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Sargassum: threat or opportunity for a Blue Economy?

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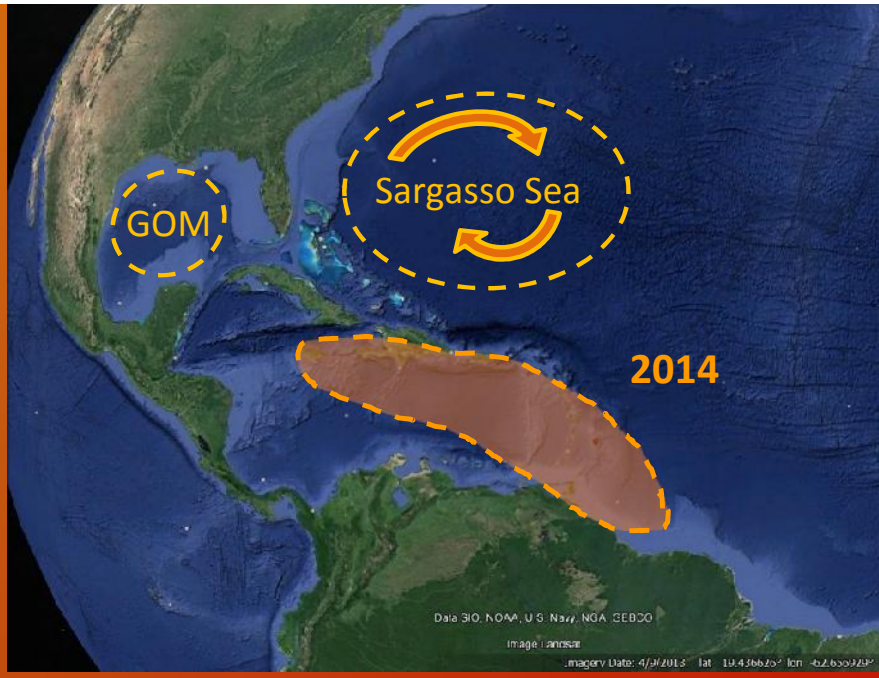
A new phenomenon for the Caribbean

Lesser Antilles

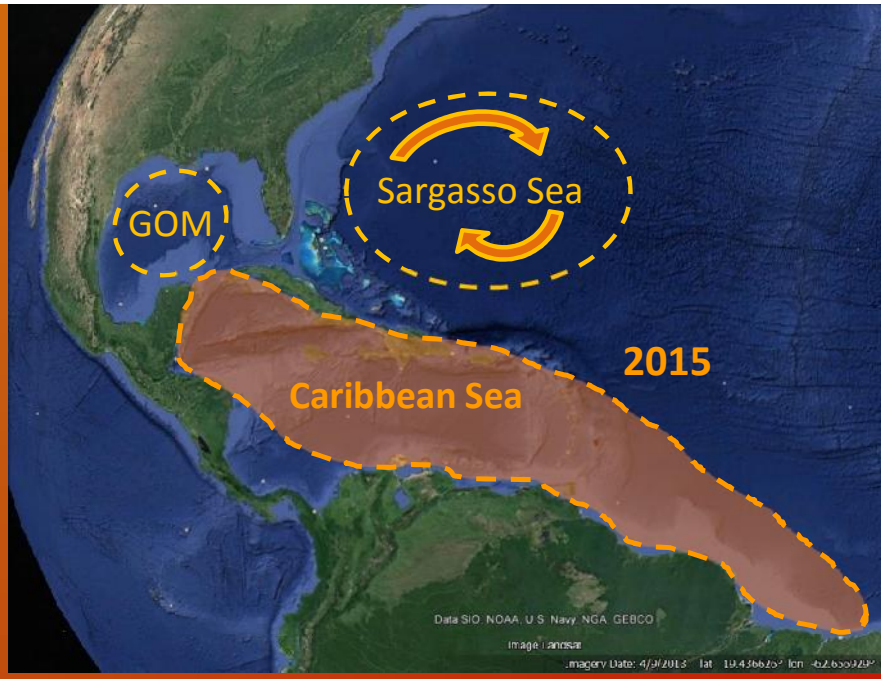
A new phenomenon for the Caribbean



Greater Antilles

Lesser Antilles

A new phenomenon for the Caribbean



Central & South America

Greater Antilles

Lesser Antilles

A new phenomenon for Caribbean


theguardian

Monday 10 August 2015 10.00 BST

Caribbean-bound tourists cancel holidays due to foul-smelling seaweed

Seaweed blankets the beach in Cancun, Mexico. The huge influx of sargassum has hit most of the Caribbean this year and prompted cancellations from tourists. Photograph: Israel Leal/AP


Newsweek U.S.

