ANNUAL REPORT 2022-2023

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JAMAICA, WEST INDIES

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Introduction

As we continue to emerge from the restrictions of the COVID-19 pandemic and regain a sense of normalcy, activities undertaken by the James S. Moss Solomon Senior (JSMSS) Chair through funding provided by the Grace Kennedy Foundation (GKF) in face-to-face mode continue to improve and develop steadily. Several Marine Science MSc, MPhil and PhD students (some of whom are also staff members) were able to continue their fieldwork and laboratory processing through the support of the GKF-JSMSS funds. The August 2022-July 2023 academic year included significant advancements in existing projects, new partnerships and an exciting new project beyond Jamaican waters. For the first time, the JSMSS Chair supported the emergence of a new project studying the efficacy of lionfish control in a marine protected area (MPA) off the coast of Belize. This excellent initiative marks the start of meaningful partnerships with fisheries and other organizations across the region; extending the reach of the Foundation.

Activities, both new and recurring, are focused around environmental stewardship, including numerous opportunities to speak at, or participate in both online and face-to-face fora (conferences, workshops, presentations and meetings). The *Acropora palmata* assessment project achieved significant milestones as a new technology has been applied to the study, through formal training, for an enhanced assessment of this critically endangered coral species. Other projects achieving new milestones were the efficacy of mFADs project, where new FADs were established in the Black River site and the completion of the assessment of effect of *Sargassum* treatments on food crops. Mangrove monitoring initiatives originating from KHEAM mangrove rehabilitation projects conducted in the Port Royal Mangroves and the Palisadoes tombolo, have been continuing steadily and great success in seedling growth and survival has been recorded in the past year. Notable achievements also include the production of three journal articles and a technical report derived from *Sargassum* projects.

Twenty-three interns accessed the 2022/23 Internship course coordinated by Professor Webber. These were employed at a range of agencies (**Alligator Head Foundation; Coastal Zone Management Division, Barbados; Discovery Bay Marine Laboratory- DBML; Environmental Foundation of Jamaica- EFJ; Environmental Research Institute of Charlotteville- ERIC, Tobago; Forestry Department; Jamaica Public Gardens; Jamaica**

Conservation Development Trust- JCDT; Plant Quarantine- Produce Inspection Division; Rural Agriculture Development Authority- RADA; St Kits Sea Turtle Monitoring Network; Scientific Research Council- SRC). There were also two interns employed by the CMS who benefitted directly from GKF-JSMSS funds used to provide them with stipends. These assisted with mangrove field work and processing of samples for carbon stocks towards the determination of blue carbon.

Overall, the activities supported by the GKF-JSMSS funds have aligned the missions and visions of the GKF-Foundation, Centre for Marine Sciences, the Discovery Bay Marine Laboratory and the Department of Life Sciences. Despite continued challenges, this reporting period has proven to be successful, benefitting ~28 persons (interns, graduate students, staff) directly and reaching ~250 (through seminars, workshops, conferences) with the message of environmental sustainability.

Outreach, Partnerships and Research Projects

Publications

Professor Mona Webber co-authored three journal articles and one technical report in the reporting year on the topic of *Sargassum*, as well as one article on women leaders within marine research. Below is the list of articles:

Marsh R, Skliris N, Tompkins EL, Dash J, Dominguez Almela V, Tonon T, Oxenford H, **Webber M.** 2023. "Climate-sargassum interactions across scales in the tropical Atlantic." *PLOS Climate* 2, *no.* 7 (July): e0000253. https://doi.org/10.1371/journal.pclm.0000253

R J Shellock, C Cvitanovic, M C McKinnon, M Mackay, I E van Putten, J Blythe, R Kelly, P Tuohy, K M Maltby, S Mynott, N Simmonds, M Bailey, A Begossi, B Crona, K A Fakoya, B P Ferreira, A J G Ferrer, K Frangoudes, J Gobin, H C Goh, P Haapasaari, B D Hardesty, V Häussermann, K Hoareau, A-K Hornidge, M Isaacs, M Kraan, Y Li, M Liu, P F M Lopes, M Mlakar, T H Morrison, H A Oxenford, G Pecl, J Penca, C Robinson, S A Selim, M

Skern-Mauritzen, K Soejima, D Soto, A K Spalding, A Vadrot, N Vaidianu, **M Webber**, M S Wisz. 2023. “Building leaders for the UN Ocean Science Decade: a guide to supporting early career women researchers within academic marine research institutions.” *ICES Journal of Marine Science* 80, no.1 (January): 56-75. https://doi.org/10.1093/icesjms/fsac214

Trench, Camilo, Shanna-Lee Thomas, Delroy Thorney, Gina-Marie Maddix, Patrice Francis, Hugh Small, Carla Botelho 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 Science* 10 (September): 932293. https://doi.org/10.3389/fenvs.2022.932293.

Victoria Dominguez Almela, Kwasi Appeaning Addo, Jack Corbett, Janice Cumberbatch, Jadu Dash, Robert Marsh, Hazel Oxenford, Thierry Tonon, Sien Van Der Plank, **Mona Webber** and Emma L Tompkins. 2023. “Science and policy lessons learned from a decade of adaptation to the emergent risk of sargassum proliferation across the tropical Atlantic.” *Environmental Research Communications* 5, no. 6 (June). DOI: 10.1088/2515-7620/acd493.

Haye, Dannielle; Young, Robyn; **Webber, Mona**; Tonon, Thierry; Chinthapalli Bhaskar Rao 2023. A comparative study on the effect of *Sargassum* soil amelioration on seed germination and seedling growth of corn (*Zea mays*), scotch bonnet pepper (*Capsicum chinense*) and tomato (*Solanum* sp.). Centre for Marine Sciences, the University of the West Indies, Mona Campus, Jamaica Technical Report. CMS03-2023 (37pp) April 2023.

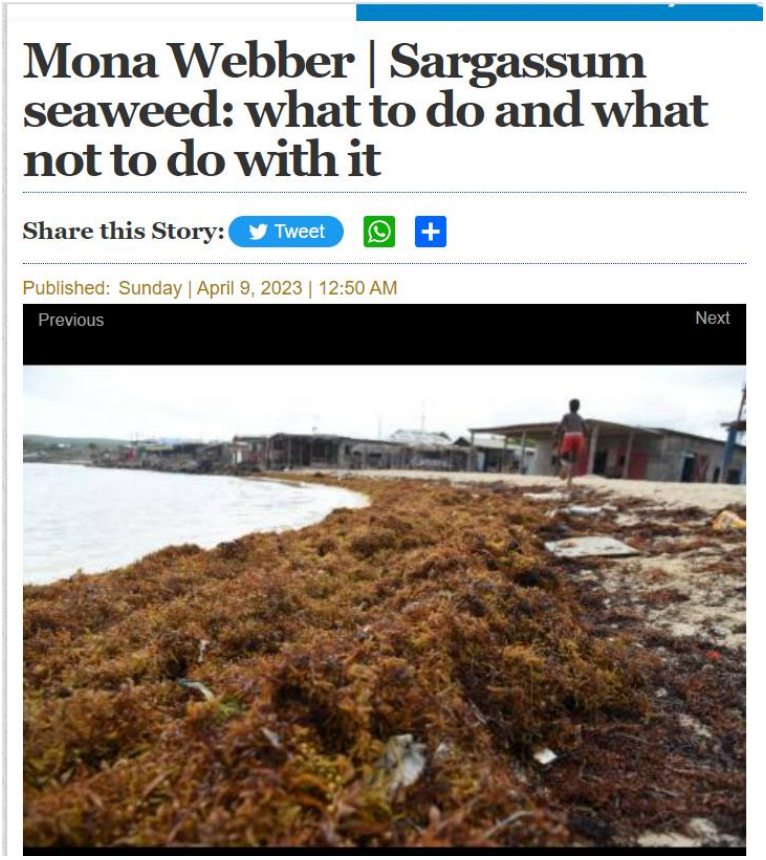
Interviews

Prof Mona Webber was interviewed by Newstalk 99fm/The Bridge 99fm (New York) on March 22, 2023 and spoke about *Sargassum* and The World Water Crisis.

