

Ocean Views

Menu

- [Voices Home](#)
- [Ocean Views Home](#)
- [BioBlitz](#)
- [Cat Watch](#)
- [Explorers Journal](#)
- [Fulbright Stories](#)
- [Voice for Elephants](#)
- [Water Currents](#)

[How a remote Indonesian island community is reclaiming its fishing heritage by restoring ruined coral reefs](#)

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(6)

[More »](#)



Is this the future of marine conservation? A remote island community in Indonesia is restoring damaged coral reefs and reclaiming its fishing heritage.

By Adam Cruise and Leïla Ezzat

Along with the spectre of global warming and ocean acidification, decades of dynamite fishing, the use of chemicals, sewage and agricultural run-off, plastic debris and poor or inactive governance are decimating coral reefs within the world's epicentre of marine biodiversity known as the Coral Triangle. The wholesale destruction of these delicate ecosystems within the broad tropical marine region of Indonesia, parts of Malaysia, the Philippines, Papua New Guinea, East Timor and the Solomon Islands, is also threatening the survival of hundreds of thousands of coastal communities who rely heavily on coral reefs for both food and income.

But now the fishing village on Seraya Besar, a tiny island off the west coast of Flores in Indonesia, is reclaiming their heritage. In partnership with [Coral Guardian](#), a French nonprofit organization dedicated to coral reef conservation and community empowerment, they have embarked on a small-scale coral reef restoration program – and it's proving remarkably successful.

Not only is a part of the marine environment being reclaimed – with attendant fish stocks boosted – the micro-scale initiative is beginning to have an impact on the wellbeing of the ecosystem and human livelihood for a much wider area, including a potential positive repercussion on the nearby UNESCO World Heritage Site of the Komodo National Park.

The Socio-Economic Value of Coral Reefs

Coral reefs support a staggering biodiversity. Although they cover less than 0.2 percent of the ocean floor, these ecosystems are home to more than 25 percent of the world's marine species, including 4,000 species of fish and 800 different varieties of hard corals. [According to](#) the National Oceanic and Atmospheric Administration (NOAA) global coral reefs provide goods and services up to U.S. \$375 billion a year through fisheries, coastal protection, tourism development and pharmaceuticals. The wellbeing of 500 million people is tied to healthy coral reefs, with the majority coming from low-income per capita communities such as Seraya Besar.



Photo Adam Cruise: village of Seraya Besar with fishing boats in the foreground

Since coral reefs encompass a wide-range of trophic food chains from the primary producers of photosynthetic organisms (sea-plants) to secondary and tertiary big consumers like sharks and game fish such as mackerel and tuna, their rapid decline can disrupt the entire marine food chain but also has a profound socio-economic impact.

On Seraya Besar, where the surrounding reefs are severely damaged, fishermen are only averaging a daily haul of 600 grams of fish per household – that’s if they get any at all. Basrin, a 25-year-old fisherman from the village, told us he managed to catch fish on only two days of the previous week. With an average of five children per household, it’s less than enough to provide adequate nutrition for the impoverished village. This is before they can begin to earn an income from selling a portion of their catch at the market.

Basrin, like many other fishermen, must also pay off a loan for his boat – a canoe-like vessel with outriggers called a *jukung* or *cadik*– and share part of his haul with the local middleman or “broker” who, in turn, sells what little fish there is onto the nearby market-town of Labuan Bajo.

The brokers too are struggling to keep afloat. “Last year, it was easier,” says Sujiman, one of ten brokers on Seraya Besar. “There were more fish and they were bigger.” Sujiman explains that year-on-year the fish stocks become less and less and his fishermen are lately catching only small underage fish on the damaged reefs. Consequently, his fishermen have to travel greater distances, further increasing their costs.



What's more, national and local government agencies are unable to provide meaningful assistance, both in the form of financial relief and reef protection and management. With a population of over 250 million spread over 17,000 islands, it's little wonder the Indonesian government is largely absent from the remote island communities, leaving them to fend for themselves. And that's precisely what the villagers of Seraya Besar have done.

Regenerating Lost Biodiversity

With the help and expertise of Coral Guardian, they have embarked on a program to regenerate the lost biodiversity of their marine ecosystems. This is achieved by repopulating damaged reefs through an uncomplicated and cost-effective artificial coral reef restoration project.

Martin Colognoli, one of the founders of Coral Guardian, explains that it's a three-phase project. First a preliminary study by his team of biologists must evaluate the state of the area to determine the optimal location of reef rehabilitation as well as its environmental impact. The site selection takes into account "marine data including surface winds, weather conditions, prevailing currents, turbidity as well as substrate and water qualities, the local bathymetry and biodiversity, and finally the surroundings water and sediment discharges and coastal installations."



Then comes the phase of design, manufacture and disposal of structures. This phase is done almost entirely by the fishermen of Seraya Basar. Concrete-iron-cage structures six by three feet in length are welded at the village then transported by boat and lowered in grids. Broken live coral fragments, collected from recently destroyed reefs, either through indiscriminate anchoring or blasting, are then attached to the cages with ties, and simply left to grow.