TECH & SCIENCE

Sargassum Is Ruining Beaches From Texas to Tobago

BY MELISSA GASKILL / JUNE 28, 2015 1:45 PM EDT


Mail Online

By Dailymail.com and Associated Press

PUBLISHED: 05:30 BST, 18 October 2015

Stinking seaweed that smells of rotten eggs invades Caribbean beaches

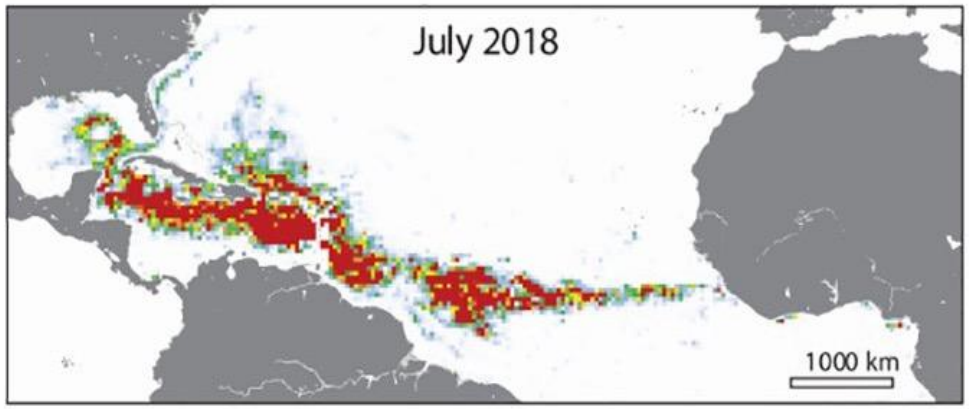
A new phenomenon for the Caribbean

REPORT

The great Atlantic *Sargassum* belt

Mengqiu Wang[1], Chuanmin Hu[1,*], Brian B. Barnes[1], Gary Mitchum[1], Brian Lapointe[2], Joseph P. Montoya[3]

Science 05 Jul 2019:



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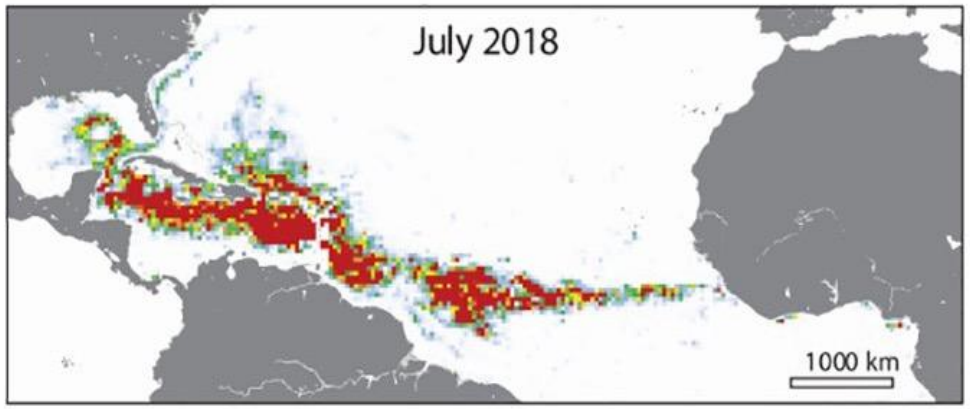
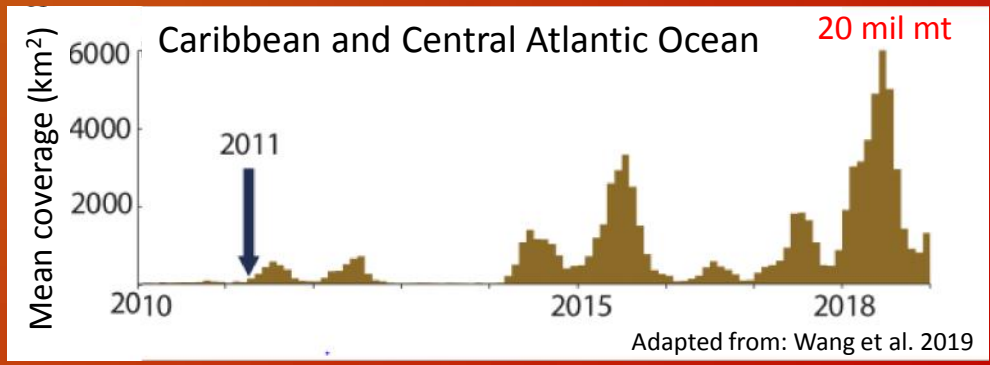
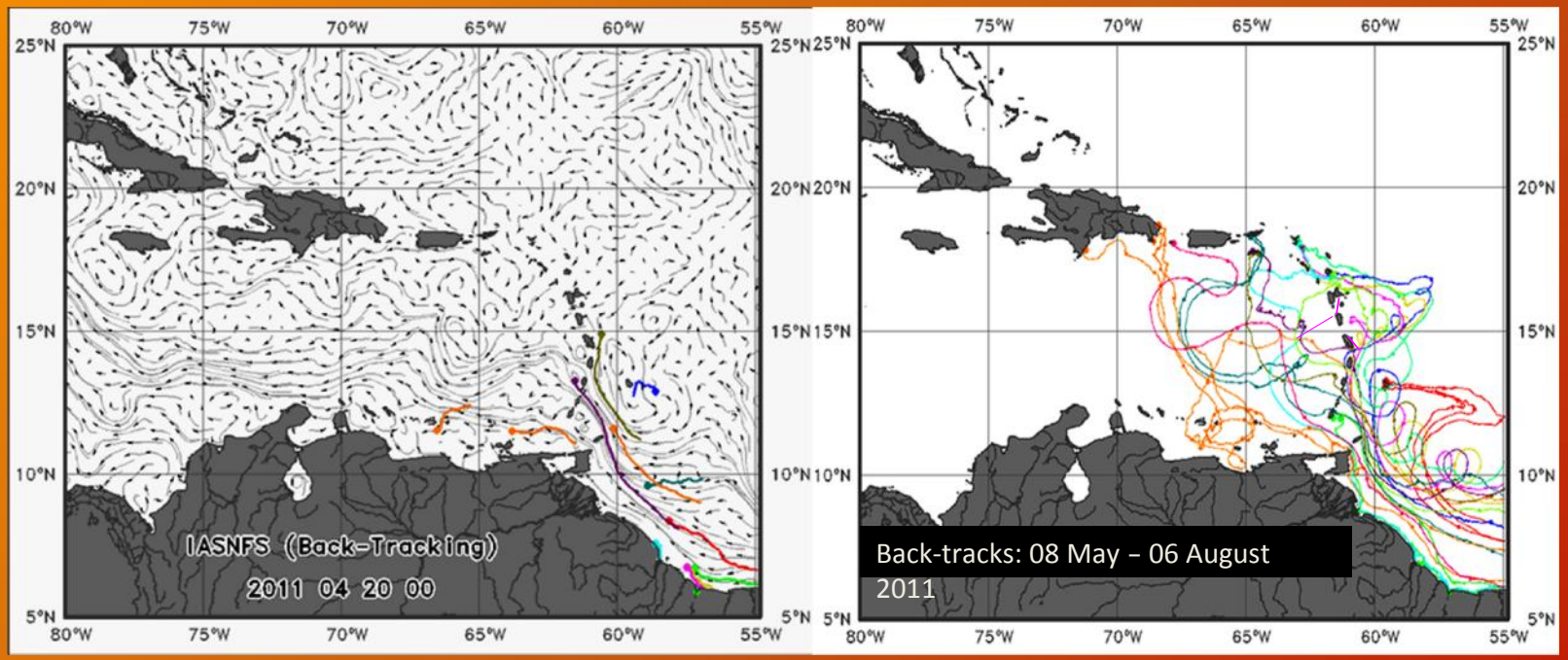


