

# The Sargassum Information hub: Exploiting satellite data to support Sargassum monitoring and forecasting



Plenary session #2

**Ecosystem Conservation** 



### **Shelly-Ann Cox**

Fisheries Management Specialist Founder and CEO Blue Shell Productions Barbados, West Indies

5<sup>th</sup> Symposium | Accra, Ghana | 24 – 28 October 2022





5<sup>th</sup> Symposium | Accra, Ghana | 24 – 28 October 2022

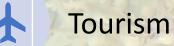
The Sargassum Information Hub: Exploiting satellite data to support sargassum monitoring and forecasting

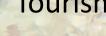
Dr. Shelly-Ann Cox, Blue Shell Productions

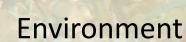


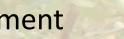


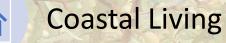
### Negative Impacts are multi-sectoral







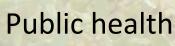


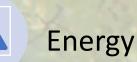


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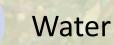








**Fisheries** 



### Sargassum Opportunities

Opportunities for valorisation of pelagic Sargassum in the Dutch Caribbean

Ana M. Lope. Truus de Vrije





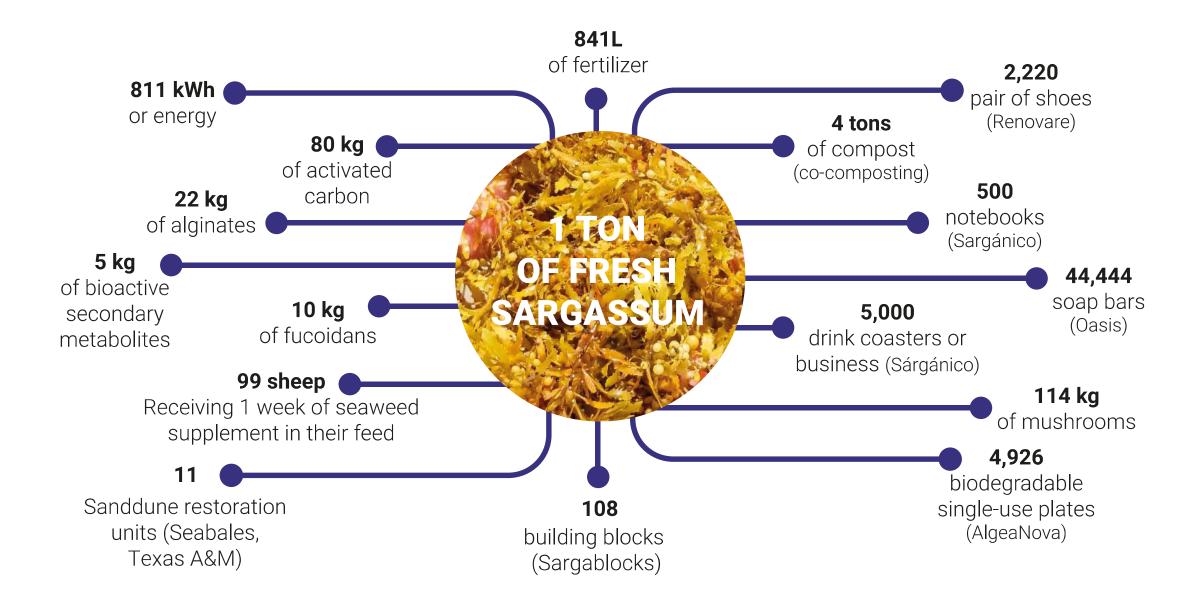
Sargassum Uses Guide: A resource for Caribbean researchers, entrepreneurs and policy makers

ERMES



Anne Desrochers, Shelly-Ann Cox, Hazel A. Oxenford, Brigitta van Tussenbroek





## Sargassum Information Hub https://sargassumhub.org



**HUB** Partners















### 2020

### **PROMOTION & UPDATES**

Promotion of the hub and periodic updates. Sargassum working group meetings lead to development of content

