Nicolas I. Rivas

Department of Biology
Florida International University
Ph.D. Candidate, Seascape Ecology Lab
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EDUCATION

Florida International University - Miami, Florida
Doctor of Philosophy In Progress
Major: *Biology*
Thesis*: Assessing the dynamic state of Caribbean coral reefs: The influence of seascape properties, macroalgae abundance and herbivory on coral population growth and community assembly*
PI: Dr. Rolando Santos-Corujo

University of Miami - Miami, Florida
Master of Science July 2020
Major: *Marine Biology and Ecology*
Thesis*: Developing Best Practices for the Propagation and Restoration of Massive Corals: The Influence of Predation, Colony Size and Genotype*
PI: Dr. Diego Lirman

University of Central Florida – Orlando, Florida
Bachelor of Science July 2018
Major: *Biology*

WORK EXPERIENCE

Florida International University- Miami, Florida
Teaching Assistant August 2023-Present
- Taught Biology 1 Lab, focusing on fundamental biological concepts, lab techniques, and scientific writing for first-year undergraduate students.
- Instruct Ecology Lab with a field-based component, providing hands-on experience in ecological data collection and analysis.
- Introduce students to R programming for statistical analysis and data visualization in ecological research.
- Guide students in writing scientific articles, emphasizing proper methodology, results interpretation, and clear communication of findings.

Research Assistant January 2023-Present
- Provide technical and logistical support for scientific research, biological assessment, monitoring, and analysis of FIU Aquarius Reef Base
- Write detailed reports on ecological assessments, ensuring data accuracy and clarity.
- Participate in the development of guidelines, protocols, and procedures for long-term monitoring.

Graduate Research Assistant August 2021-July 2023
- Executed over 300 scientific dives to monitor benthic habitats, contributing to high-resolution ecosystem mapping.
- Onboard vessels (up to 24 feet in length) for 100+ days of fieldwork in Florida and Puerto Rico open-water marine environments
- Supported image acquisition employing photogrammetry methods, along with processing, archiving and analyzing for multiple projects.
- Conducted intensive fieldwork activities, including photogrammetric surveys, cement module building, coral outplanting, and BRUV community assessments

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- Cataloged and identified benthic communities across the Florida and Caribbean region
- Synthesized data for public dissemination and annual reports.

Research Associate January 2021-August 2021

- Managed developing scientific lab, including data management and laboratory processing.
- Maintained and operated laboratory equipment, ensuring functionality and compliance with safety protocols.
- Developed field protocols for integrating photogrammetry methods.
- Developed data extraction protocols from Large-Area Images.

SECORE International - Miami, Florida

Research Intern April 2021-January 2021

- Led fieldwork activities for coral spawning monitoring and collection, ensuring accurate data acquisition and sample preservation.
- Managed spawning setups and conducted settlement survivorship analyses to support coral restoration efforts.
- Tested innovative coral spawn collection tools to improve efficiency and effectiveness in restoration practices.

University of Miami - Miami, Florida

Graduate Research Assistant August 2018-July 2021

- Executed over 200 scientific dives to monitor restoration sites.
- Conducted field research on massive morphology coral outplanting, investigating the influence of genotype on targeted predation.
- Managed ex-situ facilities, overseeing coral husbandry and the development and construction of coral trees for restoration initiatives.
- Participated in the Florida Fish and Wildlife Disease Response Program (DRM), monitoring and tracking coral health across the Florida Keys.
- Collaborates with multiple interdisciplinary teams to conduct research on coastal seascape environments.

Field School - Miami, Florida

Research Intern August 2018-May 2019

- Assisted in tagging sharks and yellow stingrays, contributing to ongoing research on marine species behavior and movement.
- Instructed passengers on boat safety protocols and proper shark tagging techniques to ensure safe and effective field operations.
- Photographed and documented field excursions, creating visual records for educational and research purposes.

Dr. William Crampton Lab, UCF - Orlando, Florida

Research Assistant August 2016-May 2018

- Entered and organized data for Amazon River species, ensuring accuracy and consistency across the dataset.
- Photographed and meticulously documented over 1,000 incoming species to support research and archival purposes.

