

# Richard Karp

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## Education:

### The University of Miami

*Doctor of Philosophy in Marine Biology and Ecology*

Overall GPA: 4.0/4.0

Coral Gables, FL

*May 2024*

### The University of Miami

*Masters of Professional Science in Exploration Science*

Overall GPA: 4.0/4.0

Coral Gables, FL

*December 2017*

### The Pennsylvania State University

*Bachelor of Science in Chemistry*

Overall GPA: 3.70/4.00

University Park, PA

*May 2014*

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## Research Experience:

### UM-CIMAS, NOAA-AOML Coral Program

*Post Doctoral Associate*

- ❖ Program and design systems to scale coral restoration through robotic automation

Virginia Key, FL

*June 2024-Present*

### University of Miami Coral Reef Futures Lab

*PhD Candidate*

Supervisor: Dr. Andrew Baker

- ❖ Aid with grant writing, laboratory management, experimental design, grant reporting, and project management of multiple projects in ~20 laboratory group
- ❖ Perform experiments to test mechanisms of thermal tolerance based on symbiont community and genetics on *A. cervicornis* and *A. palmata* through laboratory and field bleaching experiments
- ❖ Test ability of corals to shift symbiont community based on bleaching threshold and environment in 12+ Caribbean coral species through quantitative-PCR and ITS2 sequencing
- ❖ Test the role of cultured algal symbionts in stony coral tissue loss disease using epifluorescence microscopy, transmission electron microscopy, and RNA sequencing

Virginia Key, FL

*May 2019-May 2024*

### University of Miami Coral Reef Futures Lab

*Graduate Student Intern*

*2017*

Supervisor: Dr. Andrew Baker

- ❖ Performed laboratory experiment to determine heat tolerance of 30 genotypes of *Acropora cervicornis* using chlorophyll fluorometry, qPCR analysis, and statistics
- ❖ Designed and constructed novel experimental raft to “stress harden” corals in the field
- ❖ Aided with Rescue a Reef dive operations to outplant, educate, and restore Miami-Dade’s staghorn coral population

Virginia Key, FL

*January 2017- December*

### Bioengineering Laboratory Intern

*Undergraduate Researcher*

Supervisor: Justin Brown, PhD

- ❖ Electrospun polymer scaffolds to test cell signaling in response to the growth environment
- ❖ Tested epigenetics of acetylated and methylated histones using Western Blot
- ❖ Learn experimental design and molecular technique troubleshooting

University Park, PA

*Spring 2013-Summer 2014*

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### Peer Reviewed Publications:

Flowers K, Golembeski P, Ross B, **Karp RF**, Baker AC (2023) Visual surveys reveal coral growth in mangrove fringe in a subtropical metropolis. *Bulletin of Marine Science*.

Cunning R, Parker KE, Johnson-Sapp K, **Karp RF**, Wen A, Williamson OM, Bartels E, D'Alessandro M, Gilliam DS, Hanson G, Levy J, Lirman D, Maxwell K, Million WC, Moulding AL, Moura A, Muller EM, Nedimyer K, Reckenbeil B, van Hooidek R, Dahlgren C, Kenkel C, Parkinson JE, Baker AC (2021) Census of heat tolerance among Florida's threatened staghorn corals finds resilient individuals throughout existing nursery populations. *Proceedings of the Royal Society B* 288.1961 (2021): 20211613.

Krest, C. M.; Onderko, E. L.; Yosca, T. H.; Calixto, J. C.; **Karp, R. F.**; Livada, J.; Rittle, J.; Green, M. T. Reactive Intermediates in Cytochrome P450 Catalysis. *J. Biol. Chem.* 2013, 288: 17074- 17081.

### Additional Publications:

**Karp RF**, Dennison CE, Kron NS, Baker AC (2023) The use of algal symbiont cultures (Family Symbiodiniaceae) as model systems to study stony coral tissue loss disease: Use of fractionated disease isolates to help with pathogen identification. Florida Department of Environmental Protection, Tallahassee, Florida. 1-27.

**Karp RF**, Dennison CE, Peters EC, Baker AC (2023) The role of algal symbionts in stony coral tissue loss disease (SCTLD): Comparison with cultured isolates from five different Symbiodiniaceae genera, and role of temperature in disease dynamics. Florida Department of Environmental Protection. Miami FL. 1-20.

Dennison CE, **Karp RF**, Weiler B, Goncalves A, del Campo J, Rosales S, Traylor-Knowles N, Baker AC (2021) The role of algal symbionts (genus *Breviolum*) in the susceptibility of corals to Stony Coral Tissue Loss Disease in South Florida. Florida Department of Environmental Protection. Miami FL. 1-23.

