

# Assisted natural recovery of sea urchin populations around Saba and St. Eustatius

**Diadema sea-urchins play a vital role in maintaining a balanced coral reef ecosystem by grazing away algae and creating bare substrate for coral recruitment. The RAAK PRO Diadema project aims to develop interventions to improve larval recruitment and juvenile survival to increase local Diadema populations. To do this, researchers are investigating the larval and settlement stage of Diadema populations around the islands of Saba and St. Eustatius. First results show that some locations have a high suitability for “assisted natural recovery”.**

The year was 1983, and unbeknownst to everyone, the Caribbean seascape was about to drastically change. Starting off the coast of Panama, a new disease began to spread, following water currents, decimating Caribbean sea urchin populations. Within a few years, 98% of the long spined sea urchin (*Diadema antillarum*) populations had been completely wiped out. Now, 37 years later, these populations have only recovered at an average of 12% Caribbean wide. Why have these populations been so slow to recover? Is there anything scientists can do to help this recovery along?

## RAAK PRO Diadema Project

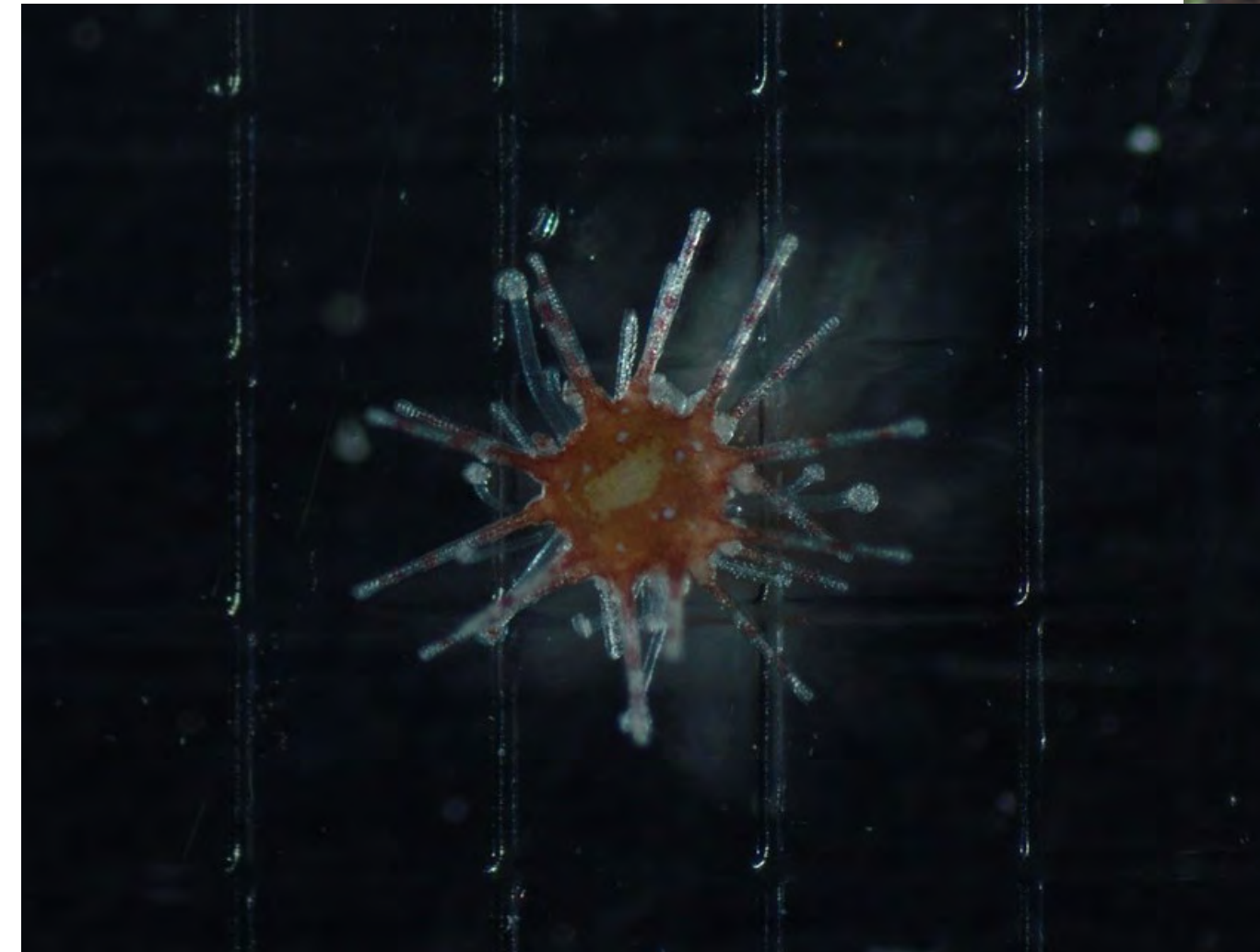
The RAAK PRO Diadema project hopes to answer these questions and provide innovative solutions to give the urchin populations around Saba and St. Eustatius a boost. The project is a collaborative effort between University