RESEARCH EXPERIENCE

Florida International University- Miami, Florida

SANTOS SEASCAPE ECOLOGY LAB *Principal Investigator: Dr. Rolando O. Santos*

Assessing the dynamic state of Caribbean coral reefs: The influence of seascape properties, macroalgae abundance and herbivory on coral population growth and community assembly

Thesis Research, NFWF and National Science Foundation August 2021-Present

- Collaborated with local nonprofits to support community-driven coral reef conservation and restoration initiatives.
- Developed a population dynamics model integrating the *Diadema* mortality event to assess its impact on coral population growth and community structure.
- Conducted BRUV (Baited Remote Underwater Video) surveys to monitor fish populations and assess herbivory dynamics.
- Applied advanced multivariate data analysis techniques, including PERMANOVAs, n-hypervolumes and trajectory analysis, in R Studio to investigate ecological patterns and community assembly.
- Partnered with interdisciplinary team to meet project requirements.

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- Delivered research findings through professional presentations and comprehensive written reports to stakeholders and funding agencies.
- Designed and implemented field monitoring protocols, including site selection, daily field operations, and installation of monitoring equipment
- Collected and analyzed high-resolution ecological data using photogrammetry techniques to assess benthic and seascape properties.

Assessing Functional Trait Dynamics of Caribbean Scleractinia Communities in Puerto Rico's Northeast Marine Corridor
Research Assistant, NOAA Puerto Rico Sea Grant Program August 2022-Present

- Conducted comprehensive literature and database reviews on Scleractinia functional traits to inform research objectives.
- Collected community data using photogrammetry techniques to create high-resolution ecological datasets.

RAPID: Here we go again - The fate of Diadema antillarum and Caribbean reefs in the 21st century
Research Assistant, National Science Foundation September 2022-December 2024

- Led field-based photogrammetry operations to document benthic habitat changes of reefs in Culebra, Puerto Rico.
- Processed high-resolution orthomosaics to analyze and determine benthic community composition.
- Collected diverse biological samples, including invertebrates, vertebrates, plants, algae, and sediments, for stable isotope analysis.
- Analyzed data and authored the report *RAPID: Here We Go Again – The Fate of Diadema antillarum and Caribbean Reefs in the 21st Century,* highlighting key findings and implications.

Restoring the three-dimensional structure of hurricane-impacted coral reefs in Puerto Rico
Research Assistant, National Fish and Wildlife Foundation January 2021-December 2023

- Led efforts to restore the three-dimensional structure of hurricane-impacted coral reefs in Puerto Rico through advanced monitoring and analysis techniques.
- Directed photogrammetry operations and deployed Baited Remote Underwater Video (BRUV) systems to evaluate stony coral and fish assemblages' community composition and demographic structure for restoration monitoring.
- Developed a comprehensive benthic community identification guide for research and training purposes.
- Supervised and mentored undergraduate students, including an NSF-funded REU participant, in designing and executing research projects, analyzing data, and preparing for program symposiums.
- Created a benthic community identification guide for use in research and training.
- Guided students in preparing and delivering research presentations at program symposia.
- Analyzed data and authored the report *Restoring the Three-Dimensional Structure of Hurricane-Impacted Coral Reefs in Puerto Rico,* outlining key findings and recommendations for restoration strategies.

Stream ECOsystems and Drought (SECO): A multilevel assessment
Research Assistant, National Science Foundation-Luquillo LTER February 2023-Present

- Assisted with shrimp mark-recapture studies as part of long-term ecosystem experiments examining drought impacts on stream ecosystems.
- Documented species-specific metrics and collected data on key environmental parameters in montane freshwater streams.
- Contributed to the development of standardized datasets, ensuring consistency and reliability in ecological research outputs.

Fish In Seagrass Habitats: Seascape Connectivity Across Protected Ecosystems
Research Assistant, NOAA May 2023-Present

- Supported the use of GPS technology and ground-truthing to train machine learning models for mapping seagrass habitats.
- Conducted underwater surveys and analyzed benthic imagery to assist with seagrass habitat mapping and ecosystem assessments.

