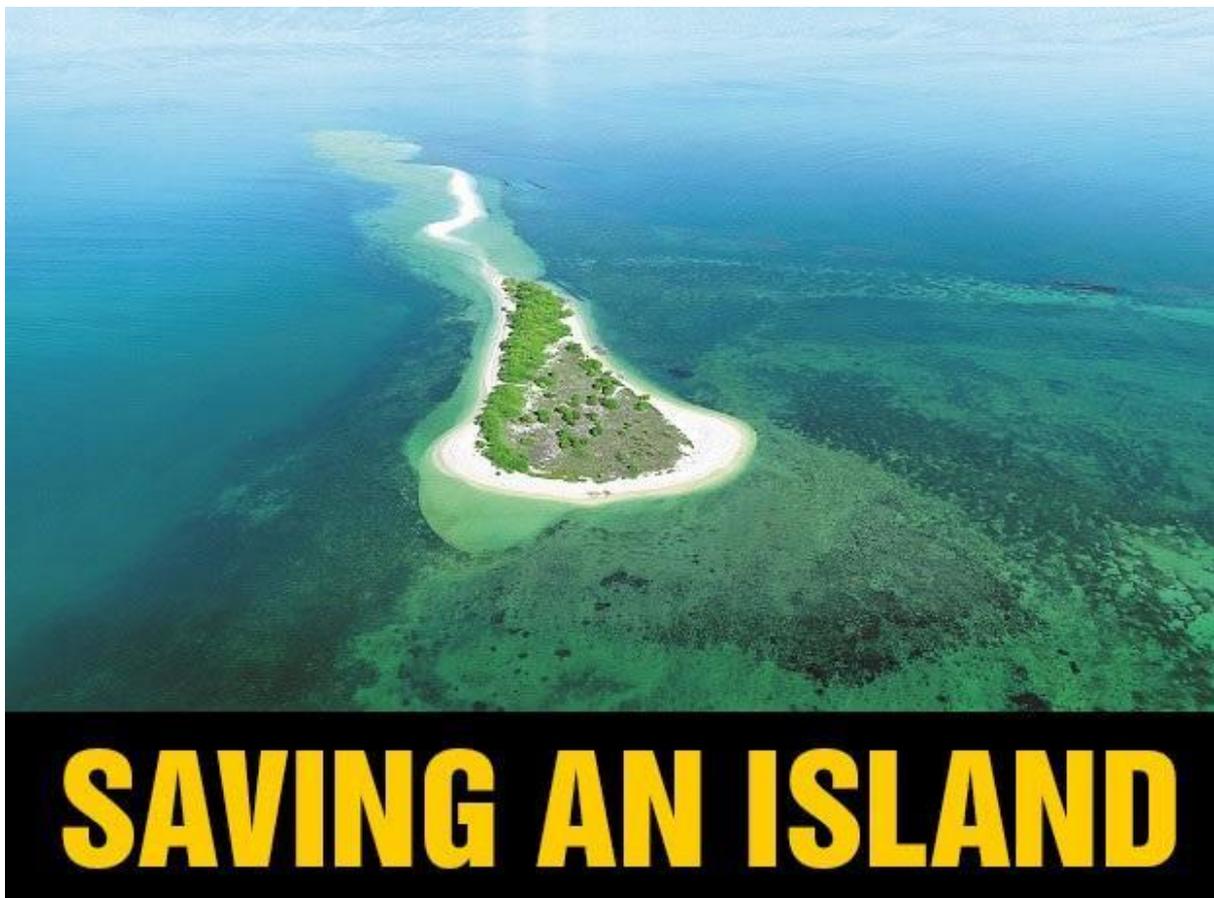


How scientists prevented an island in the Gulf of Mannar from disappearing (web)

Scientists have been trying to stop Vaan Island in the Gulf of Mannar from disappearing. Their success means hope for other such threatened islands

Source: Business Standard- https://www.business-standard.com/article/beyond-business/how-scientists-prevented-an-island-in-the-gulf-of-mannar-from-disappearing-120031301510_1.html

