Quicklook Report

Coral Spawning 2025: Activities and Observations

NOAA Fisheries

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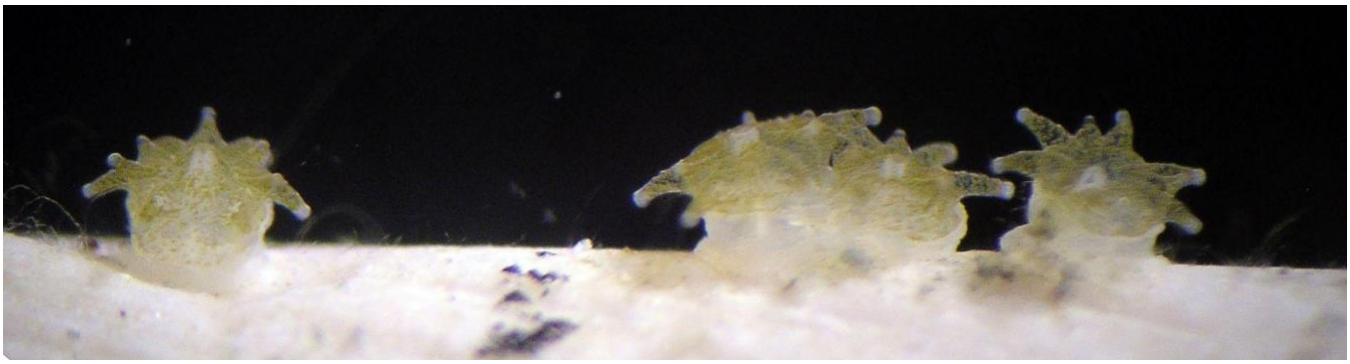

Nine-day-old *Orbicella faveolata* recruits settled on field-conditioned substrates, with zooxanthellae visible within the polyp tentacles.

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Overview

The Coral Research and Assessment Lab (CoRAL) at NOAA's Southeast Fisheries Science Center has monitored coral spawning patterns and collected gametes from the ESA-listed species *Acropora palmata* and *Orbicella faveolata* in the upper Florida Keys since 2000. Following field monitoring and spawn collection, gametes are fertilized on site and transported to the CoRAL wet lab facility located at the University of Miami's Experimental Hatchery in Miami, Florida where the larvae are reared and settled for grow-out and use in future research and restoration projects. Spawning observations and gamete collections were made for seven coral species in 2025: *Diploria labyrinthiformis* (DLAB) in April and May, *Acropora palmata* (APAL), *Orbicella faveolata* (OFAV), and *Eusmilia fastigiata* (EFAS) in August, *Montastraea cavernosa* (MCAV) in August and September, and *Pseudodiploria strigosa* (PSTR) and *Colpophyllia natans* (CNAT) in September.

Due to population declines resulting from the 2023 marine heatwave (Williams et al. 2024), observations for APAL were limited to Elbow Reef as it is the only known site in the upper Florida Keys with sufficient mature APAL colonies of multiple genets, thus allowing spawning observations, collections, and successful fertilization. The populations of our other focal species (DLAB, OFAV and PSTR) did not experience notable changes in abundance between 2023 and 2025 at the sites we used for spawning observations and collections in 2025 and thus were not modified.

Coral larvae produced from gamete collections in the field were reared and settled at the CoRAL wet lab facility. A portion of larvae produced from spawn collections were settled on substrates for lab-based experiments evaluating the effect of sediment type and depth (port sediment vs. reef sediment; 2mm vs. 4mm) on coral settlement success. In addition to larvae produced by the CoRAL team, DLAB and PSTR larvae were acquired from other research partners for use in settlement experiments. The remaining larvae not used for experiments were settled under ambient (i.e., non-experimental) conditions and will be grown out in the CoRAL wet lab facility to be used in future experiments and restoration projects. Spawning observations and gamete collections were conducted in collaboration with the Coral Program at NOAA's Atlantic and Oceanographic & Meteorological Laboratory (AOML) and the REVERSE Lab at Florida International University (FIU) where gametes were used for various research projects led by each group.

Methods

In 2025, the CoRAL team monitored seven coral species for spawning activity: DLAB, APAL, OFAV, PSTR, EFAS, CNAT and MCAV. Formal genotyping has only been done for the monitored APAL. For other monitored species, individual colonies are assumed to be distinct genotypes. Clonality is common in OFAV (and EFAS), so this assumption likely leads to observations and collection of gametes from fewer genets than estimated. Clonality is less likely among DLAB, CNAT, MCAV, and PSTR, and therefore the assumed number of genets is likely similar to the number of colonies observed or collected from.

Five of the seven species monitored (DLAB, APAL, OFAV, PSTR, and CNAT) are hermaphroditic broadcast spawning corals that release bundles containing both eggs and sperm. Gamete collection for all hermaphroditic broadcast spawning corals was accomplished by placing a spawning net on the colony and accumulating gamete bundles in a collection tube attached at the top of the net. The top of the net consists of a plastic transmission funnel, the mouth of which leads to a 50ml centrifuge tube screwed onto a permanently attached cap at the top of the net (**Figure 1**). The cap has a hole drilled in the center that is placed over the narrow end of the funnel allowing gamete bundles to pass through while retaining the threaded sides for attaching and swapping centrifuge tubes. Because gamete bundles are buoyant, when they are released during spawning, the bundles float towards the top of the net where they are concentrated and collected in the tube (**Figure 1**). Once the collection tube at the top of the net is partially filled with gamete bundles (~5–10ml of gamete bundles), the

tube is removed, capped, and labeled to identify the genotype or colony ID from which the gamete bundles originated.

Gamete collection for MCAV, a gonochoric species in which individual colonies release either eggs or sperm, was accomplished by siphoning the eggs or sperm released from the colony into a large syringe. EFAS is a brooding coral species releasing fertilized eggs (i.e., zygotes) and was only observed since collection from this species is not included in our permit.

