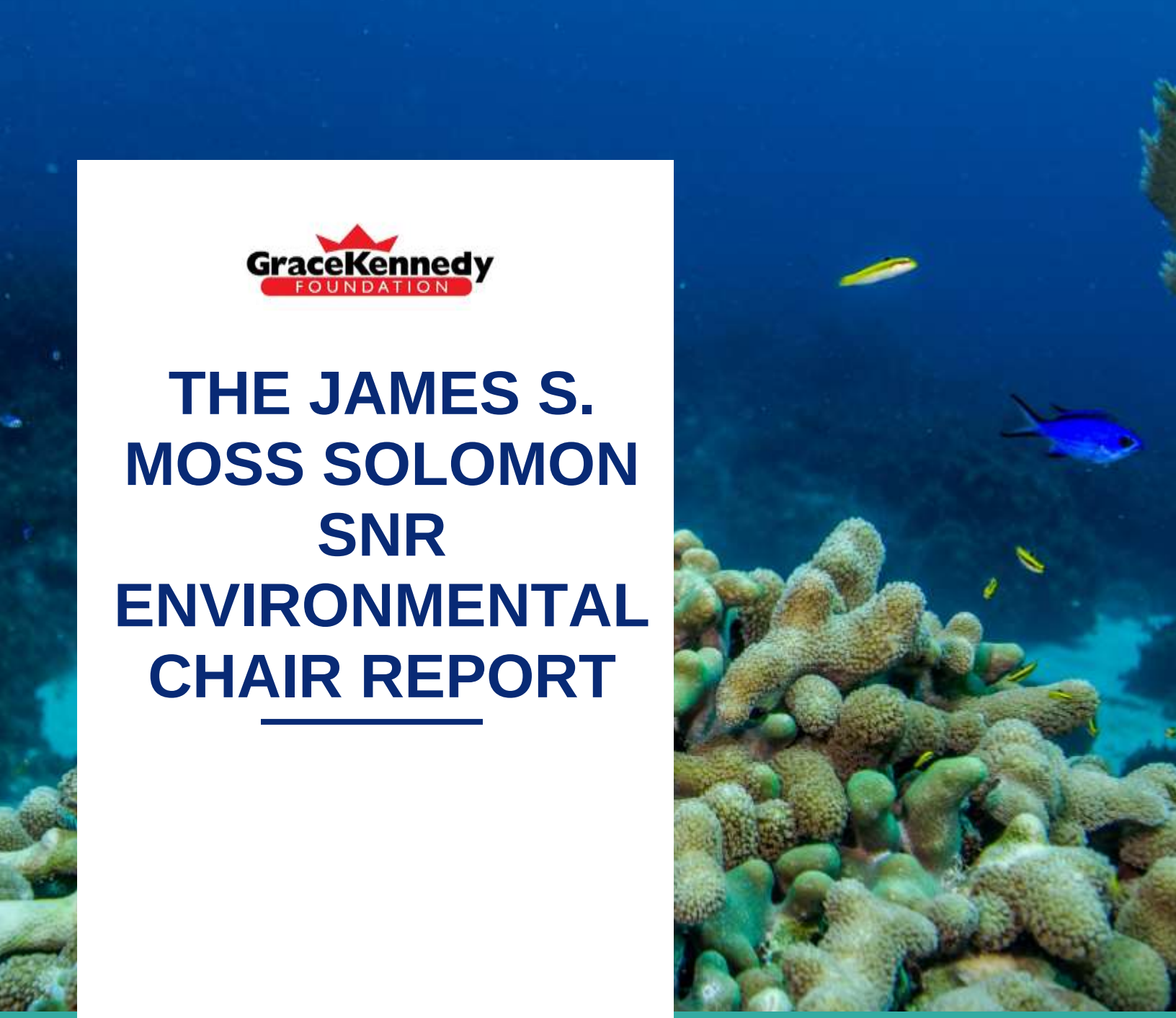

THE JAMES S. MOSS SOLOMON SNR ENVIRONMENTAL CHAIR REPORT

REPORTING YEAR: 2021-2022

Professor Mona Webber
Centre for Marine Sciences
Department of Life Sciences
The University of the West Indies

UWI
MONA CAMPUS
JAMAICA, WEST INDIES

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"As the world faces numerous challenges and populations become more marginalised, there is a tendency to disregard the issues of natural systems and their associated biodiversity. However, the services produced by natural ecosystems and their associated biota are valued at two times what humans produce each year," Mona Webber,2020 (The Gleaner.)