Prof Mona Webber spoke at the ICENS celebration of Women Scientists on International Women’s Day- March 8, 2023.

Media Article

Prof Mona Webber authored an article that was published in the Sunday Gleaner on how sargassum can be used and more importantly how it should not be used "*Coastal communities should also be advised NOT to collect sargassum and boil it into a drink as is done with 'Irish moss'. Irish moss is from a group of marine red algae mostly from the genus Gracillaria. Sargassum seaweed is brown (golden brown) algae from the genus Sargassum. The types of seaweed are NOT the same*." This is particularly important as coastal communities were beginning to use sargassum (which is high in arsenic) as they would use other beneficial seaweeds.



Mona Webber | Sargassum seaweed: what to do and what not to do with it

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Published: Sunday | April 9, 2023 | 12:50 AM

Previous Next

Gleaner article on *Sargassum* research.

Visits

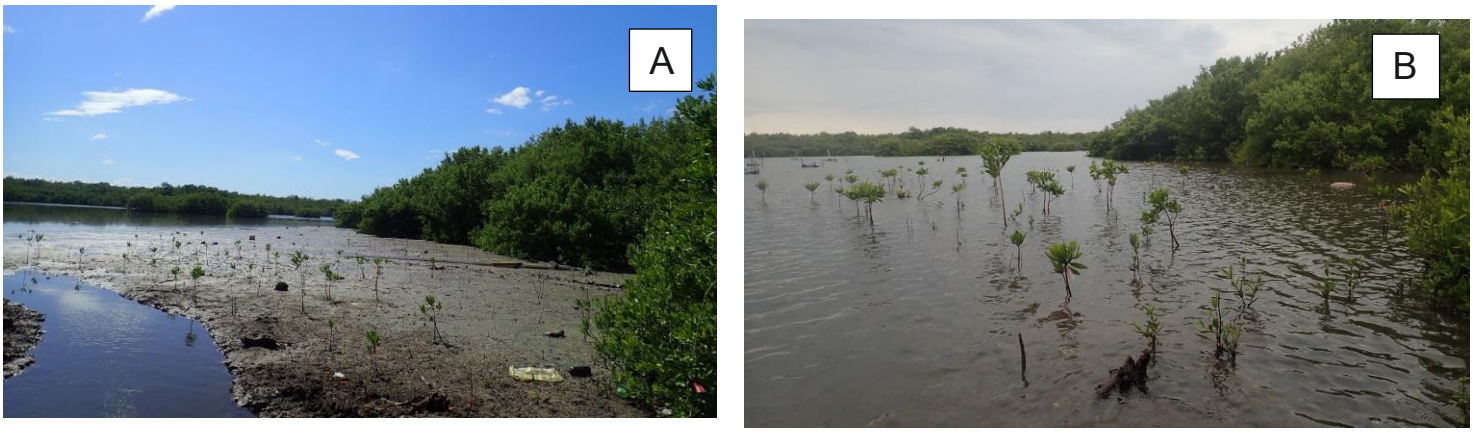
Mr. Saul Perez Pijuan, International Atomic Energy Agency (IAEA) Section Head for the Technical Cooperation Department for Latin America and the Caribbean and Mr Ryan Bolt, IAEA Trainer visited the Centre for Marine Sciences', Discovery Bay Marine Laboratory on April 27, 2023. Presentations were made by Prof Mona Webber, Mrs Marcia Creary-Ford and Ms. Shanna-Lee Thomas on the work of the CMS and DBML, respectively. The visitors were taken on a boat tour of the Discovery Bay SFCA. Prof. Webber was afford a visit to IAEA's Monaco and Vienna laboratory to observe the operations of the IAEA and to foster a relationship for future projects.

Images: Profs. Mona and Dale Webber alongside IAEA representatives (top left and right) in Monaco; Prof Mona at the OA-ICC (bottom left) in Monaco and the UN in Vienna (bottom right). (Photos courtesy of: Prof. Mona Webber)

Images: IAEA and PIOJ visit to the Discovery Bay Marine Laboratory in Jamaica. (Photos courtesy of: Prof. Mona Webber)

Mangrove Monitoring Initiatives: KHEAM Gallows Point Red Mangrove Rehabilitation Monitoring & Implementation of Eco-System Adaptation Measures for the Kingston Harbour

Consequent to the completion of the Gallows Point Mangrove Rehabilitation Project in October 2022, overall improvement in health of seedlings planted since June 2022 has been observed, i.e. increase in height, number of nodes and improved health. The physiochemical conditions (decrease in salinity from >100 to 30 ppt; tidal movement) have also improved and are now conducive to the continued success of introduced seedlings as well as facilitating natural recruitment from the surrounding forest. The wetland at Gallows Point has seen improvements in hydrology which have resulted in tidal flushing of the degraded mangrove area, thus allowing nursery grown seedlings to survive. Mangrove rehabilitation is a complex and slow process; however it is believe that the planted seedlings, as well as the natural recruits found along the 2 ha area, will thrive as was seen on an adjacent degraded mangrove area on Refuge Cay.



Images: Photographs showing seedling surviving on Gallows Point at month 6 - December 2022 (A) versus 9 month - March 2023 (B) (Photo Credits: Patrice Francis)

The Implementation of Eco-System Adaptation Measures for the Kingston Harbour project which started just before the COVID-19 pandemic was completed in February 2023. The team led by Professor Mona Webber, Ms. Patrice Francis (Senior Scientific Officer) and Mr. Anthony Johnson (Outreach Officer) executed and completed the following tasks over the three year period:

1. Collection of over 20,000 seeds and propagation of 15,000 for replacement of seedlings used during project cycle (Figure A)
2. Restoration of 15 hectares of mangroves through hydrological restoration and replanting of seedling at various sites (Figure B)
3. Monitoring and conservation of 250 hectares of mangroves with assistance of community youths from Port Royal, private sector, service clubs and Life Sciences students (Figure C)
4. Training of mangrove warden team and other community members
5. Final project conference presentation highlighting the challenges, solutions and lessons learnt in restoring the mangroves of Kingston Harbour

Fig. A: Seedlings grown in the mangrove nursery by KHEAM community members (Photo Credits: Anthony Johnson)

Fig. B: Drone image of Refuge Cay showing growth in mangroves from July 2021 to July 2022 (Photo Credits: Darren Fletcher)

Fig. C: KHEAM community members monitoring health of mangroves along Gun Boat Beach restoration site (Photo Credits: Anthony Johnson)

Teleconnected SARgassum risks across the Atlantic: building capacity for TRansformational Adaptation in the Caribbean and West Africa (SARTRAC)

"A comparative study on the effect of *Sargassum* soil amelioration on seed germination and seedling growth of corn (*Zea mays*), scotch bonnet pepper (*Capsicum chinense*) and tomato (*Solanum* sp.)."

In the final year of the SATRTAC project, Work Package Three: Agricultural Applications, SARTRAC WP3 Soil Amelioration experiments were completed with the assistance of Ms. Dannielle Haye, research associate. The use of *Sargassum* in agriculture, particularly in soil amelioration for crop plants has greatly increased in recent years due to its high macro and micronutrient content, moisture capacity, nutrient input and demonstrated improved seed, seedling and yield improvement effects. This research sought to explore the efficacy of exploiting Caribbean *Sargassum* inundations as a new resource for sustainable agricultural development. The research objectives were to investigate the effect of *Sargassum* soil amelioration treatments on seed germination and seedling growth on three different crops using traditional agricultural farming practices. These traditional farming practices relate to production of compost and mulch and the typical ratios used for application to soils. In addition to comparing *Sargassum* in compost or mulch form, the treatments would consider using *Sargassum* rinsed free of salt or un-rinsed. The comparative utility of the washed vs. unwashed *Sargassum* would be of importance to local users as washing *Sargassum* with fresh water is expensive, time consuming and results in reduction in concentration of important plant nutrients (CARDI, 2015). Elemental analysis of Arsenic (As) concentrations was also conducted, as As occurs in *Sargassum* in high concentrations, which can be harmful to humans if consumed.

