

Tourists' willingness to  
return to coastal  
destinations after  
encounters with sargassum:  
Preliminary results from  
Barbados

---

Peter W. Schuhmann

Hazel A. Oxenford

Jeanelle Irvine

Janice Cumberbatch

Karima Degia

Micaela Small

Julian Prato Valderrama

---

# Overview

---

- Adaptation to sargassum influxes will require resources for mitigation efforts
- Understanding the economic consequences of sargassum influxes can assist policy makers in planning and budgeting
- An important gap in current understanding is a quantification of the impacts of sargassum on the tourism sector





# Overview

---



We investigate:

1. The relationship between tourists' willingness to return to Barbados and encounters with sargassum, and
2. Tourist responses to (hypothetical) scenarios involving future increases in sargassum

# Estimating the economic impacts of sargassum is complicated

---

We need estimates of:

1. 'lost' market transactions
2. the impacts of sargassum on ecosystems
3. the related losses of ecosystem goods and services
4. economic value to those "non-market" losses





# Estimating the economic impacts of sargassum is complicated

---



We must account for:

1. suppliers' ability to substitute to other forms of employment and income
2. buyers' ability to substitute toward other goods and services that provide economic value



# Estimating the economic impacts of sargassum is complicated

---

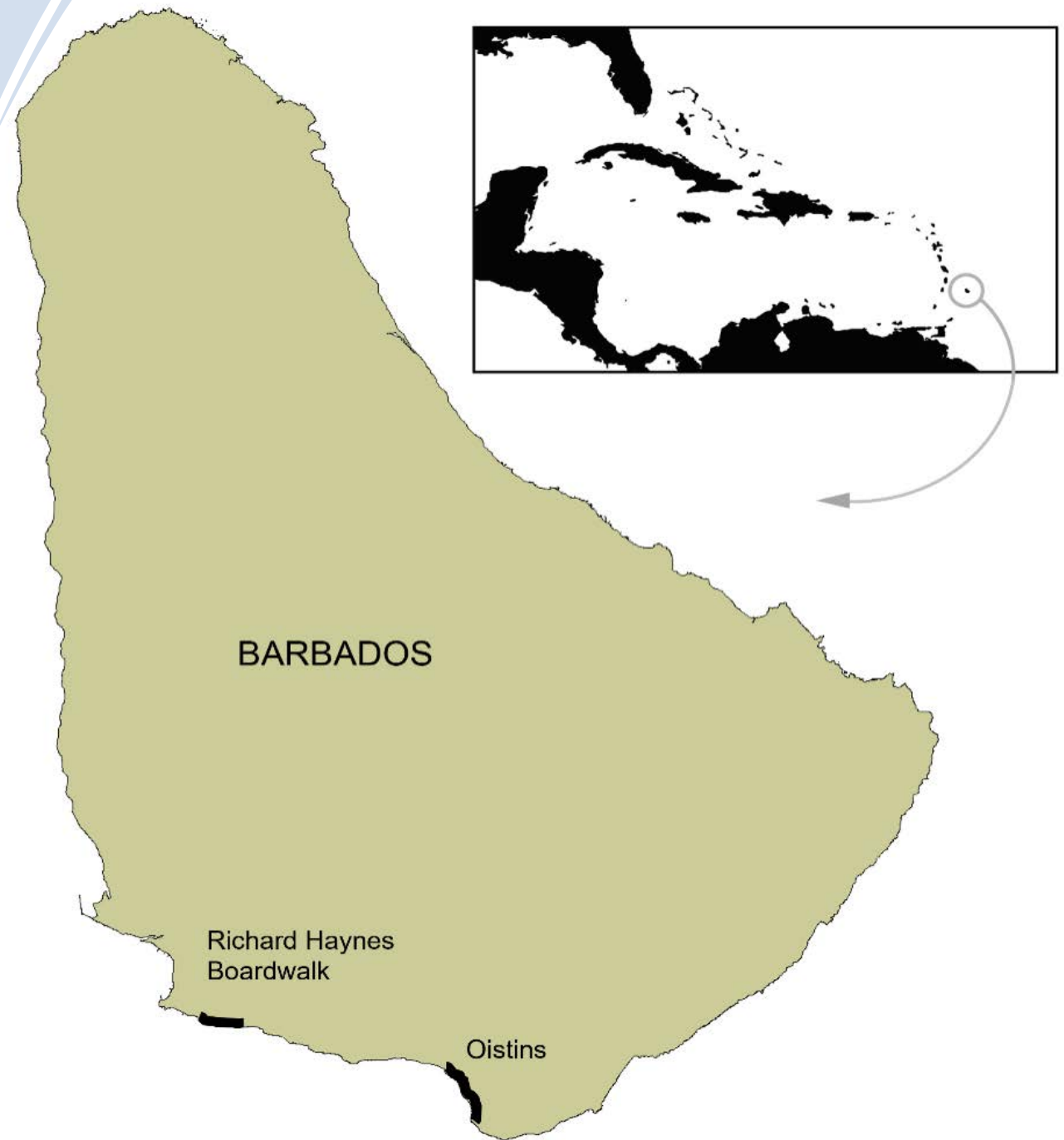
## Constraints:

1. Lack of baseline data on market and non-market economic activity at relevant temporal and spatially explicit scales, against which to measure losses
2. Paucity of systematic shoreline monitoring to measure the timing, scope and magnitude of sargassum inundation events, particularly in relation to the seasonal and spatially patchy tourism industry

# Setting

---

- Barbados
- Tourism is the leading economic sector, and has been the major foreign exchange earner since the 1970s
- More than 15% of annual GDP annually
- 29.5 % of GDP and 37.4 % of total employment in 2019





# Data

---

Beach recreationist intercept survey, included questions regarding

- Respondents' trip to the beach
- Respondent's trip to Barbados
- Intention to revisit Barbados again in the future: "definitely yes" (1), "probably yes" (2), "unsure" (3), "probably not" (4), "definitely not" (5)
- Encounters with sargassum seaweed on beaches during their visit: "Yes, a lot of sargassum was on the beaches", "Yes, but only a little", "No" and "I don't know"
- *A contingent behavior* scenario: how would the decision to return to Barbados be affected if sargassum arriving on beaches and seawater were to increase by four different percentages (10%, 30%, 50% and 90%)
- Demographic information such as respondent age, gender, income, education and marital status



	I will definitely return (1)	I will probably return (2)	I am unsure if I will return (3)	I will probably not return (4)	I will definitely not return (5)
If seaweed on beaches and seawater increases by 10%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 30%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 50%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If seaweed on beaches and seawater increases by 90%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Next, we want to ask you how your decision to return to Barbados in the future might be affected by changes in the coastal and marine environment.

If **Sargassum (brown-golden algae or seaweed)** arriving on **beaches** and seawater in **Barbados** were to increase by a percentage % (shown below), and all other conditions remain the same, would you return to Barbados in the future?

# Data

---

Survey administered in April and May of 2022 by trained enumerators at two beach locations on the south coast of Barbados: Oistins/Miami Beach and the Richard Haynes Boardwalk

n = 175





Richard Haynes Boardwalk

Oistins/Miami Beach

Survey sites are on the south coast of Barbados

- High tourist activity
- Affected by sargassum



# Methodology

---

**Are tourists who encounter sargassum less likely to return?**

- Probit regression analysis of the association between tourists' responses to initial willingness to return question and encounters with sargassum on beaches during their visit
  - Ordered probit for ordinal (5-point Likert scale) responses
  - Binary probit for most favorable response ("definitely will return")





# Methodology

---

**Are tourists who encounter sargassum more sensitive in their willingness to return under scenarios of higher sargassum in the future?**

- Multivariate probit regression (simultaneous estimation) of responses to the willingness to return question under the four sargassum scenarios
  - Ordered probit for ordinal (5-point Likert scale) responses
  - Binary probit for most favorable response (“definitely will return”)



# Methodology

**Are tourists who encounter sargassum more likely to change their willingness to return response when presented scenarios of higher sargassum in the future?**

- Multivariate probit regression (simultaneous estimation) of change in responses from original willingness to return question





# Results

---

~ 73% of the sample viewed sargassum on beaches while in Barbados

---

~ 60% viewed “a little”

~ 13% viewed “a lot”