### LAUNCH

Co-design and co-development participatory process culminates with a launch at the <u>All-</u> <u>Atlantic 2021: Sargassum side event -</u> <u>EU4OceanObs (2 June)</u>

### 2021

### 2022

### **HUB 2.0 LAUNCH**

Version 2 launched at the Seaweed around the clock 24-hour event (2 June)

## Satellite-based Sargassum Watch System (SaWS)

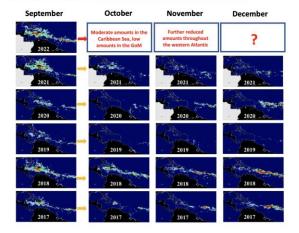


#### Outlook of 2022 Sargassum blooms in the Caribbean Sea and Gulf of Mexico\*

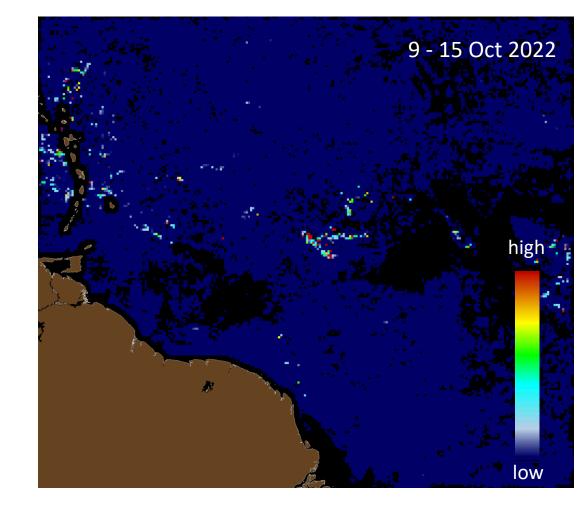
#### Outlook of 2022 Sargassum blooms in the Caribbean Sea and Gulf of Mexico\* October 4<sup>th</sup>, 2022, by University of South Florida Optical Oceanography Lab (bbarnes4@usf.edu, yuyuan@usf.edu, huc@usf.edu)

The maps below show Sargassum abundance, with warm colors representing higher values. In September 2022, the overall Sargassum amount in the central Atlantic Ocean continued to decline from previous months, but remained at record levels (totaling "8.5 million tons) compared to previous years - roughly 20% higher than the previous September record (in 2021). Sargassum abundance in both the Caribbean Sea and the Gulf of Mexico decreased roughly 40% from August levels, which was especially apparent near the end of the month. While this decrease was expected, it coincided with substantial hurricane activity (Flona, Ian), which may have also played a role.

Looking ahead, following previous major bloom years (2018, 2021), the overall Sargassum abundance in the western Atlantic, Caribbean Sea, and Guif of Mexico will likely continue to decrease through November. Of note, however, Sargassum is amassing in the east-central Atlantic (especially just offshore the west coast of Guinea, Sierra Leone, and Liberia) – up 40% from August. Such a buildup has been observed in the year prior to all previous major blooms. More updates will be provided by the end of October 2022, and more information and near real-time imagery can be found under the Sargassum Watch System (SaWS, https://optics.marine.usf.edu/projects/saws.html).