It was concluded that *Sargassum* media have varied positive effects on seed germination, seedling growth and the final biomass of crop plants as compared to commercial soil premixes. Rinsed compost media showed consistent favourable impacts across parameters and crop plants including shoot height, diameter and number of leaves, as well as post-harvest parameters. Results could further be improved by investigating underlying effects of the treatments in varied composite samples with soil to determine the exact degree of the effects and responses to the different proportions with additional and more sensitive statistical analyses. Future studies will involve the evaluation of vegetative biomass and reproductive yield as compared to synthetic fertilizers.

Prof. Mona Webber attended and presented at the two-day end-of-project conference (March 29 – 30) for the project - Adapting to Sargassum Risks in the Caribbean and West Africa, hosted at the University of South Hampton. She made three presentations on the UWI led aspects of the 3-year project:

14:30-15:00 (30 min)	**Effect of sargassum on seed germination and seedling growth of corn (*Zea mays*), scotch bonnet pepper (*Capsicum chinense*), and tomato (*Solanum sp.*)** *Prof Mona Webber, University of West Indies*
15:15-15:40 (25 min)	**Application of stranded sargassum compost in mangrove seedling production with heavy metal analysis** *Prof Mona Webber, University of West Indies*
15:40 -16:00 (20 min)	**Bio-methane potential (BMP) of co-digested sargassum with heavy metal analysis of the residue** *Prof Mona Webber, University of West Indies*

Images: Scotch bonnet pepper (*Capsicum chinense*) growth over time with *Sargassum* treatment. (Photos courtesy of: Presentation by Dannielle Haye, Carla Botelho Machado, Thierry Tonon and Mona Webber)

The workshop was blended with 22 virtual participants and 34 in-person at the University of Southampton (UK). Picture of the conference and project researchers is given below.

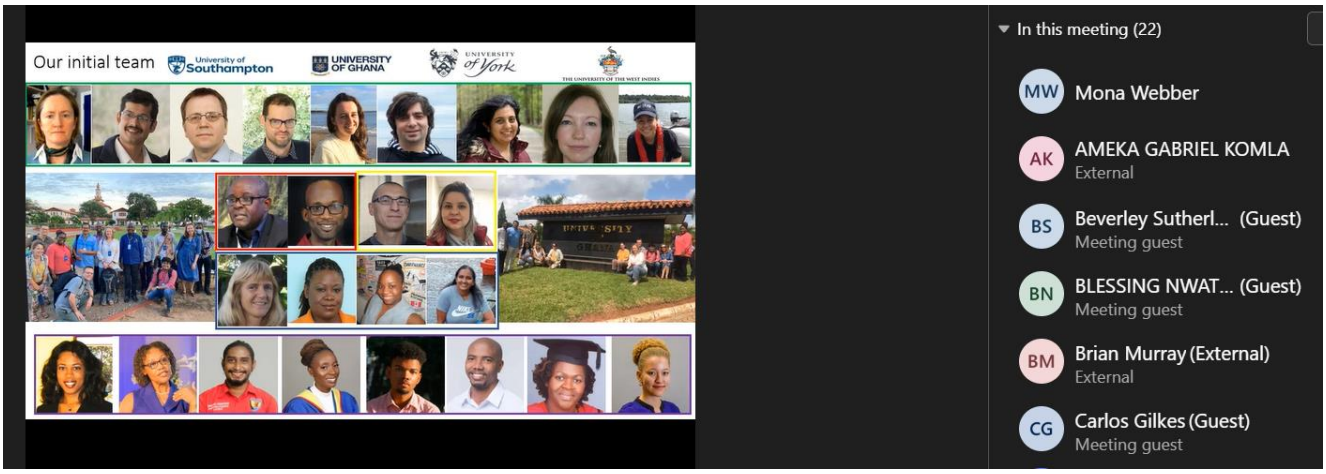
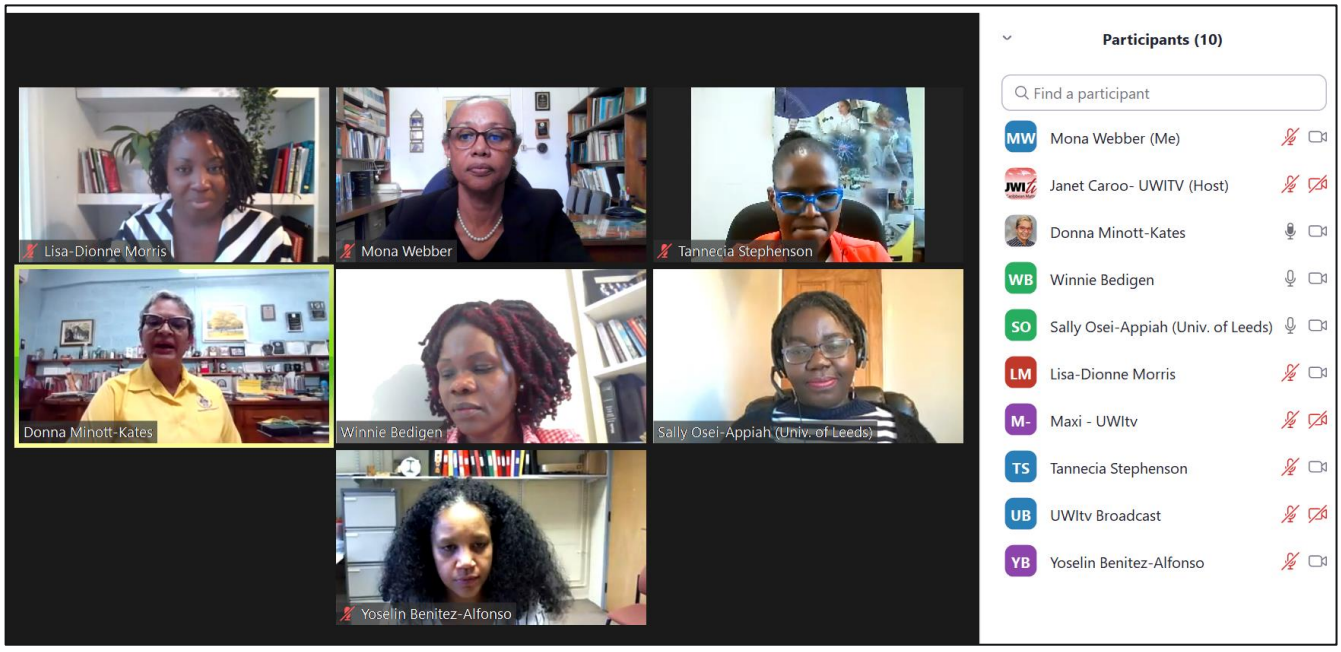


Image- SARTRAC final workshop in Southampton and on-line March 2023.

On March 30, 2023 Professor Mona Webber participated in the Professor speaks Lecture series- "Let the Research Speak for Itself" Celebrating the accomplishments of female professors and senior female academics in the UK, Africa and the Caribbean. The talk was streamed live on You Tube to over 100 viewers in several countries.



Let the Research Speak participants (speakers and host).

