Restoring the underwater habitat at SEA Restaurant: Phase 1

February 2017

Before

After

Andrew Bruckner
Georgia Coward

CORAL REEF CPR
CONSERVATION · PROTECTION · RESTORATION

HARP
HOLISTIC APPROACH TO REEF PROTECTION

ANANTARA
KIHAVAH · MALDIVES VILLAS

EXECUTIVE SUMMARY

Phase I of the restoration of the undersea habitat surrounding SEA restaurant at Anantara Kihavah, Baa Atoll, Maldives was completed during February 2017 by Coral Reef CPR. The project included:

a) Removal of all man-made metal "adopt a coral" frames and other trash and debris;
b) Removal of dead coral skeletons and giant clam shells from the platform surrounding the windows;
c) Removal and disposal of all pest species including coral-eating snails (*Drupella*) and *Culcita* starfish;
d) Collection of corals, anemones, soft corals, leather corals, sponges, and other invertebrates along with their associated motile invertebrates and fishes onto the new reef matrix; and
e) Transplantation of corals and other invertebrates onto the platform and stabilization of the smaller corals with non-toxic underwater epoxy.

A small coral nursery was also created on the left side of the restaurant, consisting of five 12 m ropes suspended from the side of the restaurant across the sand flat to the outer edge of the metal grid.

All of the organisms were collected from the lagoon, reef flat and reef slope surrounding Kihavah. Invertebrates transported to the site included injured and abraded corals, diseased corals, corals affected by *Drupella* (snail) predation and corals being overgrown by algae and cyanobacteria. Most of the corals were naturally detached and had accumulated in sand channels, at the base of the reef slope and in depressions on the reef. These corals were being buried and/or moved around by waves and currents and had lost considerable amounts of living tissue due to abrasions and smothering. While this project had minimal impact to surrounding reefs and was likely to enhance the survival of corals that would otherwise die, we expect to experience some mortality of the transplanted corals.

A total of 489 stony corals (43 species), 129 anemones (four species), 41 soft/leather corals (6 species), 21 giant clams and a number of other invertebrates (false corals, colonial anemones, sponges, blue coral, whip corals, and tunicates) were translocated from the surrounding habitats to the platform surrounding SEA. The corals ranged in size from 10 cm diameter up to 1 m, including large massive boulder corals that were up to 100 kg. All animals were kept fully submerged, and were moved either in large buckets or using lift bags. An additional 293 coral fragments were attached to suspended ropes. These will be grown for up to 18 months and subsequently transplanted onto the surrounding reef slope.

ACNKOWLEDGEMENTS

Phase I of the SEA restoration would not have been possible without the help, support and enthusiasm that our team received from all staff at Anantara Kihavah. We are particularly grateful for the help and patience of the restaurant and bar staff based at SEA.FIRE.SALT. The entire team at the dive center, Elements, were an asset to the project- assisting us with gear and equipment, moving tanks, boat support and a fantastic atmosphere. A special thank you to the dive center manager, Javier and assistant manager Sonja for all of their help and support throughout the restoration. Talya Davidoff, the resident marine biologist, was an incredible help throughout the entire project. Thank you to the launch section that organized the *dhoni*, especially at such short notice. As always, the sales and marketing team, Christine, Liezl and Ernestina were always on hand to assist us with logistical arrangements. Thank you to the HR office for assisting with visa arrangements. Finally, a huge thank you to the General Manger, Dylan Counsel, for recognizing the importance in this project and for protecting and restoring the coral reefs surrounding the resort. We always love working at Kihavah as part of such a wonderful team.

The underwater team

BACKGROUND

SEA Restaurant is part of *SEA. FIRE. SALT.* a signature overwater and underwater dining experience located at the end of a long overwater walkway adjacent to Kihavah House Reef and a deep channel at Anantara Villas, Kihavah Huravalhi, Baa Atoll, Maldives. The restaurant is approximately 8.5 m wide, with a 19 m long walkway leading to the main dining area. The walkway contains the wine cellar and two large windows on opposite sides. The Restaurant is octagonal, with eight large windows facing out to the reef slope (on the sides) and the drop-off in front. The six on the front face are approximately 2.4 m wide, and two on the sides are 2 m wide. There is a cement ledge outside of these windows that is about 50 cm wide on the sides and about 1.5 m wide on the front. A large rebar frame is placed on the southern side, extending from the platform and sloping upward to the reef slope. The structure sits in a channel between the reef, with 8-10 m of sand/rubble and rock on each side leading to the reef slope and reef flat.

Fig. 1. SEA photographed from the deck. The roof of the long walkway and octagonal restaurant are situated within a sandy area in a cut between the reef. A submerged platform surrounds the structure. The edge of the drop-off is about 3-5 m from the front of the restaurant. The roof is in 1-3 m depth (depending on tide) and the cement platform ranges from 3-5 m depth.