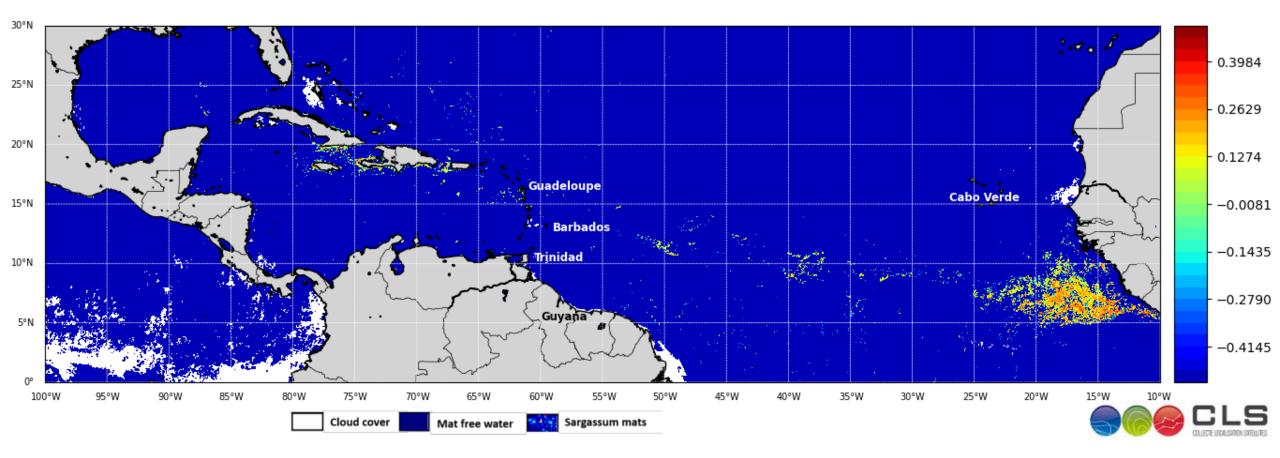


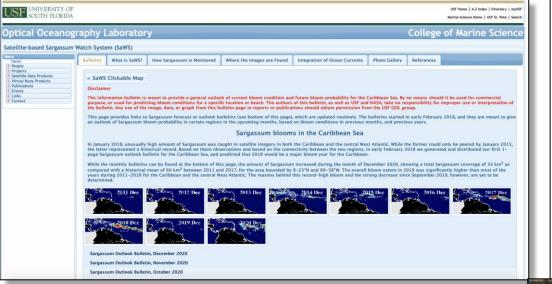
Disclaimer: The information bulletin is meant to provide a general outlook of current bloom condition and future bloom probability for the Caribbean Sea. By no means should it be used for commercial purpose, or used for predicting bloom conditions for a specific location or beach. The authors of this bulletin, as well as USE and NASA, take no responsibility for improper use or interpretation of the bulletin.



CLS - SAMTool

OLCI / MODIS NFAI CLS 7 days Mean (2022-10-12 00:00:00 UTC)







#### ERISNet: deep neural network for Sargassum detection along the coastline of the Mexican Caribbean

Javier Arellano-Verdejo1,", Hugo E. Lazcano-Hernandez1," and Nancy Cabanillas-Terán<sup>4</sup>

<sup>1</sup> Estacion para la Recepcion de Informacion Satelital ERIS-Cherumal, El Colegio de la Frontera Sur, Chetumal, Quintana Roo, México <sup>1</sup> Caterdas CONAUT-TI Glorigo de la Prontera Sur, Chetumal, Quintana Roo, México <sup>1</sup> These authors contributed equally to this work.

#### ABSTRACT

Peer

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OPEN ACCESS

Additional Information and Declarations can be found o page 15

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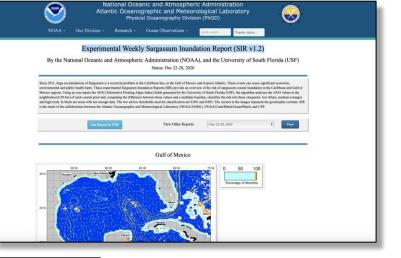
ponding authors vellano-Verdeio.

Recently, Carlbbean coasts have experienced atypical massive arrivals of pelapic Sargasum with negative consequences both ecologically and economically. Based on deep learning techniques, this tudy proposes a novel algorithm for floating and accumulated pelapic Sargasum detection along the coastline of Quintana Roo, Mexico. Unig combulosian and necurrent neural networks architectures, a deep neural network (man e ERISNet) was designed specifically to detect these macroalgae along the coastline through remote sensing support. A new dataset which includes pixel values with and without *Sargassen* was built to train and test ERISNet. Aqua-MODIS imagery was used to build the dataset. After the learning process, the designed algorithm achieves a 90% of probability in its classification skills. ERISNet provides a novel insight to detect accurately algal blooms arrivals.

ects Computational Science, Environmental Impacts, Spatial and Geographic Information Science Keyworda Remote Sensing, Neural Networks, Algal blooms, Sargassum, MODIS, Mexico, Deep learning