MPhil Research Project: *Determination of the Efficacy of Moored Fish Aggregating Devices (mFADs) in Jamaican Waters*

Fish Aggregating Devices (FADs) are floating structures that are intentionally deployed offshore to attract pelagic fish (NOAA, 2017). The mFADs used during this project are made from four subsurface floats and 15, three-foot-long rope appendages which are attached to a mooring made from a concrete-filled vehicle tyre. A PADI Advanced Open Water diver certification was deemed necessary for data collection and mFAD deployment for the Black River sites, and through the funding provided by the JMSS Chair, Graduate student, Jonathan Morris was able to attain this dive training, as well as diving and fishing gear to execute his methodology in 2023. The mFAD sites in Black River were established in February, the devices were assembled and deployed in April and fortnightly visual surveys alongside experimental fishing trips began in May. Fish have been observed and caught around the mFADs in Black River as well as in Port Royal. A total of 12 species have been seen around the mFADs and another 3 species have been caught during the experimental fishing. Data collection will continue on a fortnightly basis until one (1) year's worth of data has been amassed.

Images: Jonathan Morris measuring his catch and showing the largest fish caught. (Photo Credits: Prof. Mona Webber)

Images: Various fish species observed around the mFADs in the Port Royal Cays (Photo Credits: Paul Kisson and Jonathan Morris.)

MPhil Research Project: *An Assessment of Microplastic and Heavy Metal Contamination of the Port Royal Mangroves, Kingston Harbour*

Contaminants such as heavy metals and microplastics are ever-present in our environment, continually posing several threats to aquatic and terrestrial organisms, including humans. These contaminants are amplified in small island states, such as Jamaica, due to their geographical location. Thus, they affect our economies as we heavily depend on tourism, fisheries, and trade as our main sources of income. Therefore, this study, conducted by graduate student Devannie Lyew, was designed to provide baseline data on the levels of microplastic and heavy metal contamination in different areas and species of the Port Royal mangroves in Kingston Harbour.

From September 2022 to August 2023, samples have been analysed to assess the concentrations of heavy metals and microplastics, as well as general water quality conditions. The results are currently being collated. The samples include whole water, zooplankton, and phytoplankton samples, as well as oyster and sediment collections. Heavy metal samples were analysed by International Centre for Environmental and Nuclear Sciences (I.C.E.N.S.), while the water quality conditions and microplastic samples were assessed by the Department of Life Sciences, UWI. In addition, Devannie attended a regional training course in Santa Marta, Colombia, on monitoring of microplastics in marine ecosystems using nuclear analytical techniques.

Images: Research student, Devannie Lyew, in the field collecting oyster samples in Port Royal (left) and plankton (middle) samples with a manta trawl in Santa Marta, Colombia, as well as conducting sediment analyses (right) (Photo Credits: Anthony Johnson and Greg Michel).

Ph.D. Research Project: *An assessment of the impact of global climate change on coral reefs in Jamaica and evaluation of potential strategies for rehabilitation*

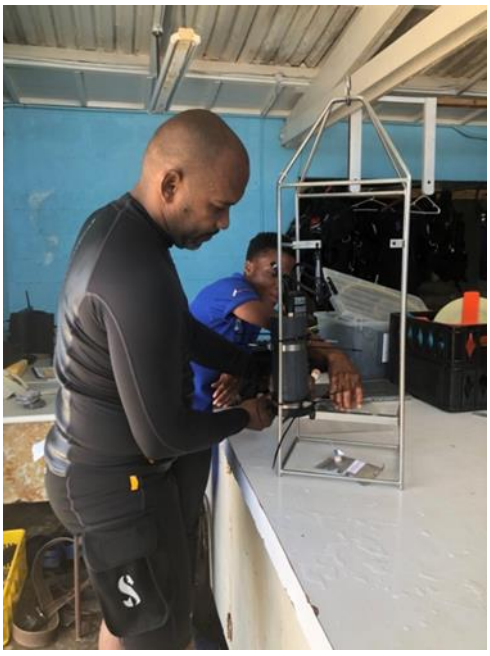
This project is focused on the investigation of ocean acidification in the coastal waters of Jamaica. Ocean acidification (OA) refers to the reduction in the pH of the ocean over an extended period of time due to an increase in uptake of carbon dioxide (CO_2) from the atmosphere. This process affects the oceans, as well as marine organisms' (such as corals and shellfish) capability to absorb the calcium carbonate from the water, which is required for their survival. The objectives of the project are:

- To measure pH and Total Alkalinity through the collection and analysis of discreet seawater samples and to use these values to calculate the other seawater carbon species.
- To measure in situ pH and temperature using the iSAMI sensor to determine the temporal variation of these parameters.
- To measure salinity, temperature and depth using the CTD sensor in support of data obtained from the seawater samples and the iSAMI sensor.
- To make data available through the GOA-ON data portal and also fulfil the requirements of the United Nations' Sustainable Development Goal 14.3.1 for Jamaica.
- These measurements will establish a baseline of CO2 in the coastal waters of Jamaica, towards the development of a time-series of dataset to better discern changes in OA over time.

Through the support of the JMSS Chair funds, Ph. D. graduate student Marcia Creary-Ford, supervised by Prof. Mona Webber, was able to set up trial ocean acidification experiments between January – February 2023 to test the possible effects of various temperatures on corals (see figures below). No coral fragments survived the trial experiments due to poor water quality and as such, the experiments will be repeated in the next academic year to determine the temperatures and pH concentration at which corals in Jamaica will be greatly affected by ocean acidification. Support was also provided to the University of the West Indies (UWI) for Marcia Creary-Ford and Nichole Sang-Prescott, graduate student in the Department

of Life Sciences to attend both the Regional Symposium and the Advanced Training Workshop.

Images: Experimental set up (left) with coral fragments in tank (right) (Photo Credits: Marcia Ford)



Images: Preparing the iSAMI and CTD sensors for deployment by Dr Camilo Trench, Shanna-Lee Thomas (left) (Photo Credits: Marcia Ford). The iSAMI and CTD sensors on the dock ready for deployment (left) (Photo Credits: Marcia Ford)

Images: The iSAMI and CTD sensors deployed in the back reef at Discovery Bay, Jamaica (left) (Photo Credit: A. Johnson) by deployment team Anthony Johnson and Oneil Holder (right).

Images: Lab equipment for total alkalinity titrations (left) and spectrophotometric pH analysis (right). (Photo Credits: Marcia Ford).

Images: Analysis of pH carried out by Gina-Marie Maddix and Abigail Richards (left) (Photo credit: Marcia Ford). Analysis of Total Alkalinity carried out by Marcia Ford (right). (Photo credit: Abigail Richards)

Ph. D. Research Project*: Examining a Social Ecological Systems approach to marine invasive species: a novel model for lionfish control in Belize*

The invasive lionfish features in nearly every tropical marine ecosystem in the Western Atlantic. Data on the status and threat of lionfish is lacking in vulnerable areas, making it difficult to implement effective management. The eradication of lionfish is no longer considered possible in their invaded range, so strategies must now focus on lionfish population suppression as a solution to alleviate vulnerable coral reef communities.

Fabian Kyne has undertaken this Ph.D. project, in partnership with the Belize Fisheries Department, University of the West Indies, Jamaica, University of Alberta, Canada and local conservation partners to pilot and evaluate a novel conservation management strategy that sets out a framework for integrating ecological, economic, and social goals for managing invasive species across Belize. It is anticipated that by developing management targets that link invader densities with ecological impacts, meaningful targets for suppression that address wide scale geographic and environmental variation can be established.

We hope that by using the best available science and the precautionary principle, conservation managers can use this information to prioritize sites, create removal targets and direct efforts towards areas identified as vulnerable to the impacts of the lionfish invasion. This is an important benefit for conservation practitioners and policy-makers seeking to allocate resources in a way that sustains sufficient invasive species control over the long term, in priority habitats.

