

# Corals of opportunity

REFORESTATION OF  
DAMAGED CORAL REEFS  
ON UNGUJA, ZANZIBAR

BY CHRISTIAN  
VATERLAUS AND  
FABIAN BUMBAK

“

The procedure allows our team of three coral farmers to transplant about 8 000 to 10 000 corals per year.

A coral farm and reforested reef structures in Jambiani Lagoon are among the most visited tourist spots in Jambiani in Unguja, Zanzibar, but the coral restoration effort has been lengthy and difficult.



In 2014, marinecultures.org initiated a coral farm in the lagoon of Jambiani. **The aim was to produce sustainably farmed corals** for the aquarium trade, thus meeting the demand for corals with a known pedigree that have not been taken from the wild. The primary focus was to provide local fishers with an alternative to fishing, and to generate improved incomes.

Initially, a team of three local coral farmers received training from Simon Ellis, a coral farming specialist from The Marine and Environmental Institute of Pohnpei in Micronesia. Within a year, the trio managed

It became clear that commercial coral farming is not feasible in the context of climate change and rising water temperatures. Rather than abandoning the project altogether, we decided to transform it into a programme to reforest damaged reefs. This transition was made possible with the financial support of our partner, coralreefcare.com.

The repositioning required us to adapt our workflows and introduce new methods. Primarily this meant giving up on our brood stock. **A brood stock refers to “mother corals” from which fragments are**

The non-governmental organization, [marinecultures.org](http://marinecultures.org), is well known for introducing sponge farming as an alternative means of income on the east coast of Unguja, Zanzibar. **Farming sponges provides a sustainable alternative to fishing and reduces the pressure on natural resources in coastal waters.** The sponge farms benefit many families in the coastal village of Jambiani, enabling farmers, mostly single women, to provide for their children and improve their quality of life. The sustainably farmed sponges have become a popular souvenir and are sold in numerous shops and hotels on Unguja.



to build up a sizable brood stock of local corals and to fully adapt the methods taught by Simon to local conditions.

However, the project received a serious blow when El-niño hit the region in 2016. Raised water temperatures caused shallow reefs around Unguja to lose more than 50 percent of their corals and the entire coral rearing project was destroyed. The farmers restocked the farm but as water temperatures rose again in 2017, the coral bleaching returned, and their efforts were shattered once more.

**taken in order to clone baby corals.**

While suitable for an aquarium, clones are less likely to survive environmental change compared to sexually reproduced corals, because while they all have the same genetic background inherited from the mother coral. Sexual reproduction promotes genetic variability which may help a species to adapt to challenging conditions. **While sexual reproduction of corals for reforestation is technically feasible, it is too complex and expensive for small organizations like marinecultures.org.**

Left: Coral farmer cleaning “baby corals”.

Above: Bleached brood stock.





“ The procedure allows our team of three coral farmers to transplant about 8 000 to 10 000 corals per year.

**However, there is an alternative approach with the potential to generate significant genetic diversity at low cost.**

Such fragments may attach to loose rocks but have a low chance of further growth. We exclusively collect corals of opportunity and record the exact GPS location of where they were found. Back at the farm, the fragments are glued onto small cement discs and placed in a marked sector on a coral table that represents fragments from the same coral species and location. For example, the Galaxea fragments collected at location XY are to be found on table D in sector 3. All fragments in a sector such as D3 are assumed to be genetically identical since

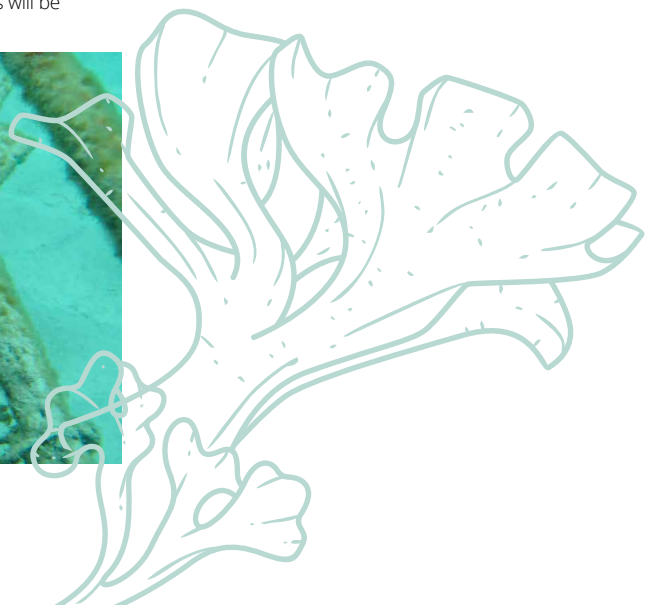
they were collected at the same location and may originate from the same coral.

Good care and maintenance (i.e. regular cleaning and removal of predators) allows the baby corals to grow large enough to be transplanted onto damaged or dead reef structures. This takes about 25 to 40 weeks, depending on the species.

**Once the corals are ready for reforestation, we drill holes into dead coral structures which enables secure fixation of farmed corals with cement.** We generally transplant clusters of 4 to 5 corals from the same sector (e.g. D3) because this increases the chance that one of them will survive. The next cluster of D3 corals will be

**Top:** Current stock of approximately 7 500 corals on 40 tables.

**Below:** Sector D3 with fragmented Galaxea from reef XY.





**From Top:** A cluster of *Astreopora* sp. Bleached coral. Coral transplants after two years on our house reef.



placed at least 50 m away from the first cluster. Baby corals from other sectors representing the same species but a different collection site (and hence a different genetic background) are placed in a cluster within 3 m to 5 m of the D3 cluster to promote sexual reproduction between genetically distinct clusters. The described procedure allows our team of three coral farmers to transplant about 8 000 to 10 000 corals per year.

In April 2020, another wave of elevated water temperatures hit Zanzibar. This time, only certain species died while others experienced various degrees of bleaching but recovered. **Overall, more than 50 percent of our transplants on damaged reef structures survived.** This underlines the effectiveness of cultivating multiple species which also promotes biodiversity.

**Today, our coral farm and some of the reforested reef structures are among the most visited tourist spots in the Jambiani lagoon because they exhibit a higher variety and density of marine life, compared to many other spots.** Our organization also runs local events to raise awareness about the vulnerability of marine ecosystems and how to sustainably utilize them.

We recognize the importance of exchange with researchers and coral reforestation experts around the world, especially the Coral Reef Initiative (<https://www.icriforum.org>). We constantly re-evaluate our methods but in principle follow the reforestation guidelines issued by the Coral Restoration Consortium (<https://www.coralrestoration.org>), particularly Baums et al., 2019 (doi:10.1002/eap.1978).

[www.marinecultures.org](http://www.marinecultures.org)