Distinguished Professor Peter Harrison is an Australian coral ecologist who, 40 years ago, fundamentally changed our understanding of how corals reproduce when he was part of a team that discovered corals mass spawning in the Great Barrier Reef. The GBR's first major bleaching event in 1982 soon followed and he first had the idea to create an enclosure to culture larvae from the coral spawn and then release them onto reef areas damaged by bleaching. He says it's a shame it's taken 30 years to get this kind of funding.

Having worked extensively on the GBR and in the Philippines, where a restoration revolution is happening, he's developed a spawn collection and culture system which can improve larval production efficiencies by more than 40% and will now apply this programme in the Maldives. These oceanic atolls and islands, where the highest point is 12 metres above sea level, have suffered catastrophic long term coral losses and bleaching over the last decades and Harrison says this region had to be his next top priority, since 58% of the population are employed in reef-based tourism and most are reliant on fisheries from nearby ocean areas.

Professor Harrison and colleagues from the Maldives Coral Institute, Maldives Marine Research Institute, and South Huvadhu Atoll, and Australian research partners from the Commonwealth Scientific and Industrial Research Organisation, University of Queensland, Australian Institute of Marine Science and Queensland University of Technology will train partners across the Maldives to first map the reefs for bleaching responses and genetic diversity, and use autonomous vehicles and AI-imaging. This creates a picture of coral cover, ecosystem function, recovery and resilience and gives a framework for selecting the best reefs to collect coral spawn to create a resilient broodstock or 'pedigree', from which future generations of corals will be propagated.

Since most corals spawn their eggs and sperm in small bundles which float to the surface of the sea, Professor Harrison's method is to capture them in a system of fine mesh nets which keeps them contained while they develop for about five days. Harrison can then apply innovative feeding processes, culturing the larvae inside the net on the reef (and in the lab in some instances) to produce tens to hundreds of millions of genetically diverse and healthier larvae. They can be directly released from the culture nets or settled and transported on natural limestone tiles before being released onto degraded reefs. The new corals can grow into reproductive adults within a few years and when they spawn their larvae can be dispersed downstream and connected to coral metapopulations among distant reefs. The control sites and the restored sites are all carefully monitored including through the autonomous vehicles and AI-imaging to ensure the restored corals are surviving and reproducing on restored resilient reefs.

The Maldives team includes a local female surfing champion called Aya Naseem who is the Vice Chairperson and Chief Research Officer for the Maldives Coral Institute. They are working with tour operators, fisherfolk and community representatives, involving everyone whose lives depend on saving the reefs in the new research. The team will be monitoring corals in early 2024 and gearing up for reef-based trials during coral spawning periods in March to April in Maldives, which is when they'll start to capture spawn and culturing the best larvae in nets, ready to be released onto damaged reef areas to catalyse their recovery.

Professor Matthew Dunbabin (QUT) is also part of the team and has designed a remote controlled submersible robot boat which can map reefs using satellite imaging. The newly planted survivors of the team's coral reproduction and larval restoration trials will be visible within one year. New coral polyps are the size of a small plate within a year, and after two or three years grow to the size of a dinner plate and are ready for breeding. This new floating robot can monitor significant changes in control and restoration sites and can also squirt larvae onto their new sites. This technology is being adapted to enable training of partners in the Maldives.