Summary

The August 2021 to July 2022 period was considered transitional for the James S. Moss Solomon Senior Chair as we emerged from the major restrictions of the COVID-19 Pandemic and were able to resume activities in a face-to-face mode (where possible). Activities were both new and recurring but all centered around environmental stewardship, development of human capacity and infrastructure towards efficiencies and effectiveness in our habitat restoration and rehabilitation activities. The Queen conch spawning project at the DBML (which started in a previous reporting period) achieved new milestones and has created new opportunities for partnerships to do more in queen conch conservation and rehabilitation of coastal populations, spawning discussions for a proposed Mobile Queen Conch Hatchery project. Other projects achieving new milestones were the north coast populations of *Acropora palmata,* and assessments of Microplastics in Mangrove Oysters and the general mangrove community. Our mangrove interventions continue to take primary focus and early in the year we took on the challenge of rehabilitating the almost 10 ha of denuded forest area at Gallows Point, Port Royal Mangroves. Internship opportunities returned based on lifting of COVID-19 restrictions; with students benefitted greatly from these and staff and graduate students being able to do in-person workshops and conferences. One exciting new project with the potential to aid fishers and take pressure off coral reefs sees the installation of moored Fish Aggregating Devices (mFADs) off Port Royal.

One of the achievements of involvement in several sargassum projects, started during previous reporting periods, was the production of **three journal articles in 2022** and **five conference/workshop presentations**. These involved overseas partners, staff and students of the Centre for Marine Sciences, Discovery Bay Marine Laboratory and the Department of Life sciences. There were also several other opportunities for communication of our research to general audiences and so several public engagement activities; presentations and media opportunities occurred during the reporting period.

During the reporting period, the JSMSS Chair was the recipient of two significant Jamaican awards:

- The Gold Musgrave medal from the Institute of Jamaica **for Science**
- The Order of Distinction (Commander) for contributions to **preserving and protecting the marine and coastal environment of Jamaica**.

These were made possible in part through the support provided by the Grace Kennedy Foundation by the provision of funds, partnerships and opportunities.

Table 1. Public engagement activities; presentations and media opportunities during the reporting period.

Conferences, Outreach and Public (Media) engagement opportunities in 2021
July 2022. Webber, M.K. 2022 Pelagic Sargassum Science and Innovation for Entrepreneurship. *Sargassum seaweed- potential uses and issues*. SARTRAC Scientific Series 4. July 18, 9 – 3 pm https://sargassumhub.org/sartrac-scientific-sargassum-series-4/ (See flyer) July 2022. Webber, M.K. 2022 *Ecosystem Restoration for Climate Change Resilience*. July 11, 2022. Negril Education Environment Trust (NEET) Young Innovators Stem Camp 2022, U of Texas, Austin STEM summer camp for Jamaican teachers (flyer & details on pg. 24) May 2022. Oral presentation at the ISE/SEB joint hybrid conference May 29 – June 22022; Kingston Jamaica. *Use of pelagic Sargassum spp. compost for soil amelioration in mangrove seedling production.* Co-authors- Camilo Trench[1] Shanna-Lee Thomas[1], Gina-Marie Maddix[2], Patrice Francis[2], Hugh Small[3], Carla Machado[4], Thierry Tonon[4], Dale Webber[5], Mona Webber[2] October 2021. Webber, M.K. FST Professor speaks- Mangroves, Microplastics and Sargassum; what's the connection. October 28, 2021. https://www.mona.uwi.edu/events/professor-speaks-prof-mona-webber (flyer & details on pg. 23) September 2021. Webber, M.K. " Causes and Consequences of Marine Litter- A Research perspective." In Marine litter: legal tools to address the crisis. Webinar No. 3 – Addressing Marine litter in the Caribbean: impacts at global and regional levels. UNEP. September 9th, 2021
June 2022. Webber, MK. "Tackling the sargassum seaweed problem." The Sunday Gleaner June 19, 2022.
July 2022. TVJ- All Angles with host Dionne Jackson Miller (with Milton Haughton, Andres Bosne Leon, Anthony McKenzie)- Sargassum solution. July 6, 2022. June 2022. Beyond the headlines (94.5 FM) with Dionne Jackson Miller- Sargassum solution. July 2021. Morning radio (94.5 Sunny side up with Paula-Anne Porter Jones)- My journey as a Marine Scientist. In recognition of the IOJ-Musgrave Gold Award for Science.

