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MAGAZINE | APRIL-JUNE 2022 | EDITION 002

SONEVA CORAL PROPAGATION PROGRAMME

Restoring coral reefs in the Maldives

002 EDITION

Coral Propagation
Hornbill Reintroduction
Myanmar Stoves Campaign

Mangrove Restoration
Forest Restoration
Soneva Namoona
Action Against Hunger

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The Maldives is an island nation with an enchanting underwater beauty. Corals play a vital role in ocean biodiversity, with 25% of sea life living on the reef.

With our implementation partners Coralive.org and the Soneva Fushi SCIE:NCE team, the Soneva Foundation has set up one of the biggest coral nurseries in the world using Mineral Accretion Technology (MAT). Located at the outer edge of the house reef, the coral nursery at Soneva Fushi comprises 432 table structures, arranged in three circular clusters.

Additional investment in coral spawning and rearing lab, micro-fragmenting lab and resilience tanks will take place later in 2022.

The yearly output of corals generated and out-planted is expected to be between 100,000 and 150,000 coral fragments.

14 LIFE BELOW WATER

150,000

coral fragments per year

Why are coral reefs important?

Coral reefs are the most biodiverse marine ecosystem in the world and play a key role in ensuring that the ocean is balanced and healthy. Covering just 0.1% of the ocean floor, they provide shelter and food for over 25% of all marine life.

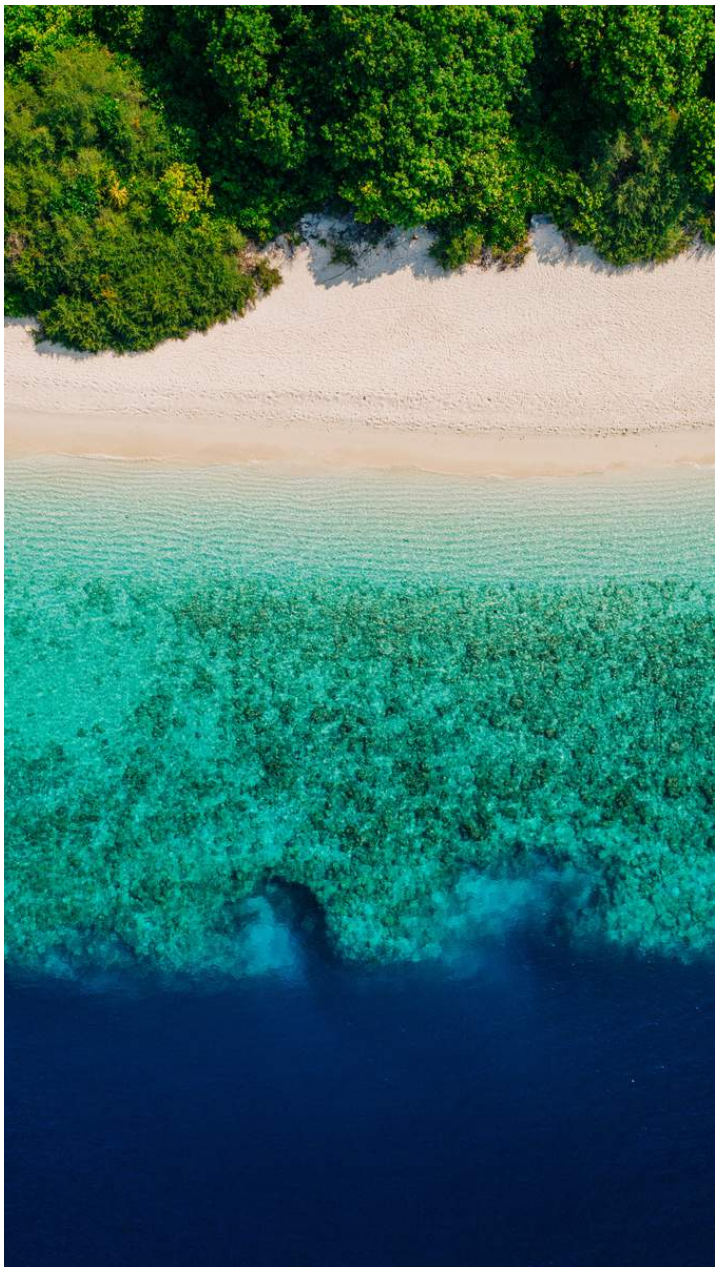
Coral reefs also supply many valuable ecosystem services for humanity, such as food security, income for the tourism industry and shoreline protection.