Prior to spawning observations and collections, a setup dive was conducted to facilitate locating and identifying colonies during spawning dives.

Species-specific site preparation

Diploria labyrinthiformis (DLAB) - unnamed sites "Dlab Reef" & "Braintown Reef"

Spawning observations and collections for DLAB were conducted at two unnamed inshore patch reefs in the upper Florida Keys within the boundary of John Pennekamp State Park during predicted spawning windows in April and May 2025. One patch reef ("Dlab Reef", 25.1340°, -80.3292°) has been monitored for DLAB spawning since 2020. A second neighboring patch reef ("Braintown Reef", 25.1253°, -80.3342°) was monitored for the first time in 2024. At both reefs, a subset of DLAB colonies were previously tagged for re-identification and future genotyping, and stakes were hammered into the reef to secure a transect line during spawning dives. Prior to monitoring DLAB for spawning, tags were relocated and cleaned, and a transect tape was deployed to facilitate site navigation. At the beginning of each spawning dive, collection nets were placed on a subset of tagged corals (approximately 35 at "Dlab Reef" and 20 at "Braintown Reef") located along the transect lines. Bundle setting and release in DLAB occurs so rapidly that we have yet to witness it in the field, despite five years of spawning observations and collections. Consequently, collection nets are placed on DLAB colonies ahead of the predicted spawning window to avoid missing the release of gametes and subsequent collections.

Acropora palmata (APAL) - Elbow Reef

Spawning observations and collections for APAL were conducted at Elbow Reef (25.1429°, -80.2582°), a spur-and-groove habitat on the Florida Reef Tract offshore of Key Largo, during predicted spawning windows in August 2025. Elbow Reef has sparsely distributed wild APAL with documented spawning observations since 2005. In 2016, in partnership with the Coral Restoration Foundation (CRF), we outplanted 288 fragments of APAL consisting of eight different genotypes within ~3x2m plots (n = 24 fragments per plot) near our long-term wild APAL monitoring plots. These outplants were first monitored for spawning in 2021, when we observed outplanted colonies of multiple genotypes spawning synchronously with wild colonies at Elbow Reef (Williams et al. 2023).

In August of 2025, the CoRAL team monitored the outplanted APAL and nearby existing wild APAL, while the FIU REVERSE lab monitored wild APAL at the south end of Elbow Reef. This was the first time that we were able to monitor the wild APAL genets located at the south end of Elbow Reef. Prior to monitoring for spawning at Elbow Reef, a set-up dive was conducted where divers identified and marked the location of known distinct genotypes for all wild and outplanted APAL colonies using buoyant plastic chains with floats and genotype ID tags to facilitate colony identification at night. During spawning dives, if a colony was observed with gamete bundles setting in the polyps, a collection net was placed over part or all of the colony. APAL typically displays bundle setting at least 15 minutes before bundle release, allowing time to retrieve nets and place them on a colony once setting is observed in the polyp mouths.

Orbicella faveolata (OFAV) - North North Dry Rocks Reef

Spawning observations and collections for OFAV were conducted at North North Dry Rocks Reef (25.1364°, -80.2894°), a spur-and-groove habitat on the Florida Reef Tract offshore of Key Largo, during the predicted spawning window in August 2025. Prior to the spawning dive, buoyant plastic chain markers with a unique ID tag and attached glow stick were placed near colonies for ease of location at night. At the time of the spawn window, divers swam from colony to colony looking for gamete bundles setting in the polyp mouths. Similar to APAL, when a colony was observed with gamete bundles setting, divers expeditiously placed a collection net on part of the colony or the entire colony.

Montastraea cavernosa (MCAV) - North North Dry Rocks Reef & "Braintown Reef"

Spawning observations and collections for MCAV were conducted at North North Dry Rocks Reef and "Braintown Reef" during the predicted spawning windows in August and September 2025. Prior to monitoring MCAV for spawning, colonies were located and temporarily marked with buoyant plastic chain markers containing a unique ID tag and attached glow stick to facilitate locating colonies during the spawning dive. Due to the high abundance of MCAV colonies at North North Dry Rocks Reef, only a subset of spawning-sized colonies present at this site were marked with floating chain markers. Since this species is gonochoric, and thus individual colonies only release either sperm or eggs (however, we observed one colony to release both eggs and sperm in 2022 and 2023) that quickly dissipate in the water column, the gamete collection method for MCAV differs from hermaphroditic broadcast spawning species that release buoyant bundles easily collected in a net. Briefly, for MCAV gamete collections, divers swim from colony to colony looking for sperm or eggs being released from the polyps. Once spawning activity is observed, the diver places a large (500ml) catheter tipped syringe near the polyp mouths and pulls the plunger to siphon the gametes into the syringe. Once the syringe is full or the colony is no longer releasing gametes, the syringe is capped with a cinched piece of airline tubing to prevent the gametes from escaping. The syringes with gametes are then brought to the boat where the gametes are mixed.

Eusmilia fastigiata (EFAS) - North North Dry Rocks Reef

Two EFAS colonies were identified and monitored during the OFAV spawning dive at North North Dry Rocks Reef in August 2025. This species slowly releases brooded fertilized embryos (i.e., zygotes) that can be observed within the polyp tentacles. Spawn collection was not attempted as this species is not included in our permit.

Colpophyllia natans (CNAT) - "Braintown Reef"

Several small CNAT colonies (~8) were identified and monitored at "Braintown Reef" in September 2025. As the duration of bundle set time for this species is uncertain, a collection net was placed over these colonies during the first dive of the night and was removed at the end of the last dive of the night. Divers monitored collection tubes for gamete bundles throughout all dives.