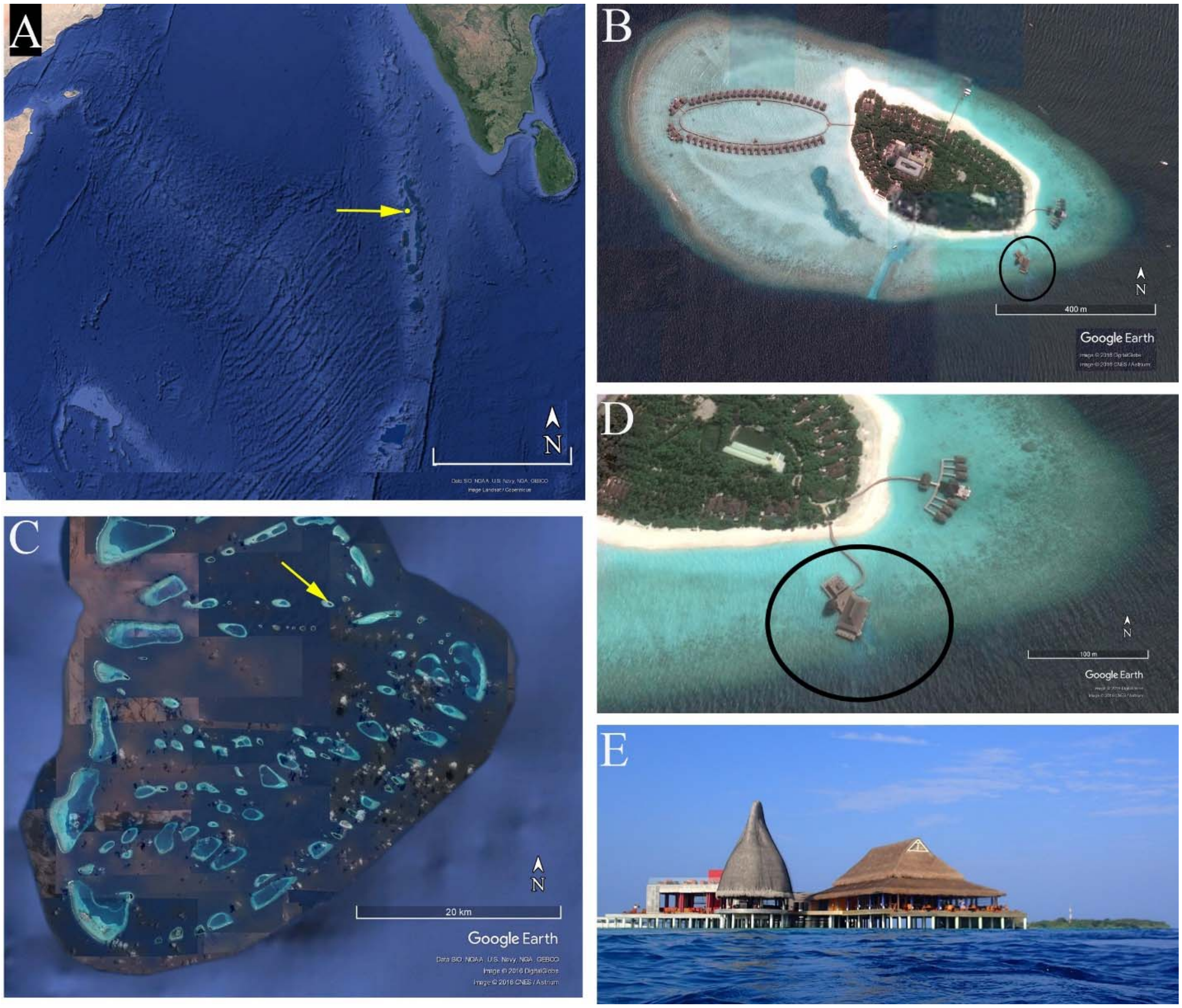

Fig. 2. Location of SEA habitat restoration. A. Baa atoll, Maldives (yellow arrow) is located in the Indian, south of Sri Lanka and India. B. Aerial image of Kihavah. *SEA. FIRE. SALT.* is located in the lower right (black circle). C. Satellite imagery of Baa Atoll. Location of Huravalhi Island is indicated by the yellow arrow. D. Close-up image showing the location of *SEA. FIRE. SALT.* E. *SEA. FIRE. SALT.* from the water.

RESTORATION APPROACH

The goal of the restoration of the underwater habitat around SEA was 1) to recreate a natural reef system that supports a diverse assemblage of sessile benthic invertebrates, motile invertebrates, fishes and turtles, including resident site-associated species as well as schooling grazers, and pelagic predators that utilize the area during different times of day; 2) enhance the quality of the habitat through removal of artificial, man-made structures and pest species; and 3) provide guests with an unmatched underwater visual and educational experience of a coral reef without getting wet. Due to the extensive mortality to corals and other invertebrates during 2016, and the large size of the area, the project is being undertaken in different phases, with Phase I (completed in February 2017) involving habitat clean-up and restoration of the platform surrounding the windows of the restaurant and the wine cellar.

1. **Removal of rebar "adopt a coral" frames.**

   The platform in front of the main windows, reef slope and reef crest on either side of the restaurant, and the reef terrace adjacent to the drop-off on the left and right side of the restaurant had 107 metal frames of various sizes and shapes that were deployed between 2013 - 2016. Small coral branches were attached to the frames in attempt to create artificial reef habitat. During the mass bleaching in April/May 2016, 98% of the corals on these frames died, including all of the branching *Acropora* spp., *Porites, Echinopora*, *Pavona*, and faviid corals, and the majority of the *Pocillopora* colonies. The frames were colonized by turf algae, cyanobacteria and tunicates and these had overgrown the dead coral skeletons. Exposed metal surfaces were heavily rusted and the frames were starting to collapse.

   All of the skeletons and the few living corals were first removed from the frames. An attempt was made to lift these from the water onto a small boat, but strong currents made this impractical and dangerous. Subsequently the frames were transported by two divers from SEA to the shallow lagoon, and then the beach, and then disposed of by engineering.

Fig. 3. The corals that were attached to the rebar frames became severely bleached in April 2016 (right) and died during May.

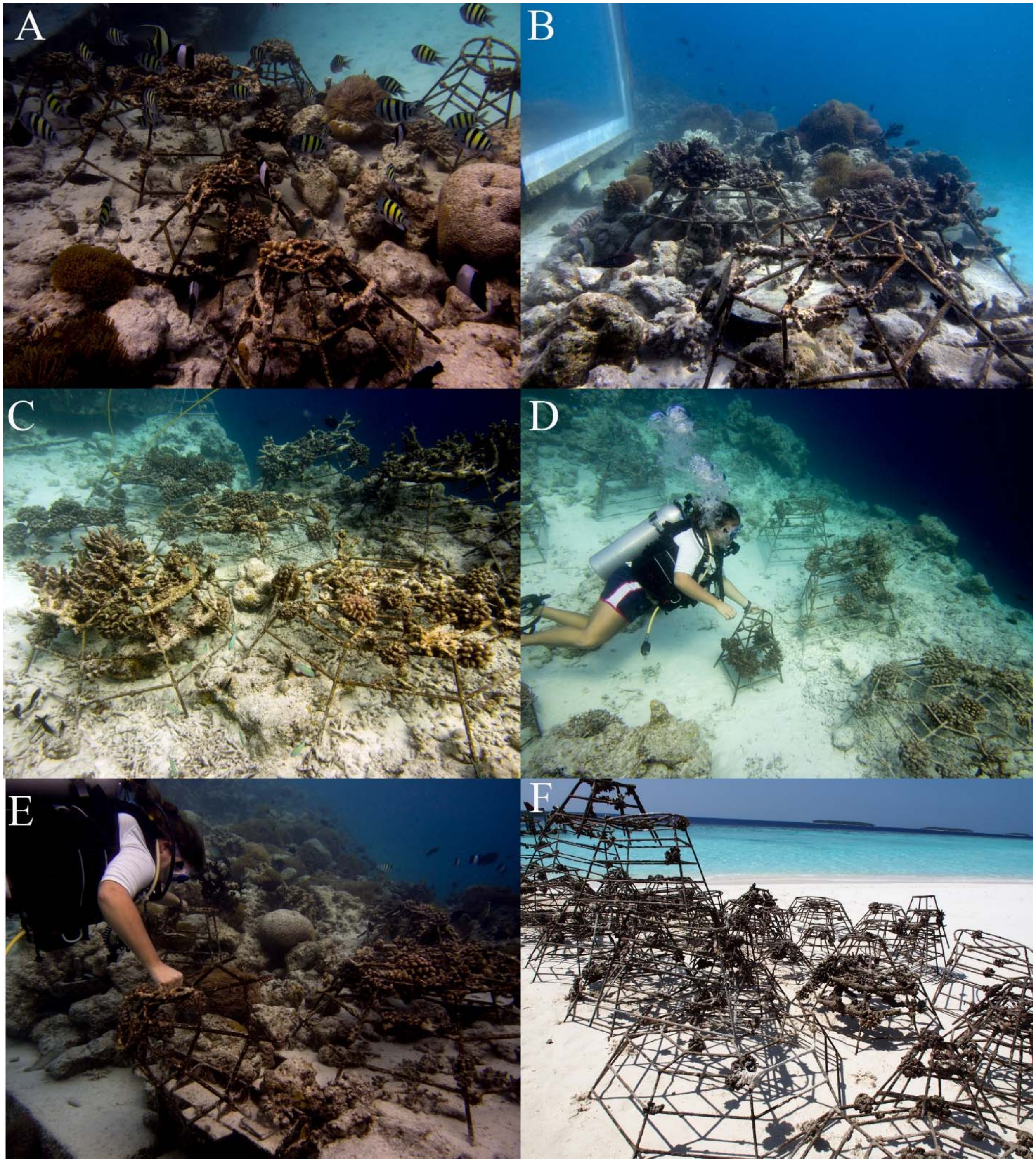

Fig. 4. Metal rebar "adopt a coral" frames at SEA restaurant. A-B. Frames with dead coral skeletons on the platform adjacent to the windows. C. Frames on the reef terrace, near the dro-off. D-E. Removing the frames from the habitat surrounding SEA. F. Frames on the beach at Kihavah before disposal.