### *In prep:*

**Karp RF**, Dennison CD, Wen ADE, Cunning RJ, Baker AC (2023) Ranking symbiont shuffling in twelve Caribbean coral species following a controlled bleaching experiment: Implications for coral intervention strategies.

Dennison CD and **Karp RF**, Wen ADE, Weiler B, Bonacolta A, Work, Peters E, del Campo J, Traylor-Knowles N, Rosales S, Baker AC (2023) Different algal symbionts (Family Symbiodiniaceae) drive the relative susceptibility of corals to stony coral tissue loss disease

**Karp RF**, Cabral C, D'Alessandro M, Hesley D, Carrick J, Kaufman M, Lirman, Baker AC (2024) Effects of prior stress exposure on the subsequent thermal tolerance of the threatened Caribbean staghorn coral, *Acropora cervicornis*

Baker AC, Karp RF, Conn T, Cunning RJ, Drury C, Schopmeyer S, Hooionk R, Lirman D (2024) A minimal-risk approach to incorporating climate resilience into reef restoration using short-distance assisted gene flow from marginally warmer habitats

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### Ongoing Research Projects:

#### *Phd Chapters:*

1. Identify how twelve Caribbean coral species shuffle their symbiont communities towards *Durussdinium trenchii* due to a laboratory-controlled bleaching and recovery experiment through qPCR and ITS2 amplicon sequencing-**Completed June 2020**
2. Test if rearing six adult coral species in chronically stressful nearshore environments will alter their symbiont communities and will subsequently increase their thermal tolerance when transplanted offshore through a one year long reciprocal transplant experiment-**Completed March 2023**
3. Test if hosting *Durussdinium* in *A. palmata* increases its thermal tolerance and alters its growth rate compared to juvenile corals hosting *Symbiodinium*-**Completed May 2022**
4. Test how outplant environments effects the same genets of *Acropora cervicornis* to increase thermal tolerance in the absence of symbiont shuffling through CBASS-**Completed May 2021**

#### *Other Relevant Projects*

- ❖ Test the role of cultured algal symbionts in stony coral tissue loss disease by exposing cultures to pathogen seawater and test for the response using chlorophyll fluorometry, light and epifluorescence microscopy, transmission electron microscopy, and RNA sequencing - **Completed June 2023**
- ❖ Assess the thermal tolerance of *A. palmata* in Floridian nurseries using CBASS to use for future breeding experiments and test for genetic markers of thermal tolerance (Collaborations Iliana Baums, Keri O'Neil)- **Completed June 2022**
- ❖ Conduct short term (2 week- 1 month) bleaching experiments on *A. palmata* and *O. faveolata* to test how heat stress effects different symbiont species and coral cell lines using single cell RNA sequencing (Collaboration Anthony Bonacolta and Javier del Campo) -**Completed May 2023**
- ❖ Monitor field bleaching in 2022 and 2023 across 20+ sites to test how CBASS thermal tolerance metrics compare to natural bleaching events and assess how symbiont community impacts field bleaching-**Ongoing September 2023**
- ❖ Coordinate sample distribution across seven agencies to sequence 19 coral species and their algal symbionts to generate long read genomes through the Tree of Life Aquatic Symbiosis Project (Coral Hub)-**Completed January 2022**

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### Research Cruises:

September 2023-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Survey bleaching severity through DRM surveys from Miami to Dry Tortugas

June 2023-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Assess thermal tolerance of 200 genets of *A. cervicornis* throughout Dry Tortugas through CBASS
- ❖ Reciprocally transplant 540 fragments of *A. cervicornis* across 3 outplant sites and 9 plots

June 2022-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Assess thermal of 172 genet x nursery combination of *A. palmata* across 4 nurseries in the northern Florida Keys through CBASS

October 2020-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Test thermal of 192 genets x nursery combinations (136 genets) of *A. cervicornis* throughout the Florida Keys through CBASS
- ❖ Conduct Disturbance Response Monitoring throughout Florida Keys
- ❖ Publication Cunning et al 2021

October 2019-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Conduct symbiont community surveys of 70+ Caribbean species across the Bahamian archipelago
- ❖ Reciprocally move *A. cervicornis* through the Bahamian archipelago nurseries in Bimini, New Providence, Eleuthera, Exumas, and Cat Island

June 2019-Coral Reef II Shedd Aquarium-Led by Dr. Andy Kough

- ❖ Conduct symbiont community surveys of 15+ Caribbean species across the northern and southern Exuma island chain
- ❖ Aid in assessing lobster and conch populations in the northern and southern Exuma island chain