#### INTRODUCTION

Pelagic Sargassum is formed by brown macroalgae S. fluitans and S. natans, and constitutes floating ecosystems serving as habitats and nurseries for important marine species like sea turtles, fishes, invertebrates, and micro and macro-epiphytes (Rooker, Turner & Holt, 2006; Witherington, Hirama & Hardy, 2012). However, over the last seven years, Caribbean shores have experienced atypical massive shoals of pelagic Sargassum, with exceptional abundances for the Mexican Caribbean during the summers of 2015 and 2018. Massive influx was observed in numerous Caribbean beaches linked with the accumulation of Sarvassum spp. (hereafter Sargassum)(Gower, Young & King, 2013; van Tussenbroek et al., 2017). Since 2011, these extensive off-shore Sareassum shoals have appeared in unprecedented ways in oceanic waters off the coast of northern Brazil (De Sa Distributed under Creative Commons CC-BY 4.0 Young & King, 2013; Sissini et al., 2017), actually, this events of Sargassum blooms were registered on the African coast as well (De Szechy et al., 2012; Mari , Hellio & Hu, 2017). Those shoals likely have origins in the North Equatorial Recirculation Region (NERR)





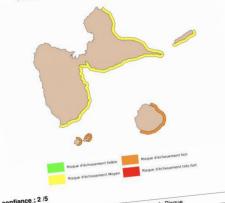
### **Bulletins**

METEO

Bulletin de surveillance et de prévision d'échouement des sargasses pélagiques pour la Guadeloupe

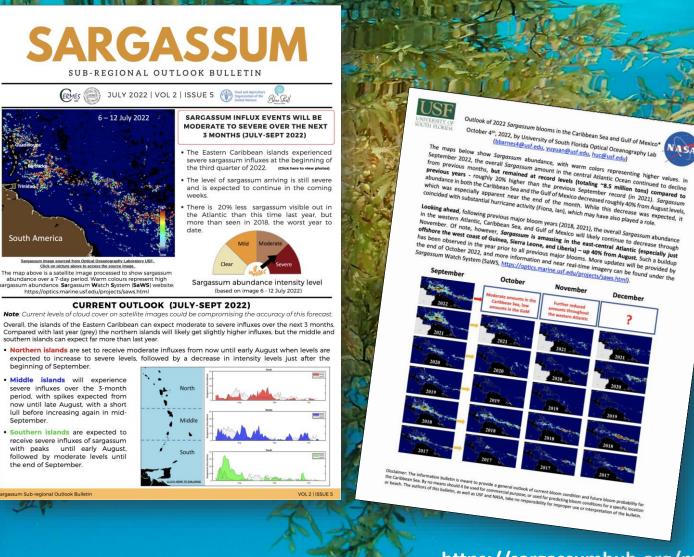
Jeudi 13 Octobre 2022

Carte de risque d'échouement pour les 4 prochains jours :



ndice de confiance : 270	Estimation du Risque
-	Moyen
Zone Nord Grande Terre	Moyen
Sud Grande Terre	Moyen
Décirade	Moyen
Basse Terre (côte sud-est)	Fort
Les Saintes	Fort
Marie Galante	

Météo France-Division Prévision Antilles-Guyane. Asroport BP 379 - 97288 Le Lamentin Cedex 02 eo France-Unvision Hrevision Antenes-Usiyane. Aeroport BY 373 - 97288 EE Lamenen Ce. Téléphone : 0596 57 23 23 – Fax : 0596 51 29 40 Prévisions : 0892 68 08 08 (0.32 €/min + prix appel) – web : http://www.meteofrance.gp

