

Curriculum Vitae

Ryan Christopher McMinds
Research Assistant Professor

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Research Interests

I study the evolution of host-microbe symbioses. In the milieu of the host-associated microbiome, there are many distinct patterns by which groups form their associations. Some are strict, obligate symbionts, some are facultative, and others are simply passersby. This forms a spectrum of consistency with which various microbial groups are found, and creates complex interactions with environmental factors and the phylogeny of both hosts and symbionts. My focus has been to disentangle these complex interactions using occurrence patterns, in order to create better hypotheses regarding the functional significance of each group. I aim to expand my current research by exploring the genetic bases for host/microbe association through genomic knockout and challenge laboratory experiments.

Education

- PhD, Department of Microbiology, Oregon State University. Advisor Dr. Rebecca Vega Thurber. December 2018.
- B.S. in Marine Science and Biology, Rosenstiel School of Marine and Atmospheric Science, University of Miami. May 2012.

Awards and Honors

- Middlekauff Graduate Achievement in Microbiology recipient, Oregon State University (2017)
- East Asia and Pacific Summer Institutes (EAPSI) Fellow, National Science Foundation (2014)
- Provost's Distinguished Graduate Fellow, Oregon State University (2013-2014)
- Foote Fellow, University of Miami (2008-2012)
- Singer Scholar, University of Miami (2008-2012)

Publications

(H-index = 8; citations = 1745; * indicates co-first authorship; † indicates as member of consortium)

- Cárdenas A, Ye J, Ziegler M, **et al.** (2020) Coral-Associated Viral Assemblages from the Central Red Sea Align with Host Species and Contribute to Holobiont Genetic Diversity. *Front Microbiol.* 11:572534. doi:10.3389/fmicb.2020.572534
- Maher RL, Schmeltzer ER, Meiling S, **McMinds R**, Ezzat L, Shantz AA, Adam TC, Schmitt RJ, Holbrook SJ, Burkepille DE, Vega Thurber RL. (2020) Coral microbiomes demonstrate flexibility and resilience through a reduction in community diversity following a thermal stress event. *Frontiers in Ecology and Evolution.* 8:356.

- Klinges JG, Rosales SM, **McMinds R**, Shaver EC, Shantz AA, Peters EC, Eitel M, Wörheide G, Sharp KH, Burkepile DE, Silliman BR, Vega Thurber R. (2019) Phylogenetic, genomic, and biogeographic characterization of a novel and ubiquitous marine invertebrate-associated Rickettsiales parasite, *Candidatus Aquarickettsia rohweri*, gen. nov., sp. nov. *ISME J.* 7:830. doi:10.1038/s41396-019-0482-0
- Maher RL, Rice MM, **McMinds R**, Burkepile DE, Vega Thurber R. (2019) Multiple stressors interact primarily through antagonism to drive changes in the coral microbiome. *Scientific Reports* 9(1):6834. doi: 10.1038/s41598-019-43274-8
- McDervitt-Irwin J, Garren M, **McMinds R**, Vega Thurber R, Baum J. (2019) Variable interaction outcomes of local disturbance and El Niño-induced heat stress on coral microbiome alpha and beta diversity. *Coral Reefs* 38(2):331-345. doi:10.1007/s00338-019-01779-8
- Pollock FJ*, **McMinds R***, Smith S, Bourne DG, Willis BL, Medina M, Vega Thurber R, Zaneveld JR. (2018) Coral microbiomes reflect host phylogeny and disease susceptibility. *Nat Com* 9(1):4921. doi: 10.1038/s41467-018-07275-x
- Thompson LR, Sanders JG, *et al*. (2017) A communal catalogue reveals Earth’s multiscale microbial diversity. *Nature* 551:457-463. doi:10.1038/nature24621
- Zaneveld JRR, **McMinds R**, Vega Thurber R. (2017) Stress and Stability: applying the Anna Karenina Principle to animal microbiomes. *Nat Microbiol* 2:17121. doi:10.1038/nmicrobiol.2017.121
- Welsh RM, Rosales SM, Zaneveld JRR, Payet JP, **McMinds R**, Hubbs ST, Vega Thurber R. (2017) Alien vs. predator: bacterial challenge alters coral microbiomes unless controlled by *Halobacteriovorax* predators. *PeerJ* 5(6):e3315. doi:10.7717/peerj.3315
- Shaver EC, Shantz AA, **McMinds R**, Burkepile D, Vega Thurber R, Silliman BR. (2017) Effects of predation and nutrient enrichment on the success and microbiome of a foundational coral. *Ecology* 98:830–839.
- Zaneveld JRR, Burkepile D, Shantz AA, Pritchard CE, **McMinds R**, Payet JP, Welsh R, Correa AMS, Lemoine NP, Rosales SM, Fuchs C, Maynard JA, Vega Thurber R. (2016) Overfishing and nutrient pollution interact with temperature to disrupt coral reefs down to microbial scales. *Nat Com* 7:11833.
- Payet JP, **McMinds R**, Burkepile D, Vega Thurber R (2014) Unprecedented evidence for high viral abundance and lytic activity in coral reef waters of the South Pacific Ocean. *Front Microbiol* 5:493. doi: 10.3389/fmicb.2014.00493
- Vega Thurber RL, Burkepile DE, Fuchs C, Shantz AA, **McMinds R**, Zaneveld JR (2014) Chronic nutrient enrichment increases prevalence and severity of coral disease and bleaching. *Glob Change Biol* 20(2):544-554. doi:10.1111/gcb.12450