---

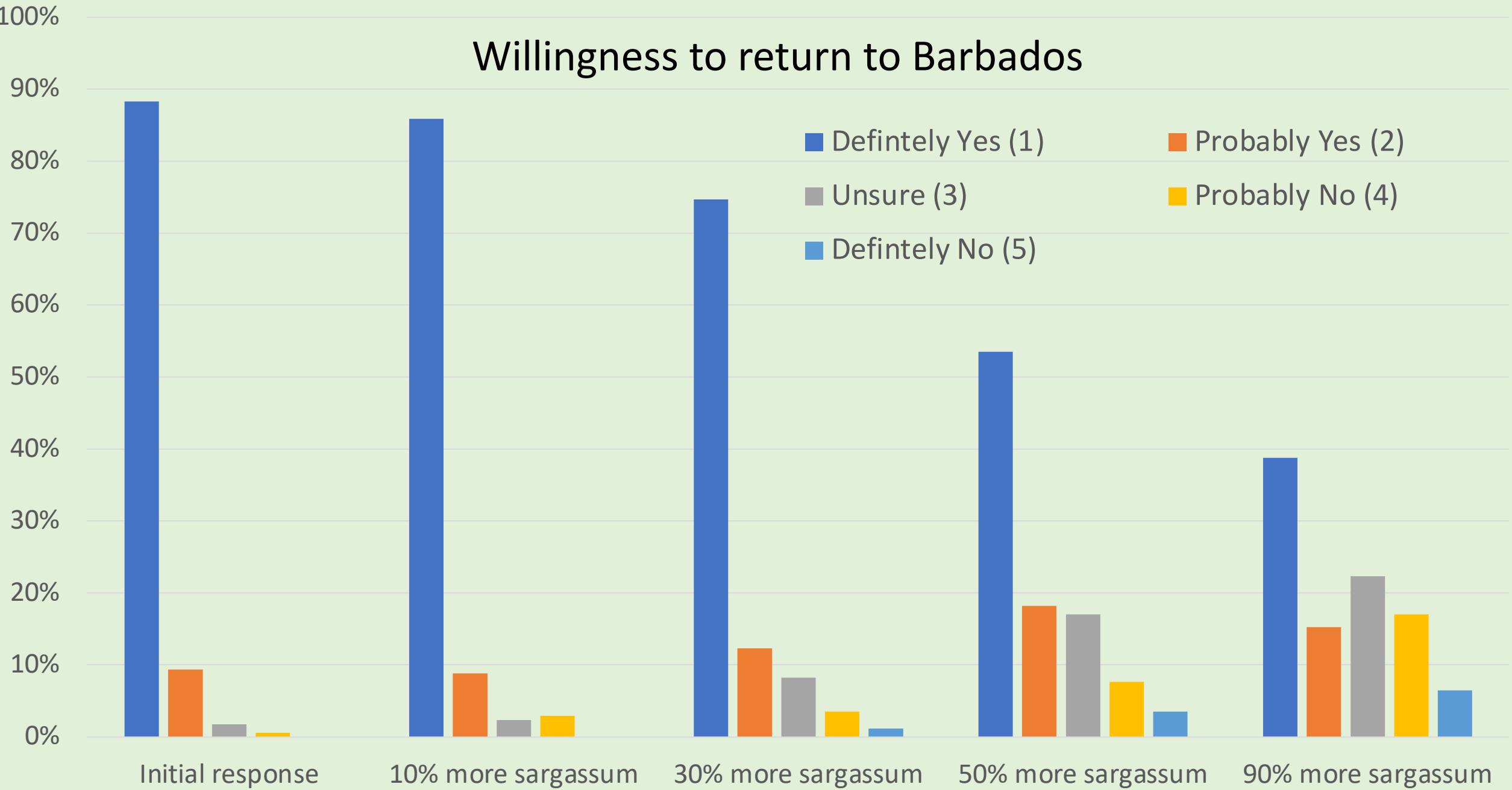
~ 25% of the sample did not view sargassum

---

< 3% did not know if they saw sargassum



# Willingness to return to Barbados





# Probit regression results

Initial stated willingness to return

	Coefficient Estimates					
	Willingness to return (1-4)			Definitely will return (0,1)		
Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept 4	-2.17***	-2.71***	-4.12***			
Intercept 3	-1.75***	-2.18***	-3.52***			
Intercept 2	-0.82***	-1.35***	-2.29**			
Intercept				-0.81***	-1.36***	-2.44**
Saw sargassum	-0.57**			-0.59**		
Did not see sargassum		0.52**			0.55**	
Saw a lot of sargassum			-1.38**			-1.32**
Saw a little sargassum			-0.72**			-0.71**
First time visitor			1.04***			0.93***
US Resident			-0.93*			-0.81
UK Resident			-0.26			-0.15
Caribbean Resident			0.65			0.57
Canada Resident			-0.21			-0.23
Male			0.79**			0.85**
Times visited beach			-0.004			0.005
Intercepted at Oistins			0.34			0.51
Intercepted on Boardwalk			-0.17			0.15
Vacation Purpose			0.89*			0.82*
Travel Hours			0.01			-0.006
-2 Log L	133.88	143.83	99.62	113.48	118.96	82.38
AIC	141.88	151.83	131.62	117.48	122.96	110.38
Percent concordant	36.4	34.6	83.3	34.6	34.8	84.6

# Marginal Effects

---

“The average percentage increase in the likelihood of the response variable for a given change in the predictor variable”

The % change in the likelihood of a stated willingness to return from viewing sargassum (0,1)





## Marginal Effects

### Results:

- Model 3: viewing any amount of sargassum decreases the probability of a “definitely will return” response by ~11%
- Model 5: *not* viewing sargassum increases the probability of a “definitely will return” response by ~10.5%



## Marginal Effects

### Results:

- Model 6: viewing “a lot” of sargassum or “a little” sargassum decreases the probability of a respondent stating that they “definitely will return” by 19% and 11% respectively
- Overall, the marginal effects from viewing a lot of sargassum are higher than those for viewing a little sargassum, and the negative impact of viewing sargassum is roughly proportional (marginally smaller) than the positive impact of not viewing sargassum.



