

Dear GSSTAR friends,

Welcome to our fourth newsletter for the GlobalSeaweedSTAR programme. What a year it has been. We are just keeping a close eye on the COVID-19 developments and adjusting our working practices accordingly to make sure all our team are kept safe and well.

The GSSTAR team though have continued, despite the current challenges, to work extremely hard on analysing existing datasets and writing up work. We've had another paper published on biosecurity policy and legislation of the Tanzanian seaweed aquaculture industry, led by one of our early career researchers and we have a further four papers in review!

We've also been busy attending online scientific conferences and webinars, something that we would never of dreamed about doing just a year ago! We've even had our very own senior researcher, Dr Flower Msuya speaking about seaweed farming in Tanzania and the Global-SeaweedSTAR programme at a side event at the UN General Assembly meeting, which went virtual this year for the first time in its history.

In addition, I've had the opportunity over the last month to speak to our 11 early career researchers about their aspirations for the future and to share my experiences of building a career in academia with them. From the feedback, this capacity building activity has proved invaluable to them and I'm looking forward to repeating these one-to-one sessions with them again next year.

Finally, I can't conclude without sharing the wonderful news of four new additions to the GSSTAR team: congratulations to Euan Paterson, Iona Campbell, Sarah Forgrieve and Rema Sibonga on the births of their beautiful baby boys!

I hope that you are all enjoying reading our newsletters and again. I would just like to thank everyone who has supported us and wish you a Merry Christmas and a Happy New Year.

Stay safe and well.

Liz Cottier-Cook, Lead Scientist

Making a seaweed manifesto see page 3



Dr Flower Msuya joined experts leading a discussion on the new Seaweed Manifesto



Dr Flower Msuya (left) and Sadock Rusekwa on fieldwork

Farmers to benefit from native species research

Team Tanzania is on the hunt for native seaweeds to help seaweed farmers regain control of their crops.

The team, comprising Early Career Researcher Sadock Rusekwa, DP Leader Dr Flower Msuya and co-DP Leader Dr Amelia Buriyo, has been out in the field collecting seaweeds for taxonomy studies as well as samples aimed at enriching the University of Dar es Salaam herbarium.

So far, they have collected

samples from Tanga (five sites off the north coast), Zanzibar Islands (four sites) and along Dar es Salaam (five sites).

The main aim is to collect samples of native varieties of the farmed eucheumatoids and study possibilities of propagating them into enough biomass to supply to farmers with the aim of complementing/replacing the imported species that are affected by climate change. The team has so far found native eucheumatoids in one area

in Tanga, two areas in Zanzibar and one area in Kunduchi near Dar es Salaam.

DNA studies will be conducted to ascertain the native eucheumatoid species. Work started during the south-east monsoon winds (August-September).

The GlobalSeaweedSTAR Tanzanian team is planning to carry out a similar survey during the north-east monsoons (hot season) during January-February 2021.



globalseaweed.org



Successful seaweed industry can help tackle global poverty

A world-renowned seaweed expert has told a meeting of UN representatives and global organisations today (Thursday, September 24) how the seaweed industry is helping people in developing nations escape poverty.

Dr Flower Msuya, from Tanzania, represented GlobalSeaweedSTAR at the meeting, Seaweed Manifesto: Towards Implementation, which took place as a side-event at the 75th UN General Assembly.

The Seaweed Manifesto, developed by Lloyd's Register Foundation and the UN Global Compact, defines a vision for global seaweed production. This manifesto is seen as a crucial step in safeguarding and developing the industry, which is well established in Asia and parts of Africa and South America, but is also expanding in other parts of the world.

Dr Msuya said: "Seaweeds have been proven to be a livelihood enhancer in emerging countries in Asia, Africa, South America and so on. It employs a large number of farmers, who benefit directly from the industry, together with their families and communities around them, including service providers.

"For example, the industry employs 30,000 farmers in Tanzania and is the third largest in the Zanzibar islands, where it contributes around 7.6 per cent of the islands' GDP."

Seaweed farming is the fastest growing of all aquaculture sectors globally, worth over USD 5 billion annually. Dr Msuya told the meeting that this crucial industry faces immediate threat from climate change and a lack of research in this area.

She said: "For a brighter future for the industry, we need to link farmers to researchers, governments, the UN, NGOs and businesses to give them courage to continue. We also need to support research and innovation, which will help the industry overcome the challenges associated with climate change, such as warming waters.

"Seaweed-producing nations should also be encouraged to use their own produce, rather than exporting all the raw material, and we must create an attractive environment that encourages young people to join the industry."

The Scottish Association for Marine Science (SAMS), in

Oban, leads the GlobalSeaweedSTAR programme and is a major contributor to the manifesto.