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University of Miami - Miami, Florida
BENTHIC ECOLOGY AND CORAL RESTORATION LAB *Principal Investigator: Dr. Diego Lirman*
Developing Best Practices for the Propagation and Restoration of Massive Corals: The Influence of Predation, Colony Size and Genotype
Thesis Research January 2019-September 2020

- Investigated the effects of predation, colony size, and genotype on the propagation and restoration of massive corals.
- Designed and conducted field and laboratory experiments to optimize best practices for coral restoration initiatives.
- Integrated ecological and physiological analyses to inform effective strategies for enhancing coral survivorship and resilience.

Methods to Increase Coral Outplanting Efficiency and Foster Colony Development
Research Assistant January 2019-July 2020

- Assisted in testing various cement mixtures to enhance coral outplanting success and durability.
- Performed coral husbandry tasks, ensuring optimal health and growth conditions for outplanted corals.
- Participated in coral outplanting efforts, contributing to large-scale restoration initiatives.
- Conducted follow-up surveys to monitor coral survivorship, growth, and colony development post-outplanting.

Lesion Recovery in the Threatened Caribbean Staghorn Coral (Acropora cervicornis): Influence of Temperature, Donor Reef Thermal History, Genotype, Colony Size, and Lesion Size
Research Assistant January 2019-May 2020

- Assisted with coral nursery maintenance and collection, ensuring healthy stock for experiments and restoration.
- Performed weighing and tissue blasting techniques to evaluate lesion healing rates and physiological responses.
- Investigated the effects of predation, colony size, and genotype on the propagation and restoration of massive corals.

Universidad de Chile - Santiago, Chile
INSTITUTO DE CIENCIAS BIOMÉDICAS *Principal Investigator: Dr. Ramon Rodrigo*
Antioxidant therapy in patients with mild hypertension
Research Intern August 2018-July 2021

- Conducted blood sample assays to analyze biomarkers related to oxidative stress and cardiovascular health.
- Researched oxidative stress mechanisms in myocardial infarctions, contributing to the understanding of heart disease pathology.

PUBLICATIONS

Published

Unsworth, J.D., Hesley, D., D'Alessandro M., Carrick J.V., Kaufman, M., **Rivas, N.**, Lirman, D. (2023). Dense clusters improve efficiency and foster colony development in restored *Acropora cervicornis*. Coral Reefs, (42), 337-341. https://doi.org/10.1007/s00338-022-02342-8

Rivas, N., Hesley, D., Kaufman, M., Unsworth, J.D., D'Alessandro, M., Lirman, D. (2021). Developing best practices for the restoration of massive corals and the mitigation of predation impacts: influences of physical protection, colony size, and genotype on outplant mortality. Coral Reefs, 40(4), 1227–1241. https://doi.org/10.1007/s00338-021-02127-5

Koval, G., **Rivas, N.**, D'Alessandro, M., Hesley, D., Santos, R.O., Lirman, D. 2020. Fish predation hinders the success of coral restoration efforts using fragmented massive corals. PeerJ 8: e9978 https://doi.org/10.7717/peerj.9978

In Preparation

Rivas, N., Nation, C., Bautista, V., James, W.R., Santos, R.O. *(in preparation)* Shifts in Reef Composition Following a **Diadema antillarum** Die-Off: Algal Proliferation and Its Ecological Impacts

James, W.R., Rodemann, J., White, Mack., Badlowski, G.A., Bautista, V., Castillo N.A., Costa, S.V., Distrubell, A., Eggenberger, C.W., Kabat, L.J., Linefelser, J.O., **Rivas, N.**, Sturges, J.W., Trabelsi, S., Rehage, J.S., Santos, R.O. *(in preparation).* Linking Productivity Shifts to Trophic Niche Dynamics with Hypervolume Analysis

Rivas, N., James, W.R., Santos, R.O. (*in preparation*). Maximizing point count accuracy in benthic cover calculations

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PUBLISHED DATASETS

Published

Santos, R., **Rivas, N.,** James, W.R., Mercado-Molina, A.E., Rehage, J.S. (2024). Data analysis code for: RAPID: Here we go again - The fate of Diadema antillarum and Caribbean reefs in the 21st century. Version 1.0. Zenodo. https://doi.org/10.5281/zenodo.

