

## Sargassum Symposium Summary

The Cave Hill Campus of The University of the West Indies brought together natural and social scientists from across the University with key stakeholders in the Caribbean's tourism, business and fisheries sectors to discuss the Sargassum seaweed phenomenon invading our region's beaches and threatening key economic sectors. The one-day *Sargassum Symposium* took place at the 3Ws Pavilion in Barbados on Monday 17 August, 2015.

The Principal Prof. Eudine Barriteau described the Symposium as "the beginning of a collective, regional search for strategies to solve the social and economic challenges blanketing our coastlines, by the pervasive, often putrid deposits of Sargassum". She indicated that the effort was linked to the twelfth objective of her vision statement for the Cave Hill Campus, namely, "Re-energizing the research for Caribbean Development Agenda." Noting that the problem is international in scope, she pledged that in the next phase the Cave Hill Campus would coordinate an international workshop to include affected stakeholders in all affected regions inclusive of West Africa, Central and South America and the Southern United States.

In his opening remarks the Vice Chancellor, Sir Hilary stated that Sargassum presented a threat at a time when the region is already economically vulnerable. He stressed the need to avoid a situation where the Caribbean became plagued with "Dirty Beach Syndrome". To this end, he stated that an institution such as a Sargassum Emergency Agency should be established to provide an immediate response to the clean up needed at the region's beaches, while at the same time conducting research and advising on policy initiatives to support ongoing national and regional efforts.

Prof. Hazel Oxenford, CERMES UWI, gave the keynote address focusing on the ecological aspects and source of the mass influx of Sargassum in the Caribbean. Prof. Oxenford explained that unlike other brown seamoss species, the two species *Sargassum natans* and *Sargassum fluitans* live as free-floating weed that can form large floating mats or long windrows of weed. She emphasised that Sargassum forms a unique and valuable ecosystem in the open ocean supporting ocean food webs, and providing essential shelter and forage for 10 endemic species, the young of many commercially important species, and the young of several endangered species. It is also an important breeding ground. In shallow water, Prof Oxenford explained that the Sargassum provides new forage, shelter and camouflage for species such as the white sea urchin, and on shore it is useful for feeding shore birds, binding sand and dunes and fertilizing shore plants.

According to Prof Oxenford, the seaweed is usually found in the Sargasso Sea, in the centre of the North Atlantic Ocean gyre, occupying an area about the size of the USA; and it is also known to occur in the Gulf of Mexico. She stated that Sargassum landfalls are not new. However, the mass influxes that have been occurring in the eastern Caribbean since 2011 did not originate in the Sargasso Sea or the Gulf of Mexico. Rather the North Equatorial Recirculation Region (NERR) is the source of our Sargassum. The west coast of Africa is also experiencing mass influxes. To date it is not understood what has caused all the favourable

environmental conditions to occur together to create the mass influxes. These conditions include the salinity, currents and nutrients in the NERR, the latter originating from the Orinoco and Amazon Rivers, deep water upwelling, as well as the Sahara dust plume over the Atlantic. It is also uncertain whether climate change is a significant driving force; and if this phenomenon will continue. At present, on-going research is attempting to predict the future occurrences of Sargassum in the Caribbean by examining patterns in North and Equatorial Atlantic climate indices, and using drifters and current models to examine and predict surface currents. They are also trying to understand the impacts on fish resources.

In the first panel discussion– “The Impacts of the Sargassum Seaweed in the Caribbean,” Fabian Hinds from the Coastal Zone Management Unit (CZMU) identified three areas that were of particular concern for his Unit. Stating that under the CZM Act it was an offence to remove beach material and vegetation, and further, that the Draft ICZM Plan recommends limiting destructive practices e.g. driving on beaches, he noted that the Unit was concerned about the destructive removal practices because they result in the removal of sand and other beach material, as well as the compaction of sand. While acknowledging that the Sargassum can have negative socio-economic impacts for the tourism, fisheries, recreation and other sectors, Mr. Hinds said that the removal was impacting on the beach profile monitoring activities and that therefore the demand for clean beaches must be balanced with threat of beach destruction. He therefore recommended that there be communication between the CZMU, NCC and other involved entities so that the Unit could make recommendations for beach cleaning that would be mindful of the threats. He did acknowledge that the National Conservation Commission (NCC) coordinates beach cleaning efforts with consideration to CZMU recommendations, and that a cabinet paper was developed jointly between CZMU and NCC to augment beach cleaning efforts. He also asked that public assistance while encouraged be done in consultation with the NCC.

The second concern raised by Mr. Hinds was the impact on nearshore water quality, because the Sargassum decay may cause increased nutrients, biological oxygen demand, hydrogen sulphide and alkalinity which would exacerbate the degradation of the corals. In this regard, he urged that the compounds released during decay of the seaweed (and their potential effects) must be determined; that monitoring efforts to be enhanced in order to capture the effects of Sargassum; and that the removal of Sargassum is required prior to decay.

Thirdly, Mr. Hinds expressed apprehension about the Sargassum smothering and shading the corals. Corals require light to photosynthesise and the Sargassum floating at the surface will block light, preventing photosynthesis and the corals will become stressed if Sargassum remains for extended periods of time. Moreover, where Sargassum settles on top of corals, physical damage may result. Mr. Hinds reiterated that appropriate techniques for removal must be developed.

In the second presentation on the panel, Mr. Stephen Willoughby, the Chief Fisheries Officer, explained that the Sargassum piles up on beaches and in nearshore waters therefore preventing access to and launching and hauling of boats. It also gets trapped in the cooling and propulsion systems of the vessels, causing them to malfunction, and as a

consequence, fuel consumption of some boats is higher and in some instances fishing trips are extended. It has also decreased the ability of some fisherfolk to take fishing trips.

