

2023 *Acropora* Recovery Implementation Team Priorities

Recovery Action 5b: Identify and Map Genotypes

The Galaxy CoralSNP *Acropora* genotyping bioinformatics pipeline and database (<https://coralsnp.science.psu.edu/galaxy/>), the development of which was funded by NOAA, has been previously housed at Penn State University. However, this crucial tool for acroporid research and management is in need of a new home and proper curation into the future. *This is a crucial and time-sensitive need.* Funding will no doubt be needed to host this resource - ideally in a public forum. This tool is of utmost importance to the goal as most other aspects of species recovery such as inventory, restoration, and tracking recovery criteria are dependent on this database.

Recovery Action 6d: Develop Ex Situ Conservation of Corals and Symbionts

The unresolved need for coordinated cryo-archive storage for *Acropora* species is also *time-sensitive and also persistent*. The urgency of this priority requirement is heightened given the severe coral bleaching event causing mass mortality of acroporids on reefs throughout Florida during summer 2023, including the permanent loss of genotypes from the Florida population. Additionally, this priority is emphasized by the expected imminent recommendation from the incipient Florida *A. palmata* population management plan (F3P; Rodriguez-Clark et al.) to prioritize banking of all Florida *A. palmata* 'founder' genets (estimated only ~ 150 left). In light of recent disease and bleaching events, this need is even more pressing. Funding for this initiative should be prioritized regardless of cost.

Recovery Action 5ai: Range-wide Monitoring: Habitat-Stratified Random Sampling for Abundance Assessment

The need persists for sustained demographic and synoptic monitoring of *Acropora* populations to support ESA requirements such as 5-year status reviews. This need is even greater with the recent extreme losses of acroporids in Florida due to recent white disease outbreaks and the mass bleaching event of 2023. Strategically revisiting sites surveyed during past synoptic efforts could provide a more comprehensive estimate of what is left, as the preliminary reports so far indicate that losses in the wild (and some restored) *A. palmata* populations are virtually complete (e.g. USGS/I.Kufner verbally reported apparent complete extirpation of all acroporids from the Dry Tortugas, pers. comm. 13 Nov). In addition, presence/absence data would allow for an analysis of the proportion of sites experiencing disappearance and repopulation. Previous synoptic survey sites in Florida (sampled in 2005-2012) could be included within Disturbance Response Monitoring (DRM) efforts to re-survey a habitat-stratified subset of sites to evaluate *A. palmata* and *A. cervicornis* populations. Secure funding streams are needed to sustain these efforts throughout Florida and the Caribbean.

Recovery Actions 6c: Enhance Genotypic Diversity in Known Genotypically Depauperate Populations, and 11: Proactive Climate Adaptation/Acclimation to Increased Climate Stress

Building resilience to climate change through the utilization of genetically resilient genotypes or by implementing interventions that build resilience within acroporid populations is a priority for restoration activities and strategies. However, some interventions such as assisted gene flow have not been accepted by all in the management community. One way to help alleviate fears is to collate and synthesize data related to assisted gene flow (AGF) and its use as a tool to increase genetic diversity within Florida's at-risk, depauperate *A. palmata* population and incorporate potential adaptation to climate change through the importation of resilient genes. Observations after the 2023 heat wave indicate that there is little to no 'native' wild population left to even sustain the potential risk of outbreeding depression while literature exists supporting the success of AGF with acroporids. Also, newer research suggests that Florida acroporid populations are not as isolated or distinct as previously believed, and that outbreeding depression would not be a concern if AGF was employed as a restoration technique. Therefore, a thorough literature review and synthesis of the latest science would be beneficial for supporting AGF as a viable option for Florida's Coral Reef.

Recovery Action 5a: Develop a Range-Wide Monitoring Program

Most acroporid monitoring occurs as part of individual research projects or as part of isolated long-term monitoring programs. As such, some, if not most, monitoring data are not completely comparable making analyses between projects, sites, regions, and jurisdictions difficult. Additionally, monitoring directed towards specific research or goals tends to ignore or miss larger ecosystem processes that may be occurring. Thus, developing a set of standardized operating procedures (SOPs) to prioritize holistic monitoring approaches for acroporids would allow datasets to be more robust and comparable while capturing ecosystem-level data that can aid in overall diagnostics and recovery success. The ARIT believes that having standards and guidelines for monitoring, similar to monitoring guidelines created by the Coral Restoration Consortium, would greatly benefit the coral restoration community, promote easier collaboration between projects and monitoring programs, and ensure that data are collected to support the needs of researchers and managers alike.

Action 8: Respond to, Control, and Minimize Effects of Disease Events

Several interventions and therapies have been developed to treat diseases that affect non-acroporid species such as ointments laced with amoxicillin to treat

stony coral tissue loss disease (SCTLD), probiotics acquired from apparently disease resistant colonies, and an antimicrobial ointment to treat black band disease. Recent summer disease events have resulted in high acroporid mortality within in-situ nurseries, outplant populations, and remnant wild populations. Research is needed to test the effectiveness of established therapies and other novel therapies to treat diseases on acroporids in the lab.

Action 6a:ii: Develop and Implement Guidelines/Policies for Risk Management of Population Restocking.

Building from the *A. palmata* and *A. cervicornis* Population Management Strategies being developed through a National Marine Sanctuary Foundation/NOAA Capacity Grant and the Smithsonian, there is a need to also create a parallel population management plan/strategy for the US Virgin Islands and Puerto Rico. As coral population enhancement and restoration efforts increase in scale and geographic spread, there is a need to organize these efforts to enhance the likelihood of successful coral reproduction and minimize the risk for genetic issues like inbreeding. Utilizing genetic information, data will support initial modeling, gathering information, and developing a strategy to create the management plan.