Pseudodiploria strigosa (PSTR) - "Braintown Reef"

A single PSTR colony was identified and monitored at "Braintown Reef" in September 2025. As the duration of bundle set time for this species is uncertain, a collection net was placed over this colony during the first dive of the night and was removed at the end of the last dive of the night. Divers monitored the collection tube for gamete bundles throughout all dives.

Spawning observations, collections and larval rearing

Peak spawning windows in the Florida Keys region are predicted based on information from previous spawning observations made by our lab as well as those from other research organizations. For each species, predicted peak spawning windows and actual days and times monitored in 2025 are listed in **Table 1**. Dates for each site, species monitored, and the number of larvae produced from each spawning event are listed in **Table 2**.

During spawning observations, collections were made as described above. Once collection tubes or syringes were capped with gametes, they were brought to the boat where gametes from different parents were mixed to create either two-parent or multi-parent crosses. Additionally, this year, we tested alternative methods of gamete transport and fertilization: (1) transporting unmixed gametes back to the dock where they were then mixed and (2) transporting unmixed gametes back to the CoRAL wet lab in Miami where they were then mixed. Thus, in addition to gametes being mixed on site, a subset of MCAV and OFAV gametes were transported approximately 40 mins to the dock before they were mixed starting the fertilization process, and a subset of OFAV gametes were transported an additional 1 hour and 30 minutes (approximately 2 hours and 10 minutes total after leaving the site) back to the CoRAL wet lab where they were mixed. The delay in mixing gametes at the dock or the wet lab did not decrease fertilization rates compared to gametes mixed on site. Batches that were mixed at the dock, however, had less cellular debris that could contribute to less productive cultures, suggesting this may be a preferable method to employ for future collections.

Once at the CoRAL wet lab in Miami, each batch is transferred to a tabletop bin with 20-micron filtered seawater to reduce the sperm concentration. The batch that was mixed at the CoRAL wet lab was diluted with seawater after approximately 1 hour. Once diluted, embryos were then ladled from the surface of the water and distributed among tabletop bins filled with 20-micron filtered seawater (**Figure 2**) to reduce the embryo concentration at the surface and are allowed to incubate for some time to continue the fertilization process. The timing of each step in this process varies by species (details for each species provided below). Fertilization rates were then estimated and recorded, and the batches were distributed to larval rearing kreisels where the larvae remained for the duration of the settlement phase (**Figure 3**). The timing of estimated fertilization rates after gametes were mixed and transfer to rearing kreisels varies by species and is described below. During the settlement phase, preconditioned ceramic tiles and/or plugs were placed in the kreisels to provide settlement substrates (**Figure 4**). Once larvae recruited to the substrates and were fully attached without risk of dislodgement, the substrates were removed from the kreisel and placed in a rearing tank for use in further experiments or for grow-out.

Diploria labyrinthiformis (DLAB)

April 2025 monitoring of DLAB for spawning activity was conducted at two inshore patch reefs on April 21 and 22 (9 and 10 days after the full moon [AFM], respectively). During both dates, the CoRAL team monitored one patch reef, and the FIU REVERSE lab monitored a second. No spawning was observed at either patch reef during these dates.

May 2025 monitoring of DLAB spawning was conducted at one inshore patch reef, “Dlab Reef”, on May 21-23 (9, 10, and 11 days AFM) by the same teams as in April. Spawning was observed on May 22 only. Gamete bundle release occurred around 18:25. When spawning colonies were no longer releasing bundles, all collection tubes with bundles were brought back to the CoRAL team’s boat where they were mixed to create one 3-parent batch mix at approximately 18:45. The fertilization process began in the concentrated mixed batches while the gametes were transported to the CoRAL wet lab. Once in the CoRAL wet lab, fertilization rate was estimated at 95%, and the batch was transferred to a larval rearing kreisel at approximately 23:00 in effect diluting the sperm concentration. All water flow was turned off in the kreisel which allowed any remaining unfertilized eggs to fertilize overnight. Approximately 3,500 larvae were produced from this collection.

These larvae were settled for grow-out to be used in future research projects. Additional DLAB were acquired from Biscayne National Park (BNP) and were used in a lab-based experiment.

Key Largo sourced DLAB larvae were first observed swimming approximately 24 hours after fertilization. Settlement was first observed on the wall of the kreisel 3 days after spawning (dAS). Precondition settlement substrates were placed in the kreisel 4 dAS. Once recruits were attached without risk of dislodgement, substrates were removed from the kreisels and transferred to tanks for grow-out at the CoRAL wet lab.

Acropora palmata (APAL)

August 2025 monitoring of APAL spawning activity was conducted by the CoRAL team and the FIU REVERSE lab at Elbow Reef during nights of August 10-14 (nights 1-5 AFM). Spawning was observed on August 13 and 14 for both outplanted and wild colonies at approximately 22:25. On August 13, one of the eight wild genotypes that were monitored spawned and three of the four outplanted genotypes spawned. No spawning activity was observed for the wild APAL colonies monitored by the FIU REVERSE lab. At the CoRAL team's site, once collection tubes were partially filled with bundles, they were removed from the collector nets and brought to the boat where they were mixed creating a 2-parent, 3-parent, and 4-parent batch mix. Gametes were mixed on the boat at approximately 23:30. Gametes were then transported to the dock where the 4-parent mix was given to the FIU REVERSE lab, and the other two batches were transported to the CoRAL wet lab where they were diluted with filtered seawater (02:15) and transferred to table-top bins allowing fertilization to continue overnight. The following morning (07:00), fertilization rates among batches were estimated at 67% for the 2-parent cross and 59% for the 3-parent mix, and batches were transferred to larval kreisels producing an estimated 6,570 larvae. On August 14, six wild genotypes and four outplanted genotypes spawned. Gametes were brought to the boat and mixed at 23:17. Gametes collected by the FIU REVERSE lab at the south end of Elbow Reef were handed off to the CoRAL team to be mixed. In total, six 2-parent crosses and one 9-parent batch were mixed. Gametes were transported to the CoRAL wet lab, diluted with filtered seawater (02:45) and transferred to table-top bins where fertilization continued overnight. The following morning (08:00), fertilization rates ranged from 76 - 95% for the 2-parent crosses and 97% for the 9-parent mix producing approximately 20,200 larvae that were transferred to kreisels for rearing.