Software and coding experience

- Data analysis packages: MCMCglmm, vegan, QIIME, VSEARCH, BEAST, BEAST2, MCMC.OTU, phyloseq, Tensorflow, Keras, JAGS, Stan.
- Coding languages: Extensive experience with R, Python, BASH, AWK, and TCSH. Limited experience with Perl, HTML, and PHP.

Teaching Experience

- Guest lecturer, MB302 General Microbiology. Oregon State University Department of Microbiology, Spring 2018.
- Instructor, Oregon State University Microbiome Initiative's inaugural Microbiome Informatics Workshop, 2017.
- Graduate Teaching Assistant, BI213 Principle of Biology. Oregon State University Department of Integrative Biology, Spring 2017.

Presentations:

- **McMinds R.** The Global Coral Microbiome Project (and other stories). 2018 Middlekauff Award Lecture, Oregon State University Department of Microbiology. May 2018, Corvallis, Oregon. Presentation.
- **McMinds R.** Preprocessing CGRB sequencing data using QIIME. Oregon State University Microbiome Initiative, Microbiome Informatics Workshop. May 2017, Corvallis, Oregon. Presentation/Lecture.
- **McMinds R.** Complementarity of Tara Pacific data with that of the GCMP. Tara Pacific Scientific Meeting. June 2017, Nice, France. Presentation.
- **McMinds R,** Klings G. Preliminary analyses of Tara Pacific metabarcoding data. Tara Pacific Workshop and Planning Meeting. January 2017, Paris, France. Presentation.
- **McMinds R.** Searching for codivergence among corals and bacteria with the global coral microbiome project. 13th International Coral Reef Symposium. June 2016, Honolulu, Hawaii. Presentation.
- **McMinds R.** Nutrient enrichment and algal competition destabilize the coral mucus and tissue microbiome. Association of Marine Laboratories of the Caribbean: Biannual Conference. May 2015, Willemstad, Curacao. Poster.
- **McMinds R.** Nutrient enrichment and algal competition destabilize the coral mucus and tissue microbiome. Animal-Microbe Symbioses Gordon Research Conference. June 2015, Waterville Valley, New Hampshire. Poster.
- **McMinds R,** Wilson ACC. Genes of the Nitrate Assimilation Pathway of *Arabidopsis thaliana* are Differentially Expressed in Response to Infestation by the Aphid *Myzus persicae*. 2012, Undergraduate Research, Creativity, and Innovation Forum, University of Miami. Poster.
- **McMinds RC.** Hop Pathogen Identification Using Genetic Techniques. 2007, Apprenticeships in Science and Engineering Symposium, Portland State University. Poster and presentation.

Research Experience

Université Côte d'Azur. **Ingénieur Opérationnel**, Center of Modeling, Simulation and Interactions (MSI) & Institute for Research on Cancer and Aging, Nice (IRCAN) under Drs. Stephane Descombes & Eric Gilson. February 2019 – present.

- Development of statistical models for analysis of Tara Pacific metabarcoding, metagenomic, and other data.
- Manual annotation of marine taxa and traits in underwater photographs from Tara Pacific.

Oregon State University. **PhD Candidate / Graduate Research Assistant**, lab of Dr. Rebecca Vega Thurber. August 2013 – December 2018.

- TARA Pacific Expedition. July 2016 – present.

