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OUTREACH AND EDUCATION: Interdisciplinary Learning at the St John's Island-Complex

Contributed by Tan Aik Ling, Tricia Seow, and Theresa Su



Participants and facilitators envisioning future plans for SJI-C.

What do you do when you want good weather? You chant "Rain, rain go away! Come again another day!"

Throughout a three-day immersive camp held in June 2022, the participants chanted for good weather and enjoyed the natural, historical and cultural heritage of the St John's Island-Complex (SJI-C).

The group composed of 25 Secondary Three students, 10 NIE preservice teacher volunteers, and six research team members from NIE, Dunman Secondary School, and the Ministry of Education. The

project, led by NIE researchers together with SJINML, hypothesised that spending time outdoors to experience first-hand the environmental and cultural aspects of a place would positively impact students' pro-environmental attitudes and behaviour.

A series of curated activities were carried out, such as creating a sensory scape in the field, roleplay to learn about land reclamation impacts, a scavenger hunt to acquaint students with Lazarus island, and a task to envision future development of SJI-C. Through these, the students and facilitators got to know SJI-C and one another better.

The students' responses to a nature-connectedness survey showed a significant increase in their enjoyment of nature, which is encouraging for the team.

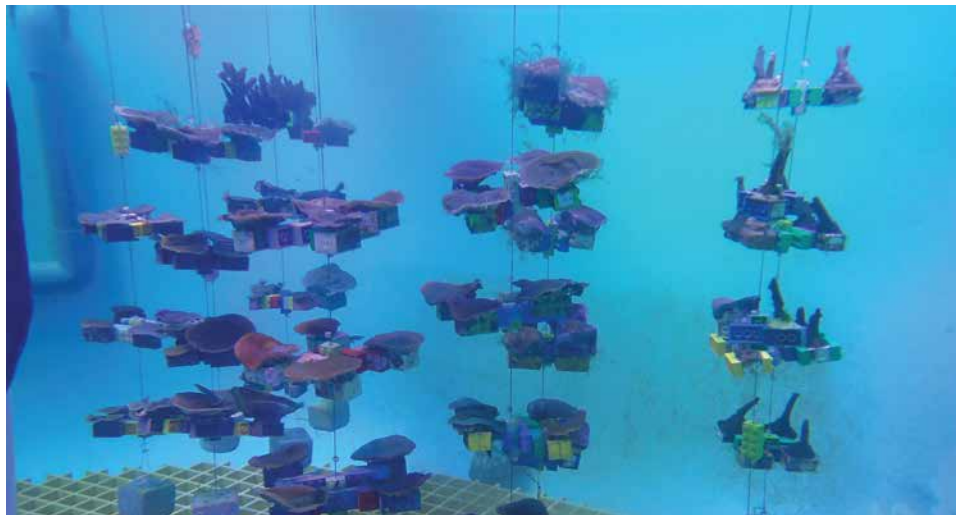
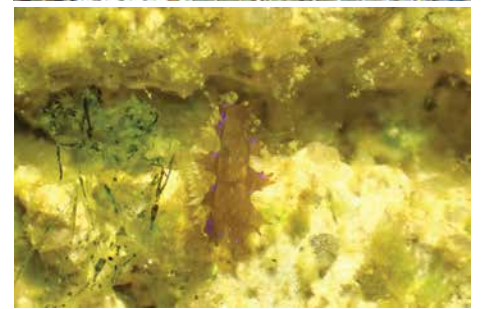
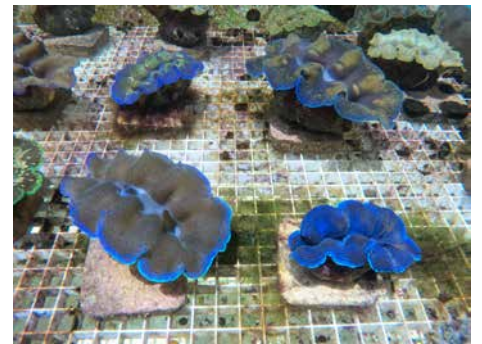
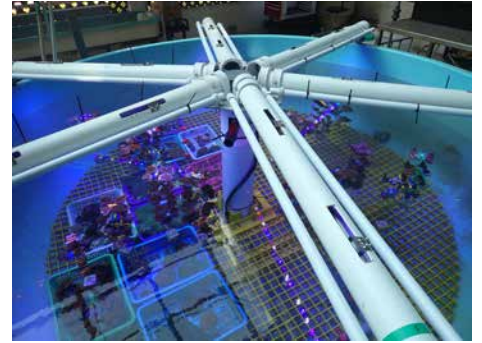


Our guests, Dr Jani Tanzil and Ms Sam Shu Qin listening to the fabulous ideas.

FEATURED RESEARCH: Making Mariculture Great Again!