ORAL PRESENTATIONS

- **Rivas, N.,** James, W.R., Bautista, V., Nation, C., Bonilla, S., Santos, R.O. (2025) Demographic shifts for Porites astreoides and Diploria labrynthiformis after the 2022 Diadema antillarum mortality event; FIU Biosymposium; February 2025
- **Rivas, N.,** James, W.R., Bautista, V., Santos, R.O. (2024) Will weedy coral species take over Caribbean reefs? Population dynamics of Porites astreoides under different environmental conditions; Benthic Ecology Meeting; December 2024
- **Rivas, N.,** Bautista, V., James, W.R., Santos, R.O. (2024) Bridging the Gaps: Spatial Insights into Coral Trait Space in Culebra, Puerto Rico; ECRS; July 2024
- **Rivas, N.,** James, W.R., Bautista, V., Santos, R.O. (2024) Population dynamics of Porites astreoides under different environmental conditions; Benthic Ecology Meeting; April 2024
- **Rivas, N.,** (2024) Assessing the Dynamic State of Caribbean Coral Reefs: The influence of seascape properties, macroalgae, and herbivory on coral population growth and community assembly; Proposal Defense April 2024
- Bautista V., **Rivas N.,** Hamle HM., Nation C., James WR., Santos R. (2024) Assessing Functional Trait Dynamics of Caribbean Scleractinia Communities in Puerto Rico's Northeast Marine Corridor. Benthic Ecology Meeting. Charleston, South Carolina; April 2024
- **Rivas, N.,** Sandquist, M., Nation, C., Trabelsi, S., James, W.R., Santos, R.O. (2024) Using a multi-level seascape approach to understand herbivore species assemblages in reef systems; FIU Biosymposium; February 2024
- James WR, Rodemann JR, Badlowski G, Bautista V., Castillo NA, Costa SV, Distrubell A, Eggenberger CW, Kabat L, Linenfelser JO, **Rivas N,** Sandquist M, Sturges J, Trabelsi S, White M, Rehage JS, & RO Santos. Seasonal variation in trophic niche size and overlap in a seagrass food web. Benthic Ecology Meeting; March 2023
- **Rivas, N.,** James, W.R., Bautista, V., Sandquist, M., Rehage, J.V., Santos, R.O. (2023) Maximizing sampling effort to estimate benthic percent cover; Benthic Ecology Meeting; March 2023
- **Rivas, N.,** James, W.R., Bautista, V., Sandquist, M., Rehage, J.V., Santos, R.O. (2023) Maximizing sampling effort to estimate benthic percent cover; FIU Biosymposium; February 2023
- **Rivas N.,** Unsworth J.D., Hesley, D., D'Alessandro, M., Lirman, D., (2020) Developing best practices for the propagation and restoration of massive corals: Predation mitigation, colony size and genotypic influences; Thesis defense; June 2020
- **Rivas N.,** Unsworth J.D., Hesley, D., D'Alessandro, M., Lirman, D., (2019) Developing best practices for the propagation and restoration of massive corals: Predation detection and mitigation; MBE Seminar; November 2019

POSTER PRESENTATIONS

- Lamle HM., **Rivas N.,** Bautista V., James WR., Santos R. (2024) Exploring the inter and intra-species pattern of spatial aggregation of coral recruits in Culebra, Puerto Rico. Benthic Ecology Meeting. Charleston, South Carolina
- Sandquist, M., **Rivas, N.,** Nation, C., James, W.R., Trabelsi, S., Mercado-Molina, A., Santos, R.O. (2023) Effect of habitat complexity on patch reef fish assemblages across different spatial scales; Benthic Ecology Meeting
- **Rivas, N.,** Santos, R.O., (2023) Maximizing sampling effort to estimate benthic percent cover. Crest All-Hands Meeting. Miami, Florida
- Carrasquillo D., **Rivas N.,** Bautista V., Santos R. (2023) Changes in functional trait space in relation to reef type on Culebra, Puerto Rico. FIU Coastal Ecosystems REU Symposium. Miami, Florida

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GRANTS, AWARDS & SCHOLARSHIPS

