GIANT CLAM SPAWNING

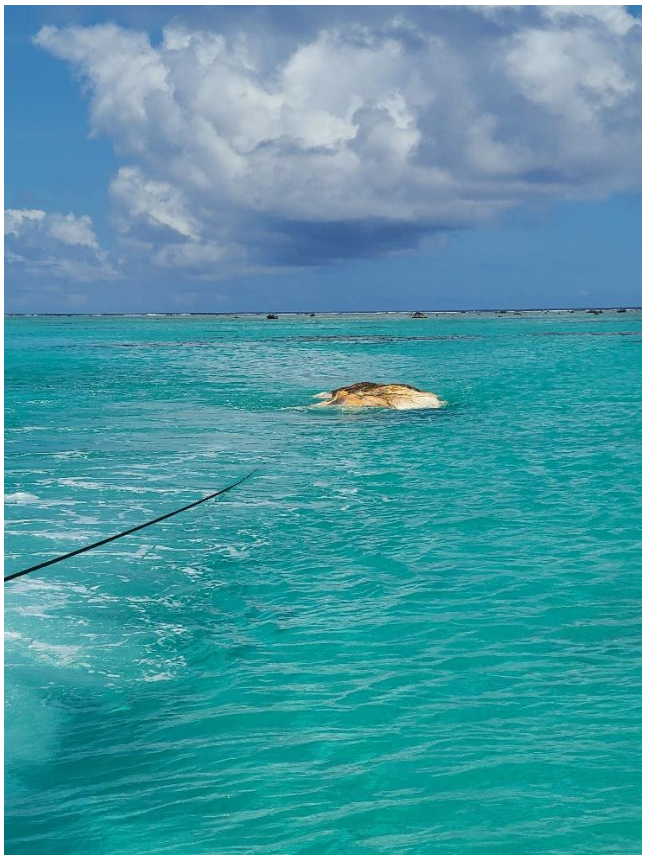
AITUTAKI, COOK ISLANDS

November-December 2021

Objectives:	Induce spawning in the brood stock of giant clams and rear from embryonic through the larval stage.
Activities Description/ Major Observations	I spent 18 days in Aitutaki (22 Nov - 9 Dec) **Schedule:** **Monday Nov 22**: Arrive in Aitutaki. Clean lab and begin cleaning rest of hatchery in preparation for spawning. **Tuesday Nov 23**: Scrubbed the runway tanks, chlorine scrubbed, then left for sun to heat, dry and kill remaining bacteria. **Wednesday Nov 24**: Began spawning of *Tridacna maxima.* Wiped spawning bowls/tubs/tanks with chlorine solution to clean and began spawning process. Successfully spawned ~2.3 million eggs and divided them between two temporary holding tanks **Thursday Nov 25**: Using 2 wild T. maxima (found in the lagoon out front of hatchery) and 10 from our breeding stock in the tanks, we successfully spawned another 327 thousand eggs and placed in a third holding tank. **Friday Nov 26**: Collected 12 *T. derasa* from Maina Nursery. Towed remains of whale carcass out of Maina Nursery several km offshore. Emptied first two tanks from day 2 (first day of spawning) and transferred baby clams to runway tank. **Saturday Nov 27**: Began draining third tank from day 3 (second day of spawning). Almost no eggs were swimming when viewed under microscope. Placed back in tank and filled back up to wait for one more day. Around 3 pm, group of *T. derasa* collected spawned in holding tank causing all *T. maxima* and *T. derasa* in the tank to spawn as well. **Sunday Nov 28**: Emptied and cleaned extra basins for 1 micron filtered saltwater storage in preparation of *T. derasa* spawning. Ran water for 2.5 hours in the morning. Found a leak and noticed cracks in most of the runway tanks. Transferred veliger larvae back to temporary holding tank and drained runway for patching. **Monday Nov 29**: Released *T. derasa* from first collection back into Maina Nursery and collected 11 new individuals. Injected with serotonin to induce spawning. Very low response to injection. No eggs, very little sperm collected. **Tuesday Nov 30**: Collected 10 *T. derasa* and 12 *T. maxima* from Maina Nursery. Successfully induced spawning in both species. Collected 3.1 milllion eggs from *T. maxima* and 5.7 million eggs from *T. derasa*. **Wednesday Dec 1**: Chlorine scrubbed one of the runway tanks, filled another to test for leaks, then patched up two other runway tanks. Removed dead veligers (pink spots on bottom) from *T. maxima* holding tank and scum (floating on surface) from *T. derasa*