# Willingness to return under scenarios of increased sargassum on beaches and seawater

---

- The prospect of increased sargassum has a negative and highly significant impact on willingness to return
- Tourists who viewed sargassum during their stay are more sensitive in their willingness to return only under conditions involving the highest sargassum scenarios (50 and 90 percent increases)
- Impacts on willingness to return are larger for visitors who viewed a lot of sargassum relative to those who viewed a little

# Potential impacts on tourism

---

- If current trends of sargassum influxes continue, adverse economic impacts related to decreased demand should be expected in Barbados and other Caribbean destinations.
- Those impacts will increase with the level of sargassum arriving on beaches and in seawater.



# Potential impacts on tourism

---

- Yet, given the spatial and temporal extent of sargassum influxes and the distribution of tourists across coastlines, the negative impacts of sargassum on tourism are unlikely to affect entire visitor populations.
- Many Caribbean visitors will not encounter sargassum
  - Sargassum tends to arrive from March-October, when there is a lower volume of arrivals. In Barbados, roughly 60% of visitors (approximately 414,000 visitors) arrive during “sargassum season”.
  - Sargassum influxes primarily affect windward coastlines, which support lower levels of tourism infrastructure and have fewer tourists.
  - Not all visitors spend time at the beach.

# Potential impacts on tourism

---

- Data from previous studies of beach use by Barbados tourists suggest that 25-30% of stay-over visitors to Barbados (between 170,000 and 204,000 visitors) have the potential to encounter sargassum during their stay.
- Using the marginal effects shown above: between 1 in 10 and 1 in 20 of visitors who encounter sargassum will be less likely to return to Barbados
- The net impact of sargassum encounters is expected to be on the order of 17,000 to 41,000 visitors who may not return.
- Given that return visitation accounts for roughly 50% of tourist arrivals in Barbados this equates to between 2.5% and 6% of total visitors or between 5% and 12% of return visitation that may be lost due to encounters with sargassum.



# Shortcomings

---

- We do not know the impact of sargassum events on tourists' willingness to travel to Caribbean destinations in the first place. Data on visitors who did not travel due to media coverage of sargassum or reports from other tourists are not currently available. It seems plausible that sargassum events in the region have tempered the overall growth in tourist arrivals, impacts of the pandemic notwithstanding.
- We do not have information on how sargassum influxes are expected to change in the future. Our contingent behavior results suggest that mild increases (10 percent more sargassum) are unlikely to have large impacts on return visitation but increases of 50 percent or more could have pronounced impacts, especially for those who have experienced sargassum in the past.
- We lack clear information on how visitors perceive sargassum. i.e., how much sargassum on beaches is considered "a lot" or "a little", nor do we know which aspects of sargassum visitors find the most offensive.
- Our estimates do not account for cumulative impacts on visitation that may occur if visitors who are deterred by sargassum persist in their decisions to not return. Reputational effects may cause adverse impacts to extend beyond the initial period of sargassum influx.

# Suggestions for future research

---

- How does media coverage of sargassum affect travel decisions?
- What is the scope and magnitude of negative “halo effects”? (visitors choosing not to visit locations that may not be affected by sargassum due to news of sargassum at proximate or similar locations).
- What are the relative impacts of the visual disamenity of sargassum on beaches, the discoloration of seawater, the odor of decomposing sargassum and the presence of clean-up equipment on beaches?
- How are visitors’ perceptions of sargassum related to objective measures of the amount of sargassum on beaches and seawater?
- How does reduced tourism demand translate into economic impacts through reduced visitor spending?
- How are sargassum events distributed across the region?



# Acknowledgements

- This work was supported by the Caribbean Biodiversity Fund (CBF) project 'Adapting to a new reality: managing responses to influxes of sargassum seaweed in the Eastern Caribbean' (SargAdapt), co-financed by the International Climate Initiative (IKI) of the German Federal Ministry for Environment, Nature Conservation, and Nuclear Safety through KfW.



# Thank you!

Peter Schuhmann

University of North Carolina Wilmington

[schuhmannp@uncw.edu](mailto:schuhmannp@uncw.edu)