Funded

- CREST Cache Travel Award - $500 Fall 2024
  - Travel to European Coral Reef Symposium in Naples, Italy.
- FIU Coastlines and Oceans Division Grant - $1,400 Spring 2024
  - Principal Investigator for the project *Trait-Mediated Indirect Effects of Parrotfish on Florida Reefs*.
  - Directed project design, writing, and budget formulation.
- BEM: Diversity Travel Award - $2,500 Fall 2024
  - Travel and participation at the 52nd Benthic Ecology Meeting
- NSF FIU CREST Cache - $335 Summer 2024
  - Commercial Drone license course and exam
- NSF FIU CREST Cache - $4,300 Summer 2023
  - Principal Investigator for the project *Grazing under threat: Unraveling predator-driven parrotfish behavior on Florida's Coral Reef*
  - Directed project design, writing, and budget formulation.
- NSF FIU CREST Cache - $1,800 March 2023
  - Received funding for field equipment to support ongoing research
- CREST Cache Travel Award - $600 July 2022
  - Travel to Reef Futures in Key Largo, Florida.
- NSF FIU CREST Cache - $665 February 2022
  - Received funds to Highland statistics course for professional development
- Florida Academic Scholar (FAS), Bright Futures Recipient 2014-2016

Unfunded

- NMFS-Seagrant Joint Fellowship – $65,000 2023
  - Proposed research project: *Coral Population Dynamics in Relation to Herbivory in Florida's Coral Reef*.
  - Principal Investigators: Dr. Rolando Santos (FIU) and Dr. Mark Ladd (NOAA), in collaboration with Dr. Diego Lirman (University of Miami)
- NOAA Dr. Nancy Foster Scholarship - $42,000 2022
  - Research project: *Coral Population Dynamics in Relation to Herbivory Across U.S.*
  - Principal Investigators: Dr. Rolando Santos (FIU) and Dr. Diego Lirman (UM), in collaboration with Rescue a Reef (UM)
- National Geographic Explorers Grant - $50,000 2022
  - Research project: *Advancing Coral Rearing Restoration through Technological Innovation*.
  - Principal Investigators: Dr. Rolando Santos (FIU) and Dr. Margaret Miller (SECORE), in collaboration with Dr. Diego Lirman (University of Miami)

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SKILLS & TRAINING

Languages
- Fluent in English and Spanish

Diving Certifications
- Open Water, AAUS, Nitrox

Boating Certifications
- Motorboat Operator Certification Course (MOCC)

First Aid & Safety
- First Aid, CPR, AED, Oxygen Administration (O2)

Laboratory Skills
- Protein assays, coral blasting, coral propagation, micro-fragmentation, coral husbandry, coral gamete fertilization
- Stable-isotope preparation, microscopy
- 3D printing for research applications

Programming & Data Analysis
- Proficient in R and Python for statistical analysis, modeling, and ecological data processing

Technology
- Proficient in Geographic Information Systems (GIS): ArcGIS Prorgee (Google Earth Engine for R)
- Adobe, CoralNet, PRIMER & PERMANOVA, VISCORE, TagLab, Agisoft Metashape Pro

Fieldwork
- Boat operation, seining, drum lining, BRUV deployment
- Coral spawning monitoring and collection, coral nursery setup and maintenance, coral outplanting
- Photogrammetry and coral disease surveys

COMMUNITY OUTREACH & VOLUNTEERING

- Reefbites – ICRS Student and Early Career Chapter — January 2025-present
  - Contribute to **making reef-related research accessible to the public** by translating complex scientific concepts into jargon-free, engaging content.
- Rescue a Reef – University of Miami — August 2019-present
  - Assist in **leading citizen science expeditions** to clean coral nurseries and outplant corals
- Coulter Undergraduate Research Excellence Program – Florida International University — April 2024
  - Served as a **research poster judge and evaluator**, providing constructive feedback to undergraduate researchers.
- Peer Reviewer – Scientific Reports — 2024
  - Reviewed scientific manuscripts for **Scientific Reports**.