2. Removal of dead corals and giant clams from platform

Many of the larger colonies of coral and giant clams placed directly in front of the windows had died, and the skeletons were covered in algae and sediment. These were removed and used to fill in holes further away from the windows, with the intent of creating a natural reef substrate that would allow placement of living corals and other invertebrates. Some of the larger giant clam shells were also used in creation of the reef framework, providing refuge for moray eels, crabs, lobsters or other more secretive animals. Much of the dead coral rubble was also moved away from the windows and placed on other parts of the cement platform (out of direct view from inside the restaurant) that was formerly uncolonized as this would provide three-dimensional structure and increase the extent of high relief habitat that could support motile invertebrates and fish. Prior to the current restoration, much of the platform lacked any organisms and was a flat low-relief substrate with an absence of life.

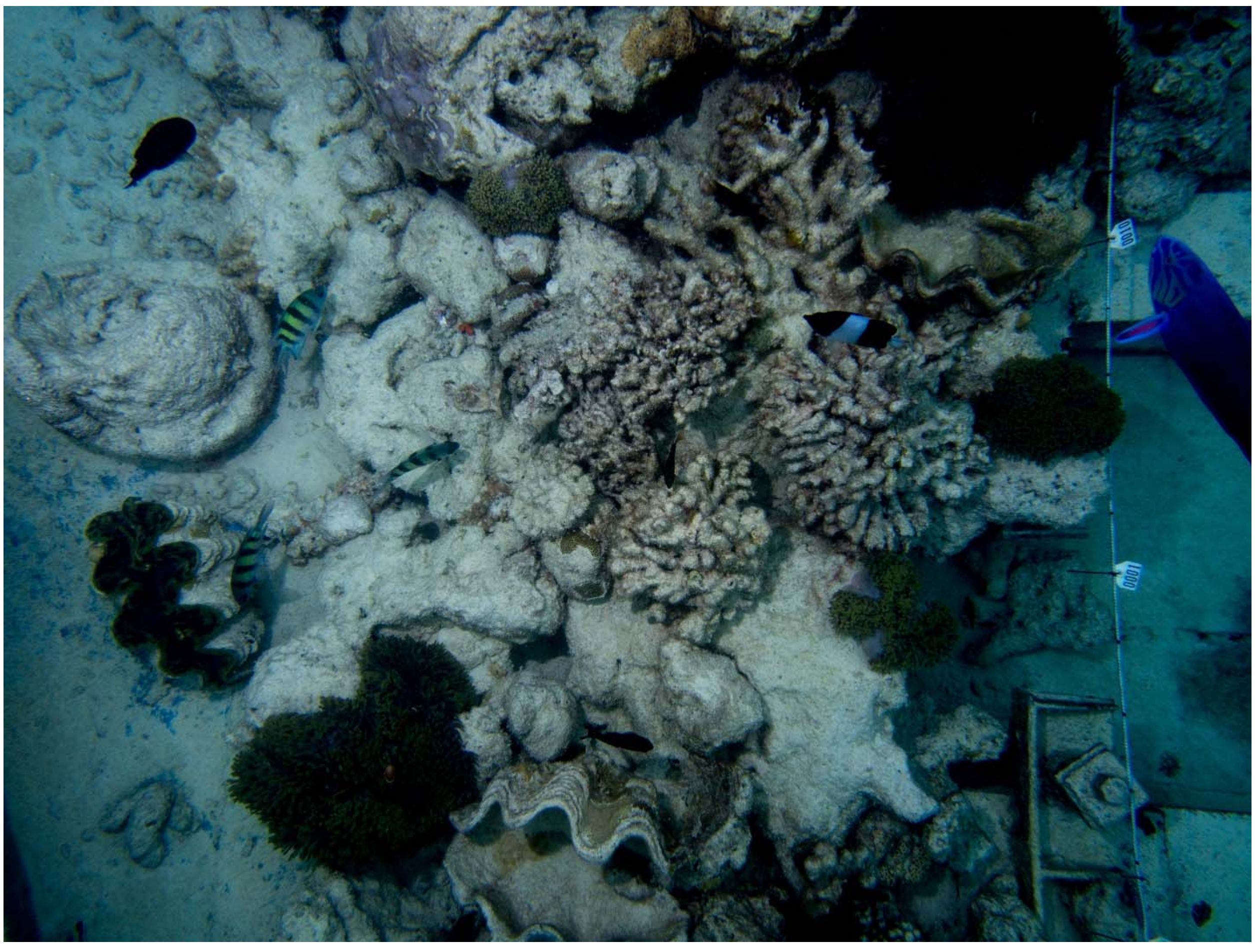

Fig. 5. Much of the cement platform near the windows was covered with dead giant clams and dead branching and boulder coral skeletons (above). These were removed to allow placement of living organisms.

3. Removal of pest species from the platform and surrounding reef

Reefs throughout the Maldives have a very high number of coral predators, including coral-eating snails (*Drupella*) and starfish (*Acanthaster* and *Culcita*). Acanthaster (crown of thorns starfish) is rare on Baa Atoll and was not observed on Kihavah House Reef during this project. The cushion star (*Culcita*) occurred at an abnormal abundance and was especially prevalent on and around the platform and on the shallow part of the reef slope of Kihavah House Reef. *Drupella* snails were abundant, with very high numbers of snails concentrated on individual corals (especially cauliflower coral, *Pocillopora*).

Drupella tend to feed on branching corals, concentrating within tightly branching species at the base of the colony and progressively eating their way up the branches. Many of the infested colonies identified in Kihavah were missing most of their tissue at the bases of the branches and only the branch tips were be surviving. *Drupella* were also observed on boulder corals such as *Porites,* presumably because their preferred food has become rare since the bleaching event.

Each coral that was brought into the site was carefully searched for *Drupella* and all snails were removed. On the last day a thorough removal effort was undertaken to eliminate any remaining snails that had been missed. In total, 574 snails were removed from affected corals.

