



SCOPING ACTIVITIES

Causes and impacts of massive accumulations of the brown macro-algae *Sargassum* in the nearshore environment of the Caribbean and West Africa

Report of the Correspondence Group

Background

1 Unprecedented, massive accumulation of sargassum seaweed in the Caribbean first appeared in 2011, and has occurred every year since, with the exception of 2013. The blooms have tended to become more extensive with time and the near-shore and shoreline accumulations cause widespread and significant social, economic and ecological impacts in both the wider Caribbean and the coast of West Africa. The Correspondence Group was established to consider whether GESAMP might play a useful role in examining the possible causes of this phenomenon. This short report is not intended to be comprehensive, but to mention some of the more significant and more recent developments.

Monitoring the distribution and abundance of sargassum

2 Satellite observations have become widely used for monitoring the presence and abundance of sargassum, although cloud cover near the coast of West Africa can be limiting. The University of South Florida operates the satellite-based Sargassum Watch System SaWA¹, and NASA has included sargassum in an ARSET training course as part of their applied science programme ecological forecasting initiative². The French-based company CLS (Collecte Localisation Satellites) has developed SAMTool in collaboration with the European Space Agency³. This commercial service provides daily satellite-based observations.

3 Sargassum Monitoring[®] is a service that provides maps showing the locations of reported occurrences and their impacts⁴. The maps are updated daily and cover West Africa as well as the wider Caribbean. The objective is to provide independent information to a wide range of interest groups in government, academia, the tourism sector, industry/commerce and journalism.

4 A Sargassum Monitoring Protocol has been developed by the Centre for Resources Management and Environmental Studies (CERMES) of the Univ. of the West Indies at Cave Hill Barbados. The protocol has been published in the SargAdapt Good Practice Guide Series, with volumes published in 2022 including a protocol for monitoring shorelines using drones and guidance on species identification⁵.

Forecasting

¹ <https://optics.marine.usf.edu/projects/saws.html>

² <https://appliedsciences.nasa.gov/what-we-do/ecological-forecasting>

³ <https://datastore.cls.fr/products/samtool-sargassum-detection/>

⁴ <https://sargassummonitoring.com/>

⁵ <https://sargassumhub.org/sargadapt-good-practice-guide-series-vol-3/>

5 Forecasting the likely occurrence, in terms of geographical distribution and density, has become routine. A monthly outlook bulletin is produced by the Optical Oceanography Laboratory of the University of South Florida, providing satellite-based observations and estimates of the probability of future blooms on a basin-wide scale⁶. CERMES publishes a quarterly sub-regional bulletin, covering the islands of the eastern Caribbean⁷. The CLS SAMTool provides five-day forecasts based on a numerical drift model.

Adaptation

6 An important element of the response to the sargassum inundations is to adapt to this new reality, minimising the negative social, economic and ecological impacts and seeking potential economic benefits. One such initiative is SargAdapt: 'Adapting to a new reality: Managing responses to influxes of sargassum seaweed in the Eastern Caribbean as ecosystem hazards and opportunities'⁸. SargAdapt is a project of the Caribbean Biodiversity Fund Ecosystem based Adaptation Facility, with financing provided by Germany.

Underlying science

7 The underlying causes of the 2011 sargassum event and those in subsequent years have been the subject of considerable debate, speculation and scientific investigation. One hypothesis gaining support is that a significant interruption in the usual circulation pattern in the Central and North Atlantic, linked to anomalously high SST and signalled by the North Atlantic Oscillation, with possible 'seeding' of sargassum in the tropical Atlantic due to transfer from the Sargasso Sea. This is thought to have been combined with increased nutrient inputs from the Amazon resulting from increased deforestation and land-use change.

8 Informally it has been noted that the two largest inundations, which occurred in 2018 and 2022, coincided with exceptionally high summer temperatures in Europe. This may be worth further scrutiny.

9 A paper published in August 2022 provided an overview of current forecasting capabilities, discussed some of the challenges in improving the results and made recommendations as to best provide information to all those impacted by the phenomenon (Marsh et al. 2022⁹).

Related issues

Sargassum as a Harmful Algal Bloom (HAB)

10 There has been recent debate about the justification of labelling sargassum a HAB. Some have argued that it should not be but the consensus amongst those more established in the field, as expressed through the IOC-SCOR GlobalHAB science programme is that the sargassum can be considered a HAB, defined as "proliferations of certain noxious and/or toxic micro- and macroalgae and cyanobacteria, regardless of their concentration, with negative impacts on aquatic ecosystems, and human health and wellbeing." According to a spokesperson from NOAA, GlobalHAB recently added sargassum blooms as a research theme and they describe the *Sargassum* mass occurrences in the Caribbean and the West coast of Africa as an emerging HAB issue¹⁰.

Sargassum sequestration proposal

11 There has been a proposal to collect sargassum, using fishing boats and barges, and sink in deeper water, principally to prevent inundation of shorelines but also justified as a means of carbon

⁶ <https://optics.marine.usf.edu/projects/saws.html>

⁷ <https://www.cavehill.uwi.edu/cermes/projects/sargassum/outlook-bulletin.aspx>

⁸ <https://www.cavehill.uwi.edu/cermes/projects/sargassum/sargadapt.aspx>

⁹ <https://www.frontiersin.org/articles/10.3389/fmars.2022.914501/full>

¹⁰ <http://www.globalhab.info/science/globalhab-new-topic/sargassum>

sequestration. This aligns with other proposals to utilise marine biomass to remove carbon from the atmosphere, with little apparent consideration given to the potential consequences on the benthic environment and the longer term efficacy of the method in removing carbon.

Action requested by GESAMP

12 GESAMP is invited to note the information provided, and take action as appropriate.