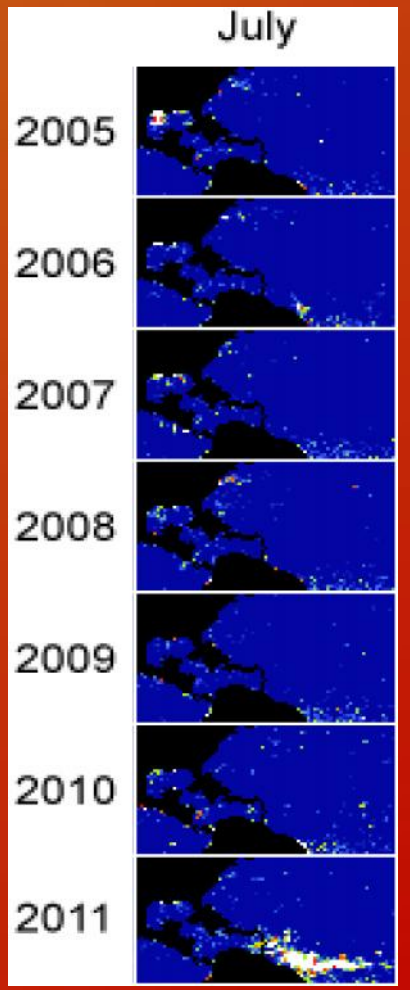


2018/2019

A new phenomenon for the Caribbean

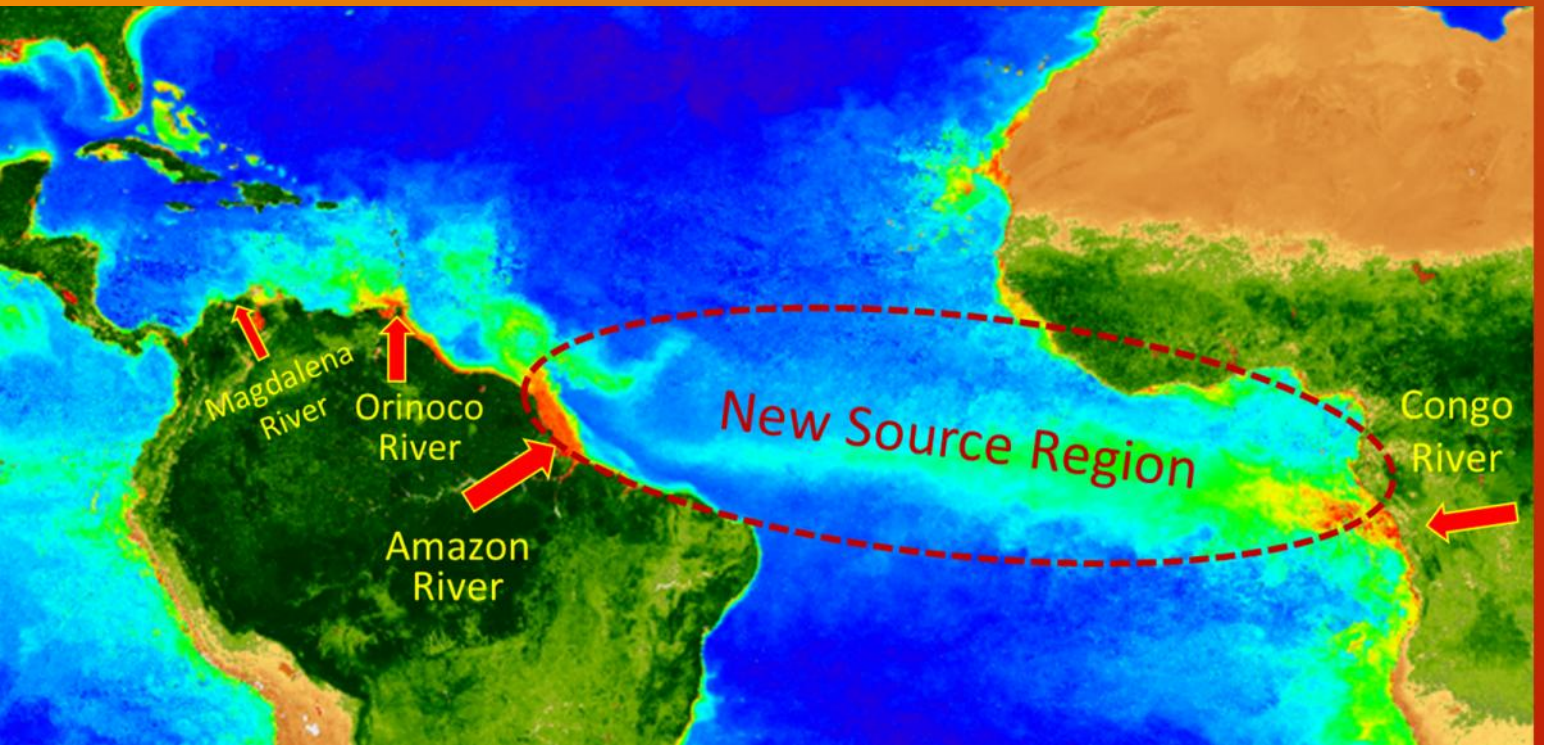


Johnson et al. (2012)