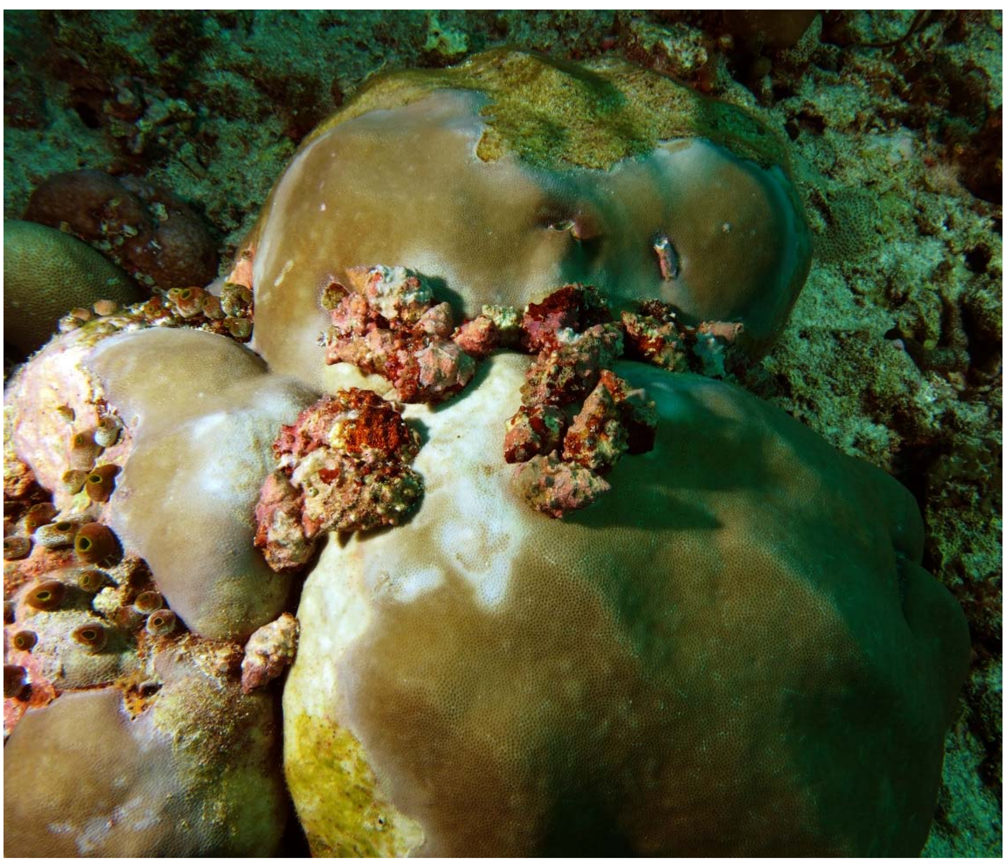

Fig. 6. A colony of boulder coral (*Porites lobata*) that is infested with *Drupella* snails.

Culcita tend to feed on small corals, especially new recruits and juvenile *Pocillopora* colonies. They will also eat larger corals, but they tend to only remove tissues from the branch tips, because they are unable to access the bases of the branches.

Culcita was found to be a serious pest during the restoration project, as numerous individuals moved onto the platform and were seen eating a number of the corals brought into the site. All cushion stars in the area immediately surrounding SEA were removed at the beginning of the project, with additional animals removed as they migrated onto the platform. During the last week of the restoration, a larger area was searched for *Culcita*. In total 87 *Culcita* were removed from the surrounding area.

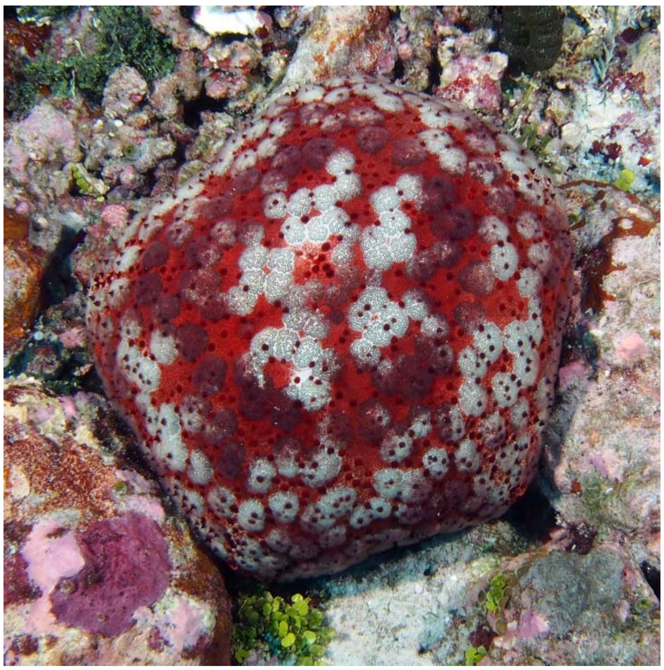

Fig. 7. A cushion star, *Culcita* among coral rubble at Kihavah.

Fig. 8. A cushion star on the cement ledge at SEA. The starfish has eaten a portion of the cauliflower coral that was transplanted onto the site.

4. Collection of corals and other invertebrates

All of the corals and other invertebrates transplanted to SEA were collected from Kihavah House Reef. The corals included 1) colonies that had been detached from the reef and were rolling around on the bottom; 2) colonies with partial tissue loss and ongoing predation from *Culcita* starfish and *Drupella* snails; 3) corals affected by disease; 4) overturned corals and broken branches that had accumulated in sand patches, sand channels and on the base of the reef; and 5) branches of coral from large thickets that had sustained mortality during the bleaching event and were being overgrown by algae.

A number of soft corals, sea anemones and leather corals were brought into the restoration site. These were only collected if they were attached to a piece of reef rock. No animals were scraped off the attached substrate, as this would have injured and killed these organisms.

Whenever a coral was found with associated reef fish, such as humbugs, chromis, anemonefish and damselfish, a mesh net was placed around the colony before transport to avoid displacing the fish. All large boulders, greater than 30 cm diameter, were carried to the site using lift bags. Smaller corals and other invertebrates were placed in large plastic boxes and transported underwater. Efforts were made to avoid removing any of the animals from the water during transport.

Fig. 9. Transporting a bucket of invertebrates.

5. Transplantation and stabilization of corals onto the cement platform and adjacent grid surrounding SEA

The existing sea anemones and surviving giant clams were left in their original position. All corals and other invertebrates were distributed onto the cement platform and grid such that open spaces were filled and the organisms were readily viewable from inside the window. Once all the largest massive boulder corals were placed onto the grid, other species were situated around these to maximize living coverage.

On the grid, corals were placed into clusters consisting of individual species, with a large number of massive boulder corals (*Porites*) placed together at the base of the grid, and an assemblage of *Pocillopora* colonies placed together. This was done to 1) minimize competition between different species and 2) maximize the potential for reproduction. By placing the same species in close proximity, successful fertilization is more likely to occur because these animals broadcast their gametes into the water column.