In the presence of Sargassum some fish species such as adult dolphinfish and amberfish, small dolphinfish, tuna, tabios and turpits are abundant, whereas flyingfish catches decrease. The Chief Fisheries Officer noted that while fish prices are high the income generated is low.

The Sargassum has presented health risks to the fishers; there have been reports of itching skin and ear infections, and a rash that may become infected. There are also sore muscles from hauling gear laden with Sargassum. Fishers have also complained that the atmosphere is polluted with hydrogen sulphide which affects the throat causing coughing; burns of the nose and eyes; upsets the stomach; and triggers respiratory problems.

Mr. Willoughby stated that in trying to cope with the situation fisherfolk were keeping a constant lookout for Sargassum while at sea. They were navigating around the Sargassum wherever possible, and were either manually removing the Sargassum from the propeller and rudder, or running the engine in reverse to clear it. Some persons had opted not to fish when the Sargassum is present. In some cases fishers have had to abandon some landing sites and fishing gear.

In the final presentation of the panel, Mrs. Sue Springer, Chief Executive Officer of the Barbados Hotel and Tourism Association, stated that rather than dwell on the negative impacts that the seaweed has had on the industry – cancellations, increased costs to bus guests to alternate beaches, clean ups etc. – she would focus on some of the possible opportunities. She said that having an Early Warning System in place would help the members of the industry prepare for expected influxes. She felt that possible ways of including the guests could be creative scavenger hunts. Mrs. Springer noted that some of the chefs were experimenting with creative ways of including the seaweed in their menus. She also informed the audience that the Caribbean Hotel Association had created a Sargassum Resource Guide to assist hotels and destinations with developing a local action plan to manage and minimize the impact of Sargassum in an environmentally sensitive manner. The guide was available on the CHA as well as the BHTA websites.

In the second panel “Adaptation and Mitigation: Social and Economic Opportunities”, Dr. Winston Moore, Senior Lecturer in the Department of Economics of the Faculty of Social Sciences UWI, led off the discussion with a focus on harnessing the Sargassum Seaweed as a Green Economy opportunity. Among the opportunities that he explored were the use of the seaweed for bioabsorption; in agriculture for plant growth; and for manufacturing bar soaps, body washes, creams and gels. Dr. Moore also presented some data on the current market prices of these items, demonstrating the positive economic impact that was possible. He stressed that there were many opportunities for small business development, green exports, employment, linkages with tourism and overall there could be a good impact on the generation of foreign exchange.

Continuing the discussion of potential uses, Dr Bidyut Mohapatra, Lecturer in the Department of Biological and Chemical Sciences, in the Faculty of Science and Technology UWI, explained that the Sargassum could potentially be used for manufacturing nutraceuticals or functional food which is any food or food ingredient that may provide a health benefit. He indicated that benthic Sargassum species elsewhere have been consumed as nutraceuticals due to the presence of polyunsaturated fatty acids, dietary fibre, vitamins, alginate, fucoidan and other bioactive compounds. It could also be used for developing pharmaceuticals, e.g. it forms a gel in the acidic stomach and protects stomach mucosa. It also has applications in wastewater treatment. The alginate present in Sargassum opens up a wide range of possible options including use in food as a thickening and gelling agent; in textiles as a substrate of colour paste to print fabrics; in animal feed as a binder and thickening agent for pet and fish feed; in cosmetics as a thickener, moisture retainer and to retain the colour of lipstick on the lips' surface; and in welding rods as a binder of flux (temperature, oxygen and hydrogen).

Dr. Mohapatra said that there could also be microbial processing of Sargassum biomass into biofuels and that a metagenomics approach, could be taken in which all genome sequences from decomposing Sargassum biomass are non-selectively cloned into a single library. This would allow the study of genomes from both cultivable and uncultivable microorganisms and thereby accelerate the identification of novel genes with potential industrial applications, including biofuels.

In the final presentation of the Symposium, Mr Mark Hill, Chief Innovation Officer, Innogen Technologies Inc., and currently an M.Phil Student with the Sir Arthur Lewis Institute for and Social and Economic Studies, UWI presented some of the products that he has already developed from the Sargassum seaweed, as well as an innovative way of harvesting the weed from the nearshore area. Mr. Hill has conducted trials using horse drawn mechanisms for harvesting the weed and from the harvested weed he has successfully manufactured several different products including animal feed, fertilizer, flour, soap and chipboard. He also advocates eating of the seaweed, noting from personal experience the positive impacts it has had on his health.

In the afternoon session of the Symposium the participants were divided into seven roundtables on the following topics in relation to Sargassum:

- Roundtable One: Environmental research agenda - Oceanography and climate change
- Roundtable Two: Environmental research agenda - Ecology
- Roundtable Three: Product research and development - viable options to be explored re agriculture – feed, fertilizers
- Roundtable Four: Product research and development - viable options to be explored re pharmaceuticals, cosmetics and health products
- Roundtable Five: Product research and development - viable options to be explored re alternative energy
- Roundtable Six: Clean up and beach maintenance - research and development of appropriate mechanisms

Roundtable Seven: Clean up and beach maintenance - developing national and regional responses

Each roundtable discussed the following:

1. What is being done and lessons learnt?
2. What are the issues to be investigated?
3. Who are the stakeholders to be involved?
4. What resources are required?
5. What are potential sources of funding?

Summaries of all of these roundtables are located on the website which has been developed to share the results of the Symposium:

<https://www.cavehill.uwi.edu/cermes/projects/sarsassum/repository.aspx>