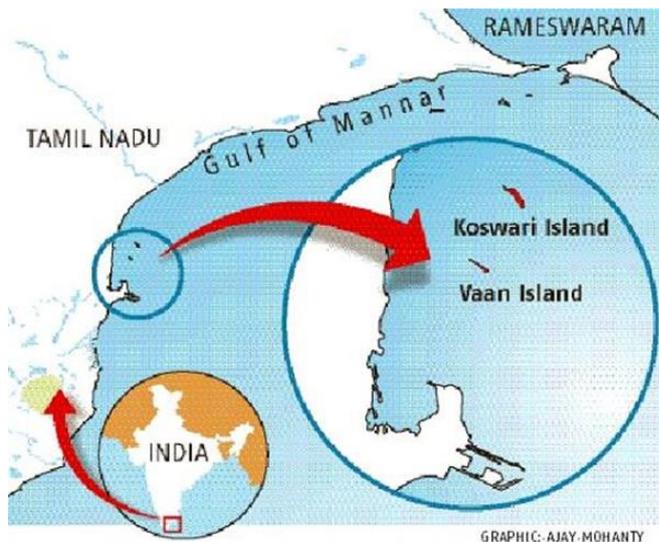
Date: Mar 14, 2020



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For close to 15 days every month, mornings at the SuganthiDevadason Marine Research Institute (SDMRI) in Thoothukudi, Tamil Nadu, begin by 5 am. Researchers, scientists and divers, including doctorate students ArathyMol A and MahalaxmiBoopathi, set off from the harbour to the Gulf of Mannar, a shallow bay between India's Coromandel Coast and Sri Lanka.

At times Arathy and Boopathi go diving for healthy seagrass; other times to identify corals. Sometimes these trips continue for the better part of the day, regardless of the mighty tropical sun. The two take immense pride in their work, and their institute. With good reason. Scientists from SDMRI have, after all, been instrumental in saving a drowning island — the first experiment of its kind in India.



Vaan Island was sinking — till recently. It is one of the 21 reef islands in the Gulf of Mannar that was declared a marine national park in 1986. Besides corals and a variety of fish, the waters here were marked out for being home to sea turtles and dolphins. A lucky few people have even seen the vulnerable dugong, commonly known as the sea cow.

Of India's four major reef areas, the Gulf of Mannar is the most easily accessible. All of its low-lying islands, which extend from the pilgrim town of Rameswaram to

Thoothukudi, are within 8 km of the shoreline. Vaan is just 6-odd km off the Thoothukudi coast.

Though the past few years have seen a dip in destructive human activities such as coral mining, unsustainable fishing and improper sewage treatment, the biggest challenge Vaan now faces is climate change.

Scientists sensed definite trouble when toposheet records, which show shorelines, were compared time to time. Surveys from 1969 indicated Vaan's area as 20.08 hectare. By 1986, when the marine park was notified, it had shrunk to 16 hectare. "The island had been slowly eroding. Then in 2013, it split into two and the northern half was lost to the sea over the next few months," says SDMRI Director J K Patterson Edward. By 2014, only 2.5 hectare remained.

The possibility of its sinking completely became very real. Two islands of this group of 21, Vilanguchalli and Poovarasampatti, submerged some three decades ago.



Though islands in the Gulf of Mannar are uninhabited, they serve a host of functions, including protecting the mainland from waves coming in from the open sea. Along with the coral reefs, the islands are believed to have helped reduce the impact of the 2004 tsunami that killed over 200,000 people across 14 countries. These islands also shelter local fishermen during rough seas and are feeding grounds for birds. Unesco has listed the area as one of the world's richest marine biodiversity spots.

The possibility of Vaan submerging brought together different stakeholders: Tamil Nadu's environment department; the Central government that came on board with its "National Adaptation Fund for Climate Change" (NAFCC) initiative; scientists from SDMRI, a non-governmental institute established in 1998 for research and higher education in marine sciences; and the Indian Institute of Technology Madras. NAFCC gave Tamil Nadu Rs 24.74 crore for the management and rehabilitation of coastal habitats in the Gulf of Mannar (for 2016 to 2020). Of this, Rs 10.5 crore was earmarked for Vaan Island.



The plan was to deploy artificial reefs near Vaan in such a manner that they would reduce the impact of high-energy waves hitting the island. There was also hope that the artificial reefs — trapezoidal perforated structures fashioned out of ferro-cement and steel — would become home to new coral colonies and fish production.

The role of corals in keeping ecosystems healthy has been highly neglected in mainstream discourse. Like the other islands in the Gulf of Mannar, Vaan too was born from the remnants of broken corals. These corals were broken down further by waves to form land mass, explains Gladwin Asir, assistant professor and geologist at SDMRI. "That's how coral islands have been formed. The sand here has a white hue indicating it is rich in calcium deposited on the island from corals that have broken off."

The Gulf of Mannar saw massive mining of corals from the 1950s to 1980s, largely for the construction of roads and buildings. "Walk along the coastline and you will still find old houses built with corals,"

says Edward. “Coral mining completely stopped 2005 onwards, but the damage already done made the seafloor unstable, and there was nothing to check the waves hitting Vaan’s shoreline.”



Coral in Tamil is pavalaparai, which translates to “dead rock”. Perhaps this is one reason why till two decades ago locals were unaware that corals were living marine creatures. “Thankfully, that’s not the case anymore and people have realised how corals contribute to their livelihood,” says Edward.