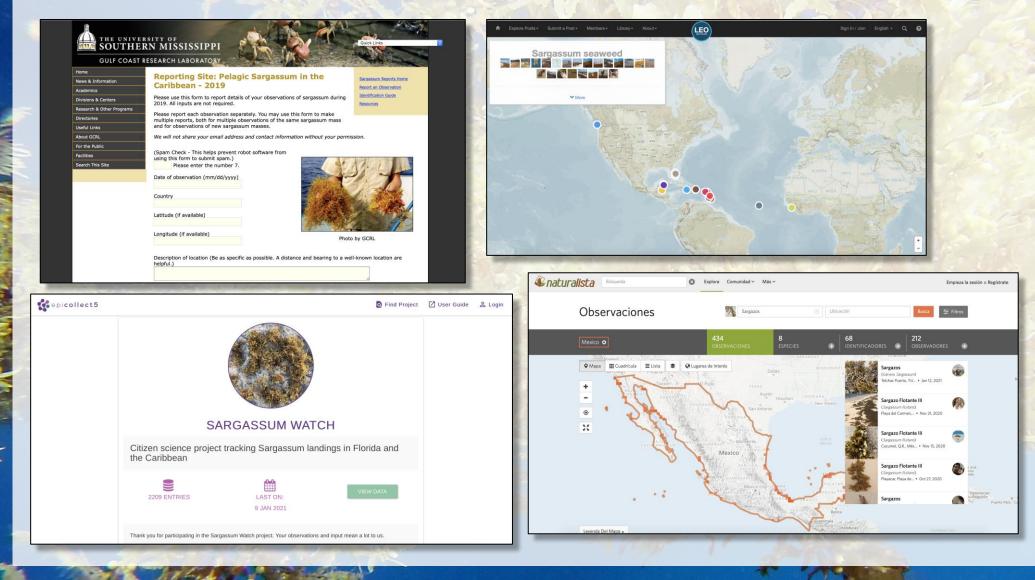


https://sargassumhub.org/monitoring/

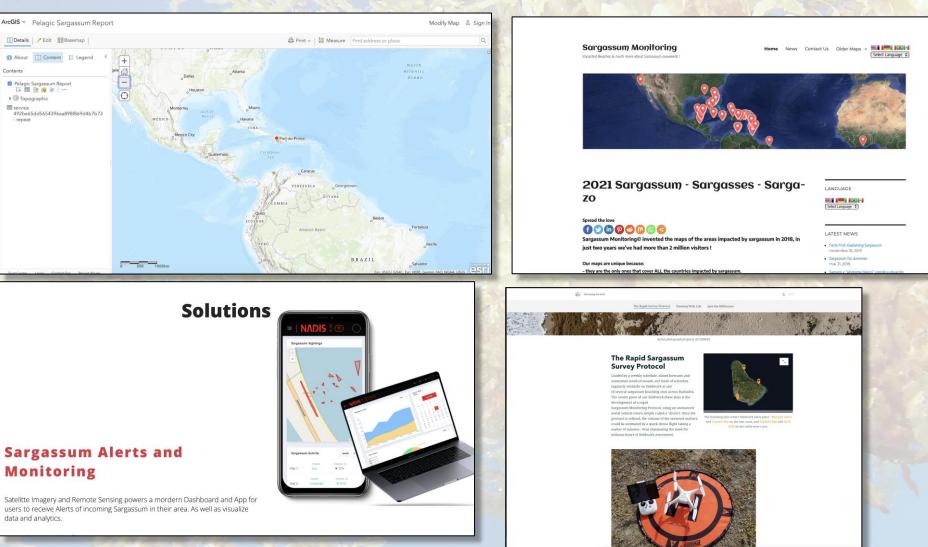
December

NASA

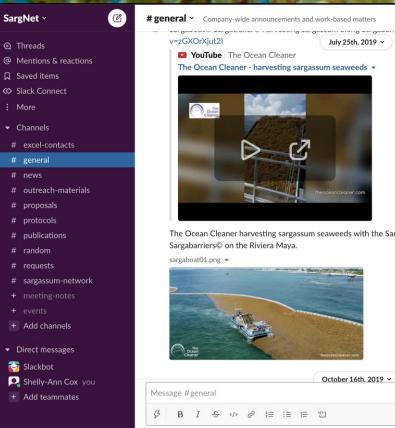
## **Monitoring Systems**



### **Monitoring Systems**



### SARGNET Listserv & Slack Workspace https://listserv.fiu.edu/cgi-bin/wa?SUBED1=SARGNET&A=1



SargNet ~

Threads

: More

# news

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### Sargassum Podcast https://marinefrontiers.org/sargassum



