

## GM August Update

### Hatchery Operation

- Water intake -we are filling the 90m<sup>3</sup> (90000ltr) reservoir every 2-3 days and then we pump internally to the tanks, to increase water exchange and improve water quality (will maintain temperature, dissolved oxygen etc). This allows us to pump water to the tanks 24/7, which is practically a flow through system- this was recommended by JF Hamel, Georgina Robinson & Luis Felaco as the gold standard.
- Implementation of more robust biosecurity protocols- including- tank specific cleaning equipment, chlorination tanks, clearer handling protocols, the review of cucumbers leaving to hapas etc.
- 2 spawn events on the 8th and 23 August for Mexicana(floridana), Planned average of 1,000,000 eggs for the month has been exceeded, with just over 1,200,000 from the 2 spawns.
- 14 more spawning females from 23rd August placed in the ranch in the marina. Again, excellent spawning 4 days before the New Moon. In this case the spawn was so efficient we were able to return the animals to the sea on the same day.
- New plastic larval rearing tank design for MX/FL, allows for minimal touching and eliminates the use of silicon, on which we have had issues with Pseudomonas bacteria in the glass fish tanks. Automated 24hr feeding tank to be tested using drip bottles in Sept.
- We are applying an imported sea cucumber health boosting probiotic to all tanks in the hatchery on a 14-day cycle, this should help with overall survival and improve tank conditions.
- Grading from larval tanks has resulted in fast compensatory growth on the smaller cucumbers left behind and increased the amount of animals leaving each tank.

### Marine Operation

- New Sea Pen Installed - 156m<sup>2</sup> in Isla Linton- to be stocked with animals of 10grams as they leave the hapas.
- More than 40 hapas installed and filled.
- Working on the production plan using current knowledge to plan space and hapa capacity for the next year.
- Hapa production sourced in China, currently quoting 4000m<sup>3</sup> for the next 10-12 months. We are seeing a per/m<sup>2</sup> cost of about 60 cents if mass produced out of China.
- 10 "Pillow Case Nets" with eggs going **directly** offshore into framed hapas on day 1 of fertilization, we will review results in late September. Luis Felaco has

seen very positive results with this technique in his marine station and if this works, we can immediately and substantially scale our spawning operation.

- Hapa survival\* from the beginning of June has averaged 90% across all size groups (\*excluding the following- results from the marina installations which we have now relocated, where the conditions are too unstable, we found gasoline, diesel, fibreglass etc due to the amount of boats; seapen 2 which was hit by a boat, so we lost the cucumbers from it, but it is unlikely that they died; one sample hapa for very small animals that had very unusual mortality rates)
- Hapa growth\* from the beginning of June has averaged 62% for the time between weigh ins (usually 28 days) We are still optimizing the densities and we have seen much better results from animals moving quickly through the hatchery to the hapas. Older (and likely stunted) animals have, we believe, skewed the results till now.
- The PanaSea Boat is registered and on the water, will reduce the cost of working offshore, 5 of our current team are licensed to pilot it and with local knowledge.
- New Marine ops lead working with the existing hatchery team, we have not needed to increase the workforce as yet, and all have been instrumental in the construction and maintenance of the installations and the monitoring and cleaning of them, as well as the weighing and movements of the cucumbers.

### **Consultant Visits**

- Visit by Luis Felaco – 1 week in the hatchery looking at actual practicalities on good husbandry and general protocols and processes. Extremely helpful visit.
- During the Summit week with Luis Felaco and Georgina Robinson, we resolved most of the current outstanding operational challenges.

### **Badionotus Operation**

- Badionotus - set up rooms using LF protocols, utilizing the custom larva tanks that had been stored for 24 months.
- Spawn event on the 27th August for Badionotus, the first in 2.5 years - 30 adults collected on the 24th August to test equipment and protocols. Egg/larva numbers to be updated.

### **Algae/ Feed Production**

- Algae production expanded to include more live algae, so we now have 5 species, Thala, Tetra, Chaeto, Nanno, and Iso. The last 2 are used for planktonic larval rearing, but will also help with the MX/FL feeding schedules. Increased production capacity to up to 1200 litres daily, which will allow us to grow out the entire current hatchery with juveniles between 30 and 90 days, whilst constantly grading the biggest and fastest growers out to the hapas.