Research & Innovation

"The measure of greatness in a scientific idea is the extent to which it stimulates thought and opens up new lines of research." - Paul Dirac.

MANGROVE PROJECTS UNDERTAKEN OVER THE PERIOD:

1. **An Assessment of Contamination of the Port Royal Mangroves**

Contaminants such as heavy metal and microplastics are now in alarming concentrations in our environment, and they continually pose several threats to aquatic and terrestrial organisms, including humans. Therefore, this study was designed to provide baseline data on levels of microplastic and heavy metal contamination in different areas and species of the Port Royal mangroves in Kingston Harbour. During the period of September 2021-August 2022, over seven successive bimonthly sampling excursions were conducted at various sites located in the Port Royal Mangroves. Samples include whole water, plankton, sediments and oysters. Heavy metal and microplastics samples are being analysed by ICENS, while water quality and plankton are assessed in the department of Life Sciences. Graduate student Ms. Devannie Lyew, supervised by Professor Mona Webber, conducts the research.

Ms. Devannie Lyew (Graduate Student) collecting oysters from the mangrove roots. (Source: Mona Webber)

Graduate Student, Ms. Devannie Lyew testing mangrove oysters for Heavy Metals by the International Centre for Environmental and Nuclear Sciences on Mona Campus. (Source: Chelsi-Ray Buckley)

2. **Rehabilitation of Gallows Point mangrove forest, Port Royal Mangroves.**

Gallows Point is a large area of mangroves in the Port Royal mangroves that has seen significant forest loss over many years due to solid waste build up and hydrology changes. Professor Mona Webber and her Centre for Marine Sciences, with funding from the Forestry Department City-Adapt project, assessed the problem and executed interventions to restore the mangrove forest.

The interventions were similar to what was done on Refuge Cay which is now seen with significant forest cover and drainage channels (figure below).

The work to rehabilitate these mangrove areas continues to support the MPhil research of Ms. Patrice Francis who has been assessing the **above and belowground biomass** and therefore blue carbon stocks for Jamaica's mangroves. These restoration efforts add to the diversity of sites available for her to compare carbon stocks associated with existing and restored mangrove areas.

Current status of Gallows Point (Source: Google Earth 2021) with lagoon/salina areas outlined in yellow. Also showing Refuge Cay.

Gallows Point (close-up) showing position of channels to be widened for restoration of hydrology.

Gallows Point Channel (GPT1) after widening of channel and with exposed sediment areas having mangroves seedlings introduced (Photo Credits: Mona Webber)

FISH AND FISHERY (INCLUDING AQUACULTURE) PROJECTS

1. Assessment of Moored Fish Aggregating Device (mFADs) in Port Royal Waters.

Fish Aggregating Devices (FADs) are floating structures that are intentionally deployed to attract pelagic fish. FADs have been found to improve food security in small-scale fisheries as well as shift fishing pressure off coral reefs. Though FADS are used extensively in the Mediterranean Sea and Indo-Pacific Ocean, FAD related research has not been previously done in Jamaica and the success may allow for the opening of a relatively underutilized fishery around the country. This research project will therefore seek to evaluate whether mFADs are viable and if mFAD fishing can be used as a possible alternative to reef fishing.

The mFADS being built at the PRML and assembled for deployment off Port Royal (Jonathan Morris).

The mFADS after ~two months of deployment (Jonathan Morris)

The mFADS attracting fish of various species (Jonathan Morris)

2. **Partnership with Harbour Branch Oceanographic Institute Aquaculture laboratory for the culture of Queen Conch and other coastal species.**

Professor Mona Webber visited the Harbour Branch Oceanographic Institute (HBOI) to meet with Dr Megan Davis and see first-hand the facilities for growing mangrove and sand dune plants for rehabilitation as well as food and the establishment of a mobile queen conch hatchery in Jamaica.

Sesuvium (a) and Batis (b) (mangrove/salina plants) being grown at Harbour Branch aquaculture facility for restoration and consumption.