For APAL larvae made from August 13 spawn, larvae were first observed to start swimming 5 dAS. Data for first observations of swimming and settlement was not recorded for this cohort. For larvae made from August 14 spawn, swimming larvae were first observed 3 dAS. At 6 dAS a portion of August 14 larvae were removed from kreisels and used in a lab-based experiment. The remaining larvae were reared in the kreisels for settlement and grow-out. Once larvae were removed for experiments, preconditioned substrates were added to kreisels for settlement. Recruit settlement was first observed on the kreisel wall 5 dAS prior to preconditioned substrates being introduced into the kreisels.

Orbicella faveolata (OFAV)

August 2025 monitoring of OFAV spawning activity was conducted by the CoRAL team and the FIU REVERSE lab at two adjacent mooring buoys at North North Dry Rocks Reef on August 15 (night 6 AFM). Divers began monitoring approximately 37 OFAV colonies at 22:45 (17 by the CoRAL team, 20 by FIU REVERSE), and at approximately 23:20 colonies were observed with gamete bundles setting in their polyps. At least 14 colonies were observed to spawn (9 CoRAL, 5 FIU REVERSE), and collection nets were placed on all colonies with bundles setting. Once collection tubes were partially filled with gametes, they were removed and brought to the CoRAL team's boat where a subset of gametes were mixed making one 10-parent batch at approximately 00:15. The remaining gametes were left in the collection tubes and transported to the dock where a 3-parent batch was mixed (01:49) and the remaining mixed at the CoRAL wet lab making another 3-parent batch (03:45). Once mixed at the CoRAL wet lab, the batch was allowed to fertilize for one hour before diluting the mix of sperm. The other two mixed batches were diluted immediately with filtered seawater (03:55). Fertilization rates among the

three batches were checked at approximately 04:30 where the batch mixed on the boat had a fertilization rate of 84%, the batch mixed at the dock was 90%, and the batch mixed at the wet lab was 99%. After diluting the batches, the boat-mixed and dock-mixed batches were distributed among tabletop bins and allowed to continue fertilization overnight. The lab-mixed batch was disposed of due to the small volume of gametes included in the batch and space limitations. The following morning (08:00), fertilization rates were estimated at 85% for the batch mixed on the boat and 100% for the batch mixed at the dock producing an estimated 47,700 larvae that were transferred to larval rearing kreisels.

OFAV larvae were first observed swimming at 2 dAS. No settlement substrates were added to the kreisels as the larvae were to be used in settlement experiments. At 4 dAS, larvae were observed settling on the kreisel wall. At 5 dAS, some of the larvae were removed and used in the lab-based experiment. The remaining larvae were provided to other research partners (listed below).

Montastraea cavernosa (MCAV)

August 2025 monitoring of MCAV spawning activity was conducted by the CoRAL team, along with divers from the FIU REVERSE lab, at two adjacent mooring buoys at North North Dry Rocks Reef on August 15 (night 6 AFM) and at "Braintown Reef" on September 13 (night 6 AFM). On August 15, divers began monitoring at 20:45. The CoRAL team monitored 25 colonies, and the FIU team monitored 22 colonies. The first colony observed releasing gametes was at approximately 21:30. A total of 12 colonies were observed to release sperm (8 CoRAL, 4 FIU REVERSE) and 3 colonies released eggs (2 CoRAL, 1 FIU REVERSE). Once colonies were no longer observed releasing gametes, divers returned to the boat with the collected gametes at 21:45. On the boat, a subset of gametes were mixed at 22:10 producing a single batch (~10 parents). The concentrated batch of gametes were stored in a cell culture flask while divers conducted the next dive monitoring OFAV for spawning activity. Gametes from ~5 parents remained in syringes until back at the dock to be mixed. Once spawning dives were completed the gametes were transported back to the dock where the remaining gametes in syringes were mixed at approximately 01:00 and then transported to the CoRAL wet lab where the batches were diluted with filtered seawater (03:55) and transferred to table-top bins allowing fertilization to continue overnight. The batch that was mixed on the boat was in poor condition once at the CoRAL wet lab. Analysis under the microscope revealed cellular pieces likely from broken fertilized embryos. Few intact embryos were observed; yet all were fertilized suggesting that fertilization was high, but the extended wait-time on the boat and transit back to the wet lab resulted in degradation of the culture. The batch that was mixed at the dock looked healthy with little cellular debris and 100% fertilization. The following morning (08:00), the batch that was mixed on the boat was discarded, and the batch mixed on the dock was put into a kreisel producing 10,500 larvae. No spawning activity was observed in September.

MCAV larvae were first observed swimming at 2 dAS. Preconditioned substrates were placed into the kreisel at 5 dAS, and larvae were first observed settling at 6 dAS.

Eusmilia fastigiata (EFAS)

During the OFAV spawning dive on August 15 (night 6 AFM) at North North Dry Rocks Reef, two EFAS colonies were identified and monitored for spawning activity. At approximately 23:00, the brooded fertilized embryos were observed in polyp tentacles (**Figure 5**) and were slowly being released for the duration of the dive (22:40 - 00:05). No embryos were collected.

Colpophyllia natans (CNAT)

August 2025 monitoring of CNAT spawning activity was conducted by the CoRAL team, along with divers from the FIU REVERSE lab, at "Braintown Reef" on September 13 (night 6 AFM). Approximately eight colonies were identified and monitored. Spawning was not observed.