- Biofloc production scaled back with a view to ceasing in September, due to the larger juveniles going offshore. We updated and archived the protocols for any future production to pick up where we left off.
- The Biofloc has been replaced with diatom traps in the sea around the hapas (so we will bring onshore the same feed they are eating in the hapas). It should give us a similar feed quality for much less work and expense (there are 4 tons of biofloc in production at any time, which signifies a great deal of fertilizer and time every month. Stopping the production also frees up 16 tanks we can use for larval rearing). The trapped diatoms are frozen to remove any parasites and contaminants, and fed to tanks with animals older than 30 days for Mx/FI, and will be used after 45-50 days for Badionotus.

### **Collaborations**

- We helped the Smithsonian with some research into the invasive LionFish species. 15 examples of the species were harpooned by the team in one evening that were delivered to the Smithsonian team for further investigation.
- Our biologist Stephanie Vargas has started a project to enable us to take on more short-term internships from the local universities, so we can slowly and cheaply prepare a knowledge pool for any future expansion.

### **Government Permits**

- With help from Epi we are keeping up to date with all reporting for the Governmental institutions.
- Meeting with ARAP on August 25<sup>th</sup> was very productive:
  - Discussed provisional permissions to begin processing and exporting small batches for traditional dried sea cucumbers as well as raw material for Mexican supplement pills.

### **Employee Quality of Life**

- New healthier eating menu options available for those that wish to partake.
- Overall vibe is excellent in the hatchery. The improvement is palpable- both during working hours and post work hours. The team is fired up now that we are seeing better-than-expected results and including them in all consultant conversations in order to enhance their understanding of the “how and why” of our new techniques.

## Photos

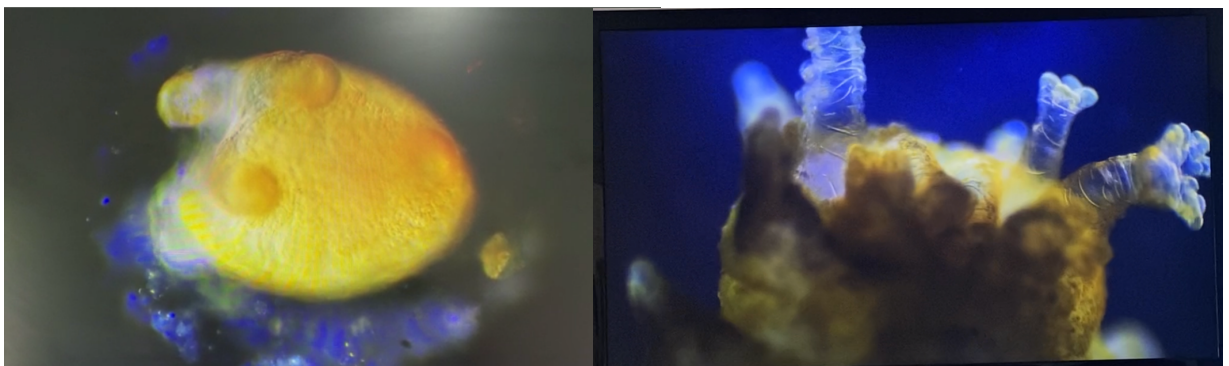
**\*Dr Georgina Robinson & Dr Luis Felaco during their visit**