Mobile Queen Conch Laboratory

The Harbour Branch Oceanographic Institute is partnering with the Discovery Bay Marine Laboratory (DBML) to explore producing juvenile queen conch for placement in the Discovery Bay Fish Sanctuary. The DBML currently has a project in partnership with NEPA and JCP to have adult conch spawn in pens in Discovery Bay. Conch spawning was observed in August, 2022 Figure below)

Queen conch spawning in Discovery Bay enclosures (Shanna-Lee Thomas)

HBOI- Queen conch hatchery (Dr Megan Davis)

<u>COASTAL AND MARINE ECOLOGY PROJECTS</u>

1. **<u>The Inundation of coastal areas by Sargassum seaweed: Problem or opportunity.</u>**

Professor Mona Webber, as the Co-lead for WP4 on an externally funded sargassum project (SARTRAC), organized a webinar and presented research findings from the project; with an emphasis on how the seaweed could be used based on different valorization pathways. The webinar; SARTRAC Scientific Sargassum Series 4, entitled *Pelagic Sargassum Science and Innovation for Entrepreneurship* was held July 18th, 2022 (flyer below).

Sargassum webinar flyer. Event organised by M. Webber & T. Tonon as part of the SARTRAC project.

Professor Webber was afforded the opportunity to assess sargassum stranding on beaches near Harbour Branch, Fort Pierce, Florida and was able to collect specimens for comparison with the strandings in Jamaica.

Assessing sargassum seaweed on Florida shores near HBOI.

Sargassum continues to be a huge problem in Jamaica and the Caribbean but it is hoped that the algal biomass can be used to benefit the coastal communities where it is causing greatest damage. Professor Mona Webber is the lead sargassum researcher in Jamaica and has taken opportunities to highlight the issue of sargassum and its potential uses.

On-line Gleaner notice of an article written by Prof Webber on the sargassum problem

Professor Webber along with her overseas and local colleagues (including staff and students of the CMS/DBML) co-authored four journal articles in 2022 on the topic of sargassum.

List is given below:

Bam, W., Swarzenski, P.W., Maiti, K., Vassileva, E., Orani, A.M., Blinova, O., McGinnity, P., Adhikari, P.L., Haughton, M. and **Webber, M., 2022**. ***Scavenging of select radionuclides and trace elements by pelagic Sargassum in the Caribbean Sea***. *Marine Pollution Bulletin*, *179*, p.113658. https://doi.org/10.1016/j.marpolbul.2022.113658 5.553

Tonon, T.; Machado, C.B.; **Webber, M**.; Webber, D.; Smith, J.; Pilsbury, A.; Cicéron, F.; Herrera, Rodriguez, L.; Jimenez, E.M.; Suarez, J.V.; et al. **2022**. ***Biochemical and Elemental Composition of Pelagic Sargassum Biomass Harvested across the Caribbean***. Phycology (2) 204–21 https://doi.org/10.3390/phycology2010011

Carla Botelho Machado, Gina-Marie Maddix, Patrice Francis, Shanna-Lee Thomas, Jodi-Ann Burton, Swen Langer, Tony R. Larson, Robert Marsh, **Mona Webber**, Thierry Tonon. **2022**. ***Pelagic sargassum events in Jamaica: morphotype abundance, provenance, and influence of sample preparation on biochemical composition.*** Science of the Total Environment Vol. 817(2022). *https://doi.org/10.1016/j.scitotenv.2021.152761* 7.963**.**

Camilo Trench, Shanna-Lee Thomas, Delroy Thorney, Gina-Marie Maddix, Patrice Francis, Hugh Small, Carla B. Machado, Dale Webber, Thierry Tonon and **Mona Webber. 2022.** ***Application of stranded pelagic sargassum biomass as compost for seedling production in the context of mangrove restoration.*** Frontiers in Environmental Sciences. Sec. Conservation and Restoration Ecology. https://doi.org/10.3389/fenvs.2022.93229 5.411

2. Health Status of North Coast Critically Endangered Coral- *Acropora palmata*

The Health Status of North Coast Critically Endangered Coral- *Acropora palmata* research project has captured imagery from eight (8) sites across the parishes of Trelawny, St. Ann and Portland during the reporting period. Over 80,000 pictures were taken during the sampling period. The pictures will be used to construct 3-dimensional models from which important parameters will be measured facilitating assessment of the corals which will be used to describe the health status of the reef. The models will be constructed under the supervision of Professor Stuart Sandin, the Oliver Chair in Marine Biodiversity and Conservation Science at the University of California- Scripps Institute of Oceanography. The JMSS Chair funds were used to send graduate student and staff member Ms. Gina-Marie Maddix to Scripts to learn how to construct the models from her underwater pictures. The models will also be used in outreach activities.

