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By Andrew Luck-Baker
BBC Radio 4, Palau

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Luke's reef: Reared larvae will come here once they are ready to settle

The coral reefs in the tropical western Pacific are at the brink of one of the most spectacular and significant nights in their annual life cycle.

By the light of April's full moon on Sunday or, quite likely a night or two after, corals will be mating en masse.

Along the length of the island archipelago that makes up the Republic of Palau, millions of coral colonies will simultaneously release billion upon billion of eggs and sperm into the dark waters.

An hour or so after sunset, each spawning coral will discharge showers of sex cells, packaged in orange and pink blobs.

They will rise to the surface in such huge numbers that they may form oily slicks metres long.

If the sea conditions are right, spawn slicks can coalesce to be large enough to be visible from space.

Depressing need

Once on the surface, the packages burst open, liberating eggs and sperm for fertilisation.

Countless free-swimming coral larvae then develop and three or four days later, a few will have survived long enough to make it to the sea bed.

There they attach to a suitable hard surface and develop into single baby coral polyps. The next generation of corals on the reefs will be launched.



A team of marine biologists from Australia, Britain and the Philippines has come to Palau to take advantage of this wonder of nature in the cause of coral reef restoration.

The scientists are here to investigate the potential of an experimental technique known as coral seeding - in other words, collecting some of the spawn from mass mating events and using it to promote the growth of new corals on reefs in need of rescue.

The reefs around Palau are in good shape but elsewhere throughout the tropical world, many coral ecosystems are in a parlous state.

Plenty spare

Pollution, over-fishing and coral bleaching events, which are caused by marine heat waves, have reduced the amount of coral to the point where these naturally bio-diverse habitats are at varying degrees of degradation.

Many are nearing ecological collapse - some have gone forever, already.

However, many reefs might be salvageable if they are first protected from pollution and overexploitation, and then are seeded with some surplus spawn from more vibrant reefs.



Acropora is an important reef-builder and is common here

Most of the eggs and larvae from a mass spawning event are eaten or die before they get an anchor hold on the sea bed, so there is plenty of spawn to share around.

In the coming experiment on Palau, the scientists will not be using coral spawn produced on the open reefs.

Partly for practical reasons, they will harvest their

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spawn under more controllable conditions at the laboratory of the Palau International Coral Reef Center.

In the lab

On Saturday, I joined them on a trip to collect 10 dinner-plate-sized coral colonies from Luke's reef about 20 minutes speed-boat-ride from the Reef Center.

James Guest, from the University of Newcastle, UK, and Maria Vanessa Baria from the University of the Philippines dived to the sea bed, armed with hammers and chisels.

They were after a particular species of branching coral which forms large tables or shelves as it grows. It is this type which is one of the most abundant and most important reef builders.

It takes a few taps at the stony stalk base of each colony to break them free. Waiting on the boat to receive the corals was Andrew Heyward of the Australian Institute for Marine Science - one of the first biologists to describe the phenomenon of coral mass spawning in the 1980s.

The colonies were put straight into tubs of sea water, and once the tenth was on board, we headed back at a high rate of knots to the Reef Center.

Back at the Center, the coral were transferred with speed to larger tanks, filled with constantly refreshed seawater.

Setting up home

Now there's a lull before the spawn. The main event could happen Sunday or Monday or Tuesday night (Palau time). And some species will synchronously spawn the day after others.

When the captive corals in the lab release their eggs and sperm, the contained spawn will be transferred to children's paddling pools floating in the sea next to the lab.

Over the following few days, the researchers will check the developing larvae to see how many are mature enough to settle down and become fixed baby coral polyps.



The spawning for these corals will occur in laboratory tanks

When sufficient numbers are good to go, the team will take the batch of larvae back to the reef and pump them over areas of potential colonisation.

The new homes for the larvae are artificial reef balls placed there specially for the purpose. They are domes of limestone concrete about a one metre wide and high.

Before the larva can be introduced, the reef balls will have to be covered so the larvae don't just float away.

Big question

So the team will dive the five metres to the sea bed and erect two-man camping tents made of fine mesh over each artificial reef structure.

The baby corals will travel from the boat through the zipped door of the tent via a hose pipe. Andrew Heyward says the aim of this experiment is to be "low tech or no tech".

He feels this approach is vital if the technique of coral seeding is ever to be used on any scale in developing countries.

Twenty-four-hours later, the team will check to see how many of their "seeds" have settled by removing small tiles they've placed on the reef balls. They will do that again in a few months and after a year.



The approach has to be low-tech to succeed, the scientists believe

Each time they will compare the number of young corals with those on tiles from control balls which would have been settled by larvae born in the mass spawning on the reef.

Andrew Heyward points out that loading the dice in the larvae's favour before they settle is only part of the issue over whether coral seeding will work to restore reefs.

"If you boost the number of larval corals settling on a coral reef, so what? Does it make any difference to the longer term compared to an area where you did nothing?"

The answer will emerge in the next 12 months following this week's frenzy of mass reproduction on the reefs of Palau.

Andrew Luck-Baker is preparing a *Frontiers* programme to be broadcast on BBC Radio 4 on Monday 26 May

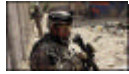
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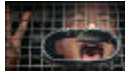
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