Fabian has trained **over 30** coastal stakeholders (fishers, rangers, MPA managers) in lionfish ecological monitoring and control activities. He also presented at the Belize Marine Fund Conference on August 18, 2022 and gave a seminar at the University of Alberta, Canada on March 24, 2023. Fabian received funding through JSMSS support to conduct lionfish survey research activities in December 2022.

Images: Fabian Kyne SCUBA diving for data collection (left) and with his research team (right) (Photo Credits: Celso Sho)

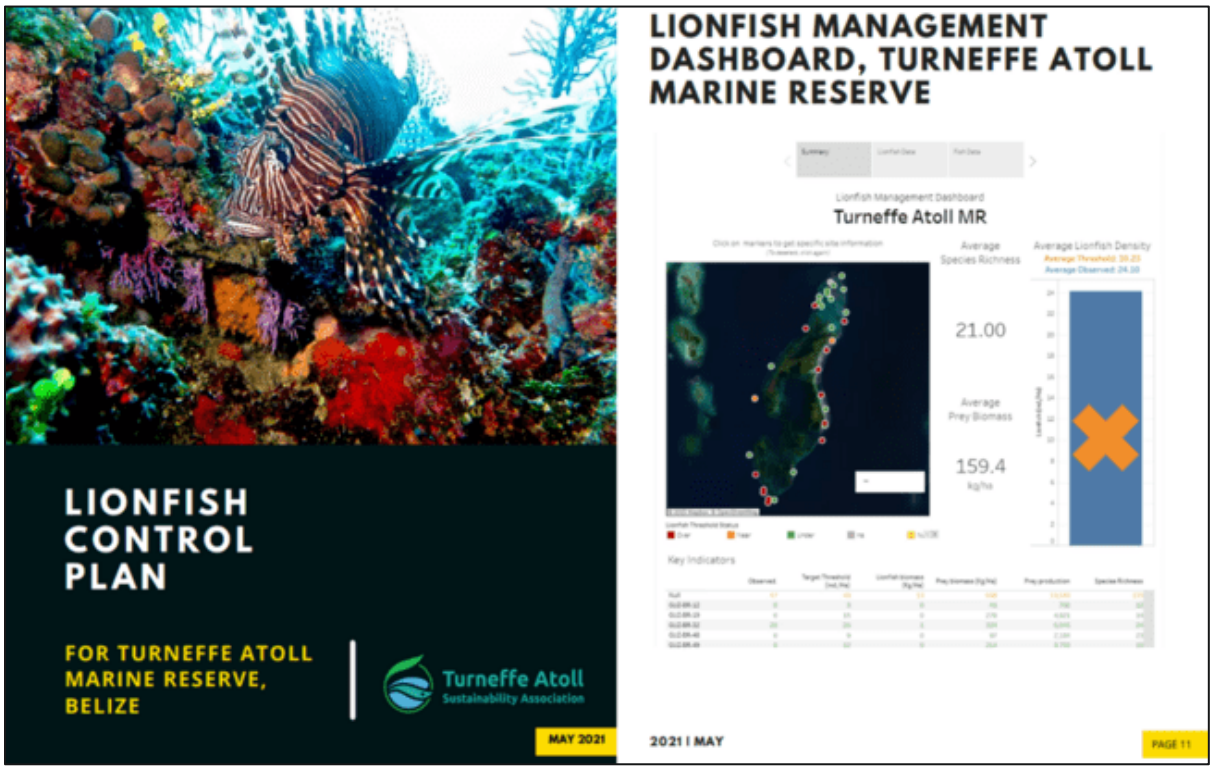


Image: Lionfish control plan for Turneffe Atoll Marine Reserve, Belize (Courtesy of: Blue Ventures)

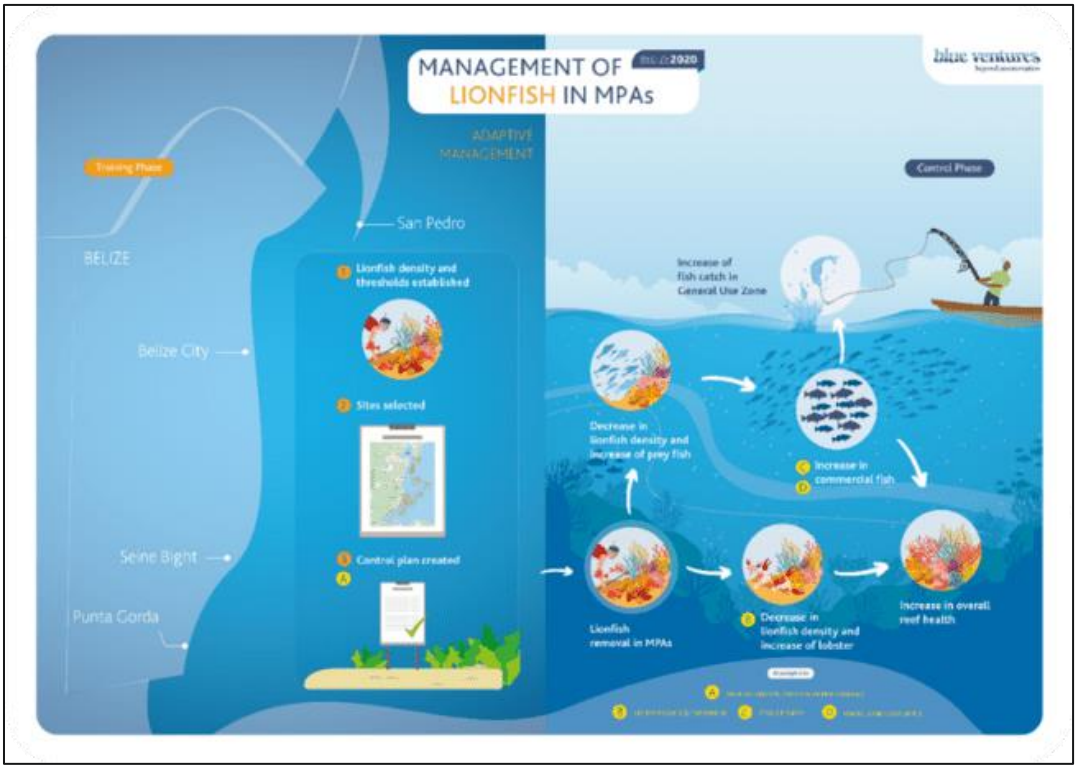


Image: Management of Lionfish in Marine Protected Areas (MPAs) model (Courtesy of: Blue Venutres)

Undergraduate and M. Sc. Research Supervision and Assistance

As coordinator for undergraduate projects, Professor Webber provided funding to complete the undergraduate research entitled “Post-Rehabilitation Assessment of Hurricane-Damaged Mangrove Forests in Malcolm’s Bay, St. Elizabeth” by Khianna Lee supervised by Dr. Camilo Trench. She also provided guidance to the student to complete the research paper.