Contributed by Lionel Ng, Ow Yong Wei Long, and Teresa Tay

The imminent loss of marine species has been attributed to habitat degradation and unsustainable extraction, which can lead to the deterioration of critical biodiversity services, including ecosystem sustenance and food supply. We need to take actions urgently to come up with scalable solutions for stemming these losses. A project on the mariculture of key Indo-Pacific marine species represents a potential avenue for gleaning basic but little-known information to support research and conservation efforts, as well as exploring future applications for bio-inspired research. We focus on advancing the sustainable culture methods of stony corals, giant clams and cowries. These organisms, frequently used as model organisms for research, are also popular in the ornamental trade and therefore are at risk of extinction from overharvesting. Building upon our collective expertise and skills, our team has developed interesting and unique techniques to propagate these animals.



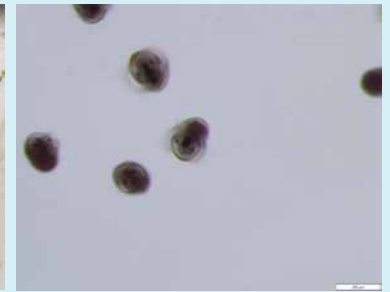
Coral fragments are reared in both the outdoor and indoor aquaria using a vertical farming approach. Photo Credit: Ow Yong Wei Long

To facilitate future culture scale-ups, we designed a system to optimise coral rearing in spite of space constraints. Small coral fragments adhered onto plastic bricks are strung on fishing lines and suspended in tanks in the outdoor aquaria. Using these plastic bricks allows a modular and flexible approach in rearing corals, where substrates of different shapes and sizes can be built to accommodate coral growth. Recently, we also expanded our coral production capabilities by outfitting a 5000L tank in the indoor aquaria with a turn-table and aquaria lights. This potentially enables the co-culture of hundreds of medium-sized coral fragments with other compatible species such as cowries and giant clams.

From top: In the indoor aquaria, a turntable and aquaria lights have been installed. Giant clam (*Tridacna crocea*) individuals in the outdoor aquaria spawn. 8-days post fertilisation, a foot can be observed. After 2-months post fertilisation, they are visible to the naked eye and have settled to the bottom of the aquaria tank. Photo credit: Ow Yong Wei Long and Teresa Tay

Unlike the corals, the giant clams and cowries require more TLC (tender loving care) when it comes to studying their reproduction. Several spawning attempts have been carried out with our giant clams (*Tridacna crocea*), and challenges were abundant at various stages of these efforts. We have generally achieved good post-spawning survival of our broodstock clams, but with moderate success in larvae survival.

So far, one attempt yielded 3 million eggs produced 600,000 viable eggs. Those larvae that developed were fed the algae, *Isochrysis lutea*, every two days to enhance their survival and growth. At 8 days post-fertilisation, the pediveligers were introduced into no-flow tanks and left undisturbed for 3 weeks to allow for metamorphosis and settlement.



Left to right: Tiger cowries (*Cypraea tigris*) are fed a diet of cucumbers and prawns. They brood over their purplish-pink egg mass (middle) until the eggs hatch into veligers (right). Photo credit: Teresa Tay

On the other hand, very much less is known of the cowries' reproduction cycle. Using the Tiger Cowrie (*Cypraea tigris*) and Arabian Cowrie (*Mauritia arabica*) as model species, we are carrying out husbandry, dietary and behavioural trials to gain deeper insights into their biology. Presently, these cowries are fed a diet of frozen shelled prawns and cucumbers, with regular monitoring of their wet weights as a proxy of health condition. Recently, we were fortunate to observe several female

cowries laying egg masses in the tanks. Apart from collecting valuable data on their spawning and brooding behaviour, we are also attempting to rear the larvae into juvenile cowries.

Concurrently, the project seeks to develop methods for tagging and tracking these cultured animals, so that sustainable harvesting practices can be enforced and the demand for species in the aquarium trade can be better managed. We can expect to apply our research to enhance Singapore's mariculture capabilities and augment trade regulation of these iconic marine animals.

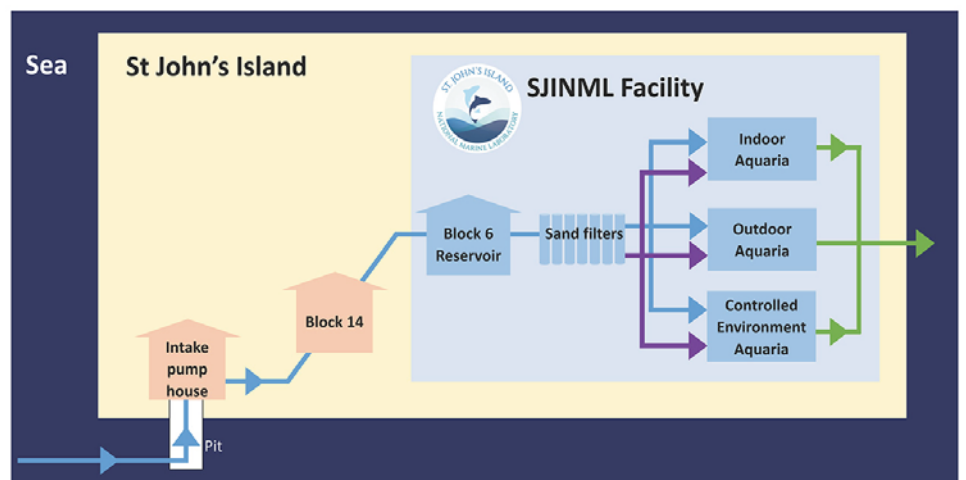
FEATURED FACILITY: Seawater Network System at SJINML

