



CARICOOS SARGASSO INUNDATION MONITORING PROGRAM

Priscilla N. Molina Cora (priscilla.molina@upr.edu)

Julio M. Morell (julio.morell@upr.edu)

Erick M. García-Troche (erick.garcia1@upr.edu)

University of Puerto Rico – Mayagüez (UPRM)

Performance Period: June 1, 2020 – November 30, 2020

LONG-TERM GOALS

Part of CARICOOS's mission is to understand changes in our ocean and coasts, inform decision-makers in the U.S. Caribbean region, and improve predictions and forecasts. Sargasso inundation events (SIE) became a significant threat to Caribbean territories after 2010, threatening tourism, coastal biodiversity, and coastal communities' quality of life. When inundation events occur, significant organic matter loads accumulate in coastal areas, driving hypoxia, eutrophication, and releasing harmful gases into the atmosphere. Therefore, understanding and observing such events align well with CARICOOS's mission and purpose. This project aims to improve our understanding of SIE's impact and extent on coastal ecosystems, including mangroves, coral reefs, beaches, and seagrass beds.

MILESTONES / OBJECTIVES

1. Implement sensor deployments to assess the impact of Sargasso inundation events.
2. Assess impacts on oxygen concentration and acidification arising from Sargasso inundation.

WORK COMPLETED

- The laboratory analyses and field cruises at UPRM restarted on June 30, 2020, and July 7, 2020, respectively. Operations were on hold since March 16, 2020, due to the COVID-19 pandemic. We completed 18 cruises to collect surface water samples and CTD profiles throughout La Parguera. The following samples were analyzed:
 - pH – 44 pending – 27
 - TA – 33; pending – 57
 - DIC – 21; pending – 17
 - Sediment cores – 16; pending – 0
 - LOI – 6; pending – 10
 - Sargasso trap – 33; pending – 0
 - CHN – 0; pending – 33
 - D.O. – 92; pending – 0
- In July 2020, we installed seven Sargasso traps in the fore reef side of three reefs in La Parguera. The Sargasso captured was recovered every week and analyzed to estimate Sargasso biomass's weekly arrival.



MAJOR OUTCOMES

- We coupled water chemistry measurements, floating Sargasso biomass, and submerged Sargasso biomass estimation to establish baseline conditions, Sargasso biomass loading, and its impact on oxygen and acidification following Sargasso inundation events.
- On July 17, 2020, we integrated visual observations, field measurements, and aerial photography to estimate the Sargasso biomass that arrived at La Parguera during a significant inundation event during July 13-17, 2020. This single event's estimated biomass was 1700 g m⁻², covering 170,474 m² of seawater surface area. Some mangrove embayments were already under hypoxic stress and low pH from previous inundation events (Figure 1).