Graduate student Ms. Gina-Marie Maddix (right) and Ms. Shanna-lee Thomas, Discovery Bay Marine Laboratory (left) capturing *Acropora palmata* imagery from the White River Fish Sanctuary. (Source: Belinda Morrow)

Ms. Shanna-Lee Thomas capturing imagery of *Acropora palmata* to be used to create 3D models. (Source: Gina-Marie Maddix)

Student & Staff Development & Enrichment

Information is a source of learning. But unless it is organized, processed, and available to the right people in a format for decision making, it is a burden, not a benefit. - C. William Pollard.

1. Training of interns at the UWI- Department of Life Sciences

Professor Webber coordinates the Department of Life Sciences Internship course (BIOL3412) which aims to expose final year students to areas of work related to their degree so they can be more ready for the job market or explore potential areas of research for the next phase of their career.

This academic year saw 20 final year Life Sciences students registering for the Internship course.

One such student (who is also a member of the technical staff in Life Sciences) worked with the Centre for Marine Sciences and was therefore exposed to data collection and processing for environmental research The JSMSS funds provided stipends and research support for some of these students.

Intern and DLS technician Ms. Lydia Gooden measuring the diameter at breast height of a black mangrove tree and processing samples for blue carbon analysis.(Source: Patrice Francis)

2. Staff Development & Enrichment (including improving laboratory facilities)

R-Statistics Course- The University of the West Indies (St. Augustine Campus)

Through the support of the GKF-JMSS Chair funds, Ms. Patrice Francis (Centre for Marine Sciences- Senior Scientific Officer & Graduate student) and Ms. Devannie Lyew (Graduate Student) were able to receive training by the UWI- St. Augustine campus in R-Course Statistics, through an on-line course. This will improve and enhance the analysis of the research being undertaken.


THE UNIVERSITY OF THE WEST INDIES

FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF MATHEMATICS & STATISTICS

Certificate of Participation

has been presented to

Patrice Francis

for participating in the

R (Intermediate Level) Online Short Course

July 18th – July 24th 2022 (14 contact hours)

Dr. Brian Cockburn
Dean
Faculty of Science & Technology

Dr. Vrijesh Tripathi
Head
Department of Mathematics and Statistics

THE UNIVERSITY OF THE WEST INDIES

FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF MATHEMATICS & STATISTICS

Certificate of Participation

has been presented to

Devannie Lyew

for participating in the

R (Beginner Level) Online Short Course

July 11th – July17th 2022 (14 contact hours)

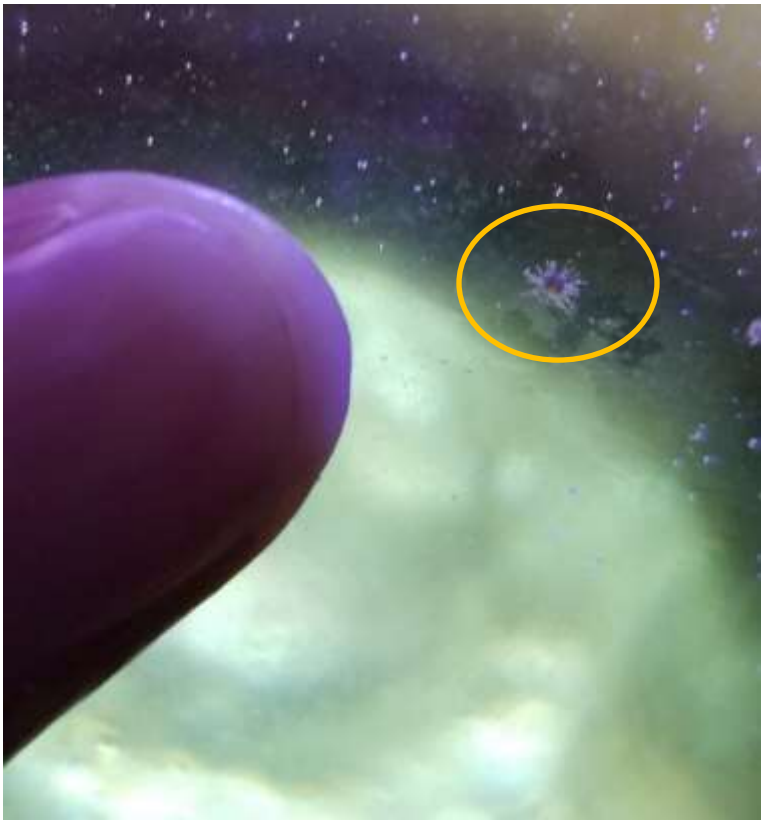
Dr. Brian Cockburn
Dean
Faculty of Science & Technology