March 2019-Coral Reef II Shedd Aquarium-Led by Dr. Ross Cunning

- ❖ Conduct symbiont community surveys of 75+ Caribbean species throughout the Exuma island chain

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### Presentations/Conferences:

**Talk-International Coral Reef Symposium 2022- Bremen, Germany, July 2022:** Testing the relative ability of twelve Caribbean coral species to shuffle symbionts following bleaching in a controlled experiment: Implications for coral intervention strategies

**Talk-Reef Futures 2022-Key Largo, Florida, September 2022:** Rapid thermal performance assessments in *Acropora cervicornis* across outplant sites determine the best performers and explain performance variability: Implications for coral restoration

**Poster-Reef Futures 2022-Key Largo, Florida, September 2022:** Rapid assessment of thermal tolerance identifies fixed genotypic hierarchies and effects of acclimatization as determinants of thermal resistance in the threatened elkhorn coral, *Acropora palmata*

**Talk-Reef Florida, Miami, Florida, November 2023:** Assessing the causes and consequences of hosting heat-tolerant algal symbionts in the foundational reef-building coral *Acropora palmata* (elkhorn coral): Implications for coral restoration

**Poster-Reef Florida, Miami, Florida, November 2023:** Characterizing Whole Genomes in the Aquatic Symbiosis Genome (ASG)Project to Find Common Mechanisms for Photosymbiosis Across a Wide Phylogenetic Spectrum: Implications for coral restoration

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## Awards and Honors:

Lifetime Achievement Presidential Service Award, 2016

Student Service Award- University of Miami, 2017

Dean's List-2010, 2011, 2012, 2013, 2014, 2017, 2019

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## Skills:

- ❖ R programmer, Python and C - 5 Years
- ❖ Experienced Field Team Leader - 8 Years
- ❖ AAUS Scientific diver-Conduct 500+ scientific dives to survey corals and other benthic species, outplant, sample, maintain, and monitor coral communities - 5 Years
- ❖ Experienced in Light and Fluorescence Microscopy, Transmission electron microscopy, Gel Electrophoresis, PCR, quantitative PCR, Sterile Cell Culture Techniques - 5 Years
- ❖ Experienced in library preparation for ITS2 amplicon sequencing and RNA-sequencing
- ❖ Experienced in design and manufacturing through- 3D printing and laser cutting
- ❖ Experienced with ArcGIS, mapping ,and surveying - 5 Years
- ❖ Expert in Microsoft Office and Google Suite - 10+ Years
- ❖ Experienced in NMR, GC-MS, FPLC, IR, Fluorescence, Light Spectroscopy - 4 Years
- ❖ Experienced in titrations, column chromatography, and organic synthesis - 4 Years
- ❖ Experienced in bacteria transformation and protein purification - 2 Years
- ❖ Experience in managing and coordinating 100s of individuals in volunteer efforts

## Certifications:

- ❖ DAN Emergency Management Provider
- ❖ FEMA National Fire Academy Wildland Firefighter Certification
- ❖ FEMA IS 100, IS 200, IS 700 and IS 800 Training
- ❖ CPR/First Aid and O2 Administration
- ❖ Marine Operator Course (MOCC)
- ❖ AAUS Scientific Diver
- ❖ Equarist Training in Water Chemistry and Quality, Life Support Systems, Coral Husbandry, and Animal Welfare

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## Other Work Experience:

### RSMAS Office of Emergency Preparedness

*Student Assistant*  
2017

**Virginia Key, FL**

*October 2016- December*

Supervisor: Vincent Torres

- ❖ Photo document RSMAS campus using nSide mapping software
- ❖ Draft emergency preparedness guidelines for RSMAS campus
- ❖ Run RSMAS Campus Command Post during Hurricane Irma and ensured proper photo documentation and cost tracking of disaster for RSMAS campus

### Americorps St. Louis Emergency Response Team

*Second Year Member*

**St. Louis, MO**

*September 2014-August 2016*

Supervisor: Will Burkes

- ❖ Respond to tornadoes and other natural disasters in the United States
  - Coordinate over 1000 volunteers through volunteer reception center
  - Distribute and locate necessary supplies
  - Properly track volunteer hours and financials to ensure FEMA reimbursement
- ❖ Lead teams of 4 to 10 members in conservation work of national and state forests in Missouri, Illinois, and Montana
- ❖ Coordinate with 10 agencies to plan week to week activities for over 30 members

- ❖ Teach new members conservation skills such as chainsawing, leave no trace, and invasive species identification
- ❖ Maintain, repair, and manage over 50 pieces of power equipment