It is estimated that around half a billion people worldwide directly depend on coral reefs for their food and livelihoods. Without the reefs, these people would not have access to their main source of protein, derived from fish.

The structure of coral reefs is the most efficient wave reduction system on Earth. Attenuating a wave's force without reflecting it, coral reefs protect shorelines from erosion, and play a role in reducing storm impacts on land. Without coral reefs, many beaches would not exist, and several coastal towns could not have been built.

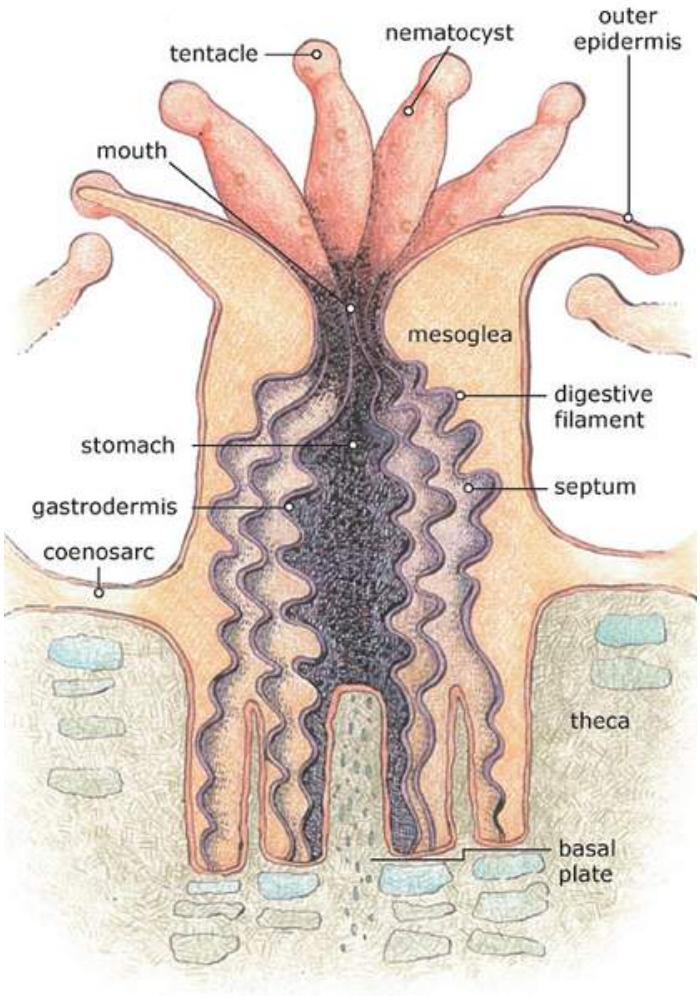
Countries like the Maldives are highly dependent on tourism related to coral reefs, which has been estimated to generate USD 10 billion globally every year.

A number of medical treatments have been discovered when analysing coral's natural chemical defences, which include research against cancer and HIV.



What is a coral?

Corals are animals living in a symbiosis with algae, while producing limestone. A coral colony, as we can observe in the ocean, is composed of numerous individuals, all living and growing connected to each other. One individual is referred to as a 'coral polyp', looking like a cylinder surrounded by tentacles, which is usually not visible except during feeding time. The tentacles are used as a defence and to gather food.



Credit: Wikipedia

Even though coral polyps eat with the help of their tentacles, their main energetic income is generated by the sun, through photosynthesis of the algae living in symbiosis with them. This type of algae is called *zooxanthellae* and is located in the outer cells of the coral. The nutrients generated by the photosynthesis support coral metabolism, growth and therefore survival. In return, corals protect the algae and support it with other nutrients generated from respiration.

Although some species live in cold and dark waters, corals are mostly found in the warm tropical seas, preferably in temperatures between 23°C and 30°C.

Why coral propagation?