***Pseudodiploria strigosa* (PSTR)**

A single PSTR colony was monitored by the CoRAL team, along with divers from the FIU REVERSE lab, at "Braintown Reef" on September 13 (night 6 AFM). Spawning was not observed.

Miami 'urban coral' spawning observations

In 2023, the CoRAL team began partnering with the Coral Program at NOAA's AOML to conduct spawning observations of populations of PSTR, OFAV, and CNAT located near the Port of Miami, Florida (25.7729, -80.1526). Colonies of these populations have been a focus of demographic monitoring by AOML's Coral Program for several years as they persist in sub-optimal conditions (e.g. high temperatures and large thermal variability). This partnership continued in 2025 with the additional monitoring of corals of opportunity (COOs). 2025 spawning observations included 24 COOs (11 CNAT, 6 PSTR, 4 OFAV, 2 DLAB, and 1 PCLI) that were collected from the MacArthur Causeway North site in July, August, and October 2024 and brought to the University of Miami's land-based nursery to monitor for ex-situ spawning. In February 2025, an additional 11 DLAB COO's were collected off MacArthur Causeway North and brought to the University of Miami's land-based nursery for ex-situ monitoring.

On April 21-24 (nights 9-12 AFM) and May 21-24 (nights 9-12 AFM), 11 DLAB colonies were monitored for spawning at the University of Miami's land-based nursery and 10 DLAB colonies were monitored at MacArthur Causeway North. One colony was observed to have spawned on April 23rd (night 11 AFM) at 19:25 at the University of Miami's land-based nursery. Gametes were collected by the University of Miami's Coral Reef Futures Lab (**Figure 6A**) and mixed with gametes spawned in their land-based nursery to create the first ever 'urban x reef' DLAB cross (**Figure 6B**). These crosses yielded approximately 3,200 larvae, which were settled onto ceramic tiles and grown out by the CoRAL team (**Figure 6C**) for use in experiments conducted by NOAA AOML and for genetic banking/propagation with partners at the Reef Institute and Rescue a Reef. On August 15-17 (nights 6-8 AFM) and September 13-15 (nights 6-8 AFM), a CoRAL team member joined the AOML Coral Program to monitor 6 PSTR, 2 OFAV, and 11 CNAT colonies at MacArthur Causeway North and the COOs being held at the University of Miami's land-based nursery. Monitoring at both sites began at 19:00 for CNAT and continued until 21:00. The OFAV and PSTR colonies were also monitored from 22:10 to 23:30. No colonies were observed to spawn during any of these observation windows.

For this project collaboration, in-water spawning observations off MacArthur Causeway North have shifted from primarily being in-person during the anticipated windows to near 24-hour coverage by KiloCam spawning cameras (https://www.austingreenephotography.com/conservation-tech) taking time lapse photos with a one-minute interval. These were deployed at the beginning of the season (July) and removed at the end (September). Analysis of the ~300,000 photos is ongoing, but spawning activity has not yet been observed.

Larvae acquired from other research partners

To supplement our supply of coral larvae for use in lab-based experiments, we acquired additional larvae from Biscayne National Park (BNP) and SeaWorld's Florida Coral Rescue Center (FCRC) in May and September, respectively. Biscayne National Park supplied 142,000 DLAB larvae produced from spawn collected at a reef site within the park on May 22 (night 10 AFM). The Florida Coral Rescue Center supplied an estimated 7,000 PSTR larvae produced from land-based spawn collected on September 14 (night 7AFM).

Gametes and larvae supplied to other research partners

Coral gametes and larvae collected and produced by the CoRAL team were supplied to the following research partners: FIU REVERSE Lab (18,000 APAL and 100,800 OFAV larvae), MOTE Marine Lab (40ml APAL

gametes and 6,000 APAL larvae), University of Miami Coral Reef Futures Lab (200ml APAL gametes and 84,000 OFAV), the Florida Aquarium (6,000 APAL larvae), NOAA-AOML (8,400 OFAV larvae), NOAA-NCCOS (30ml APAL gametes and 4,200 OFAV larvae), and Nova Southeastern University (12,600 OFAV larvae).

Understanding the effects of sedimentation on coral settlement and recruit survivorship

Larvae produced from our 2025 spawning collections and partners were leveraged to facilitate lab-based experiments (FDEP Award #C3FC5D to Drs. Victor Rodriguez-Ruano and Dana Williams), aimed at understanding the effects of sedimentation on coral settlement. Larval settlement assays were conducted for APAL, OFAV, and PSTR to test the effect of live sediments sourced from the Port of Miami versus a reef ~3 miles offshore of Key Biscayne, as well as sediment depth (2mm vs. 4mm).

Field and lab support

Field and lab support from the SEFSC CoRAL team includes Mark Ladd, Dana Williams, Allan Bright, Kathryn Grazioso, Sophia Ippolito, Colin Murphy, Victor Rodriguez-Ruano, Eliana Galindo, and Alex Howard. Additional field support from collaborating organizations is as follows: AOML (Michael Studivan, Ashley Rossin, Emilia Silverberg, and Ashley Stevens) and the REVERSE lab at FIU (Alain Duran, Silvana Guzman, William Barriera, Angel Avedo, and Kathia Jaramillo). Histology and fecundity analyses on urban coral samples were completed by Louisiana State University (Daniel Holstein, Ashley Rossin, Gillian Coleman, and Morgan Coleman). The urban coral spawning observations and histological analyses were supported by funding through FDEP's Coral Protection and Resilience Program (POs C3EAC4 and C5C486) to Michael Studivan, Ashley Rossin, Ian Enochs, and Mark Ladd, with collections permitted under FWC SAL SAL-22-2116B-SCRP. Spawning monitoring and collection activities in the Florida Keys National Marine Sanctuary (FKNMS) were permitted by FKNMS-2024-178 and are funded by CRCP project 1091. Observations and collections for DLAB took place on patch reefs within the John Pennekamp State Park within the FKNMS and were permitted by FDEP-04152515 and FKNMS-2024-178. All land-based coral rearing and husbandry at the CoRAL wet lab facility was conducted under FDEP permit SAL-24-2578-SCRP.