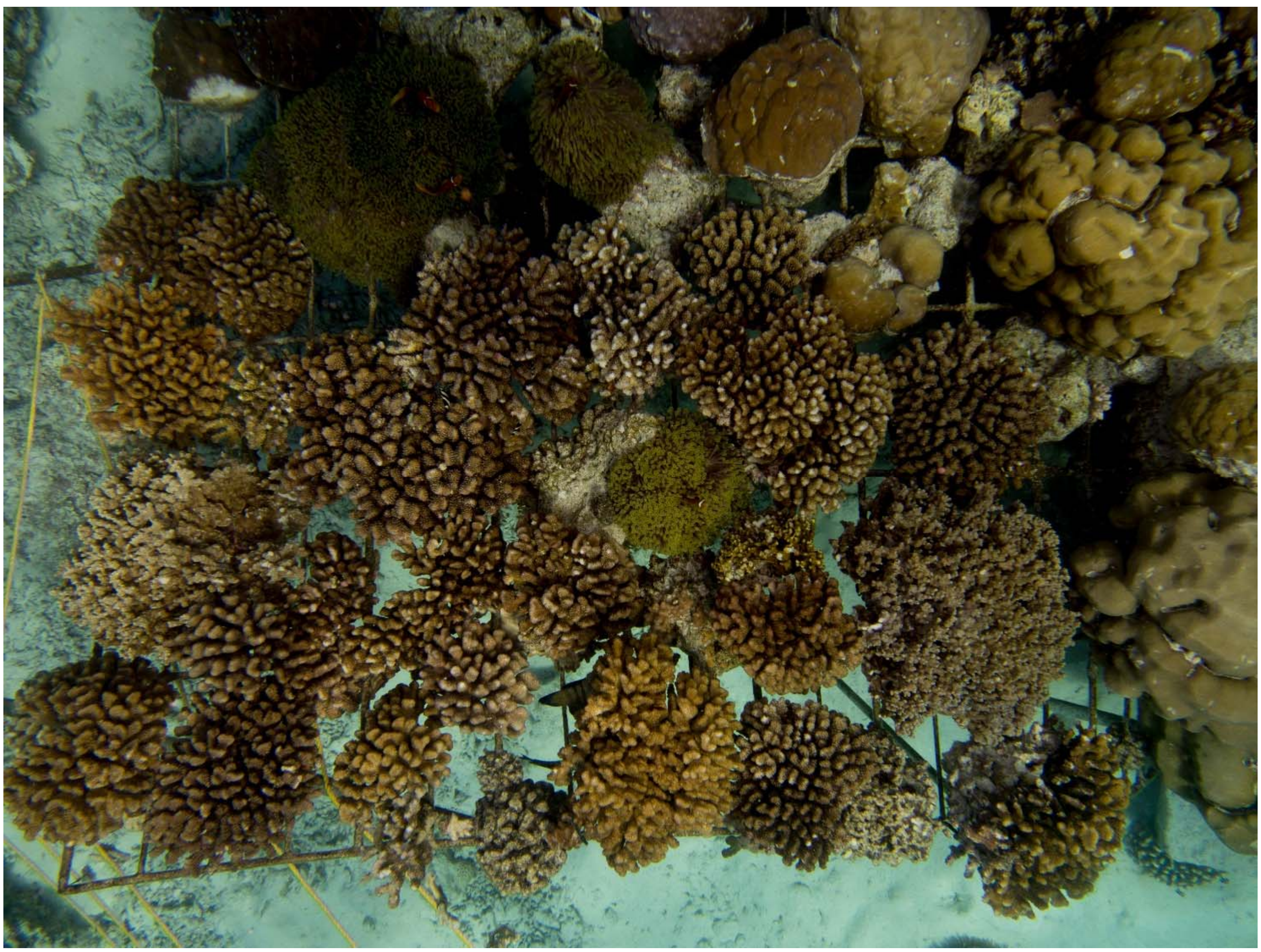

Fig. 10. A cluster of cauliflower coral (*Pocillopora verrucosa*) at the upper portion of the metal grid.

Whenever possible, the animals were placed at the same depth from which they were collected. Animals were also placed in a current regime that matched their prior distribution, with species that prefer high currents being placed on the outer portions of the cement platform and in elevated locations; species that prefer lower currents placed on the side windows and lower onto the substrate. The species with the highest tolerance for sediment were placed outside the windows near the wine cellar, especially on the right sides these areas tend to have high deposition rates of sediment.

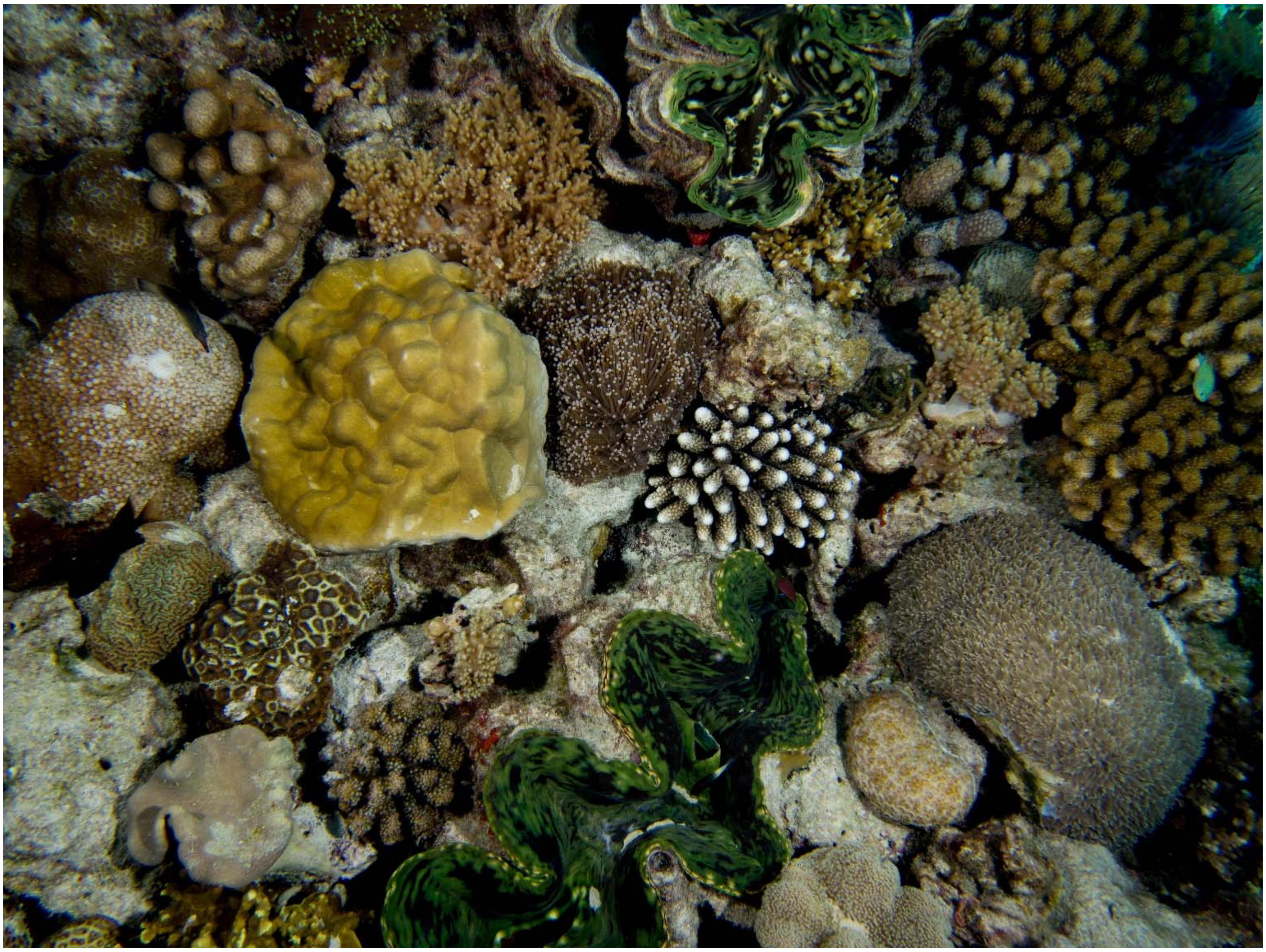

Fig. 11. The community established on the cement platform contains more than 60 different species of corals and sea anemones.

6. Establishment of a coral nursery

A small coral nursery was established on the left side of the restaurant between the wine cellar windows and the outer edge of the large grid. Five nylon ropes with attached fragments of *Acropora* (7 species) were secured between a metal grid adjacent to the restaurant and the upper portion of the metal grid near the reef slope. Each rope was approximately 10 m in length.

All of the corals used in the nursery were salvaged from a sand extraction site within the lagoon (near Plates Restaurant) and from broken, unattached colonies that had fallen off the reef and accumulated in sand channels and at the base of the reef. Corals from the sand extraction site were predominantly small recruits and juveniles, 1-3 cm in length that had settled on dead staghorn coral branches. These were repeatedly overturned and buries during the sand extraction process, and many had small Drupella snails on their surfaces. The detached branches were generally dead at their bases, or had scars from snail predation and/or disease. The branch ends were clipped off (2-5 cm in length) and secured to the ropes with cable ties.