Conservation and restoration aim to protect coral reefs and help them jumpstart their healing process. Conservation can also influence the conditions in which coral reefs are evolving in order to reduce threats and stress factors, allowing corals time and space to adapt and become more resilient. Parallel, adaptive breeding programmes can also support corals to evolve faster and therefore keep pace with the changing temperatures of the ocean.

The primary aim of Soneva Foundation's coral propagation programme is to restore and increase the diversity of the coral reef at Soneva Fushi. Indeed, the Maldives' coral reef systems have been damaged by earlier severe weather events like heat waves, which have unfortunately resulted in corals being bleached and dyeing.

To help the reefs recover, the Soneva Foundation aims to bring back the reef diversity and coral cover. With a higher number of coral colonies on the reef, the chances for these corals to grow, reproduce, and repopulate the reef are higher, increasing the number of corals and the diversity of coral species.

As corals repopulate the reefs, reef fish and other animals will thrive as well, taking on a symbiotic role by cleaning and protecting the corals, and eventually transforming it into a thriving reef once again.

The Soneva Foundation aims to restore and increase the diversity of the coral reef.

Coral propagation methods

The founder of Coralive.org, Ahmad 'Aki' Allahgholi has dedicated his energy to marine conservation for over a decade. He helps the Soneva Foundation to explore various coral propagation methods, which complement each other very well.


Ahmad 'Aki' Allahgholi.

“Corals from Maldivian reefs that survived stressful events are specifically selected for their genetic material,” he explains. “These corals will be placed in the spawning and rearing lab, to engender new generations of gametes and hence juvenile corals. This process can be repeated several times to create a large quantity of new, genetically unique corals. These so-called 'super coral' will have the highest thermotolerant features.”

Once elevated temperature resistant corals are identified, they can go in the micro-fragmenting lab to be produced in high numbers of fast-growing small colonies on land.

“As soon as these corals have grown into fragments that are around 7cm in size, they will be transferred to the MAT nursery,” Aki elaborates. “These corals not only cope better with the transfer from ex-situ with a perfectly controlled environment to in-situ where other factors like pH & oxygen levels are different, turbidity and pollution could have an influence, but also grow quickly to a decent sized colony before out planted onto the natural reef.”

The different labs work in parallel to create high numbers of corals individually, which can be transferred to the MAT nursery, and/or directly to the natural reef .

A MAT frame at Soneva Fushi with some of the 15,000 corals colonies saved from a dredging project in Gulhi Falhu.

Spawning and rearing lab

The aim of a spawning and rearing lab is to re-create, on land, all the environmental conditions for corals to spawn. The lab controls all the parameters that have an influence on spawning, such as light, temperature or tides, allowing corals to spawn more often, and at a determined time.

Coral spawning. Credit: Coral Spawning Lab.

Genetically selected eggs and sperm can be collected and crossed between different colonies or species to assess survivorship and to create corals that will be more tolerant to climate change. These new corals, when spawning again, will then pass on their heat tolerant capacities to the next generation, supporting corals to adapt even more to the changing conditions in the ocean.

Resilience tanks

In the resilience tanks, corals are deliberately stressed out by increased water temperatures. This process will select the thermotolerant corals, which will survive these tests. These corals are likely to better adapt and survive during potential future ocean condition and bleaching events. Once selected, these corals will sexually reproduce in the spawning and rearing lab.

Micro-fragmenting

When micro-fragmenting, coral colonies are broken-down into very small pieces consisting of 1 to 5 polyps maximum, using a specialised saw. As these coral colonies are put back to their 'infant' size, it allows them to grow 25 to 50 times faster than normal growth rates. Every micro-fragment that originates from the same coral colony will be a clone of that particular colony.

This process usually happens on land, in water tanks, allowing the biologist to control the environment, supporting the new small and fragile coral fragments in the perfect conditions. Any potential threat, such as algae, is regularly removed. The fragments are placed onto a substrate only a few centimetres apart. After some time, they will eventually fuse together and form a large coral colony which would usually take years. When the corals are fully grown, they are then out-planted back into the ocean.