Prof. Webber also supervised four students and co-supervised two in the MSc: Natural Resource Management- Marine and Terrestrial Ecosystem 2021-2023 cohort. The following are the titles of the research projects:

Students supervised and project titles:

- Ms. Eartha Cole- An Assessment of the Peat Stored (Carbon Stocks) Below Different Ecological Areas of Mason River Protected Area (MRPA) Under Wet and Dry Conditions, Clarendon Jamaica, W.I. *Supervised along with Ms Patrice Francis*.
- Ms. Olivia Bispott- Variability in Seagrass carbon in different areas of the Palisadoes and Port Royal Protected area, Jamaica. *Supervised along with Ms Patrice Francis*.
- Mr. Donavan Sankey- Assessing the use of Stranded Pelagic *Sargassum* Biomass as Compost for Red Mangrove Seedling Growth in the Context of Mangrove Restoration in Jamaica.
- Ms. Xiomara Granger- Seagrass Chlorophyll a variability in different areas of the Palisadoes and Port Royal Protected area and at varying depths in the Port Royal Cays.
- Ms. Tonya King- An assessment of dive tour earnings from selected Jamaican Coral Reefs towards quantifying their blue economy potential. *Supervised along with Dr Camilo Trench.*
- Mr. Felix Charnley- Testing the Performance of Scalable, Low Tech Reef Building Coral Propagation Techniques in Acute Swell Conditions in Discovery Bay, Jamaica. *Supervised along with Ms. Shanna-Lee Thomas.*

Graduate Student and Staff Development and Enrichment

SCRIPPS INSTITUTE OF OCEANOGRAPHY

MPhil Research Project: *A Comparative Assessment of the critically endangered Acropora palmata population located on the North Coast of Jamaica.*

The GKF JMSS Chair funds supported Ms. Gina-Marie Maddix, MPhil student during her travels to the Scripps Institute of Oceanography at the University of California San Diego, from August 26th-October 2nd, 2022. Ms. Maddix has been assessing the population of the *Acropora palmata* through the use of Photogrammetry technology and travelled to the institution to build the models from the over 960,000 photographs which she and her dive buddies had collected. Over the six weeks spent at the institution under the tutelage of Professor Stuart Sandin and Mr. Clinton Edwards (images below), Ms. Maddix constructed over 320 elkhorn coral models and over 15 reefscape plot models ranging from 50m x 50m to 50m x 70m. The 3D models represented corals from 12 different locations from the parishes of Trelawny, St. Ann and Portland.

At Scripps, Ms. Maddix was registered as a Visiting Graduate Student, where she had to be initially trained in the university's lab behaviour and policies. Her Photogrammetry training consisted of the following task:

1. Organizing and renaming the photos according to the format of the programme
2. Learning the Agisoft Metashape and Viscore software programmes
3. Constructing the 3D Models

Apart from being trained in photogrammetry, Ms. Maddix presented The History of Jamaica's Reefs at the Coral Club for the department. The first meeting of its kind since the pandemic. Over 20 supervisors and students were present for the presentation, after which Ms. Maddix answered questions from the audience. Ms. Maddix also had a meeting with Professor Forest

Rohwer and his team from the San Diego State University in which the team discussed how various approached from microbiology could assist in rehabilitating coral reefs. Ms Maddix also assisted with the daily maintenance of the laboratories fish tank.

Image: MPhil Student Gina-Marie Maddix presenting at the Scripps Institute Coral Club. (Photo Credits: Stuart Sandin)

Image: MPhil Student Gina-Marie Maddix assisting in the cleaning of the lab's fish tank which housed several pacific reef fish and outside the lab. (Photo Credits: Maria Lambre)

3D Models: Snapshots taken of the 3D models from the Photogrammetry Viscore Programme

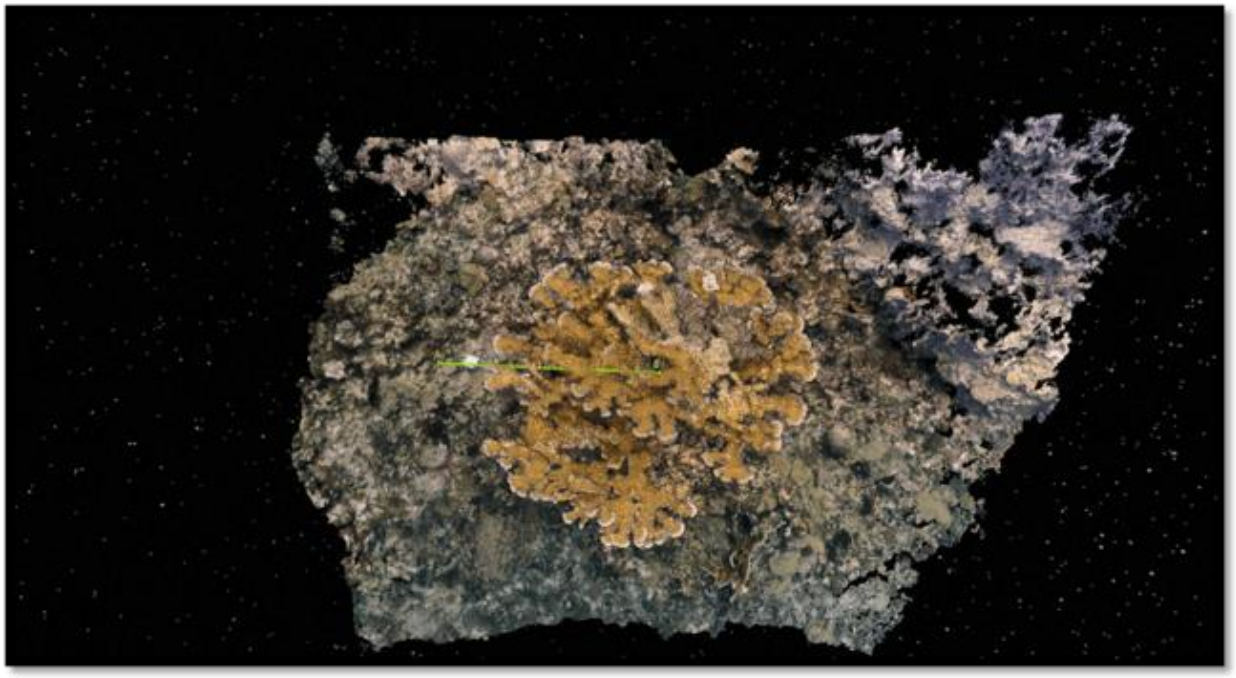


Image: Acropora palmata colony 01 located at Turtle Crawle site located in Portland. (Photo Credits: Gina-Marie Maddix)

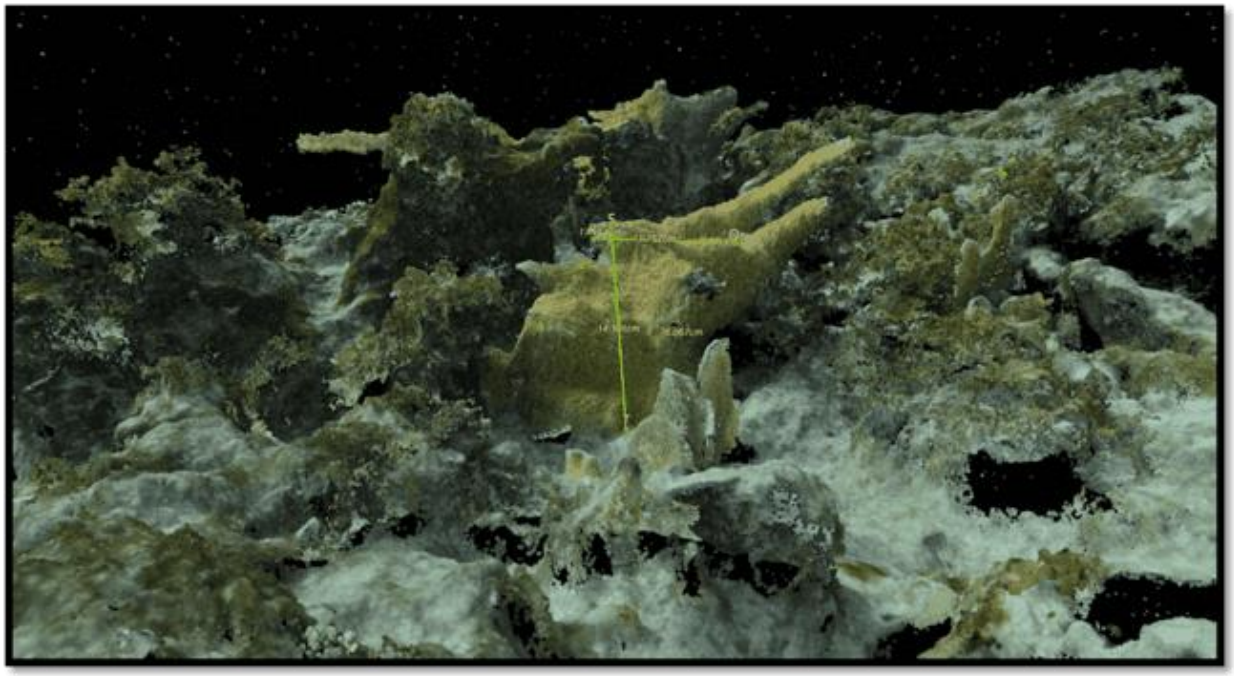


Image: Acropora palmata colony 03 located at Winnifred Beach Bay site located in Portland. (Photo Credits: Gina-Marie Maddix)