of Applied Sciences Van Hall Larenstein, STENAPA, Saba Conservation Foundation, Wageningen Marine Research, Wageningen University, Caribbean Netherlands Science Institute, University of Applied Sciences HZ, ISER Caribe, Wortel Product Design and Golden Rock Dive Center. The project is partially funded by the Dutch Organization for Scientific Research (NWO) and will run through 2023.

## Importance of Diadema sea urchins

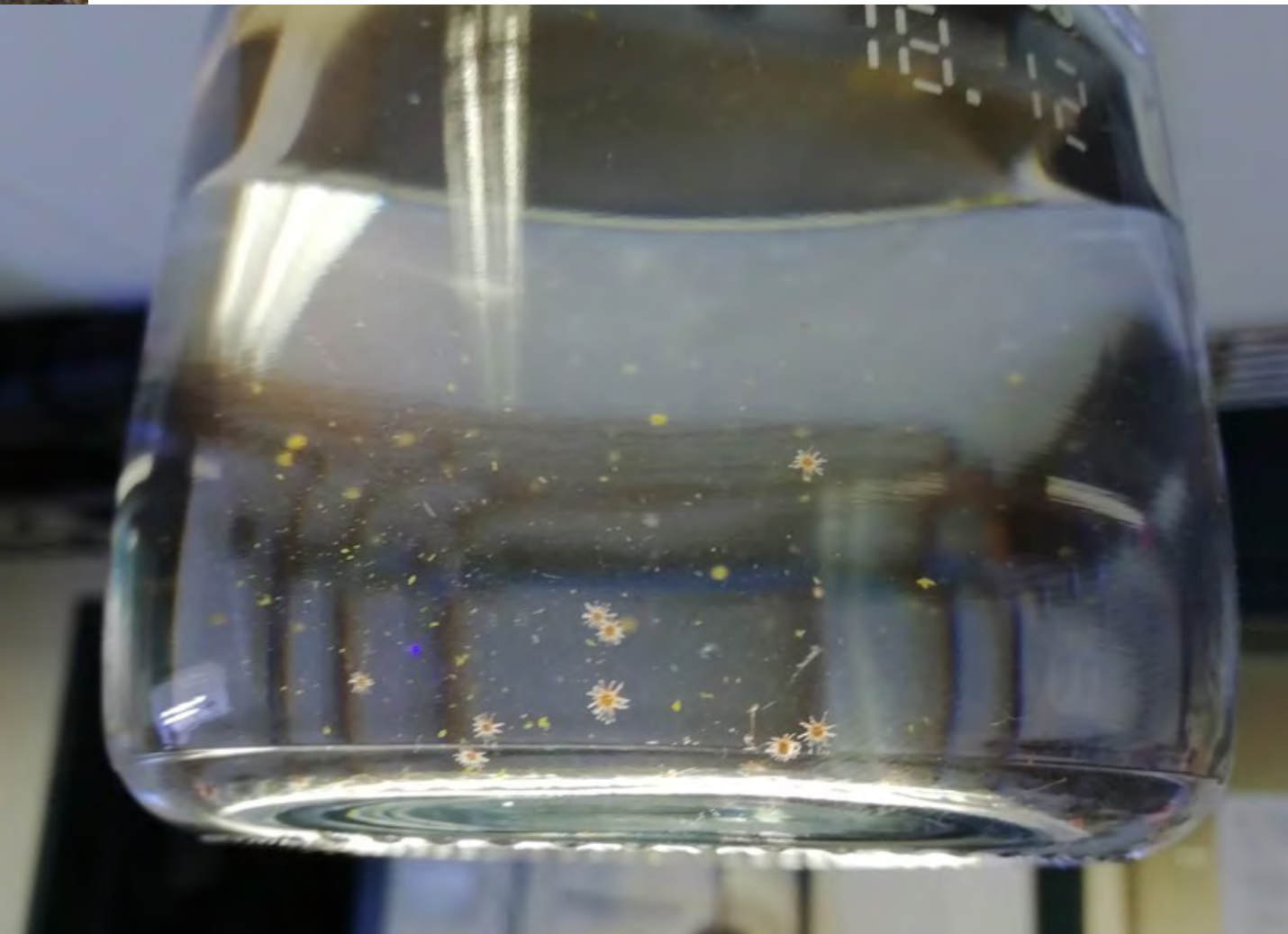
*Diadema* are important herbivores on Caribbean coral reefs. Without them, macro algae can quickly flourish, smothering corals and preventing future coral recruitment. Globally, corals are already under immense pressures due to changing water conditions, so anything that can be done to improve their overall health is bound to make a significant difference.