Dr. Vrijesh Tripathi
Head
Department of Mathematics and Statistics

Certificates of Participation in The UWI-St. Augustine R-Course Statistics for Ms. Patrice Francis and Ms. Devannie Lyew.

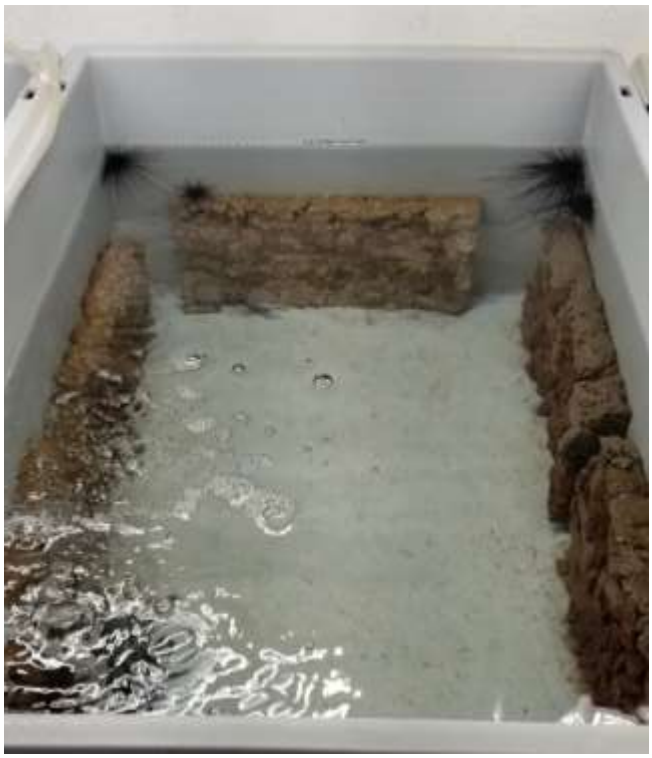
Diadema **Disease Workshop- SABA Island**

The rapid and widespread death of the long-spine sea urchins (*Diadema antillarum*) a major reef herbivore, was first observed in February, 2022 in the U.S. Virgin Islands and had spread as far west as to Jamaica, almost immediately. The sea urchin known for clearing algae from substrate allowing coral recruits to settle mysteriously disappeared from some sites for the first time in 30 years. The Dutch Caribbean Nature Alliance led by the University of Applied Sciences Van Hall Larenstein (VHL) hosted a sea urchin restoration workshop between April 5th and 6th on Saba. This workshop helped 21 coral experts from the Caribbean region and more than 65 online attendants, to obtain a comprehensive view of the overall situation of the Diadema sea urchin in the Caribbean, including the current die-off events and new restoration techniques. Through the support of the GKF-JMSS Chair funds, Ms. Shanna-Lee Thomas (Chief Scientific Officer-The Discovery Bay Marine Laboratory) was able to attend the training workshop and the knowledge gained will certainly assist in Jamaica's efforts in protecting and conserving the very important herbivores.