Adapted from: Gower et al (2013)

A new phenomenon for the Caribbean



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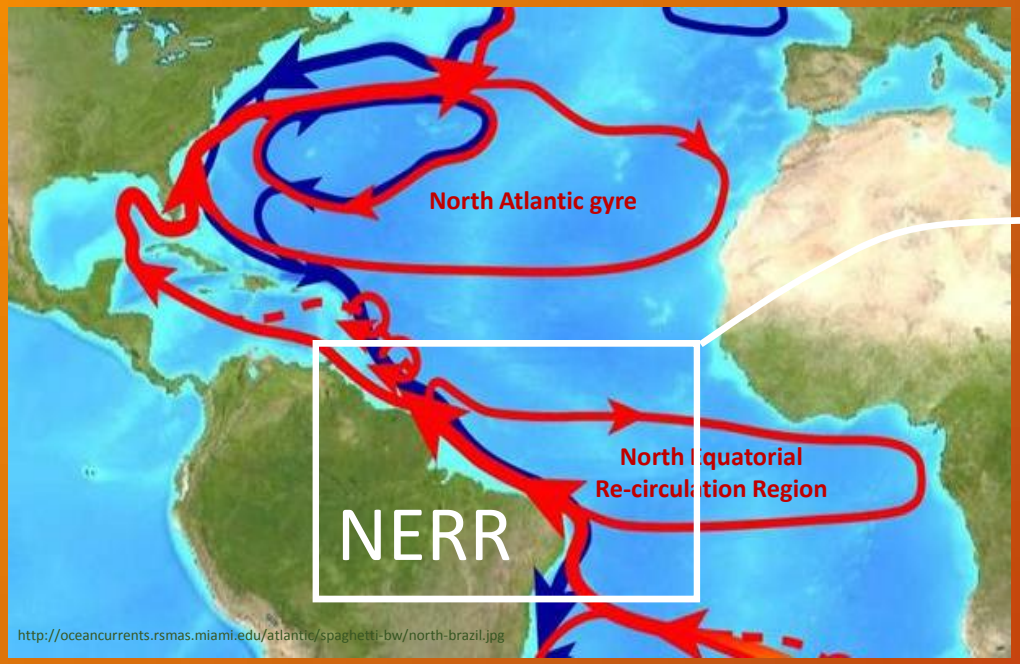
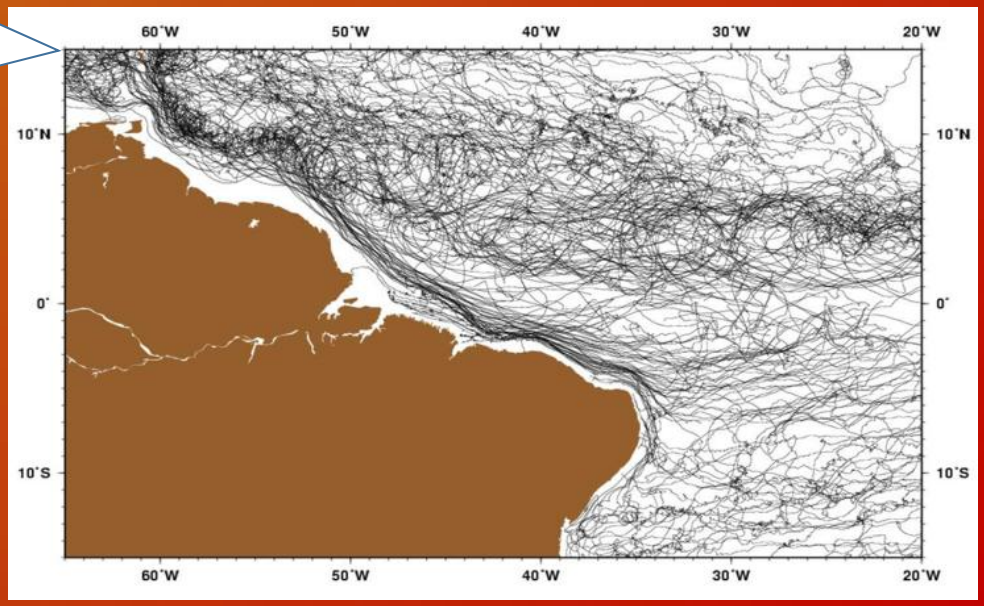


Surface drifting buoy tracks (1978 - 2003)