Programme leader Prof Elizabeth Cottier-Cook, of SAMS, said: "The seaweed industry is crucial to so many coastal communities in the developing world.

"It provides income to millions of families, often allowing women to become economically active in areas where few other opportunities exist.

"I'm delighted that a special side-event dedicated to seaweed was held during the 75th anniversary UN General Assembly, giving it a global platform from which to highlight key challenges and discuss how to grow the industry sustainably."

More information on the Seaweed Manifesto can be found here: <https://seaweedmanifesto.com/>

What is the Seaweed Manifesto?

This seaweed manifesto is a visionary document outlining how seaweed can contribute to delivering on the sustainable development goals. It defines a vision for the industry, explores the opportunities and benefits, as well as outlining the challenges and barriers for responsible development of the industry. The focus is on the untapped potential, which might not be met without new thought leadership and convening power to improve knowledge and expertise, develop new funding initiatives and influence policy makers, regulators and consumers. Therefore, the manifesto proposes a set of success factors for all stakeholders, and provides the basis for different initiatives that will be required.

Promotion for STAR scientist

Congratulations to GSSTAR scientist Poong Sze Wan for her promotion to senior lecturer at the Institute of Ocean and Earth Sciences, University of Malaya.

Joining the programme as an early career researcher (ECR), Sze Wan has been key to the work being done in Malaysia and is involved in two of the work packages.

She is the ECR for WP1 and leads a separate GSSTAR Research Fund project looking into the phylogeography and population genetics of epiphytic filamentous red algae on eucheumatoids.

As part of WP3, she is in charge of the work on the genetic diversity of Indonesian eucheumatoids.

Her new role will involve more teaching, on top of her research work.



GSSTAR Malaysian researcher Poong Sze Wan

Aquaculture 'makeover' to ensure future expansion

A paper from GSSTAR scientist Dr Grant Stentiford has called for a 'makeover' of evidence and policy in the global aquaculture sector to prepare it for future expansion.

One third of all animal protein produced on the planet comes from the water, half of this is from aquaculture. Seaweed contributes a significant additional contribution, mainly in tropical waters.

With a projected flat lining of output from the global capture fishery in the next three decades, aquaculture will become the dominant provider of protein from aquatic habitats to a population projected to reach 10 billion by 2050.

His [paper](#), published in Nature Food, considers this projected growth through the lens of One Health - the philosophy that simply reminds us that the health of all life on earth is inter-connected.

Capacity Building Fund accepting applications

GlobalSeaweedSTAR offers financial support for capacity building activities, that will strengthen the seaweed industry in developing countries or the UK.

This could be used to support travel, online events or online courses.

For eligibility, see https://globalseaweed.org/?page_id=3531

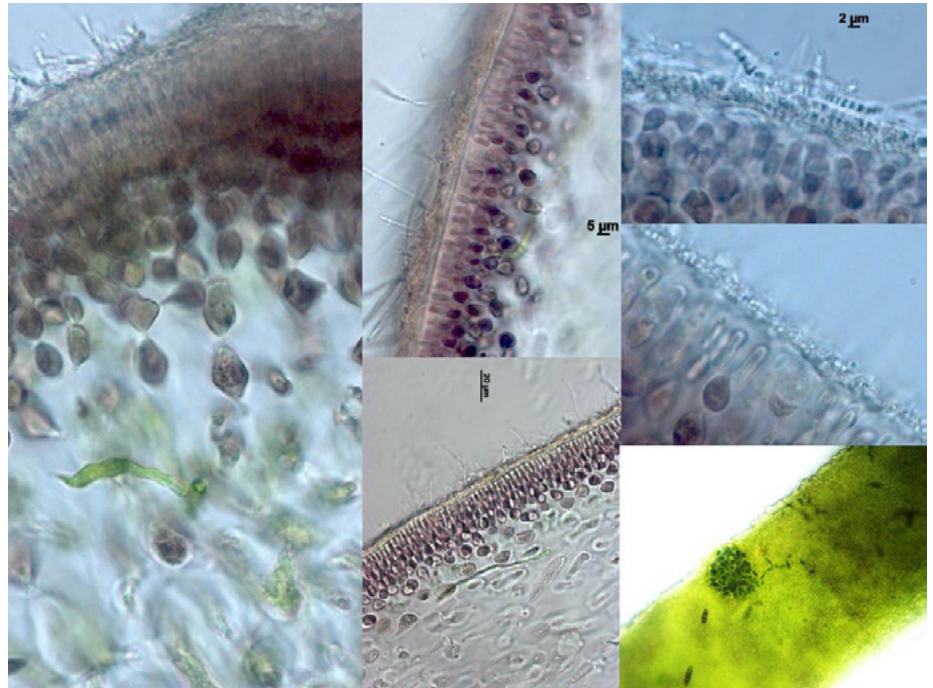
Virtual lesson takes a deeper look into seaweed

Among the fascinating features of seaweeds is the diversity of other organisms that live on (epiphytes), in (endophytes) or partly on and partly in (epi-endophytes) these macroalgae.