The majority of the coral fragments were brought to shore in large buckets, and secured to the ropes by guests during coral gardening demonstrations. Attempts were made to minimize the time the branches were out of the water.

Fig. 12. A family learning how to attach corals to ropes for use in our coral nursery.

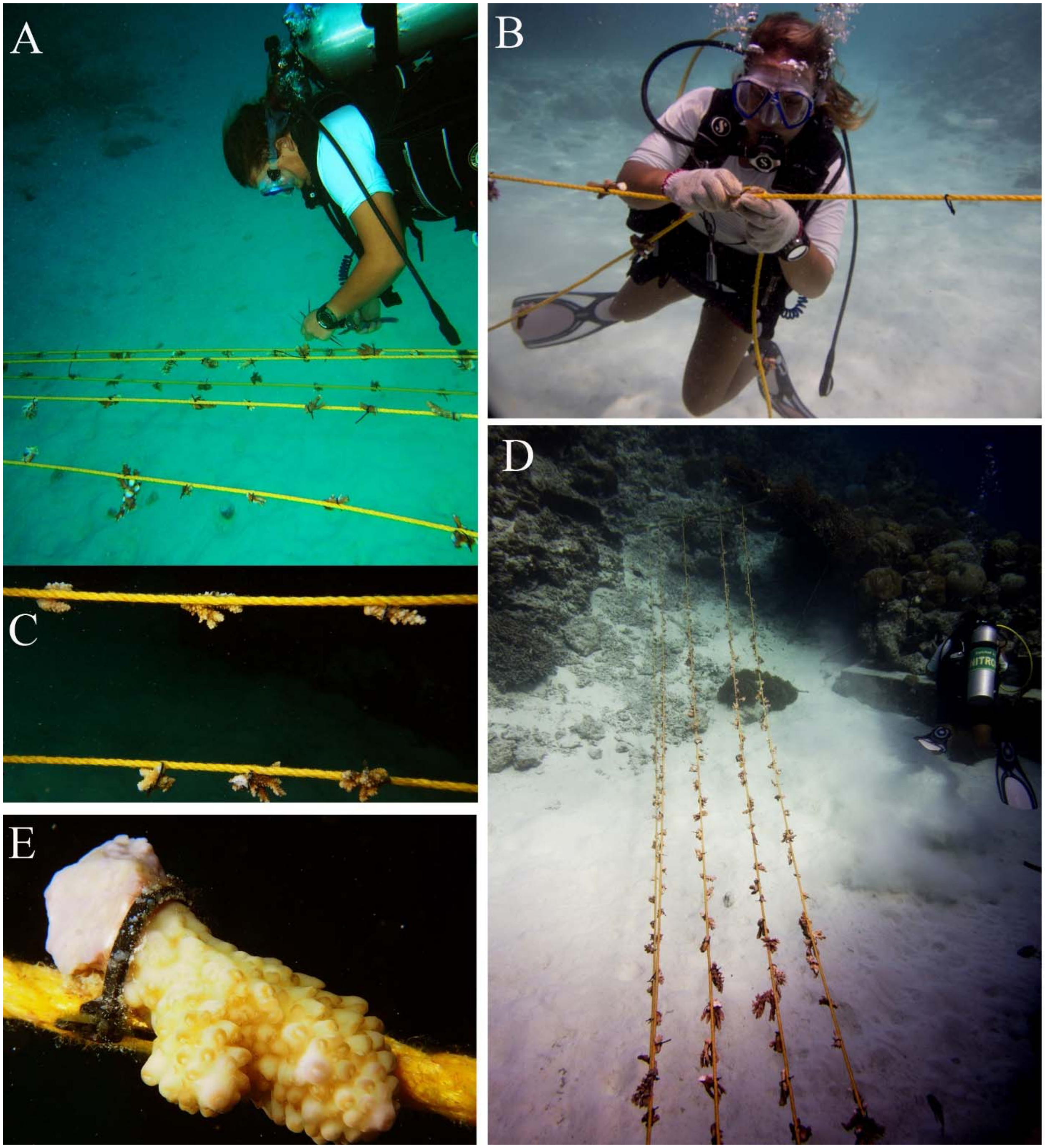

Fig. 13. Kihavah SEA coral nursery. A-B. Attaching fragments to the ropes. C. Close-up of the fragments on a rope. D. Coral nursery ropes extending from the SEA structure to the outer edge of the metal grid. E. A single *Acropora* fragment attached to a rope.

7. Evaluating outcomes and success

A key aspect of the restoration is to rehabilitate the environment and create a natural, thriving reef system. The success at achieving this goal requires the collection of scientific information on the corals and other invertebrates transplanted into the site, including their survivorship and growth, colonization of the site by reef fishes, and potential reproduction of the introduced corals. Throughout the restoration process, the habitat was assessed to document changes. Baseline data on surviving corals and other invertebrates, and existing fishes was compiled. A final inventory of the total number of species and their abundance was taken in March 2017. During future visits additional changes to the site will be documented.

Fig. 14. Conducting a reef fish survey on the cement platform.

Table. 1. Diversity and numbers of different invertebrates transplanted to the habitat surrounding SEA.

Organism	No. Species	No. Individuals
Scleractinian corals	43	489
Anemones	3	129
Soft corals	6	41
False corals	1	3
Colonial anemones	2	4
Other cnidarians	6	8
Sponges	4	12
Bivalves	4	21
TOTAL	**69**	**707**

Fig. 15. A series of images showing the exact same location before (left) and after (right) the restoration. All of the images were taken from inside SEA, looking through the glass.

Importance of the work

This project demonstrated that a beautiful thriving coral reef can be created using corals that would otherwise die. All of the corals transported to SEA were collected on the reef surrounding Kihavah. They included corals that were 1) broken, fractured and detached from the bottom and rolling around on the bottom; 2) piled up in sand channels and at the base of the reef and being buried by sand; 3) under attack by voracious coral-eating snails; 4) affected by coral diseases. Many of the colonies were partially dead, but all diseased tissue, predators and algae were first removed from the colonies.

One component included the establishment of a small coral nursery. Small broken branches were attached to ropes suspended in the water column near the wine cellar. These branches will be grown for about 18 months until they form small "bushes". The corals will be removed from the rope and used to restore other areas surrounding the restaurant. This will be a continual nursery, and once grown corals are removed the ropes will be replaced with new fragments.

The corals used in the restoration are colonies that did not bleach in 2016, and are more tolerant of higher temperatures. This project will demonstrate whether these corals are hardier and are more resistant to future periods of unusually hot water, which are predicted to occur.

Benefits for the environment

The habitat surrounding SEA was extensively degraded with near total mortality of stony corals during the 2016 coral bleaching event. The only survivors were the magnificent sea anemones (many bleached but recovered) and approximately 30% of the giant clams. The platform surrounding the restaurant and the habitat at the seaward edge, near the drop-off had more than 100 metal (rebar) '"adopt a coral" coral frames that were rusting and had attached dead coral skeletons and fleshy algae as all of the attached coral fragments had died. Due to the absence of living coral, most of the small reef-associated fish such as the chromis, humbugs, butterflyfish, gobies, damselfish, angelfish and other species had disappeared.