MENTORSHIP

- Research Technician – *Christine Nation* — March 2023-present
  - Conducted **data entry and organization** for research projects.
  - Extracted and analyzed data from various sources to support ongoing research.
  - Performed **coral identification** for ecological assessments.
  - Utilized computational tools such as **ArcGIS, TagLab, ImageJ, and Viscore** to process and analyze data.
- Research Technician – *Arianna F* — February 2023-August 2024
  - Utilized computational tools such as **ArcGIS, TagLab, ImageJ, and Viscore** to process and analyze data.
  - Processed data and performed **coral identification** for ecological studies.
  - Applied **computational techniques** (ArcGIS, TagLab, ImageJ, and Viscore) to analyze data.
- Research Intern – *Justine Answeeny* — May 2024-August 2024
  - Introduced to **scientific literature review** and **scientific writing**.
  - Conducted **Diadema antillarum population assessments**.
  - Trained in **TagLab software** for coral identification and delineation.

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- FIU Sprouting Program January 2024-May 2024
  - Introduced to **scientific literature review** and **writing skills**.
  - Authored two unpublished papers: *Mycorrhizal Fungi in Florida's Coastal Ecosystem* and *Invasive Species in South Florida*.
- Research Experience for Undergraduates – *Daniela Carrasquillo* May 2023-August 2023
  - Developed expertise in **quantitative ecological techniques** (e.g., hypervolumes for functional trait assessments).
  - **Presentation**: Functional trait approaches in coral reef ecosystems
- Research Technician – *Madison Sandquist* June 2022-May 2023
  - Mentored a technician now pursuing a **Master's degree at Moss Landing Marine Laboratories**.
  - Applied **photogrammetry techniques** in seascape ecology.
  - Performed **data analysis** and coral identification for ecological assessments.
  - Use of computational programs; ArcGIS, TagLab, Image-J, and Viscore to support ongoing research
  - Fish identification and data extraction from Baited Remote Underwater Videos
- Research Technician – *Mark Walenta* September 2022-September 2023
  - Mentored a technician now employed at the **Florida Department of Environmental Protection**.
  - Applied **photogrammetry techniques** in seascape ecology.
  - Performed **data analysis** and coral identification for ecological assessments.
  - Use of computational programs; ArcGIS, TagLab, Image-J, and Viscore to support ongoing research
- Hutton Junior Fisheries Biology Program – *Karen Rojas* May 2022-August 2022
  - Introduced to **scientific literature review**
  - Fish identification and data extraction from Baited Remote Underwater Videos
  - **Presentation**: BRUVs as a community assessment tool of reef fish in Culebra, Puerto Rico.
- Internship – UM's Master's of Professional Science January 2022-August 2022
  - Mentored an intern now working as a **Research Associate at Florida International University (FIU)**.
  - Processed ecological data, specializing in **coral and fish identification**
  - **Authored a report**: *The Abundance of Reef Fish Species with Fisheries Importance in Culebra, Puerto Rico*.

PROFESSIONAL MEMBERSHIPS

- American Fisheries Society (AFS)
- American Society for Photogrammetry and Remote Sensing (ASPRS)
- International Coral Reef Society (ICRS)
- ICRS Student and Early Career Chapter - Reefbites
- Sigma Xi
- The Coral Reef Research Hub

PROFESSIONAL DEVELOPMENT

- Reef Futures – Using artificial intelligence, machine learning, and computational science and technology to create efficiencies in coral reef restoration December 2024
- Reef Futures – Large-Area imagery: Past, Present, and Future December 2024
- Primer-e – Primer/Permanova essentials September 2024

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- Physalia Courses – Functional Trait Space Analyses in R — September 2024
- NOAA LMRCSC – Entering Mentoring — May 2024
- Physalia Courses – Species distribution and ecological niche modelling in R — March 2024
- USGS Photogrammetry course — August 2023
- Highland Statistics – Data exploration, multiple linear regression, GLM, and GAM — March 2022
- Highland Statistics – Mixed-effects models and GLMM — March 2022

REFERENCES/SUPERVISORS

Dr. Rolando Santos
Assistant Professor, Department of Biological Sciences, FIU
rsantosc@fiu.edu

Dr. Ryan James
Senior Postdoctoral Associate, Institute of Environment, FIU
wjames@fiu.edu

Dr. Diego Lirman.
Associate Professor, Department of Marine Biology and Ecology
dlirman@rsmas.miami.edu

Dr. Margaret Miller
Research Director, SECORE
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Fernando Bretos
Founder, Cresta Coastal Network
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