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#### **The Sargassum Podcast**

SARGASSUN Dodcast

A podcast hosted by marine educators and scientists with a range of expertise in Sargassum and Coastal Communities. The podcasts interviews a variety of stakeholders such as scientists, entrepreneurs, resource managers, community leaders, government officials, artists, fishermen, people working in the tourism sector etc. about how they experience Sargassum, a floating algae that has caused severe problems when beaching in the wider Caribbean and West Africa. Each interviewee will their solutions or new knowledge concerning how they deal with Sargassum. The podcasts enables a reciprocal knowledge exchange between experts and local communities and between different local communities. We hope to be platform for exchange of ideas across regions and to catalyze local solutions to this international problem.

ENGLISH







## Webinars, Workshops, Symposia, Conferences....

#### SARGASSUM

ABOUT SARGASSUM THE HUB MONITORING MANAGEMENT DIRECTORY RESEARCH REGIONAL PAGES EVENTS NEWS MEDIA

#### EVENTS AND OUTCOMES Webinars | Meetings | Workshops | Conferences

CAST-CHTA Sargassum Virtual Learning

8 & 15 September 2022 | 10:00 AM - 11:00 AM ET |

GEO BLUE PLANET 5<sup>th</sup> SYMPOSIUM SHARE AN EVENT ABOUT SARGASSUM?

SUBMIT THE EVENT INFO HERE

AGU 2022 Fall Meeting: Sargassum



### November 2022: GCFI75 - Fort Walton - Destin, Florida

Living With Sargassum: Current Scientific Perspectives And Future Outlook For Fisheries, Coastal Managers And Entrepreneurs.

Organizers: Global Ocean Institute, World Maritime University, Sweden in association with CERMES, University of West Indies, Barbados, Gulf Caribbean Fisheries Institute.

For over a decade, influxes of the floating sargassum seaweed to the Caribbean and Gulf of Mexico have caused major environmental and socioeconomic problems for fisheries, tourism and coastal communities. In the early years responses were reactive, uncoordinated and inefficient leading to environmental degradation. Millions of dollars were channeled into emergency efforts to deal with the problem, regional coordination, research to understand the problem and innovative ways of using sargassum for commercial purposes. With the realization that sargassum influxes will persist into the foreseeable future, proactive and coordinated management responses across the region are essential. However, as highlighted by the 2021 UNEP white paper on sargassum, it is a complex problem with inevitable trade-offs between clean-ups, harvesting initiatives and environmental impacts. The session will present a current state of understanding, with a

particular emphasis placed on what the future holds and what research will be needed to resolve the key challenges.

All / CITIZEN SCIENCE EFFORTS / CONFERENCES / EVENTS / MEETINGS / SYMPOSIUM / WORKSHOPS

Local Knowledge of Sargassum Events – Project Results Meeting

https://sargassumhub.org/events/

8 August 2022 | Online

### Sargassum Reference Repository

#### **RESEARCH INFORMATION**

**CERMES Sargassum Reference Repository** 

The Sargassum Reference Repository is a living and constantly growing collection of scientific works related to the biology, impacts and uses of sargassum within the Wider Caribbean Region and beyond.

For each entry in our repository you can view reference metadata (authors, title, date, etc.), and in most cases also its abstract. When an item is from an open source, you can click the URL provided to access it.

The references are organised and searchable based on a predetermined set of tags, listed below.



#### **UWI – CERMES SARGASSUM REFERENCE REPOSITORY TAGS**

Region Atlantic	taxonomy/life history	use – agriculture	
Caribbean	biodiversity (associated)	use – antifouling	
Europe	growth	use - bioenergy	