It is still unclear why *Diadema* populations have struggled to recover, although evidence suggests that it is likely due to a combination of low settlement and high predation rates of juveniles. *Diadema* go through a larval phase, where they free float in the water for around 30 days. As tiny larvae, they float along ocean currents before they eventually settle on the reef where they will go through metamorphosis, becoming the sea urchins we recognize. The RAAK PRO Diadema project aims to develop interventions with the purpose to maximizing settlement of larvae and survival of juveniles.



Close-up of settler. Photo by: © Tom Wijers





Settled juveniles. Photo by: © Tom Wijers

### Lab and field approach

In the VHL marine lab in Leeuwarden, adult *Diadema* are induced to spawn and fertilized eggs are collected by the researchers. During the first two rounds of egg collection (from May 6th and 27th), researchers were able to collect 10,000 and 40,000 eggs respectively. Researchers continue to improve collection methods and an impressive 6 million eggs were collected on June 16th. Excitingly, the eggs from the first two rounds have already begun to settle and go through metamorphosis, growing to very tiny sea urchins, about 1 millimeter in size. *Diadema* are famous for being difficult to culture, so this is the first big accomplishment of the project. As adult *Diadema* can spawn every 2 weeks, the larvae will now be used to identify the biochemical cues responsible for settlement and metamorphosis.

The Caribbean part of this project also includes measuring and collecting settlers with the use of settlement collectors, which are small 10 x 10 cm plates suspended in the water column around both islands. These collectors have already demonstrated a significant difference in recruit density between locations, with recruitment ranging from very high to almost nothing. In addition, they also found that the highest settlement rates were between the months of May through September. Both of these facts will help researchers decide when and where to deploy “assisted natural recovery” efforts to help boost the settlement and survival rates for *Diadema* larvae and juveniles.

In addition, field surveys are being conducted to identify the most significant predators. This will aid in the design of shelters which will be built and deployed to protect the juveniles on the reef. A combined settlement collector and juvenile shelter will result in the “Diadema Booster,”

hopefully encouraging a more successful recovery of these urchins around Saba and Sint Eustatius. If successful, this project will facilitate an increase in adult sea urchin populations, along with an overall decrease in macro-algae, leading to improved coral cover and healthier reefs.

After year 1 of the project, researchers concluded that some reefs have very high natural settlement rates and therefore have a high potential for assisted natural recovery with help of the *Diadema* booster. However, on some reefs natural settlement is low or absent. To restore *Diadema* populations on these reefs, the project partners intent to start a new project with the focus on other methods to restore *Diadema* populations, for example the large scale production and out planting of juveniles. Interested organizations are encouraged to get in touch with the researchers!

### International Collaboration

In July, researchers Alwin Hylkema and Tom Wijers from Van Hall Larenstein shared their findings in an international *Diadema* restoration seminar hosted by Healthyreefs to encourage knowledge sharing within the region. In the seminar experts from around the Caribbean were able to showcase their research, highlighting efforts which they have found to be successful. The key to healthy reefs is maintaining a balance between all of its inhabitants, therefore the recovery of key species, such as the *Diadema*, is critical for reestablishing this balance. It will be exciting to see what projects such as these will discover next.

For more information on the RAAK PRO *Diadema* project you can follow along [website](#) or on [Facebook](#) or get in touch with project leader Alwin Hylkema: [alwin.hylkema@hvhl.nl](mailto:alwin.hylkema@hvhl.nl).

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