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Paper on the *Sargassum* seaweed invasion of West African and Caribbean coasts UNEA-2 Side Event

Conceptual background

Pelagic *Sargassum*, commonly referred to as seaweed or the golden tides, is a floating brownish alga. Satellite narrative maps indicate that the *Sargassum* seaweed blossoms naturally in the Sargasso Sea, spanning 2 million square miles in the warm waters of the North Atlantic Ocean.

The unprecedented quantity of pelagic *Sargassum* in the Caribbean islands in the spring of 2011 was subsequently reported along the coasts of Sierra Leone and the Gulf of Guinea in June 2011. Satellite images show an unusual spread throughout the tropical Atlantic. *“While the expansion of floating rafts of Sargassum from the Sargasso Sea to areas like the Gulf of Guinea may be seen as biological invasion in a broad sense of the definition, their occurrence and eventual deposit along the shoreline is not indicative of their colonising shallow coastal habitats”* (Smetacek and Zingone, 2013).¹

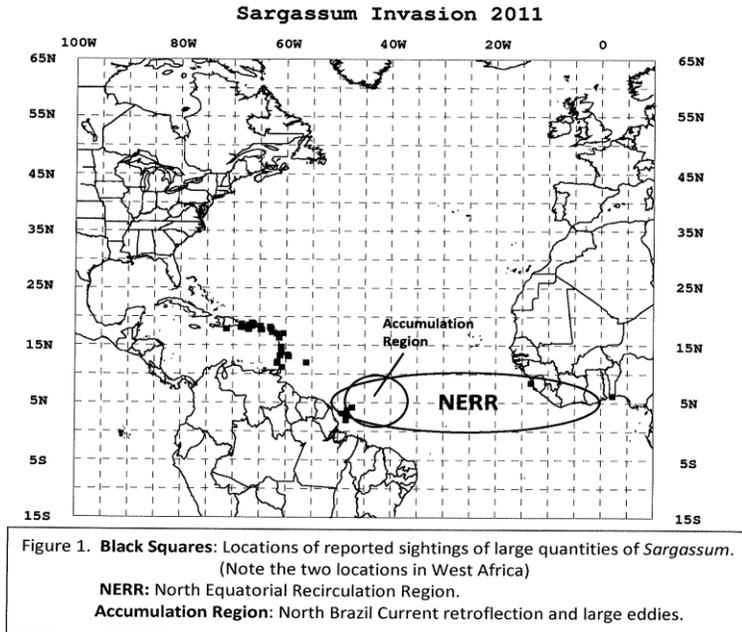
Causes of *Sargassum* Invasion

In 2013, satellite data showed that there was a new area of origin north of the mouth of the Amazon River². For about 18 months prior landing, back traces from the *Sargassum* sighting location were made using a high resolution numerical ocean current model which pointed to the North Equatorial Recirculation Region (NERR) off Brazil (**Figure 1**) (Johnson et al. 2013)³. Additionally, it is suggested that *Sargassum* consolidates in the NERR accumulation Regions and blooms there. Reports indicate that when the North Equatorial Counter Current broke down prior to 2011, *Sargassum* was ‘flushed’ from the NERR in spring of 2011. . Further research suggests that *Sargassum* cycles are closely linked to a seasonal change of sea surface temperature, which results in the movement of *Sargassum* into the Eastern Caribbean and Northwest African coastlines.

¹ Smetacek, V. and Zingone, A. (2013): Green and golden seaweed tides on the rise, *Nature*, 504 (7478), pp. 84-88 . doi: 10.1038/nature12860

² Gower, J., Young, E. & King, S. (2013): Satellite images suggest a new *Sargassum* source region in 2011, *Remote Sensing Letters*, 4:8, 764-773, DOI: [10.1080/2150704X.2013.796433](https://doi.org/10.1080/2150704X.2013.796433)

³ Johnson, D.R., Franks, J.S., Ko, D.S., Moreno, P., Sanchez-Rubio G (2013): *Sargassum* Invasion of the Eastern Caribbean and West Africa 2011 : Hypothesis. Proceedings of the GFCI 2012 annual meeting.



It should be noted that surface waters of the NERR are warm and relatively rich in nutrient coming from the Congo River, equatorial upwelling, coastal upwelling off West Africa, the Amazon River, and from Northwest Africa's iron-rich dust (Johnson et al. 2013)³⁴. This nutrient value may enhance the growth of *Sargassum*.

Maps of the sea surface temperature indicate that the NERR and the Accumulation Regions are the warmest regions in the Atlantic Ocean.

Presently, the exact conditions (chemical, physical, or biological drivers) responsible for the unusual bloom of seaweeds in the region are unclear. However, the probable causes for the proliferation of the massive seaweeds in recent times are suggested as follow:

- *Warming and changing of ocean temperature due to global climate change.*
- *Increased land-based nutrients and pollutants (which include nitrogen-heavy fertilizers and sewage waters) washing into the ocean water.*
- *Flow of nutrients from the Congo River, Amazon River, Northwest Africa iron-rich dust.*
- *Maritime traffic as a potential introduction vector.*

Effects

Recent reports on the invasion of *Sargassum* in West Africa and the Caribbean suggest that it is becoming a regional phenomenon, negatively impacting aquatic resources, fisheries, waterway, shorelines and tourism.