- **Chief Scientist**, Indonesia/Palau transect. December 2017-January 2018.
- **Scientist**, Australia/New Caledonia transect. Coral sampling team. August-October 2017.
- **Scientist**, Panama transect. Coral sampling and planning team. July-August 2016.
- Global Coral Microbiome Project (GCMP) team member. August 2013 - present. (Pollock and McMinds *et al.* 2018+)
 - Planned and led expeditions to Australia, Saudi Arabia, Curacao, Reunion, Hawaii, and Mo'orea to collect diverse coral species on SCUBA.
 - In-field sample processing, DNA extraction, and bacterial culturing.
 - Developed and applied diverse statistical models to analyze HTS amplicon data in the context of host and microbial phylogenies.
 - Provided samples and metadata to the Earth Microbiome Project. (Thompson *et al.* 2017+)
- Rickettsiales work in *Acropora cervicornis*. December 2014 – April 2019. (Shaver *et al.* 2017+, Klinges *et al.* 2019+)
 - Processed tissue samples of corals exposed to nutrient and *Coralliophila* snail predation.
 - Trained undergraduates in laboratory techniques including DNA extraction and 16S amplicon library preparation.
 - Developed statistical framework and analyzed 16S amplicon data.
 - Assisted with genomic, phylogenetic, and taxonomic analyses and interpretation of novel bacterium *Candidatus Aquarickettsia rohwerii*.
- Waitt Institute / Blue Halo Initiative volunteer survey team member. October 2015. On SCUBA, explored diverse sites around the island of Montserrat to better inform the local government of distributions of their marine resources.

Oregon State University. **Faculty Research Assistant**, lab of Dr. Rebecca Vega Thurber. June 2012 - August 2013.

Administrative lab duties including ordering and processing lab supplies, assisting grad students and postdocs, training undergrads, etc.

- Mo'orea virus work: Conducted nutrient augmentation study and collected coral fragments on SCUBA. CRIOBE, Mo'orea. (Payet *et al.* 2014+)
- USVI virus and disease work: Conducted viral infection experiments in aquaria and collected coral fragments on SCUBA. University of the Virgin Islands, St. Thomas and St. John, US Virgin Islands. (Soffer *et al.* 2014*)
- HERBVRE project: >165 dives in the Florida Keys maintaining long-term exclosures, setting up and performing coral-algal interaction experiments, collecting coral mucus and algae samples, catching parrotfish, performing surveys, etc. Labwork in Oregon preparing samples for 454 sequencing of 16S amplicons. QIIME data analysis of 16S sequence data. (Vega Thurber *et al.* 2014+, Zaneveld *et al.* 2016+)

University of Miami. **Undergraduate student**. 2008-2012.

- **Volunteer Undergraduate Research Assistant**, class and lab of Dr. Peter Glynn. January 2012-May 2012. *Coeloplana* species description.
 - Collected coral samples, identified octocorals to species, observed putative new species of benthic ctenophore. (Glynn *et al.* 2014*)

- **Undergraduate Research Assistant**, lab of Dr. Alex Wilson. June 2010-May 2012. Studied aphid-*Buchnera* symbiosis and effects of aphid herbivory on gene expression of *Arabidopsis*.
 - *Arabidopsis* project: Developed equipment and protocol for controlled hydroponic growth of *Arabidopsis* and containment of aphids; designed, tested, and optimized qPCR primers and reaction protocol; isolated and purified RNA, created cDNA, and carried out experimental qPCR; prepared plant tissue for stable isotope analysis.
 - Transporters & RNAi project: Selected gene targets for RNAi trials, designed primers with modified *E. coli* expression factors and restriction enzyme target sites, isolated, amplified, and sequenced mRNA transcripts, designed and created plasmid vectors, transformed *E. coli*, extracted RNA and created gene-specific dsRNA, performed RNAi trials on aphids via artificial diets. (Price *et al.* 2011*)
 - **AAUS volunteer diver** for master's student Mark Hartman of the University of Southern Florida studying coral damage caused by mini-season divers near Key West. July 2011. Surveys on SCUBA of freshly damaged coral and abundance of *Panulirus argus*. (Hartman 2011*)
 - **Volunteer field assistant** to Ph.D. student Nathan Dappen studying speciation of Ibiza Wall Lizards in Formentera, Spain. April-June 2011
 - Studied behavioral responses of wild lizards to various stimuli, used clay models to quantify relative predation rates between color morphs and identify predators, collected tissue samples for microsatellite analysis, etc. (Dappen *et al.* 2013*)
 - Helped create NESCent Evolution Film Festival-winning short film about the research. (Dappen & van Alphen 2011*)
 - **AAUS student diver**, field course in underwater archaeology at Little Salt Spring (North Port, Florida) with Dr. John Gifford. January 2011.
 - Prepared site and excavated artifacts on SCUBA.
 - **AAUS volunteer diver** for Ph.D. student Remy Okazaki studying controlled coral growth rates in the Florida Keys. April 2010
 - Manipulated water chemistry and sampled corals on SCUBA. (Okazaki 2013*)
- Oregon State University / Apprenticeships in Science and Engineering. **Research Assistant**, lab of Dr. David Gent, USDA – Agricultural Research Service. June – August 2007. Species delimitation and host fidelity of the oomycete hop pathogen *Pseudoperonospora humuli* and close relatives. Extracted DNA from environmental samples, designed species-specific primers, and prepared samples for Sanger sequencing. (Mitchell 2010*)