Lastly, it's the ecological and social survey phases. Every month, locals supported by biologists assess the rates of coral growth and organisms re-colonisation over the different restoration areas. They also undertake overviews of marine fishery resources. A dozen or so fishermen are questioned every month on the size and nature of their catches. The success of the project depends entirely on the villager's constant monitoring and preventing fishing during the restoration process as well as boats from anchoring.

The results have been astounding. Within a year the reef grew significantly, with hundreds of new polyps emerging from the transplanted corals. Reports have shown an increase in the number of fish species of up to 114 percent, and in some areas of the reef there is as much as 300 percent of new individuals per 100 m². The fish-life, mostly small "pioneer" species such as schools of brightly coloured *Anthiadinæ*, have colonised the artificial reefs in greater abundance than before since the cages provide a safe-haven for juveniles and breeding adults.

After two years, corals have bulked, and almost look like a normal reef with the steel struts of the cages barely visible. The fish-life is more diverse with bigger fish like groupers, trigger and butterflyfish taking occupancy — all this for the price of a few bits of steel and salaries for the Indonesian team of reef restorers.

"It's probably one of the most efficient conservation programs around," says Sutopo, the program's manager who supervises the local team of reef restorers.



And surprisingly, the restored reef areas seem to have developed a greater thermal tolerance to the ravages of global warming compared with neighbouring coral colonies that have been greatly damaged by the last bleaching event.

For Professor Denis Allemand, Scientific Director at the [Scientific Centre of Monaco](#), a multi-disciplinary research institute that specializes in understanding the eco-physiological and resistance mechanisms of corals to future climate and anthropogenic changes since 1960, “it seems that the method developed by Coral Guardian allows for the promotion of the growth of more resistant colonies.”

But it’s the human involvement where this conservation project is really thriving. “The fishing community is seeing tangible benefits of the restored reef compared to damaged reefs,” says Sutopo. With the success of the artificial reefs they are beginning to understand the advantage of protecting all the coral.

Making Waves

The small-scale project is also having an impact beyond its scope. Sutopo says their work is having a ripple effect on neighbouring communities and beyond. The word has got around. Fixed boat moorings are being set up to prevent anchoring, and dynamite and other harmful fishing practices have essentially become things of the past.

And it’s not just fishing: tourism is becoming a major factor in the reef restoration programs too.

According to a [study published in the Journal of Marine Policy](#) by The Nature Conservancy, coral reefs have become the poster child of nature-based tourism. The study revealed that 70-million vacation trips are supported by the world’s coral reefs each year, showing that coral reefs are an extremely powerful engine for driving tourism. Tourism is a sector that [already contributes](#) over U.S. \$26 million to Indonesia’s GDP.

In light of these potential tourism benefits, Coral Guardian has initiated two more reef restoration zones in the

area – one for a newly created eco-resort on a nearby island of Seraya Kecil, whose owner wants to re-establish the resort’s house reef for snorkelers and scuba divers; the other for a privately owned island to establish a coral reef in anticipation of nature-based tourism.

Both projects tap into another aspect of tourism, one that specifically uses the locals in restoring the reefs. Sutopo and his team have already begun guiding groups of international volunteers, recruited by Coral Guardian, to help expand the restoration zones and, at the same time, they can earn a more stable income than fishing, which now serves as a supplement income to restoring reefs.



Furthermore, the local Indonesian team with Coral Guardian has initiated a variety of other awareness and educational projects, not only on Searya Besar, but in other local communities around Flores. “We try to respond to a global food security problem with a grass-roots participative program,” says Coral Guardian’s other founder, Guillaume Holzer. “Using a hands-on process where young people can experience and manipulate things themselves, the future custodians of the coral reefs are able to better understand the importance of saving and protecting their heritage.”

Coastal Communities are Crucial to Coral Conservation

But it’s the importance of local participation, and more importantly, local management of coral restoration schemes such as these in Indonesia that are being increasingly regarded by scientists and conservationists as crucial to the future survival of the world’s most important coral reefs.



“It’s impossible to restore or even protect an environment if the local population do not support the project,” says Professor Allemand. “By protecting and restoring ‘their’ reefs, local people take into account the importance of this ecosystem for their society and integrate it in the long term by defending it from future aggressions.”

“I really think that special initiatives like this, small drops of water in the ocean, will help to save the reefs,” he says. “If such initiatives are multiplied, the reef area will be gradually regained.”



Adam Cruise

Adam Cruise has a philosophy degree in environmental and animal ethics from the University of Stellenbosch, South Africa. He specializes in wildlife conservation and wildlife crime and has traveled throughout the continent documenting and commenting on the key conservation issues and crises that face the continent.



Leïla Ezzat completed a MS in Environmental Sciences and Engineering at the EPF in Lausanne, Switzerland. While studying fluid mechanics and hydraulics, she became truly interested in marine sciences. She served as an intern in France, U.S. and at the Scientific Centre of Monaco, where she obtained her Ph.D. in coral-ecophysiology and ecology in 2016. Her dissertation focused on how climate change and