Mineral Accretion Technology (MAT)

Mineral Accretion Technology (MAT) uses low voltage electricity to improve the health and growth rates of corals and other calcifying marine organisms. As electrons flow from an anode to the coral metal structures placed underwater, calcium carbonate ($CaCO_3$ or limestone), which is the building material of most hard and some soft corals, will accumulate on those structures. This will help coral fragments attach and grow faster. Also, a slight increase in the pH-level helps to create the perfect environment for corals to grow and propagate.

One billion coral fragments

Saving the world's oceans and is a noble effort that needs several parallel tasks combined pushing and pulling into the right direction. Hence the Soneva Foundation coral propagation programme, even at scale, will only be one of the many efforts needed to be effective and to reestablish the natural balance of our marine environment.

The Coralive.org team, transferring coral colonies to the MAT nursery. These are then broken down into fragments, which will grow before being transplanted onto the reef.

"The Australian Institute of Marine Science (AIMS) calculated that, in order to bring our coral reefs back to where they were 20 years ago, we would need to outplant one billion coral fragments a year," says Aki.

Following this idea, 6-7,000 coral propagation projects like at Soneva would be needed worldwide, working in parallel through a coordinated effort.

"The two labs with the tanks as well as the MAT nursery are easily installed and hence scalable," he adds. "The main bottleneck would be the number of marine biologists and environmental specialists needed to maintain these projects. Especially, out-planting the 100,000 coral fragments every year (per project), requires high numbers of scuba divers and efficiently prepared logistics."

And what would such a global endeavour cost, you might ask?

"The capital expenses would be around USD 5 billion while the annual operating expenses would reach around USD 1.5 billion," says Aki.

The male oriental pied hornbill, enjoying the tree canopy for the first time after its release.

Around 40 years ago, hornbills disappeared from Koh Kood, Thailand. It is said that hunting from migrant workers and some locals was the cause.

The Soneva Foundation is working with the Hornbill Research Foundation to reintroduce hornbills on Koh Kood in Thailand. The Hornbill is an important species for the island as it helps spread the seeds of bigger trees, which improves the biodiversity of the forest.

On May 17, 2022, we opened the enclosure to allow our first oriental pied hornbill pair to enjoy nature in the wild. The female ventured out first and spent the night in the canopy near the enclosure. Her male partner was initially reluctant, but joined her the next day.

In the first month, the birds have stayed near the enclosure, as expected. They are slowly getting used to making it on their own, as we gradually reduce feeding.


The female's first steps outside of the enclosure.

At the beginning of July, we will bring a new pair to the island. The plan is to release them in a month or two, depending on how they adapt to their new environment.

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Ma Khin Myaing, the owner of the first fuel efficient stove in Baw Di Kone village. Over 200,000 people have benefited from the Myanmar Stoves Campaign to date.

The Myanmar Stoves Campaign is a Soneva Foundation programme that distributes fuel efficient cook stoves to thousands of families. It is the first Gold Standard-certified carbon project in Myanmar.

Indoor cooking on inefficient stoves is a silent killer. Air pollution from domestic cooking is responsible for the premature deaths of over 4 million people a year worldwide, more than HIV/Aids and malaria combined.

Myanmar has one of the fastest rates of deforestation in the world, with most of the wood used for domestic cooking.

Each fuel efficient stove saves 2.5 tonnes of wood per year and reduces air pollution by 80 percent – improving the health and safety of the whole community.

The Myanmar Stoves Campaign has been successfully operating for nine years, together with our implementation partner Mercy Corps Myanmar.

7,068 stoves have been distributed so far this year, benefitting 34,000 people. Below you will see the overall impact of the project.

Positive impact

44,901
stoves distributed

209,622
people benefitted

253,901
GS VERs issued

USD 34 million
in social value generated

1 NO POVERTY
3 GOOD HEALTH AND WELL-BEING
7 AFFORDABLE AND CLEAN ENERGY
13 CLIMATE ACTION

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Blue carbon is captured by the world's oceans, representing more than 55% of the carbon sequestrated by plants. Mangroves sequester up to five time more CO2 than trees in terrestrial forests.

The Soneva Foundation recently engaged Worldview International Foundation to plant 1.5 million mangroves this year in Ayeyarwady, Myanmar, restoring 600 hectares of mangrove forest.