Contributed by Theresa Su and Mohamad Razali Bin Duriat

As the national research infrastructure for marine science, SJINML offers access to clean seawater drawn from the southern shoreline of St John's Island, at approximately 20 m depth, 50 m away. Water is drawn from the sea through a series of 23 kW and 45 kW pumps before reaching the facility at the Block 6 reservoir.

The seawater is then passed through a series of seven sand filters before use. Besides the sand-filtered seawater, raw (unfiltered) seawater is also available at all three aquaria facilities (indoor, outdoor, controlled environment) each with flow rate of approximately 60 m³/h and 10 m³/h, respectively.

At the experimental tank systems, researchers can opt to perform further filtration on the seawater, or vary the abiotic parameters according to experimental needs. Unused seawater is then pumped back into the sea, resulting in a flow-through system. To ensure a steady supply of seawater at the facility, the entire network system runs alternately on two sets of pumps, where the second set is on standby or undergoing maintenance when the first is at work.



Legend:

- Intake seawater (raw/unfiltered)
- Filtered seawater
- Discharge seawater

Seawater is drawn from the sea and stored in the reservoir. Before entering the facility, the water passes through sand filters and are then pumped into the various aquaria. The water is then pumped back into the sea after use.

SIGHTINGS: Field Support Officers of SJINML

Contributed by Sebastian Yeo and Darren Somchai

As Field Support Officers of SJINML, Mr Sebastian Yeo and Mr Darren Somchai often find themselves in various marine field environments, ranging from intertidal zones to beyond Singapore's Port Limits. They have participated in a plethora of projects such as reef and seabed surveys and coring, hydrographic surveys, water parameters measurement and testing, coral transplantation, bio-fouling surveys, micro-plastics surveys, and seagrass sampling, and the list goes on! They have gained invaluable knowledge and experience working with various teams from the local marine research institutions, allowing them to render support in planning and executing fieldwork. They are also capable of using various resources in their arsenal, such as field equipment (e.g., sediment grabs, corers, and more), and field-sampling techniques.

Under their purview, the research vessel *Galaxea* provides an extension to the Field Support Office's capabilities as it allows them to conduct research to the edges of Singapore's Port Limits. R/V *Galaxea* is equipped with a hydraulic winch and an A-Frame which allows for easier and safer deployment of equipment out in the field.



Our friendly Field Support Officers, Mr Sebastian Yeo (left) and Mr Darren Somchai (right) onboard R/V *Galaxea*.



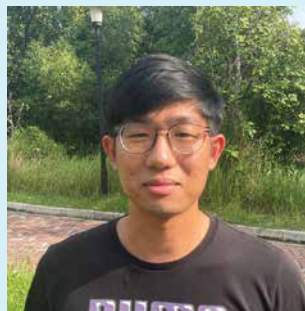
The field support team deploying a vertical water sampler. Photo credit: Wong Ann Kwang

OTHER NEWS

We congratulate Mr Jackson Chan, who is awarded the Efficiency Medal by the Prime Minister's Office. As a Facility Manager (Aquaria), Jackson is responsible for the upkeep and maintenance of all aquaria systems at SJINML.



The Medal was instituted in 1969 and is awarded to persons for exceptional efficiency or exceptional devotion to duty or for work of special significance.



Our warmest welcome to Mr Lim Tzer Shyun, who joins the team of laboratory managers at SJINML.

SJINML co-hosted a workshop on "Climate Change on Marine Ecosystems: Integrative Ecological Approaches" from 30 August to 2 September 2022 with the Singapore-HUJ Alliance for Research and Enterprise (SHARE), with support from CREATE, and the National Research Foundation (NRF). The 4D1N programme developed by Dr Nicholas Yap and Dr Bee Yan Lee of SJINML and Dr Jessica Bellworthy of The Leon H. Charney School of Marine Sciences, University of Haifa offered participants a hands-on crash course on designing and planning modern ecological studies and analysing data.

EDITORIAL TEAM

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The team would like to express our gratitude to all contributors of this issue of *Sakijang Times*. If you wish to contribute, please contact theresasu@nus.edu.sg or tmsnml@nus.edu.sg.