	holding tank. **Thursday Dec 2**: Syphoned out any dead veligers on bottom of tanks. Filled two tanks to test if they will hold water from patching. Check life cycle process of both species under microscope. **Friday Dec 3**: Cleaned, chlorine scrubbed, and filled two runway tanks. Then, transferred 71,000 *T. derasa* and 77,000 *T. maxima* to the runways from the temporary holding tanks. Sacrificed one *T. maxima* and one *T. derasa* for feeding **Saturday Dec 4**: Removed dead bugs from tanks, ran filter for 2 hours and checked air flow to tanks **Sunday Dec 5**: Repeated Day 4. Fed clams. **Monday Dec 6**: Collected 10 *T. derasa* from Maina Nursery. Cleaned the shells then placed in tank with brood stock for overnight. Cleaned all basins and prepared for spawning **Tuesday Dec 7**: Attempted spawning for *T. derasa*. None produced any eggs. Cleaned equipment again and prepared for spawning for *T. maxima* on Wednesday **Wednesday Dec 8**: Carried out spawning for *T. maxima*. Successfully produced 1.14 million fertilized eggs. Used plunger (pole attached to flat, plastic disk with holes in it) to circulate the eggs and oxygenate the water every couple of hours. **Thursday Dec 9**: Checked on clams from previous and recent spawning. Fed clams for last time. Prepared for flight back to Rarotonga **Notes:** Before any clams were used for spawning, the shells were scrubbed free of any snails or algae growth on the outside. They were then scrubbed again with a chlorine solution and set in the sun to dry and kill any bacterial growth before being placed in 1 micron filtered saltwater. **Observations:** *T. derasa* typically spawned 1 day after collection from Maina Nursery after heat stress from transferring from the nursery to the hatchery. Some of them still needed to be induced for spawning, others began spawning without the need for serotonin injections. Additionally, injections of serotonin was easier from underneath for T. maxima as this put the gonads closer to injection point and removed waiting time for the clams to open up. **Additional Observations**: Spawning typically occurred in the mid to late afternoons when the temperature was hottest. This might suggest that multiple consecutive hot and sunny days are ideal for spawning *T. derasa* and at least one hot/sunny day for *T. maxima*. **Other Observations:** There was a humpback whale carcass that had been stuck on the reef in Maina Nursery. When collecting *T. derasa* for spawning, the bones from the carcass were found on a coral bommie nearby. The fat and skin had detached from the bones and had floated closer towards the reef crest to the west of where the bones were located. A rope was wrapped around a portion of the remains and was then towed out of the lagoon 2 km offshore.

Issues and Problems:	• Runway tanks had cracks in them which caused a small leak. The leaks weren't noticed until after we had the first one running with 440,000 pediveliger T. maxima in it. We ended up having to drain the entire tank back into the temporary holding tank where we held the eggs for the first two days until tanks were patched with a temporary fix. None of the first group from spawning survived. • *T. derasa* decided to spawn in the holding tank before we were ready to attempt the controlled spawning. This also induced spawning in all of the *T. maxima* brood stock that were also in that holding tank. Need to collect new group of *T. derasa* for breeding. • Most days were cloudy and/or raining while in Aitutaki.
Key Achievements:	1. A total of 8.8 million Tridacnid eggs were fertilized between *T. maxima* and *T. derasa*. 2. 148,000 eggs made it to the veliger stage 3. Learned the process for inducing spawning and care for the eggs up until juvenile stage at which point they can be taken to the nursery and released onto various coral bommies. 4. Clam spawning SOP is currently being updated by Tuaine Turua
Follow up	Surveys should be carried out before releasing juveniles into lagoon and again after 3 years to determine successful attachment rates. Since *pa'ua* can spawn year-round, hatchery should apply primary focus to restocking lagoons, or hire more staff to focus solely on spawning and releasing *pa'ua* into protected areas of the lagoon.



Left: Richard Story teaching Tuaine Turua where to inject T. maxima with serotonin to induce spawning.
Right: Remains of humpback whale carcass being dragged from Maina Nursery out of the lagoon.