https://sargassumhub.org/research-information/ https://bit.ly/SargRefRepository

management - collection

management - guidance

management - governance

#### AIP Advances scitation.org/lournal/ad Dynamical geography and transition paths of Sargassum in the tropical Atlantic Cite as: AIP Advances 12, 105107 (2022); doi: 10.1063/5.0117623 ∰ **₫** Submitted: 1 August 2022 · Accepted: 12 September 2022 · Published Online: 10 October 2022 F. J. Beron-Vera, 💷 💿 M. J. Olascoaga, 💷 💿 N. F. Putman, 💷 💿 J. Triñanes, 🍱 G. J. Coni, 🖉 and R. Lumpkin 🐲 AFFILIATIONS pheric Sciences, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami Florida 33149, USA ent of Orean Sciences, Dosenstial School of Marine and Atmospheric Science, University of Miami, Miami, Eloridi 33149. USA <sup>3</sup>LGL Ecological Research Associates, Inc., Bryan, Texas 77802, USA \*Atlantic Oceanographic and Meteorological Laboratory, National Oc 33149, USA Cooperative Institute for Marine & Atmospheric Studies, University of Miami, Miami, Florida 33146, USA Departamento de Electrónica y Computación, Universidade de Santiago de Compostela, Santiago, Spair Author to whom correspondence should be addressed: fberon@mi Also at Cooperative Institute for Marine & Atmospheric Studies, University of Miami, Miami, Florida 33146, USA and Departamento de Electrónica y Computación, Universidade de Santiago de Compostela, Santiago, Spain ABSTRACT ine-homogeneous Markov chain constructed using trajectories of undrogued drifting boays from the NOAA Global Drifter <u>Last methodality</u> density can during the terminal structure of terminal structure o By analyzing a time By analyzing a Program, we<sup>-4</sup> high Sargan analysis of t a correspon Orinoco riv remote sou data-deriv revealed. ( Gulf of G margin. T © 2022 (http://cr In situ observation of holopelagic Sargassum distribution and aggregation Peer state across the entire North Atlantic fron LINTE Deborah S. Goodwin<sup>1</sup>, Amy N.S. Siuda<sup>2</sup> and Jeffrey M. Schell<sup>1</sup> ation Association, Woods Hole, Massachusens, United States cience, Eckerd College, St. Petersburg, Florida, United States Between 2011 and 2020, 6,790 visual observations of holopelagic Sargussion we Between 2011 and 2020, 6.780 visual observations of holopelagic Sargo recorded across the North Atlantic Ocean to describe regional distributi and aggregation state at hourly and 10 km scales. Influences of oceanog and aggregation state at hourly and 10 km scales. Influences of oceanog and aggregation state at noticity and 10 And scanes, information to considered, and wind/sea conditions as well as temporal trends were considered. ate what/see conduitons as were as semporar trends were consistered; marine regulationa associates documented the coological value of aggregations. Hol gnama anocumenteo the ecological value or aggregations. Hosopea guouan was present in 64% of observations from the western North Atlantic "Approach may provide an other of courses where not use weater a sound a statistical spectrack holopelagic Sergassian fragments and clumps were found in 97% of outries conservations whereas aggregation without one (27.7%) and main (27.9%) and main (27.9%) are tool of the second se thons whereas aggregated windrows (37%) and mats (1%) were less common, arow new observations notes nonopengoe Surgestion in the AFAI algorithm detection limit for the MODIS sensor. Aggregat ale AFA a agontum detection tunit for tae AU-0125 senset. Aggregation state juniters were similar across regions, windrow proportion increased with higher wind speech to a state or to the detection of the det were similar across regions: windrow proportion increased with higher wind speeds. In 8 of 10 years in the Sargasso Se hologelagic Sargassaw was found in over 65% of observations on contrast, the Tropical Atlantic and Carthhean Ses exhibited preter using annual variability (1-289, and 1)-28% presence, respectively) that dd not align with extenses in central Atlantic bologedant. Concerner was all contrast-ments and all and the second second second and and and and align the strumes in central Atlantic bologedant. Concerner was all contrastannual variability (1-86% anu 31-76% presente registerer) en extremes in central Atlantic holopelagic Sargassam areal covers extremes in central Atlantic holopelagic sargassam evid he with extremes in termina statistic insopringle surgestation areas torstopy one from satellite observations. Mogafauna association patterns varied by taxor toom steams overviewoods, angesteams association patients varied by taxonomic groups. Will soone tudy regimes were impacted by hologelapic Sargurum dynami in the equatorial Atlantic, the Sargurus of and consistently high preserve and independency: Find outervaluous capture important symmetry and cological othersporal scales, including transient aggregation processes and cological othersporal scales, including thereafter among another according of the state of the st 2 spannoremportal scales, inclusing transient aggregation processes and ecosogical as for megafatina associates, and therefore remain essential to future studies of the former and the studies of the holopelagic Sargassum.