Restoration of the platform surrounding SEA helped restore the three dimensional structure of the habitat providing refuge and feeding areas for coral reef fishes. Introduction of a diverse community of live corals, soft coral, anemones, leather corals, sponges, and other sessile (attached) invertebrates increases the productivity of the area and it supports coral-associated fish and many invertebrates such as shrimp, crabs, crinoids and starfish, sea urchins and worms. Living coral also provides a habitat for cleaning stations occupied by shrimp and gobies; these stations provide a key service for other fishes that maintains their health.

Removal of the metal frames reduces the amount of iron being released due to the rusting of the frames. Iron is a key nutrient that promotes growth of algae; too much algae is harmful as it grows faster than coral and can smother coral colonies and also prevent settlement and survival of baby corals. It also gives the area a more natural feel, rather than artificial with large amounts of visible metal structures.

Transplantation of corals of the same species into the environment is creating breeding clusters which will aid in the recovery of surrounding areas. By placing the same species close together, they will produce more coral larvae that can settle in adjacent areas and recolonize the sea floor.

Benefits for the guests

SEA restaurant offers guest the opportunity to see a thriving, healthy coral reef without getting wet, which is ideal for guests that cannot swim or dive. It allows them to see what a natural reef looks like, instead of an artificial reef at a public aquarium. Because the restaurant is located at the edge of the drop-off, the guests can view the reef associated animals as well as the larger pelagic fishes, sharks, turtles and other larger animals that visit this area in search of food. In addition to viewing a very high number of different coral and fish species, more than they are likely to see on most un-restored reefs in the Maldives, they have the opportunity to watch unique behaviors that occur on a coral reef. This is Kihavah's signature restaurant and is visited by almost all guests that stay at the resort, hence it is critical that they have the most amazing experience and the restaurant offers them the ultimate 'wow factor' any time of the day.

The guests can have a completely different experience at the restaurant depending on the time of day and the tide cycle. Fish activity varies depending on the time of day, and different species visit the reef based on the tidal cycle and water currents. Also, many of the corals expand their polyps at night, and look very different than during the day.

Next steps

Coral Reef CPR and Anantara Kihavah are planning additional phases of the project to continue restoration of the entire habitat. Phase II will be undertaken in July 2017. During this time, Coral Reef CPR will complete a restoration of the reef slope off the left side of the restaurant, adjacent to the grid. This is currently a rubble/boulder slope with a complete absence of living corals.

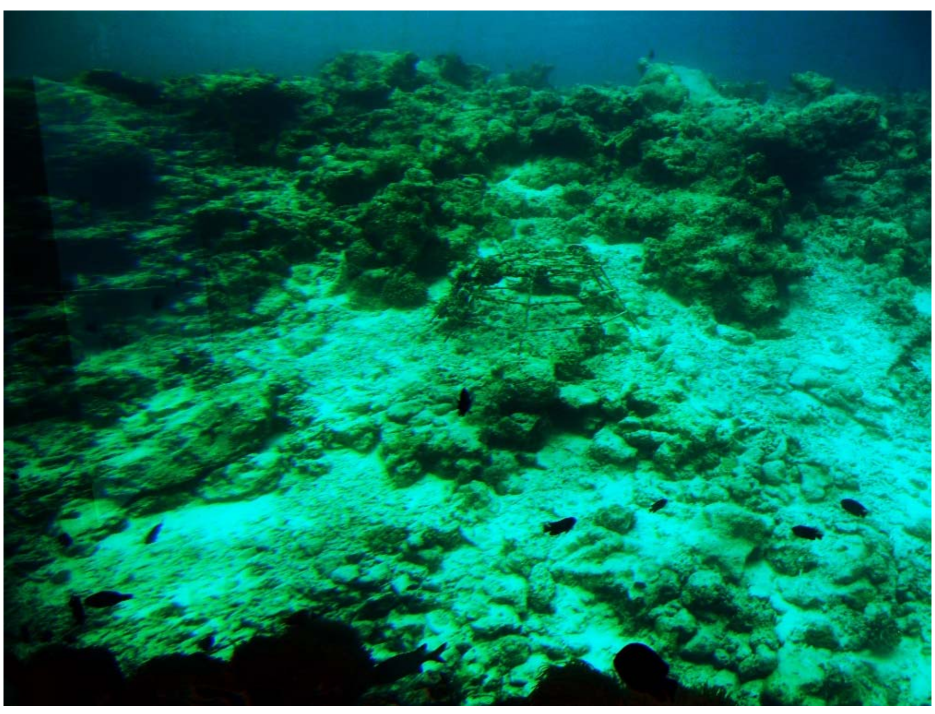

Fig. 16. Phase II of SEA restoration will rejuvenate the reef slope off the left side.

Appendix 1. Cnidarians transported to SEA

Group	Species	Common name
Ahermatypic corals	*Tubastrea micranthus*	Green tube coral
Ahermatypic corals	*Tubastrea coccinea*	Orange tube coral
Alcyonaria	*Heliopora coerulea*	Blue coral
Alcyonaria	*Sinularia brassica*	Brassy leather coral
Alcyonaria	*Cladiella spp.*	Color changing leather coral
Alcyonaria	*Clathria spp.*	Gorgonian
Alcyonaria	*Sarcophyton (two species)*	Long polyp and mushroom leather coral
Alcyonaria	*Lobophytum spp.*	Ridged leather coral
Alcyonaria	*Dendronephthya spp.*	Soft coral
Antipathidae	*Stichopathes spp.*	Whip coral
Corallimorph	*Amplexidiscus fenestrafer*	False coral
Hermatypic corals	*Acropora hemprichii*	Staghorn coral
Hermatypic corals	*Acropora divaricata*	Table coral
Hermatypic corals	*Acropora humilis*	Finger coral
Hermatypic corals	*Alveopora gigas*	Flowerpot coral
Hermatypic corals	*Astreopora myriophthalma*	Volcano coral
Hermatypic corals	*Cyphastrea seralia*	Small polyp star coral
Hermatypic corals	*Diploastrea heliopora*	Volcano star coral
Hermatypic corals	*Euphyllia glaberescens*	Hammer coral
Hermatypic corals	*Favia favus*	Star coral
Hermatypic corals	*Favia speciosa*	Star coral
Hermatypic corals	*Favites abdita*	Moon coral
Hermatypic corals	*Favites complenata*	Moon coral
Hermatypic corals	*Favites pentagona*	Moon coral
Hermatypic corals	*Fungia spp*	Mushroom coral
Hermatypic corals	*Galaxea fasicularis*	Galaxy coral
Hermatypic corals	*Goniastrea edwardsi*	Honeycomb coral
Hermatypic corals	*Goniastrea pectinata*	Honeycomb coral
Hermatypic corals	*Goniopora columna*	Columnar flowerpot coral
Hermatypic corals	*Goniopora lobata*	Boulder flowerpot coral
Hermatypic corals	*Hydnophora microconus*	Velvet coral
Hermatypic corals	*Leptastrea purpurea*	Encrusting star coral
Hermatypic corals	*Lobophyllia corymbosa*	Flower coral
Hermatypic corals	*Montastrea curta*	Star coral
Hermatypic corals	*Merulina ampliata*	Spiky brain coral
Hermatypic corals	*Montipora tuberculosa*	Monticule velvet coral
Hermatypic corals	*Oulophylia bennetta*	Grooved brain coral
Hermatypic corals	*Pavona clavus*	Club coral
Hermatypic corals	*Physogyra lichtensteini*	Pineapple coral
Hermatypic corals	*Platygyra daedalea*	Brain coral
Hermatypic corals	*Platygyra lamellina*	Brain coral
Hermatypic corals	*Pocillopora verricosa*	Cauliflower coral
Hermatypic corals	*Pocillopora meandrina*	Smiling cauliflower coral
Hermatypic corals	*Pocillopora damicornis*	Bird's nest coral
Hermatypic corals	*Porites lobata*	Boulder coral
Hermatypic corals	*Porites rus*	Column coral
Hermatypic corals	*Psammocora digitata*	Club coral
Hermatypic corals	*Symphyllia recta*	Symphony coral
Hermatypic corals	*Symphyllia radians*	Symphony coral
Hermatypic corals	*Turbinaria mesenterina*	Cup coral
Sea anemone	*Heteractis magnifica*	Magnificent anemone
Sea anemone	*Stichodactyla mertensii*	Merten's anemone
Zoanthid	*Palythoa caesia*	Colonial anemone

