudek 2018
Analysis of benthic and pelagic microbial diversity in the Pacific Ocean 3 days
Deep-sea submergence vehicle: ROV *DocRicketts*

R/V *Western Flyer*; Chief Scientist: Victoria Orphan — 2017
Monitoring of whalefall and cold seep communities in the Monterey Canyon — 3 days
Deep-sea submergence vehicle: ROV *DocRicketts*

R/V *Western Flyer*; Chief Scientist: David Clague — 2016
Genetic analyses of hydrothermal vent communities in the Northeast Pacific — 10 days
Deep-sea submergence vehicle: ROV *DocRicketts*

R/V *Western Flyer*; Chief Scientist: Robert Vrijenhoek — 2015
Taxonomic and genetic studies on vent and seep animals in the Gulf of California — 10 days
Deep-sea submergence vehicle: ROV *DocRicketts*