OPEN ACCESS

Nindrow, Aggregation, In situ observations, Holopelagic Sargassum

Holopelagic Sarganum, a brown macroalgae, drifts at the water's surface creating a unique Hoopenage sargustam, a brown macrosage, drats at the water s surface creating a unique and ecologically significant floating marine ecosystem in the eligatophic open ocean ("regimentation instances marine volvey) and and volgevolvey on the volvey of the sectors of the sectors and the sector of the sectors of forms of holopelagic Sargassion are recognized and distributed throughout the equatori

Biogeography, Marine Biology, Plant Science, Spatial and Geographic Information



## THE SARGASSUM INFORMATION HUB SHOULD NOT BE ALIEN TO CULTURAL AND LOCAL CONTEXTS



#### ABOUT SARGASSUM THE HUB MONITORING MANAGEMENT DIRECTORY RESEARCH REGIONAL PAGES EVENTS NEWS MEDIA

### MEXICO

Since 2011, the Mexican Caribbean has periodically received atypical influxes of floating Sargassum. In 2015 and 2018 major events were experienced along the coasts of the Quintana Roo State. In 2018 Sargassum reached volumes of up to 2 m-3 per linear meter of beach and this led to a declaration of emergency from the State. These atypical massive influxes have entailed severe impacts on coastal and marine ecosystems and their ecosystem services (e.g., beach erosion, water pollution, decreasing tourism, death of seagrasses, loss of corals, etc.). In Mexico, most governmental efforts have focused on cleaning the beaches of tourist importance, although this is starting to change. There have been several initiatives to start harvesting Sargassum at sea and using it as a resource. This would prevent most of the negative impacts associated with the Sargassum decomposing process that starts at shallow water and on the beach. It is a goal for the country to stop managing Sargassum as a problem and start managing it as a national resource.



## IT IS NO LONGER ENOUGH FOR THE SARGASSUM INFORMATION HUB TO BE BEAUTIFULLY PASSIVE

## Shifting mindsets



#### EDUCATE

Clearinghouse for information related to pelagic sargassum in the Tropical Atlantic

#### ENGAGE

Provide quarterly updates on the latest research, events and publications.

### **INFORM DECISION MAKING**

Highlight monitoring and forecasting initiatives to inform decision-making

### **INSPIRE ACTION**

Provide best practices for management and highlight sargassum innovations

## Future developments of the Hub

- Incorporation of disability friendly features to facilitate wider access
- Dashboards to illustrate statistics on the impacts of sargassum influxes, volumes, clean up costs etc
- The integration of a RSS feed crawler to assist in populating the Events and News web pages
- Feature summaries of sargassum publications and book reviews

- Integrating an online forum to connect people with similar interests
- Job advertisements for sargassum related projects
- Features on sargassum innovations and the use of digital technologies in building sustainable sargassum value chains
- Delivering online courses on sargassum management and valorisation

## Moonshot Ideas

- Launching a virtual sargassum art gallery and promote the use of Non-Fungible Tokens (NFT) to sell/trade digital art,
- Developing a Computerised Decision Support System that incorporates monitoring, forecasting, and sargassum hazard and exposure data,
- Hosting a Sargassum Tournament to promote the use of simulation adaptation frameworks in response planning, and
- Launching an online Sargassum Store that sells certified sargassum products produced by various companies.

5<sup>th</sup> Symposium | Accra, Ghana | 24 – 28 October 2022



The Sargassum Information Hub https://sargassumhub.org



5<sup>th</sup> Symposium | Accra, Ghana

24 – 28 October 2022



Thank You. Medaase. Oyiwaladon.

