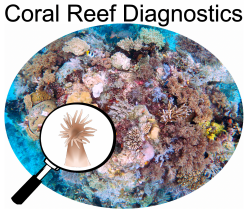
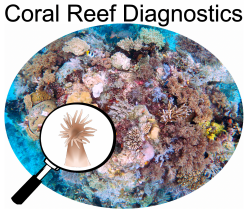
Coral Reef Diagnostics



As a marine biologist with 20 years of research experience (13 years post-Ph.D.) who is now the lead scientist at Coral Reef Diagnostics (coralreefdiagnostics.com/; a coral reef consulting enterprise geared towards fostering coral reef resilience), I am seeking opportunities that would allow me to leverage my background in coral reef ecology, reef coral physiology, marine conservation, molecular biology, and data science to devise and implement novel, innovative coral reef conservation solutions; the latter are not limited to "coral rescue" (see schematic at end of letter.), reef restoration, environmental mitigation, and bioprospecting. Although I maintain an interest in all facets of coral biology, from molecules to satellite-derived data, I have dedicated the past few years to creating predictive models from the ever-growing body of scientific data at our fingertips to inform, and even customize, conservation strategies via "big data" analytics (namely artificial intelligence & machine-learning). Such approaches will allow us to rank reefs along a spectrum of resilience, from highly stress susceptible to markedly resilient, such that we can prioritize conservation efforts. Please now allow me to elaborate.

Although having been trained as a "hard" scientist whose *modus operandum* has historically been research (namely field work, laboratory experiments, molecular benchwork, data analytics, & drafting of manuscripts for the peer-reviewed literature), I nevertheless have a strong background in conservation biology in both the Caribbean (where I am currently based) and the Indo-Pacific. For instance, prior to moving to Florida in 2019 to start a researcher position at NOAA's cooperative institute with the University of Miami (known as CIMAS; mid-2019 to mid-2022), I was based in Taiwan for 11 years as part of a series of postdoctoral research stints (see C.V.). As a small country with rich, high-biodiversity coral reefs, I had plentiful opportunities to undertake my own coral reef research, which at that time was focused more on understanding the physiological implications of climate change on reef corals through using state-of-the-art coral reef mesocosms, while also gaining exposure to numerous coral reef conservation projects (particularly within the nearby Kenting National Park, with whom I worked closely on developing & implementing best coral reef management practices). Before my sojourn in Asia, I spent six years in Hawaii, where I undertook both my Master's and Ph.D. degrees on coral molecular biology at the Hawaii Institute of Marine Biology with the late Dr. Ruth Gates. I am now in charge of a modest fund on behalf of Dr. Gates that seeks to support young coral researchers who are saving reefs with cutting-edge science.

While based in Asia, I had the incredible opportunity to traverse the Indo-Pacific as part of the Khaled bin Sultan Living Oceans Foundation's (LOF) "Global Reef Expedition" (GRE), the largest coral reef survey ever undertaken. My role as a postdoctoral research fellow with LOF was to sample corals and use customized "stress test" assays I had developed in Taiwan to assess their health. Since then, I have been integrating these data with those of the benthic surveys conducted by other members of the LOF science team to understand the overall resilience of the reefs surveyed. I encourage you to consult coralreefdiagnostics.com, to learn more about these experiences (both professional & personal), but the overall goal is to develop a global coral reef health map



that will aid managers in A) management “triage” (i.e., prioritizing habitats for conservation based on their climate resilience) and B) bioprospecting (via predicting where the most resilient corals are likely to be found).

Since re-locating to Miami, I have become better versed in Caribbean marine ecosystems, as well as the surrounding Caribbean and Latin American political environment. My time here has also given me ample opportunities to work with local marine managers and, particularly, coral reef restoration practitioners (e.g., Rescue a Reef & Coral Restoration Foundation, with whom I meet nearly weekly). I actually began my coral reef research career in this part of the world, working in Mexico at a small NGO called “Centro Ecologico Akumal” back in 2003; I now relish the idea of soon coming “full circle,” taking the knowledge of the oceans I have acquired since then to help develop and implement conservation solutions on a more global scale.

In addition to being an avid, AAUS-certified diver familiar with marine “refugia,” marine restoration (among the many focuses of my research; see C.V.), and coral reef management, I currently serve as the treasurer for the primary international agency for coral reef research, the International Coral Reef Society (ICRS), and it is through working with ICRS that I have re-familiarized myself with the fiscal landscape of NGOs, as well as how they can act singularly and with other agencies to aid coral reef ecosystems. In fact, I regularly represent ICRS on various international committees, such as the “resilience-based management” team spearheaded by the International Coral Reef Initiative. My volunteer work with ICRS has also introduced me to many working on coral reefs with the United Nations (as part of their “Environmental Programme”), and I am now a scientific advisor for their new “Global Fund for Coral Reefs.” This fund, and others on the horizon, will be instrumental in shaping the future “conservation landscape,” and I dedicate a large portion of each week on fundraising on behalf of coral reefs (& those who study them).

We now have the unprecedented opportunity to exploit the wealth of oceanographic data now in existence to both better understand the fate of Earth’s oceans and how best to manage them. Data-driven marine conservation is still in its infancy; many researchers appear to be “stuck in a rut,” employing antiquated approaches (e.g., farming highly stress-susceptible corals) that have poor track records for fostering ecosystem function and resilience. It is my hope, then, that I can slowly but surely “up the ante” and convert the series of novel conservation ideas I have been devising (not limited to those discussed in this letter) into a “living” document or web product that could serve as a resource for proactive, science-based marine conservation for coral reef researchers and managers across the globe. The ultimate goal, of course, is to ensure that scientific data and discoveries are rapidly translated into products that will save coral reefs. Please do not hesitate to reach out to me at anderson@coralreefdiagnostics.com if you have questions on any topic broached herein or would simply like to talk about coral reefs, coral biology, or SCUBA diving. Fair warning; you will be in for an earful.

Sincerely,

Anderson B. Mayfield, Ph.D. (chief scientist)
Coral Reef Diagnostics

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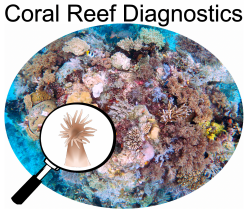

Professional references. Please see C.V. for a more extensive list.

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Joanie Kleypas, Ph.D.	NCAR (Colorado)	kleypas@ucar.edu	Mentor in coral reef conservation
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Andrea Grottoli	ICRS president	grottoli.1@osu.edu	Collaborator in coral reef-focused non-profit/NGO

Appended figure

I have been formulating a series of machine-learning (ML)-based decision-making schematics that dictate the optimal approach for preventing species extinction (be it via stress-hardening, cross-breeding, transplantation, or other means). When all such efforts are still projected to fail, and conditions in the ocean are no longer amenable to target species survival, my colleagues and I have developed a series of marine invertebrate biopreservation tools (namely *ex situ* husbandry & cryopreservation; see C.V.). The flow chart appended below summarizes this concept (Mayfield et al. 2019, *Biopreservation & Biobanking*); sadly, many of the dramatic, late-stage means of improving the odds of coral survival proposed therein as "thought experiments" are now under investigation by myself, my colleagues, and others in the coral reef field. In fact, I am currently working with the Florida Keys National Marine Sanctuary to implement this ML-driven "coral rescue" approach through NOAA's new "Mission Iconic Reefs" program.