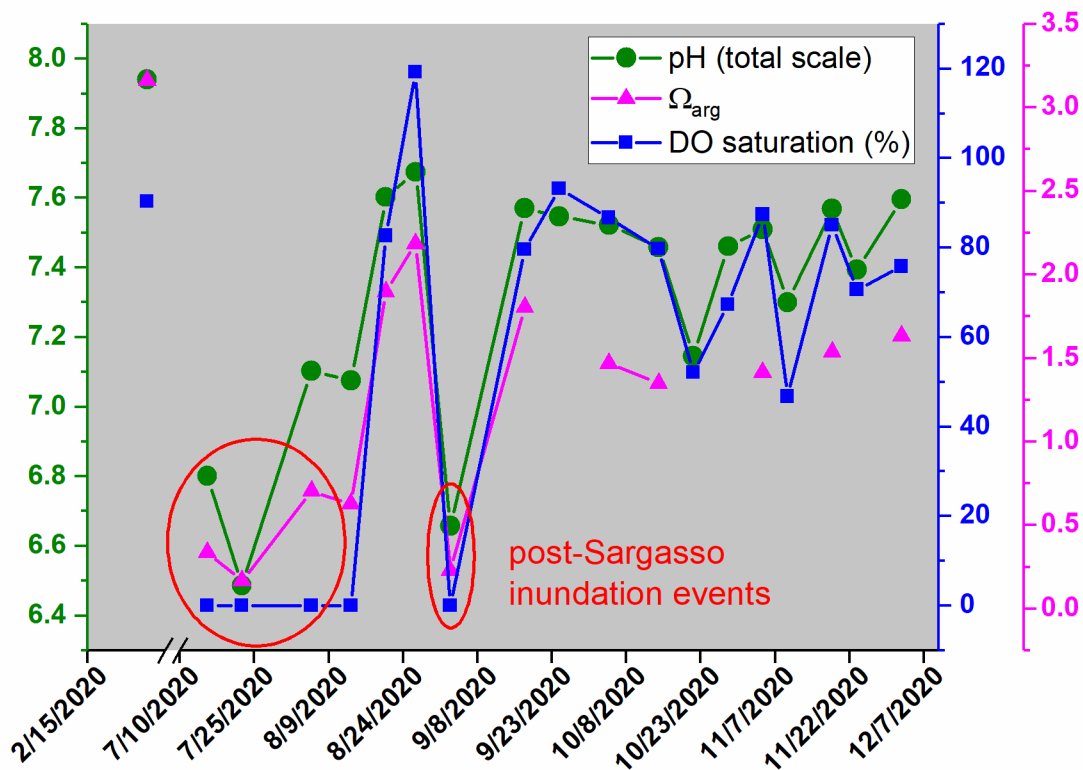


Figure 1. Time series of pH, D.O., and Ω_{arg} for the 2020 season. Time series corresponds to a station (17.968662, -67.077189) located west of La Parguera Town.

- One of the goals of this project is to compare the magnitude of carbon input from various sources. We carried out an exercise to compare the carbon input from the July 2020 event to input from mangroves and seagrasses (Table 1). Assuming that mangroves in La Parguera exported carbon into the water for one month, we estimated the carbon input as Sargasso at 1.5 times that of mangroves.



Table 1. Biomass estimates from various carbon sources at La Parguera.

Ecosystem	Biomass (kg m⁻²)	Carbon (kg)	Nitrogen (kg)	Phosphorus (kg)
Sargasso	0.17	7899.35	282.12	28.21
Mangrove (Vega, 2008)	0.12	564.54	5.65	5.65E-03
Seagrass (Hertler et al. 2002)	6.72E-02	6.44E-01	2.30E-02	2.30E-03

WORK PLAN FOR UPCOMING PERFORMANCE PERIOD (Dec 1, 2020 – May 31, 2020)

- A series of short-term assessments will be carried out in La Parguera, using a recently acquired sensor package capable of measuring temperature, salinity, dissolved oxygen, pH, pCO₂, and chlorophyll-a, turbidity, and colored dissolved organic matter. The sensor package will be deployed before, during, and after an inundation event at representative seagrass beds, coral reefs, and mangroves. Data will provide an improved understanding of the Sargasso inundation impacts on acidification and oxygen availability and its persistence/recovery responses.
- Improve the Sargasso trap system throughout La Parguera.
- Continue the weekly sampling fieldwork to monitor temperature, salinity, pH, dissolved oxygen, total alkalinity, DIC, and Sargasso biomass.
- Data analysis

REFERENCES

Hertler, H., 2002. Implications of resource management in La Parguera, Puerto Rico. Dissertation. Drexel University.

Vega, M., 2008. Estimating primary productivity of red mangrove in southwestern Puerto Rico from remote sensing and field measurements. M.S. Thesis. University of Puerto Rico at Mayagüez.

Wang, M., Hu, C., Cannizzaro, J. et. al. 2018. Remote sensing of *Sargassum* Biomass, Nutrients, and Pigments. *Geophysical Research Letters*, 45, 12,359-12,367. <https://doi.org/10.1029/2018GL078858>.