Diadema antillarum juvenile on the surface of one of the tanks at the workshop. (Source: Shanna-Lee Thomas)

Ms. Shanna-Lee Thomas beside an artificial reef with *Acropora cervicornis* corals attached. (Source: Kimani Kitson-Walters)



Diadema antillarum adults growing in a raceway after being transported as juveniles from the settlement tanks. (Source: Kimani Kitson-Walters)

Georgia Aquarium Visit

Georgia Aquarium is a public aquarium in Atlanta, Georgia, United States. It exhibits hundreds of species and thousands of animals across its seven major galleries, all of which reside in more than 11 million US gallons of water. Dr. Camilo Trench, Academic Coordinator at the UWI-Discovery Bay Marine Laboratory represented the lab and the Centre for Marine Sciences in a recent trip to the Georgia Aquarium. The Georgia Aquarium will like to partner with the University of the West Indies on several new initiatives including coral research. Dr. Trench met with Dr. Dayne Buddo, Director of External Engagement and other members of staff. This initiative was supported by the GKF-JMSS Chair funds.

Dr. Camilo Trench (left) meets with Georgia Aquarium staff members including Dr. Dayne Buddo (second right).

Laboratory Equipment and Supplies

The Life Sciences laboratory (Block C, Lab 6) assigned to the JSMSS Chair was in need of a fume hood to facilitate the processing of microplastics samples as well as the rehabilitation of the Milli-Q (Millipore) deionised water system for use in the preparation of chemicals for processing of oyster

samples for heavy metal analysis. The JSMSS funds facilitated purchase, refurbishing and installation of these items.

Portable (ductless) fume hood set up in Lab 6, Block B, UWI (Mona).

Lab 6- Deionised water system now operational

Outreach Opportunities

"In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught." Baba Dioum.

Faculty of Science & Technology: The Professor Speaks Lecture Series

The UWI- Faculty of Science and Technology, The Professor Speaks lecture series provides an opportunity for faculty members at the rank of Professor to speak on a topic of national and regional importance. The second of such lectures was delivered by the JMSS Chair, Professor Mona Webber, Professor of Marine Biology under the title, “Mangroves, Microplastics and Sargassum; What’s the Connection?” on Thursday, October 28, 2021.

The event was streamed live on the Faculty’s YouTube Channel.

University of Texas (UT) and Negril Education Environment Trust (NEET) STEM summer camp for primary school teachers

Professor Webber was invited to deliver the main lecture at the University of Texas (UT) and Negril Education Environment Trust (NEET) STEM summer camp for primary school teachers. The camp was led by Dr. Melissa Kemp and Dr. Rowan Martindale from U of Texas. The six day programme included beach a clean-up activity, coral reef visits and exposure to other coastal environments in the Negril area. The lecture was streamed with the help of the JTC and MOEY to all primary schools across the island.

Financial Report

"Every hour a scientist spends trying to raise funds is an hour lost from important thought and research. — Isaac Asimov"

The expenditure for the reporting period is given below. We exceeded the yearly alocation but there were funds remaining from previous years that allowed us to accommodate the overexpenditure.

Table of Expenditure for 2021/22 reporting period.

Expenditure	Activity	Amount
Accountable Advance	Research: Above/ Belowground mangroves	$ 282,072.62
Accountable Advance	Travel expenses & vehicle repair	$ 251,474.51
Accountable Advance	Acropora palmata research Bonaire mangrove conference Vehicle repairs	$ 263,915.86
Accountable Advance	Onset Weather Licence Vehicle repairs Statistics course Labware	$ 288,459.43
Accountable Advance	Travel Expenses Lab equipment repairs	$ 202,317.93
Accountable Advance	Travel Expenses FADs Research Hyperbaric Safety Director Course	$ 251,921.82
Accountable Advance	Acropora palmata research Beach licence	$ 250,315.58
Accountable Advance	SABA Diadema workshop Fume hood installation	$ 295,332.73
Accountable Advance	FADs Research Georgia Aquarium visit & consultation ISBW 14 seagrass registration	$ 308,695.74
Accountable Advance	Acropora palmata research Travel expenses	$ 299,811.99
Accountable Advance	Travel Expenses Lab equipment repairs	$ 253,584.53
Accountable Advance	Travel Expenses Internship Research: Above/ Belowground mangroves	$ 250,719.33
Equipment & Supplies	Air Sciences: Fume Hood Marine Delta International: Floats for FADs Research ICENS: Water Sample testing Forestry Suppliers: YSI VH Cooke & Son Custom broker	$ 2,924,653.14
Subsistence	Foreign travel to Mangrove, Seagrass & Diadema conference	$ 813,215.56
Travel	Boat use for Acropora palmata research	$ 37,048.80
Fees	Bursary	$ 900,000.00
Total		$ 7,873,539.57

September, 2022