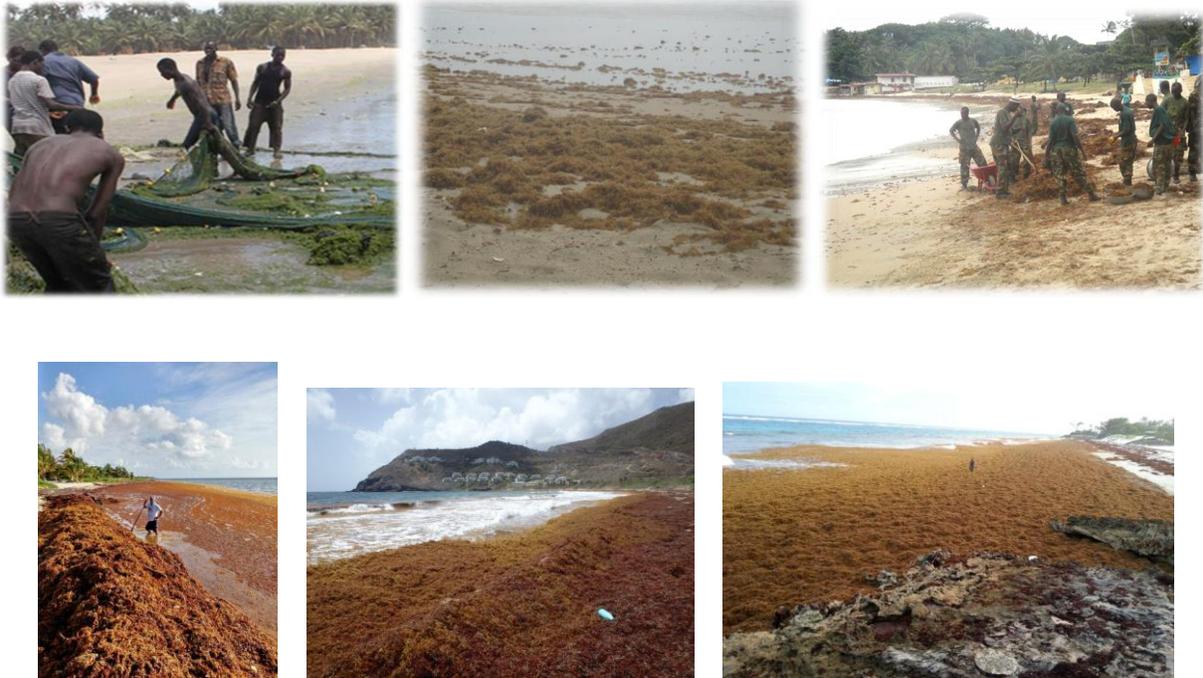


Figure 2: Recent invasion of Sargassum in West Africa and the Caribbean – top row: Côte d'Ivoire and Sierra Leone; bottom row: Canucn, Mexico, St. Kitts and Barbados

Ecological – Unfortunately, there is very little knowledge of the ecological impacts of invasive seaweeds on the ecosystem in general which needs to be assessed. The assumption however is that massive influx of seaweed has resulted to potential disturbance of marine life living in the coastal zone (dead fish and sea turtles have been found when Sargassum washes onto the shore in massive quantities, showing the potential correlation, beach fouling, and coastal dead zones. Moreover the use of machinery to remove seaweed impacts beach habitats.

Socio-economic – Massive Sargassum deposits on beaches (as shown on **Figure 2**) has negative impact on the socioeconomic livelihood (tourism, fishery industries etc.) of coastal communities, hence the need to develop regional cooperation on ocean governance and ensure an ecologically friendly management (transformation and value-addition to animal feed and fertilizers etc.) intervention of the Sargassum seaweed.

While “Sargassum algae are not toxic, the decay of many tons can however lead to anoxia and the build-up of poisonous hydrogen sulphide, which is harmful to most marine animals and humans. They can therefore trigger mortalities of fish and coastal invertebrates, and can severely impact local fisheries and aquaculture” (Pfaff, 2015)⁵.

Importance of Sargassum

Besides the ecological and socio-economic effects of the invasive seaweeds, it is noteworthy to underpin that Sargassum provides refuge for migratory species and serves as an important nursery habitat for a vast array of invertebrate and fish species that are closely associated with

⁵ Pfaff, M. (2015) Key scientific questions addressing environmental drivers and effects of periodic mass deposits of a brown seaweed (golden tides) along the Sierra Leone coast. Draft report for Oceans and Coastal Research, Directorate: Biodiversity and Coastal Research.

the ecosystem. At least, "127 species of fish and 145 invertebrate species have been associated with the presences of *Sargassum* algae"(Laffoley, 2011)⁶. Further research shows that just two species of *Sargassum* seem to be involved in the influx, namely the *Sargassum natans* and the *Sargassum fluitans*. Of these species, 10 are known to be endemic to our ecosystem which includes the *Sargassum* crab, *Sargassum* shrimp, *Sargassum* pipefish, *Sargassum* anemone, *Sargassum* slug, *Sargassum* snail, juvenile swordfish, triggerfish, filefish, driftfish, and the Atlantic sea turtle.