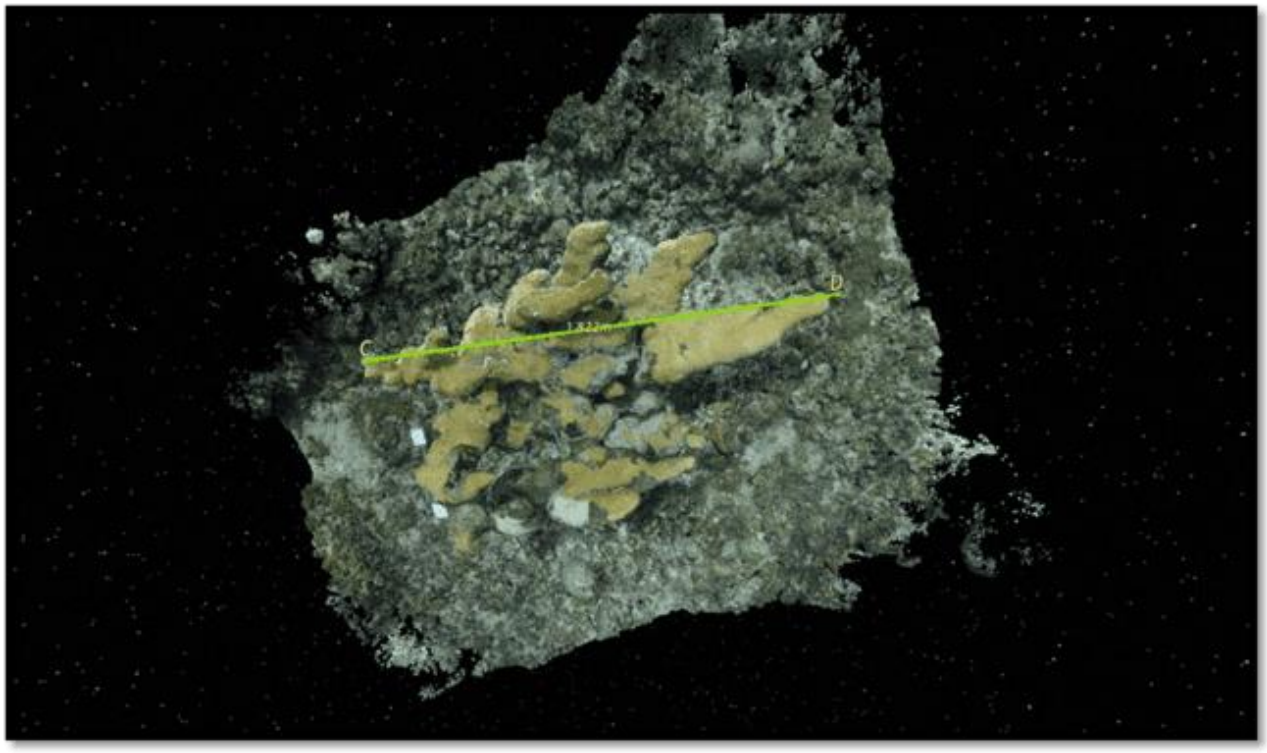


Image: Acropora palmata colony 17 located at Winnifred Beach Bay site located in Portland. (Photo Credits: Gina-Marie Maddix)

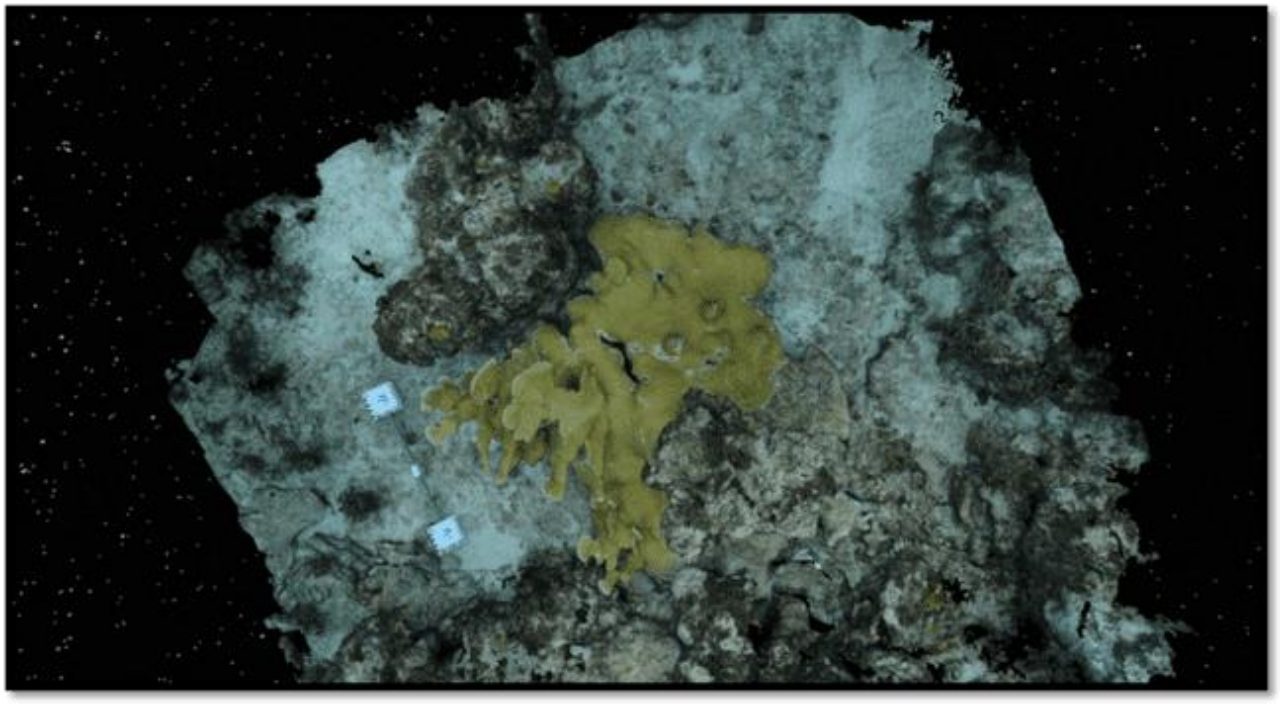
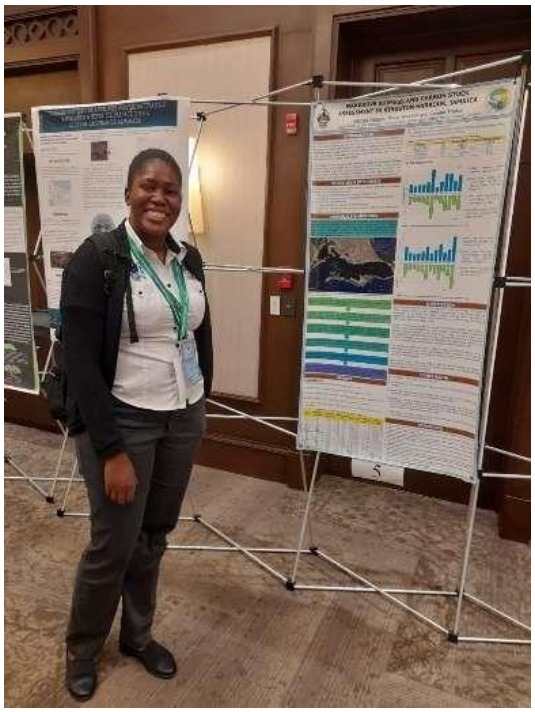