One of the challenges when studying diversity and function of this holobiome, i.e. the host and its associated prokaryotes (e.g. bacteria) and eukaryotes (e.g. green filamentous endophytic algae and oomycetes) is how to observe the organisms within the seaweed host.

With this in mind, GSSTAR scientist Prof Juliet Brodie led a virtual histology knowledge exchange 'mini-meeting' in September for sharing experiences working with carrageenophyte crop species *Eucheuma*, *Kappaphycus* and our model species *Chondrus crispus*, which has also been harvested for carrageen, a valuable polysaccharide used in the food industry.

Prof Brodie said: "For making thin sections (c. 2-5 μm thick) to study under the microscope, the traditional method of wax



embedding does not work well with these seaweeds because the wax barely penetrates the seaweed - use of resins and mixed staining gave better results.

"For thicker sections (c. 30 μm), hand sectioning is a good technique, particularly for the green endophytes because they ramify through the outer part of the seaweed (cortex) and in some cases into the

middle (medulla) and can be difficult to find in very thin sections. I attempted a virtual demonstration from my dining room table converted to a 'mini-lab' without chopping off anything vital with the razor blade."

The early career researchers (ECRs) and postdocs all contributed in different ways and a lively discussion provided future direction for this work.

Seaweed disease on ice in project breakthrough

The GSSTAR team has developed a method to cryopreserve *Paraphysoderma sedebokerense*, a pathogen that infects green microalgae of industrial interest and that can have a great impact on the biomass production of those algae.

Such methods are commonly used on a variety of microal-

gae, but not so much used for pathogens that infect those algae.

If not freeze-preserved, then such pathogen cultures often need constant 'taking care of' on a very regular basis.

This is a very time-consuming process and always bears the risk of losing the pathogen culture.

Cryopreservation of such pathogen cultures secures their long-term availability to researchers and consequently allows future investigation of the interaction between microalga and pathogen.

Read the paper at: <https://doi.org/10.1080/00318884.2020.1827825>

Seaweed fund helps to boost business and save lives in Zanzibar

A project funded by the GlobalSeaweedSTAR research programme is teaching seaweed farmers in Zanzibar how to swim and survive at sea, in response to their businesses moving further offshore.

Seaweed farmers in Zanzibar face challenges related to climate change, which is impacting their capacity to farm sufficient quality seaweed to meet the global demands. One of the effects of climate change forces farmers to have to farm the seaweed in deeper waters. This challenge is especially hard on women who currently make up more than 80% of seaweed farmers and who are more vulnerable to drowning. At the same time, production and prices of seaweed over the past decade have fallen. The project, Building Resilience of Seaweed Farmers in Zanzibar, received a grant from the GlobalSeaweedSTAR Capacity Building Fund and will work with 120 seaweed farmers – 108 of whom are women – from three shehia (district wards).

Project leader Alice Mushi, from the Milele Zanzibar Foundation, said: “We aim to assess and build evidence around how best to support and empower both individual seaweed farmers and seaweed associations.

“For individual seaweed farmers, the research will assess how building the capacity of women to swim and how enabling both women and men to utilize innovative production techniques to be able to farm greater quality seaweed in greater quantities, is able to improve the livelihoods of individual seaweed farmers.

“For seaweed associations, the research will assess how strengthening the associations’ governance, leadership and savings and lending capacities will enable them to provide greater social and financial support and advocacy for the seaweed farming communities.”

Funding from GlobalSeaweedSTAR helped the

research team to identify ways to support seaweed farmers, especially women, to be resilient on climate change and practice deep farming to increase income.



Specifically, the funding covered 15 days of training on sea safety and swimming skills; training on innovative seaweed farming practices in deep water; and the formation of village savings and loans associations and training to strengthen financial the management, literacy and leadership and negotiation skills of all 150 seaweed farmers.

GlobalSeaweedSTAR is funded by UK Research and Innovation’s Global Challenges Research Fund.

Programme leader Prof Elizabeth Cottier-Cook said: “The Building Resilience of Seaweed Farmers in Zanzibar project entirely fits in with the aims of GlobalSeaweedSTAR, which is designed to improve the resilience and sustainability of the seaweed sector globally.

As one of the world-leading producers of seaweed, Tanzania, and Zanzibar in particular, is key to the success and sustainability of the global industry. This industry is facing a huge challenge in climate change, which has signalled a rise in pests and diseases in crops and has highlighted gaps in biosecurity planning across many countries.”