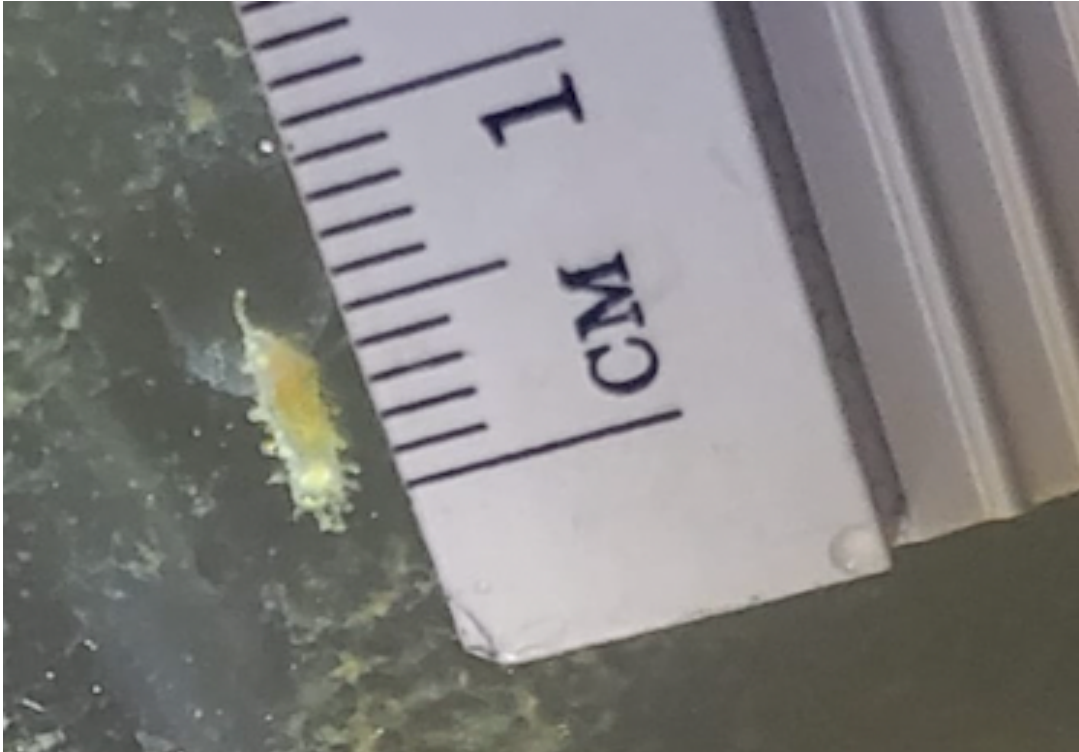
**Dr. J-F Hamel during his visit teaching the team. He is *THE* top sea cucumber expert globally.**



**Remarkable HD photos & videos captured by the production team from Albatross Media for *Voces de Naturaleza*- this is basically the “*Planet Earth* of LatAm”**



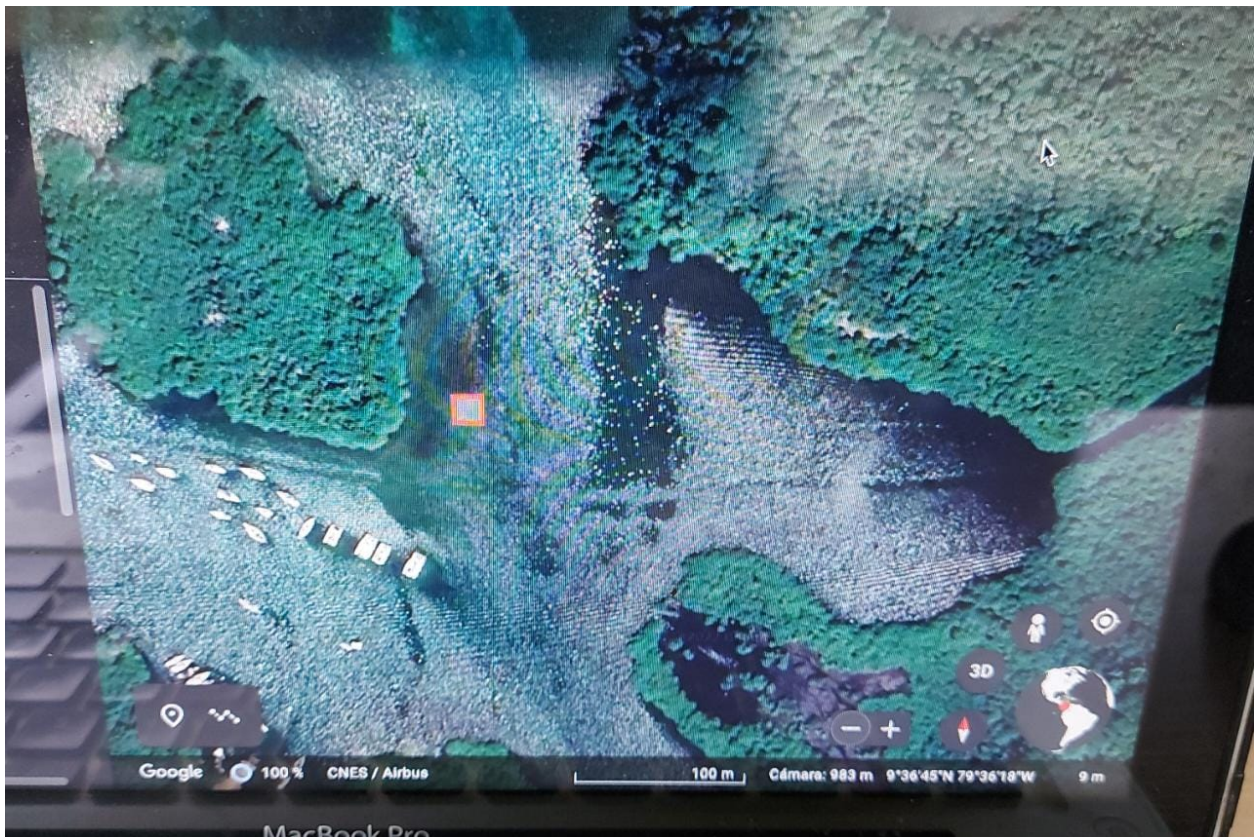
**Size of juvenile ready to go into the sea now that we are transitioning to sea ranching immediately from the hatchery.**