* = acknowledged in, † = authored

Outreach

- Contributor, scientific resource, and interviewee for documentary film *Saving Atlantis*, plus featured speaker following screenings at OSU in Corvallis, the Oregon Museum of Science and Technology in Portland, the Emerald Earth Film Festival in Eugene, and an OSU Science Pub event in Bend (2018).
- Co-writer of the web comic mini-series *Coral County*, 2017. (<https://www.briannaleahyart.com/coralcountycomic>)

- Invited speaker to answer audience questions following a Union of Concerned Scientists screening of the documentary film *Chasing Coral*, 2017.
- Invited speaker at the 2017 Portland EcoFilm Festival, to answer audience questions following a screening of the documentary film *Chasing Coral*.
- Contributor to extensive video materials explaining the GCMP and the background natural history.
- Founder, author, and editor of *The Cnidae Gritty*, a blog dedicated to communicating science in an accessible way as it's happening

Certifications / Authorizations

- PADI Rescue Diver (2017)
- Fédération Française d'Études et de Sports Sous-Marins license holder (2015)
- Queensland Recreational Boating license holder (2014)
- National Association of State Boating Law Administrators (NASBLA) approved motorboat operator (Oregon State Marine Board, 2013)
- NSS Cavern Diver (2012)
- PADI Nitrox Diver (2012)
- PADI Advanced Open Water Diver (2012)
- DAN Diving First Aid for Professional Divers (Provider, 2012)
- AAUS Scientific Diving Authorization
 - 60 ft. authorization (Oregon State University, 2012)
 - Nitrox, Night, 30 ft. authorizations (University of Miami, 2009)

Other Notable Experience:

- Moderate Spanish and French speaking abilities
- >500 logged dives
 - >425 scientific dives by AAUS standards
 - 17 logged cold water dives

Work acknowledged in:

- Gorsky G, *et al.* (2019) Expanding Tara Oceans protocols for underway, ecosystemic sampling of the ocean-atmosphere interface during Tara Pacific expedition (2016-18). *Front Mar Sci* 6:750.
- Planes S, Allemand D, Agostini S, Banaigs B, Boissin E, *et al.* (2019) The Tara Pacific expedition—A pan-ecosystemic approach of the “-omics” complexity of coral reef holobionts across the Pacific Ocean. *PLOS Biology* 17(9): e3000483. doi:10.1371/journal.pbio.3000483
- Love MI, Anders S, Huber W. (2017) Analyzing RNA-seq data with DESeq2. (R package reference manual)
- Rosales S. (2016) The use of omics for disease evaluation in the brains of marine mammals. (PhD Dissertation, Oregon State University)
- Welsh RM. (2015) Bacterial predation in host microbiomes. (PhD Dissertation, Oregon State University)

- Glynn PW, Bayer FM, Renegar DA (2014) *Coeloplana waltoni*, a new species of minute benthic ctenophore (Ctenophora: Platyctenida) from south Florida. *Proc Biol Soc Wash* 127(2):423-436.
- Soffer N, Zaneveld J, Vega Thurber RL (2014) Phage-bacteria network analysis and its implication for the understanding of coral disease. *Environ Microbiol* doi:10.1111/1462-2920.12553
- Dappen N, Losin N, Perez-Mellado V (2013) *The Symbol: Wall Lizards of Ibiza and Formentera*. Day's Edge Productions. (Book)
- Okazaki RR. (2013) Responses of Stress-Tolerant Corals to Ocean Acidification. (PhD Dissertation, University of Miami)
- Dappen N. (2012) Intralocus sexual conflict, ontogenetic conflict, and color evolution in the Ibiza Wall Lizard, *Podarcis pityusensis*. (PhD Dissertation, University of Miami)
- Hartman ML (2012) Assessment of diver impact during the spiny lobster sport season, Florida Keys, USA. (Master's Thesis, University of Central Florida)
- Price DR, Duncan RP, Shigenobu S, Wilson ACC (2011) Genome expansion and differential expression of amino acid transporters at the aphid/*Buchnera* symbiotic interface. *Mol Biol Evol* 28:3113–3126.
- Dappen N, van Alphen J, dirs. (2011) Cold-blooded cannibals: Extreme adaptations to island life. Day's Edge Productions. <http://vimeo.com/24918263> (Short film)
- Mitchell MN. (2010) Addressing the relationship between *Pseudoperonospora cubensis* and *P. humuli* using phylogenetic analyses and host specificity assays. (Master's Thesis, Oregon State University)

Current and Past Collaborators

- Dr. Monica Medina, Penn State University
- Dr. Serge Planes, Centre de Recherches Insulaires et Observatoire de l'Environnement
- Dr. Christian Voolstra, King Abdullah University of Science and Technology
- Dr. Deron Burkepille, University of California Santa Barbara
- Dr. David Bourne, James Cook University