Appendix 2. Fish species identified at SEA

Family	Species	Common name
Acanthuridae	*Acanthurus leucosternon*	Powderblue Surgeonfish
Acanthuridae	*Ctenochaetus striatus*	Lined Bristletooth
Acanthuridae	*Naso brachycentron*	Humpback Unicornfish
Acanthuridae	*Naso brevirostris*	Spotted Unicornfish
Acanthuridae	*Naso elegans*	Elegant Unicornfish
Acanthuridae	*Naso lituratus*	Orangespine Unicornfish
Acanthuridae	*Naso thynnoides*	Barred Unicornfish
Acanthuridae	*Zebrasoma desjardinii*	Indian Ocean Sailfin Surgeonfish
Acanthuridae	*Zebrasoma scopas*	Brushtail Tang
Aulostomidae	*Aulostomus chinensis*	Trumpetfish
Balistidae	*Balistapus undulatus*	Orange-lined Triggerfish
Balistidae	*Balistoides conspicillum*	Clown Triggerfish
Balistidae	*Balistoides viridescens*	Titan Triggerfish
Balistidae	*Odonus niger*	Redtooth Triggerfish
Caesionidae	*Caesio xanthonota*	Yellowback Fusilier
Caesionidae	*Pterocaesio pisang*	Ruddy Fusilier
Caesionidae	*Pterocaesio tile*	Bluestreak Fusilier
Carangidae	*Caranx melampygus*	Bluefin Jack
Carangidae	*Caranx sexfasciatus*	Bigeye Trevally
Chaetodontidae	*Chaetodon falcula*	Double Saddle Butterflyfish
Chaetodontidae	*Chaetodon trifascialis*	Chevroned Butterflyfish
Chaetodontidae	*Chaetodon trifasciatus*	Redfin Butterflyfish
Chaetodontidae	*Forcipiger flavissimus*	Longnose Butterflyfish
Chaetodontidae	*Hemitaurichthys zoster*	Indian Ocean Pyramid Butterflyfish
Chaetodontidae	*Heniochus varius*	Humphead Bannerfish
Cirrhitidae	*Cirrhitichthys oxycephalus*	Pixy Hawkfish
Holocentridae	*Myripristis kuntee*	Epaulette Soldierfish
Holocentridae	*Myripristis murdjan*	Blotcheye Soldierfish
Holocentridae	*Neoniphon sammara*	Spotfin Squirrelfish
Labridae	*Anampses meleagrides*	Yellowtail Wrasse
Labridae	*Anampses twistii*	Yellow-breasted Wrasse
Labridae	*Cheilinus trilobatus*	Tripletail Wrasse
Labridae	*Coris caudimacula*	Spottail Coris
Labridae	*Coris dorsomacula*	Palebarred Coris
Labridae	*Epibulus insidiator*	Slingjaw Wrasse
Labridae	*Gomphosus caeruleus*	Bird Wrasse
Labridae	*Halichoeres hortulanus*	Checkerboard Wrasse
Labridae	*Halichoeres melanurus*	Pinstriped Wrasse
Labridae	*Halichoeres trimaculatus*	Threespot Wrasse
Labridae	*Labrichthys unilineatus*	Tubelip Wrasse
Labridae	*Labroides bicolor*	Bicolor Cleaner Wrasse
Labridae	*Labroides dimidiatus*	Bluestreak Cleaner Wrasse
Labridae	*Oxycheilinus digrammus*	Linecheeked Wrasse
Labridae	*Thalassoma amblycephalum*	Two-Tone Wrasse
Labridae	*Thalassoma hardwicke*	Sixbar Wrasse
Labridae	*Thalassoma jansenii*	Jansen's Wrasse
Labridae	*Thalassoma lunare*	Moon Wrasse
Labridae	*Thalassoma quinquevittatum*	Fivestripe Wrasse
Lutjanidae	*Lutjanus bohar*	Red Snapper
Mullidae	*Parupeneus barberinus*	Dot-dash Goatfish

Mullidae	*Parupeneus multifasciatus*	Manybar Goatfish
Nemipteridae	*Scolopsis margaritifer*	Pearly Monocle Bream
Pempheridae	*Parapriacanthus ransonneti*	Golden Sweeper
Pempheridae	*Pempheris adusta*	Dusky Sweeper
Pinguipedidae	*Parapercis hexophthalma*	Speckled Sandperch
Pomacanthidae	*Centropyge multispinis*	Dusky Angelfish
Pomacentridae	*Abudefduf vaigiensis*	Indo-Pacific Sergeant
Pomacentridae	*Amblyglyphidodon aureus*	Golden Damsel
Pomacentridae	*Amphiprion clarkii*	Clark's Anemonefish
Pomacentridae	*Amphiprion nigripes*	Maldive Anemonefish
Pomacentridae	*Chromis viridis*	Blue-green Chromis
Pomacentridae	*Dascyllus aruanus*	Humbug Dascyllus
Pomacentridae	*Dascyllus trimaculatus*	Three-spot Dascyllus
Pomacentridae	*Plectroglyphidodon lacrymatus*	Jewel Damsel
Pomacentridae	*Pomacentrus caeruleus*	Caerulean Damsel
Pomacentridae	*Pomacentrus indicus*	Indian Damsel
Pomacentridae	*Pomacentrus philippinus*	Philippine Damsel
Scaridae	*Cetoscarus bicolor*	Ocellated Parrotfish
Scaridae	*Chlorurus sordidus*	Bullethead Parrotfish
Scaridae	*Scarus frenatus*	Bridled Parrotfish
Scaridae	*Scarus niger*	Swarthy Parrotfish
Scaridae	*Scarus psittacus*	Palenose Parrotfish
Scorpaenidae	*Pterois volitans*	Common Lionfish
Serranidae	*Aethaloperca rogaa*	Redmouth Grouper
Serranidae	*Anyperodon leucogrammicus*	Slender Grouper
Serranidae	*Cephalopholis argus*	Peacock Grouper
Serranidae	*Cephalopholis miniata*	Coral Grouper
Serranidae	*Plectropomus laevis*	Blacksaddle Coral Grouper
Serranidae	*Pseudanthias squamipinnis*	Scalefin Anthias
Serranidae	*Pseudanthias tuka*	Purple Anthias
Siganidae	*Siganus corallinus*	Coral Rabbitfish
Syngathidae	*Corythoichthys haematopterus*	Reef-top pipefish
Syngathidae	*Trachyrhamphus longirostris*	Longnose pipefish
Zanclidae	*Zanclus cornutus*	Moorish Idol

Fig. 17. Maldivian anemonefish *Amphiprion nigripes*


AFTER


BEFORE