The project will be registered under VERRA and is expected to generate 860,000 carbon credits.

Mangroves play a key role in maintaining healthy oceans, and are the only forest that grows in salt water, as a buffer between land and sea. This tree filters and cleans runoff and sediments, protects coral reefs and seagrass meadows, as well as providing the highest capacity to mitigate CO2, with permanent storage in the ground. Their ecosystem services are of the highest value for life on our blue planet.


Rhizophora mucronata species.

Positive impact

1.5 million
mangroves to be planted

600 hectares
to be restored

860,000 tons CO2
to be mitigated

1 NO POVERTY

13 CLIMATE ACTION

14 LIFE BELOW WATER

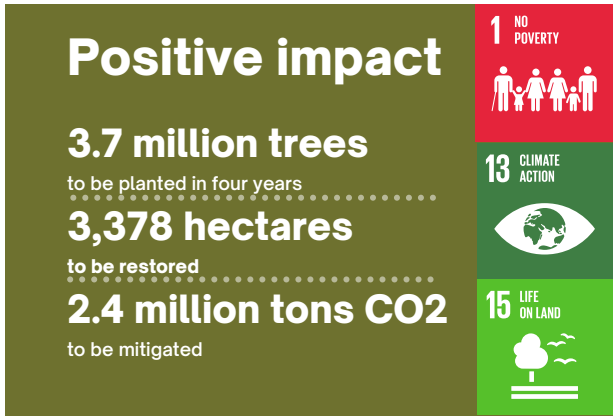
Deforestation is responsible for around 11% of global carbon emissions. Forests sequester or store carbon mainly in trees and soil, making them a sink. Restoring forests is an important solution to reverse climate change and improve biodiversity.

The Soneva Foundation supports projects that restore the natural forest by planting a variety of native species. We recently engaged Eden Reforestation Projects to plant 3.7 million trees in Matica Sede, Mozambique, over a period of four years – starting from January 2022.

A key component of the project is to use indigenous tree species, based on the mimbo forest type, which are planted by the local community.

To date, 365,389 trees have already been planted.

The first seedballs planted at Matica Sede.



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Soneva Namoona is working closely with the local community.

Soneva Namoona provides a blueprint for how all Maldivian islands can phase out single-use plastic, introduce recycling and inspire a new generation of ocean stewards by fostering a love for the ocean.

In 2020, Soneva Namoona helped the island communities of Maalhos, Dharavandhoo and Kihaadhoo to become the first islands in the country to end the practice of open burning. Currently the team is working with eleven islands in the Baa and Noonu Atoll.

This year, Soneva Namoona signed an MOU with the Noonu Atoll Council as the Strategic and Technical Consultant on atoll-wide waste management issues, in the move towards a circular economy.

A water bottling facility – Soneva Water – was set up at Maalhos in November 2018 that serves 80% of the island's households, and all the local guest houses and cafes. As a result, we have eliminated the production of 200,000 plastic bottles.

The team is currently planning to set up two additional water bottling facilities on Kudafari, which will serve as important initiatives to eliminate single-use plastic.

Soneva Namoona has also launched the Fehi Madharusa (Green School) framework, an environmental education pilot programme in partnership with the Ministry of Education and the National Institute of Education. Seven pilot schools participate with training sessions on introductory topics connected to environmental education, as well as how to adapt existing lessons to include environmental themes.

Soneva Namoona is a Maldivian NGO. The Soneva Foundation co-funds the initiative and is also on the board.

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Childhood malnutrition is a potentially fatal health condition. The Soneva Foundation works with Action Against Hunger to fight it across the world.

In 2020, we committed USD 150,000 for a three-year project in southern Bangladesh to strengthen households' capacity for climate adaptive and resilient livelihoods to tackle food insecurity and under-nutrition.

Our implementation partner, Action Against Hunger, is helping communities in rural Bangladesh adapt to climate change. They are teaching families new skills and offering business training, as well as increasing their food production at home using new climate change-resistant farming methods. This dual action plan ensures that families can access nutritious food either from their gardens or with their income.

Left: Shilpi Khatun produces nutritious food from her own vegetable garden.
Right: “I am pleased that we now can afford to send our children to school,” says Shilpi.

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