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Table 1. Predicted, monitored, and observed spawning times for target coral species in Key Largo, FL for 2025 coral spawning.

Species	Predicted Months	Predicted Night AFM	Predicted Time (EDT)	Monitored Dates	Monitored Night AFM	Monitored Time (EDT)	Observed Night AFM	Observed Time (EDT)
DLAB	Apr, May	9-11	18:00-19:00	Apr 21-22	9, 10	17:50-19:00	--	--
DLAB	Apr, May	9-11	18:00-19:00	May 21-23	9, 10, 11	17:30-19:00	10	~18:25
APAL	Jul, Aug	1-6	22:00-23:00	Aug 10-14	1, 2, 3, 4, 5	21:45-23:00	4, 5	~22:25
MCAV	Aug, Sep	6-7	20:00-22:45	Aug 15	6	20:45-21:45	6	~21:10
MCAV	Aug, Sep	6-7	20:00-22:45	Sep 13	6	20:45-21:45	--	--
OFAV	Aug, Sep	6-8	23:00-00:00	Aug 15	6	22:45-00:05	6	~23:20
CNAT	Aug, Sep	6-8	20:30-22:00*	Sep 13	6	18:30-21:00	--	--
PSTR	Aug, Sep	6-8	20:30-21:30**	Sep 13	6	20:45-21:45	--	--
EFAS	--	--	--	Aug 15	6	22:25-00:05	6	~23:00

* Timing not well documented; limited observations of spawning before sunset
** Population includes an early group and a late group that spawns 23:00-00:00
-- No data

Table 2. 2025 spawning observations in Key Largo, FL, and subsequent larval production.

Date	dAFM	Site	Colony Origin	Species Monitored	Spawning Observed	Spawning Collected	Genets Monitored*	Genets Spawned	Larvae Produced
4/21/2025	9	Dlab Reef	Wild	DLAB	No	No	30	0	--
4/21/2025	9	Braintown Reef	Wild	DLAB	No	No	20	0	--
4/22/2025	10	Dlab Reef	Wild	DLAB	No	No	30	0	--
4/22/2025	10	Braintown Reef	Wild	DLAB	No	No	20	0	--
5/21/2025	9	Dlab Reef	Wild	DLAB	No	No	35	0	--
5/22/2025	10	Dlab Reef	Wild	DLAB	Yes	Yes	35	2	3,500
5/23/2025	11	Dlab Reef	Wild	DLAB	No	No	35	0	--
8/10/2025	1	Elbow Reef	Wild	APAL	No	No	8	0	--
8/10/2025	1	Elbow Reef	Outplant	APAL	No	No	4	0	--
8/11/2025	2	Elbow Reef	Wild	APAL	No	No	8	0	--
8/11/2025	2	Elbow Reef	Outplant	APAL	No	No	4	0	--
8/12/2025	3	Elbow Reef	Wild	APAL	No	No	8	0	--
8/12/2025	3	Elbow Reef	Outplant	APAL	No	No	4	0	--
8/13/2025	4	Elbow Reef	Wild	APAL	Yes	Yes	8	1	14,500**
8/13/2025	4	Elbow Reef	Outplant	APAL	Yes	Yes	4	3	
8/14/2025	5	Elbow Reef	Wild	APAL	Yes	Yes	8	6	30,200**
8/14/2025	5	Elbow Reef	Outplant	APAL	Yes	Yes	4	4	
8/15/2025	6	North North Dry Rocks Reef	Wild	OFAV	Yes	Yes	~37	~14	148,500**
8/15/2025	6	North North Dry Rocks Reef	Wild	MCAV	Yes	Yes	~47	~15	10,500
8/15/2025	6	North North Dry Rocks Reef	Wild	EFAS	Yes	No	2	2	--
9/13/2025	6	Braintown Reef	Wild	CNAT	No	No	~8	0	--
9/13/2025	6	Braintown Reef	Wild	MCAV	No	No	~25	0	--
9/13/2025	6	Braintown Reef	Wild	PSTR	No	No	1	0	--

* Formal genotyping has only been done for APAL. For other species individual colonies are assumed to be distinct genotypes. This assumption is known to be unreliable for OFAV, but for the other species it is a reasonably likely assumption.

** Totals include larvae produced and reared by the CoRAL team and gametes/larvae provided to the FIU REVERSE lab. For gametes provided to the FIU REVERSE lab, the larval estimates are based on the volume of embryos at a hypothetical 100% fertilization rate.