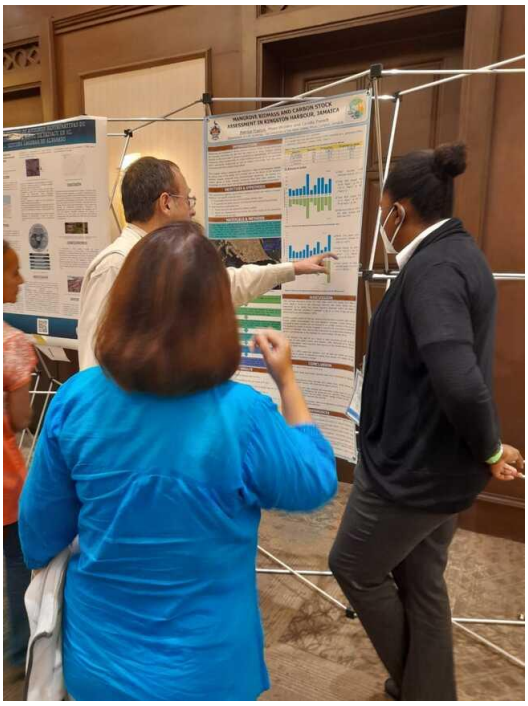
Image: Acropora palmata colony 03 located at Pellew Island site located in Portland. (Photo Credits: Gina-Marie Maddix)

MANGROVE CONFERENCE: 2nd Mangrove Congress of America

Through the support of the GKF-JSMSS Chair funds, Dr. Camilo Trench (Academic Coordinator- UWI Discovery Bay Marine Laboratory) and Ms. Patrice Francis (Senior Scientific Officer-Centre for Marine Sciences) attended the 2nd Mangrove Congress of America to present on the ongoing mangrove research occurring within the country. The National School of Higher Studies-Mérida organized the 2nd Mangrove Congress of America, bringing together **317 participants from 21 countries**. The purpose of the 2nd Mangrove Congress of America is to strengthen strategies for the use, conservation and management of mangrove resources, aimed at ancestral users of the mangrove, the scientific community, professionals, university students and the public linked to the protection of this ecosystem. Dr. Camilo Trench presented under Restoration and Ecosystem Services; Restoration Actions. Ms. Patrice Francis presented under Climate Change and Extreme Events; Carbon Stocks and Carbon Flux.

Image: Certificate of Participation for the 2nd Mangrove Congress of America





Images: Ms. Patrice Francis beside her project poster (top left) and discussing her findings (top right). Dr. Camilo Trench (bottom) presenting mangrove restoration in Jamaica at the congress. (Photo Credits: Patrice and Florence Francis).

Through the support of the JMSS Chair funds, Ms. Patrice Francis (Senior Scientific Officer-Centre for Marine Sciences) also attended the 14th Annual Meeting of the International Blue Carbon Scientific Working Group (IBCSWG) from October 10-14, 2022. The overarching goals of the IBCSWG are to advance blue carbon (BC) science, particularly as needed to facilitate climate-relevant policy and management, to expand blue carbon research collaboration, and to ensure the integration of blue carbon into international climate change actions. The meeting was attended by **100 persons from 16 countries**, and highlighted salient research by both young and established Mexican scientists; recent global research and work being done to integrate blue carbon into national initiatives, including nascent work being done to clarify the potential feasibility of including macroalgae as a new blue carbon ecosystem. The manual for the ecological restoration of mangroves in the Mesoamerican reef system and the Caribbean was present for the first time to all participants. The JMSS chair and her UWI team have subsequently utilized a new method "dispersal centers" to assist with restoration of mangroves in Jamaica.

Images: Working Group poster (left) and welcome session (right). (Photo Credits: Patrice Francis)

SEAGRASS CONFERENCE: 2022 World Seagrass Conference & 14th International Seagrass Biology Workshop

Through the support of the GKF-JSMSS Chair funds, Mr. Hugh Small (Chief Scientific Officer-UWI Port Royal Marine Laboratory) was able to attend The 2022 World Seagrass Conference & 14th International Seagrass Biology Workshop in Annapolis, MD, USA from 7 August - 12 August, 2022. The theme of WSC2022 and ISBW14, “Signs of Success: Reversing the Course of Degradation," was inspired by the recent successes in the conservation, resurgence, and restoration of seagrasses and other submerged aquatic vegetation (SAV) in areas around the world. The Chesapeake Bay, the location of this year's meeting, is a perfect example of such success. Thanks to sustained research and management efforts, Chesapeake Bay - the largest estuary in the U.S. - is now home to the most expansive resurgence of SAV known. Mr. Small is currently pursuing his PhD in Seagrass Ecosystems with a focus on how the grass community is impacted by artificial overwater structures which block crucial lighting. The knowledge garnered from the conference and workshops will greatly assist his research as well as provide up to date knowledge to be taught in the undergraduate programme.

Images: Mr. Hugh Small standing beside his research poster presentation entitled *The Impact of Artificial Shading on Seagrasses at Sandals South Coast, Westmorland, Jamaica* at the 2022 World Seagrass Conference & 14th International Seagrass Biology Workshop.

Financial Expenditure

Financial Report from The University of the West Indies Bursary is given below.

THE UNIVERSITY OF THE WEST INDIES

GRACE KENNEDY FOUNDATION
JAMES MOSS-SOLOMON CHAIR IN ENVIRONMENTAL DEVELOPMENT

STATEMENT OF EXPENDITURE FOR THE PERIOD
NOVEMBER 1, 2022 - JULY 31, 2023

PARTICULARS	BUDGET YEAR 5 - 11	EXPENDITURE 01/08/16 - 31/1/22 J$	EXPENDITURE 01/11/2022 - 31/07/2023 J$	EXPENDITURE 01/08/16 - 31/07/2023 J$	BUDGET BALANCE J$
Equipment & Maintenance	15,050,500.00	14,336,638.22	827,740.58	15,164,378.80	(113,878.80)
General Office Expenses	2,062,000.00	1,662,051.81	81,764.07	1,743,815.88	318,184.12
Local & International Travel	10,737,500.00	10,119,655.48	744,230.35	10,863,885.83	(126,385.83)
Research & Publication	5,050,000.00	4,641,868.14	819,749.04	5,461,617.18	(411,617.18)
Salaries & Stipends	2,450,000.00	2,197,311.27	0.00	2,197,311.27	252,688.73
Administrative Expenses	3,150,000.00	2,812,500.00	337,500.00	3,150,000.00	0.00
TOTAL	**38,500,000.00**	**35,770,024.92**	**2,810,984.04**	**38,581,008.96**	**(81,008.96)**

Bursary, Mona
August 25, 2023

THE UNIVERSITY OF THE WEST INDIES

GRACE KENNEDY FOUNDATION
JAMES MOSS-SOLOMON CHAIR IN ENVIRONMENTAL DEVELOPMENT

INCOME/EXPENDITURE STATEMENT FOR THE PERIOD
NOVEMBER 1, 2022 - JULY 31, 2023

INCOME	J$
Surplus/(Deficit) b/f 01/11/2022	**2,729,975.08**
	2,729,975.08
EXPENDITURE	
01/11/2022 - 31/07/2023	(2,810,984.04)
Surplus/(Deficit)	**(81,008.96)**

This is to certify that the expenditure recorded is in accordance with the terms and conditions of the Grant Agreement.