The plan to save Vaan, once an island surrounded by corals, kicked off in 2015 as artificial reef modules were loaded onto barges and pulled into the sea by a trawler. The deployment went on till 2019. The modules had to be placed with great specificity in a zigzag manner without disturbing the natural corals on the ocean floor. Bathymetry and wave dynamic studies had already been conducted to ascertain the depth of the ocean floor and wave directions. Currently there are 10,600 artificial reefs in the Gulf of Mannar. “All of these are for Vaan Island alone,” says Edward.

The primary goal of these artificial reef modules was to halt erosion, but they’ve done more than that. They’ve actually helped the island grow. From 2.5 hectare in 2014, Vaan has grown to 3.05 hectare as of January 2020. And surveys of the depth around the area where the island had split indicate that it is becoming shallower — from 2.5m in 2015 to 0.5m in 2019. So, there’s a good chance of the land re-emerging in the future.



These shoreline measurements are done by GPS tracking, says Asir. Immediately after a full moon or new moon day, Asir and SDMRI's team find themselves on Vaan's shores. Their job is to track, during low and high tide, "the point where the land and water meet". The poetry of this image barely compares to what scientists have been able to accomplish with Vaan. Now Arathy and Boopathi, both in their 20s and among the youngest in the lot who learnt scuba diving after joining the institute, gush about their regular sightings of starfish, jellyfish, sea urchins, soft and hard corals and dolphins. A plethora of life forms has emerged where there were next to no fish, says Gilbert Mathews, a marine biologist at SDMRI.

"Looking at the speed at which Vaan was eroding we had predicted that it would go under in 10 years if nothing was done," says K Diraviya Raj, assistant professor and coral expert at SDMRI. "I had never imagined any of this could happen. I had known about Vaan eroding, but had never realised the seriousness of the situation till the island split."

Raj is among the many who couldn't swim before coming to the institute in 2004. Today, he doubles as a scuba diving instructor for the team of researchers whose jobs demand they closely monitor the artificial reef modules, which have become a hotspot for coral and other reef-associated marine diversity.

"Corals are the main barriers to shore erosion. Corals reproduce both sexually and asexually and their larvae can swim up to 10 days. These get attached to the artificial reef modules and grow naturally,"

says Raj. The design for these artificial reef modules was a modification of the artificial structures that the SDMRI already had. These were made primarily to boost fish production for local livelihoods as well as to increase biodiversity in the area, with support from IIT Madras, says Edward. Even the corals SDMRI transplanted back in 2002 to increase biodiversity and fish production have adapted to the artificial structures so well that you cannot even see the concrete placed in shallow waters, says Raj.

Using artificial material to help increase biodiversity isn't new. New York has been using refuse steel, decommissioned ships and trucks to build expansive artificial reef systems for a while. A fleet of 1,200 of its subway cars was stripped and decontaminated in late 2000 before being sunk off the coast of Delaware to create more reef structures. The folks at Tuticorin have been doing it since 2002.

While researchers primarily credit these artificial modules for helping save the island, two other diving-intensive techniques have contributed significantly. The first of these is coral transplantation, which sees marine biologist Mathews and his team collecting a small percentage of corals from different colonies and bringing them here. "We then manually plant these corals by tying them onto concrete platforms. Till they are ready to be transplanted, we keep these in troughs on our boats," he explains. "It can take an hour or so for us to reach areas marked to transplant these. We have to regularly change the water in the trough to keep the corals from being stressed."

Like corals, seagrass, which is often mistaken for seaweed, is essential for maintaining a healthy marine ecosystem. When researchers such as Arathy and Boopathi aren't seeking out mature seagrass shoots, which will then be tied up with jute ropes and transplanted, they are monitoring the health of transplanted corals as well as of the corals naturally growing on the artificial reef.

Vaan Island's is a story of hope in dismal times. Take the case of the Maldives, a group of 1,192 coral islands in the Indian Ocean. If the country doesn't get financing to fight climate change for building "sea walls" — concrete walls to keep the sea out — it will lose entire islands. The environmental panel of the United Nations believes that at the current rate of rising sea level, most of the Maldives will be submerged by 2100.

Even in places where sea walls have been built, off the coast of the Indonesian capital of Jakarta, for instance, these structures have only been able to buy time. As the sea claims the land bit by bit, the country has set in motion plans to relocate the capital. A futuristic capital city is envisioned in the East Kalimantan province on Borneo, Asia's largest and the world's third-largest island that is governed in parts by Indonesia, Malaysia and Brunei. But critics have said the will would be an environmental disaster considering the effect it would have on Borneo's rainforests and endangered orangutans. Meanwhile, in Fiji, people of at least four communities have already been forced to relocate because of the threat of their homes sinking.

For India's reef islands, at least, the Vaan experiment can be replicated in the face of similar threats. Here's hoping that other islands and islanders also get a second chance.