-- No data

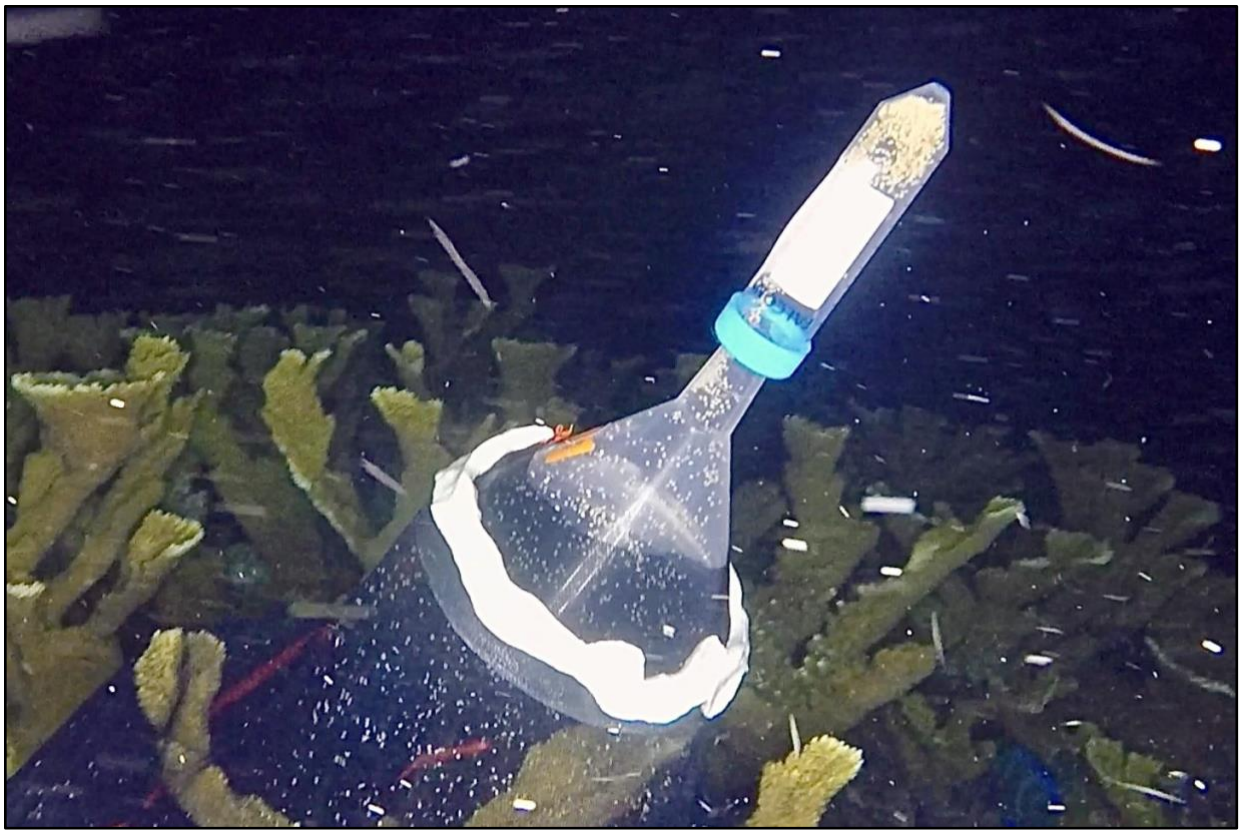

Figure 1. Spawning net with collection tube on outplanted *Acropora palmata,* on August 14, 2025, at Elbow Reef, Key Largo, FL.

Figure 2. Table-top bins with *Acropora palmata* gametes at the CoRAL wet lab facility in Miami, FL, on August 15, 2025.

Figure 3. Larval kreisels with *Diploria labyrinthiformis* larvae at the CoRAL wet lab facility in Miami, FL on May 22, 2025.

Figure 4. Larval kreisels containing *Diploria labyrinthiformis* larvae with preconditioned settlement substrates added at the CoRAL wet lab facility in Miami, FL, on May 26, 2025.