One of the new Sea Ranches w/ black mesh being used to simulate the grass habitat for the larger juveniles. This offered shade as well as increasing surface area.



Happa/ Sea Ranching Sites. All are indicated in google earth map [here](#).





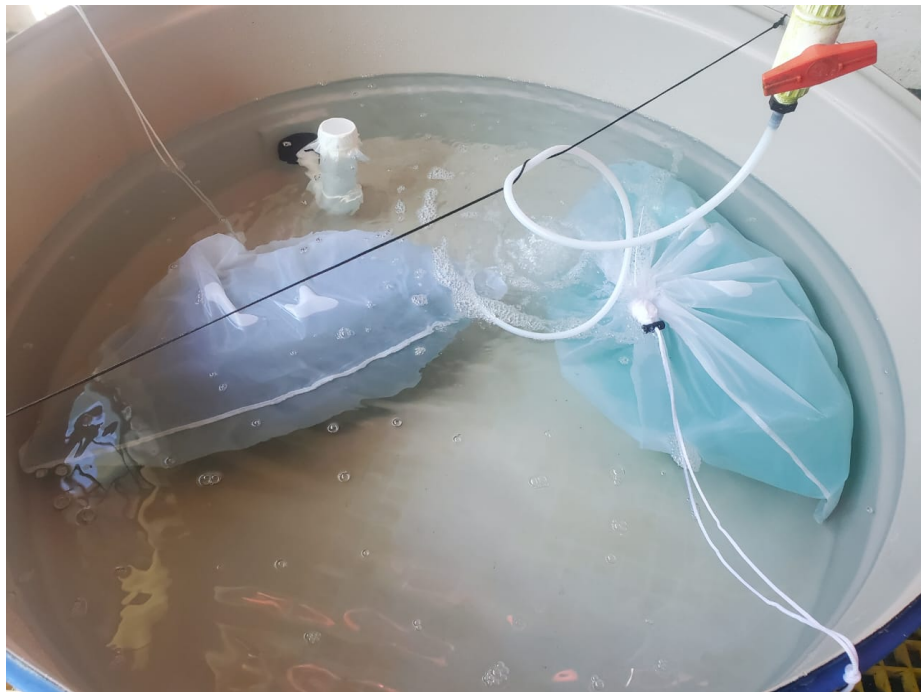
**More Photos of Happas/ Sea Ranches**







**“Pillow Case” prototypes for putting eggs to grow directly in the sea**



**Photos from Inside Happa Nets of Juveniles Consuming Biofilm**



**\*Note the *poop* next to the animals. It's a great sign!**

**Healthy/ happy juveniles ready to be placed on the seabed**



**Remarkable juvenile growth in 28 days from .2g to 6g**



**Photos from inside Sea Ranch- directly on seabed.**







**Newly constructed for *Badionotus* production**



Collected *Badionotus* for Spawn