Of all these marine vertebrate species, the Atlantic sea turtles appear to be the most threatened as they depend on *Sargassum* not only to provide structural complex habitat but also as refuge from predators, protection against threat from poaching, coastal development and fisheries by-catch. This implies that *Sargassum* plays an important role during the critical neonate cycle of sea turtle.

Regional Activities on the Sargassum Influx

Regarding this transatlantic issue, the Abidjan Convention collaborates with the Cartagena Convention, through its biodiversity Protocol and its SPAW-RAC (the Regional Activity Center for the implementation of the Protocol Concerning Specially Protected Areas and Wildlife of the Cartagena Convention). Since early 2015 the SPAW-RAC developed a regional cooperation and information platform with all interested countries and organizations for the enhancement of collaboration between different sectors and sharing of information and experiences through an on-line forum on which more than 200 members are registered and contribute to the exchanges.

The year 2015 was marked by many initiatives and the *Sargassum* influx was discussed in several scientific and management events in the Caribbean and in West Africa. The first *Sargassum* Caribbean Symposium hosted at the University of the West Indies in August (<http://www.sargassum-at-cermes.com/>), the Gulf and Caribbean Fisheries Institute Annual meeting in Panama, the first Caribbean Sea Commission Symposium in Trinidad (both in November 2015). In March 2016, a *Sargassum* East Caribbean Conference was organized on Mosquito Island in the British Virgin Island, by the BVI Government, Virgin Unite, the Caribbean Council, the UK Foreign & Commonwealth Office and the Organisation of Eastern Caribbean States. This brought together various stakeholders from the Caribbean, Europe and Africa concerned by the issue. The need for coordination at a wider scale was highlighted, including for the development of best management practices and awareness.

In response to this new transatlantic marine environmental challenge with its negative effects on aquatic resources, fisheries, waterways, coastal habitats and the tourism sector in particular, UNEP/Abidjan Convention Secretariat at regional level in partnership with the USAID West Africa Biodiversity and Climate Change (WABiCC) Programme and the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), convened last year (11th to 13th November 2015) a Regional Expert Group meeting in Freetown-Sierra Leone bringing together marine-biologist, oceanographers, policy experts from affected countries in the region (Benin, Côte d'Ivoire, Ghana, Guinea, Liberia, Nigeria, Senegal, Sierra Leone, and Togo) local and international organizations working on marine and coastal biodiversity management *to share information, build knowledge on the phenomenon, promote best practice and develop ocean governance arrangement in combating the Sargassum phenomenon in West Africa.*

⁶ Laffoley 2011; The protection and management of the Sargasso Sea: The golden floating rainforest of the Atlantic Ocean. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance

Following-up on the Freetown meeting, the Abidjan Convention is making further strides to put in place **1)** a management mechanism for invasive seaweed, **2)** conduct an Exploratory Mission on Sargassum, **3)** formulate and validate a Regional Sargassum Management Strategy, **4)** and subsequently develop and ratification of a Protocol on invasive species which will include Sargassum and the Nypa plan (affecting Nigeria and Cameroun).

Sargassum on the 2nd United Nations Environment Assembly (UNEA-2) agenda

In the context of the Post-2015 Sustainable Development Goals **13** (combating climate change and its impacts) and **14** (conserving and sustainably use of the oceans, seas and marine resources for sustainable development), and in the framework of the United Nations negotiations of a new global agreement for biodiversity in areas beyond national jurisdiction, the Abidjan and Cartagena Conventions are working with UNEP/Global Programme of Action and affected member States to ensure that the Sargassum seaweed impact is discussed at the upcoming United Nations Environment Assembly UNEA-2 Side Event.

Objective of the UNEA Sargassum Side Event

The objective for bringing Sargassum at the level of the United Nations Environment Assembly is to draw attention of the wider environment community on the severe impacts of Sargassum in West Africa and the Wider Caribbean States, mobilize required resources for regional programmes to address this new global environmental phenomenon with emphasis on **“inclusive green-economy opportunities”** which has the potential to contribute in achieving UNEP's global environmental mandate.

Considering the transatlantic nature of Sargassum and its impacts on the coastlines of the Gulf of Guinea and the Caribbean, tackling the problem would require a regional coordinated action beyond national jurisdiction focusing on the collection of floating seaweeds at sea.

Preventing the occurrence of marine bio-invasion is by far the best option to avoid ecological damage to the region's native marine vegetation. Hence a regional adaptive strategy would require greater understanding of the seasonal landing of seaweeds, including their growth dynamics, and their economic potential use.

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