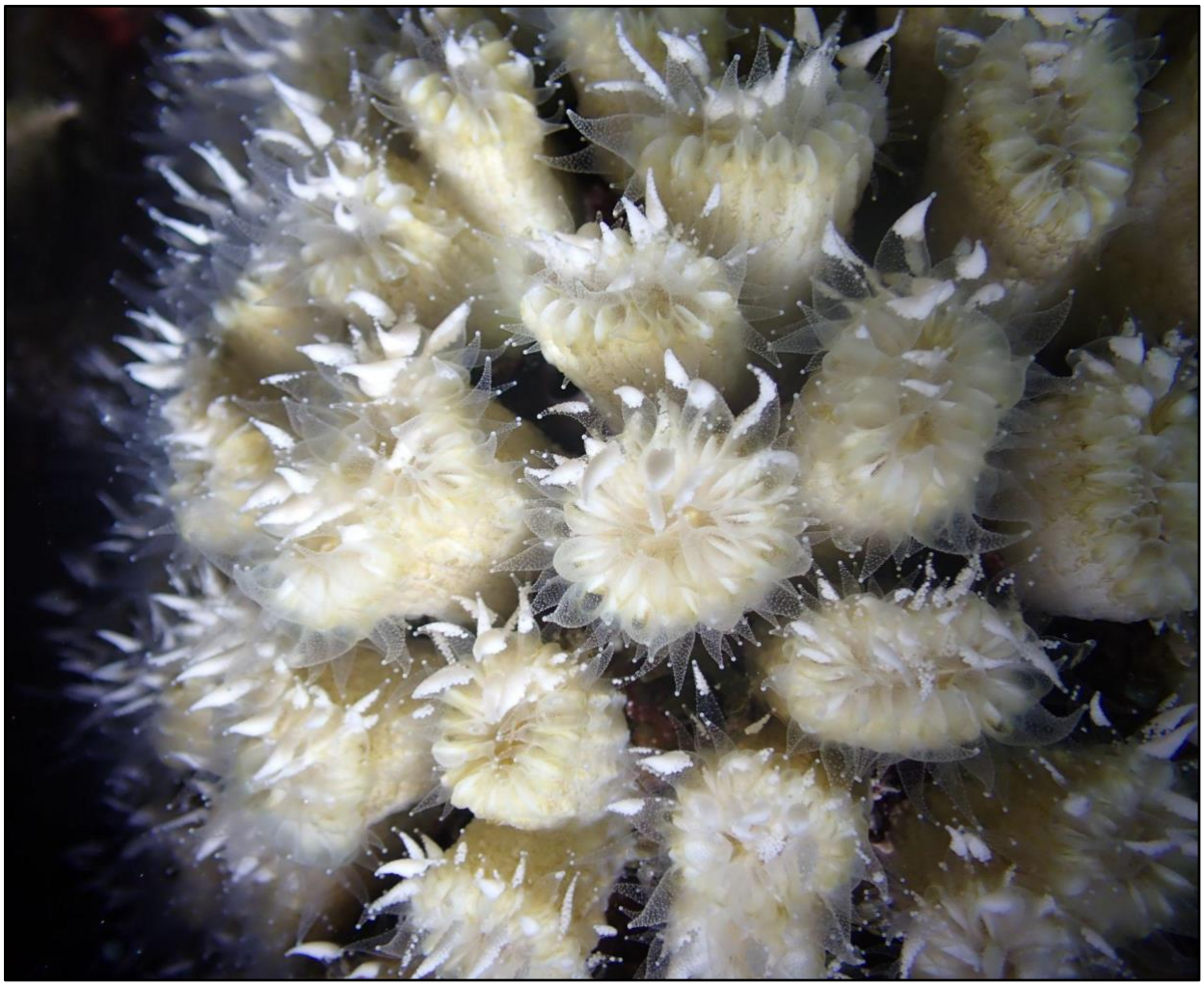

Figure 5. A *Eusmilia fastigiata* colony with brooded fertilized embryos visible within polyp tentacles at North North Dry Rocks Reef in Key Largo, Florida, on August 15, 2025.

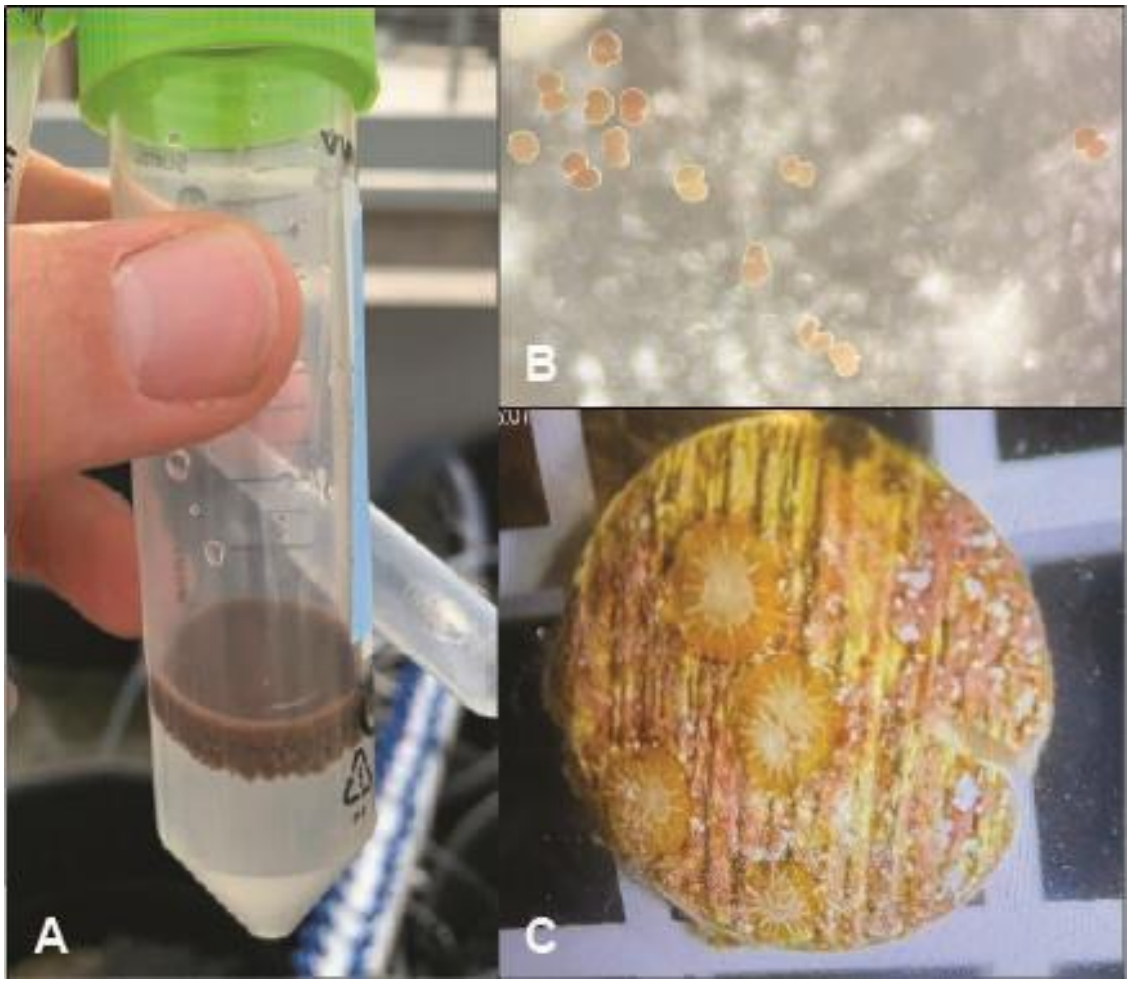

Figure 6. Gamete collection, fertilization, and settled juveniles of Diploria labyrinthiformis (DLAB) during the 2025 ex-situ spawning effort. (A) Collection tube containing gamete bundles released on April 23, 2025, by a DLAB colony monitored at the University of Miami's land-based nursery. (B) Fertilized embryos produced from the first 'urban x reef' DLAB cross, created by mixing gametes collected from corals sourced from MacArthur Causeway North with gametes collected from corals sourced from an offshore reef. (C) Juvenile 'urban x reef' DLAB eight months after settlement on ceramic tiles. Approximately 3,200 larvae were produced from these crosses and grown out by the CoRAL team for experimental use and genetic banking.