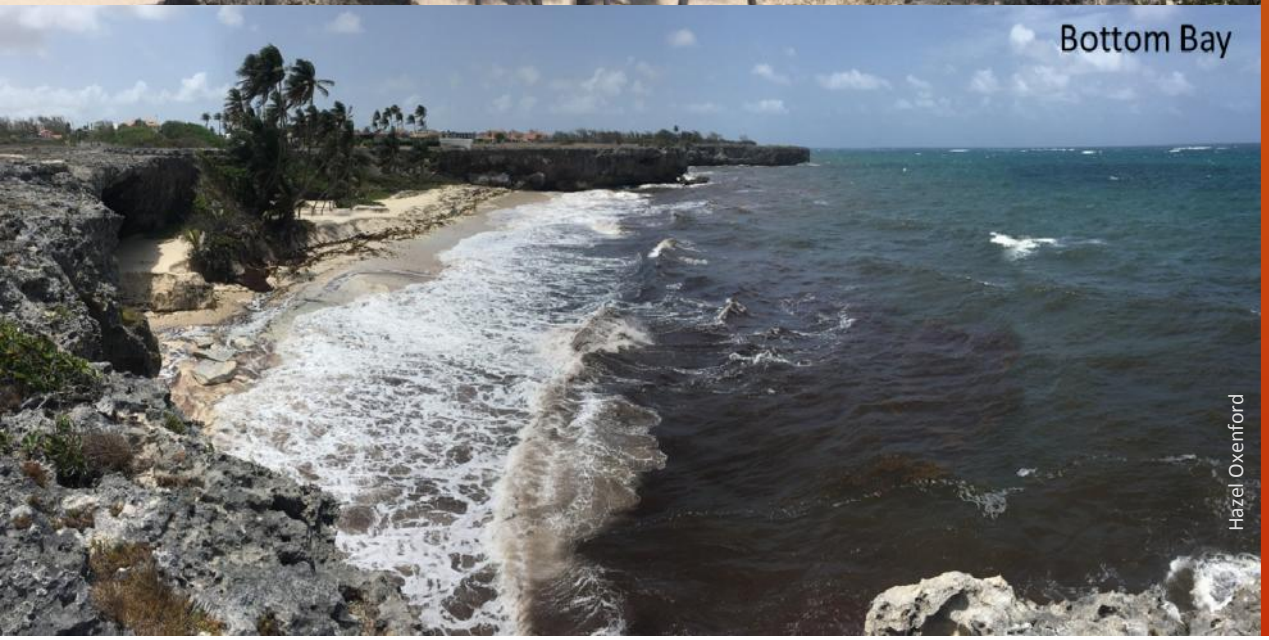
Multi-sectoral impacts
TOURISM

- Most tourism-dependent region of the world
- Iconic white sand beaches
- Turquoise warm water

- Worth US$49 billion (2018)
- > 15% GDP
- Provides 13.2% jobs

Multi-sectoral impacts
TOURISM

- Aesthetically devastating



TOURISM

- Aesthetically devastating

TOURISM

- Aesthetically devastating
- Terrible smell
- Loss of access

TOURISM

Beaches become building sites

Agencia EFE, Mexico

- Aesthetically devastating
- Terrible smell
- Loss of access
- Heavy equipment

TOURISM

Socio-economic challenges

- Enormous cost of clean up
- Dissatisfied clients
- Loss of bookings
- Tourism-reliant livelihoods negatively impacted
- Tourism revenue at risk

Negative Impacts

Inundating beaches

- Ruining appearance
- Destroying recreational space
- Making access to sea difficult
- Rotting and releasing H_2S gas
- Efforts to clean very disruptive

Nearshore

- Turning water brown
- Affecting sea bathing
- Affecting water sports
- Destroying visibility for snorkeling and SCUBA diving

Multi-sectoral impacts
FISHERIES

- Dominated by small-scale fisheries
  - Reef-associated species
  - Offshore pelagics
  - Shrimp and groundfish
  - Deep slope species

- Employs 1000s in harvest and post-harvest sectors
- Key for food security
- Some species high value exports

FISHERIES

- Access to boats and fishing grounds challenging
- Affects gear performance and catches

Shrimp trawl inundated with sargassum

Flyingfish

FISHERIES

- Access to boats and fishing grounds challenging
- Affects gear performance and catches

BARBADOS

Flyingfish

- 60% of all landings
- Ex-vessel value US$ 2 mil
- Overall value US$ 19 mil

Dolphinfish

- 25% of all landings
- Ex-vessel value US$ 2.5 mil
- Overall value US$ 6.7 mil

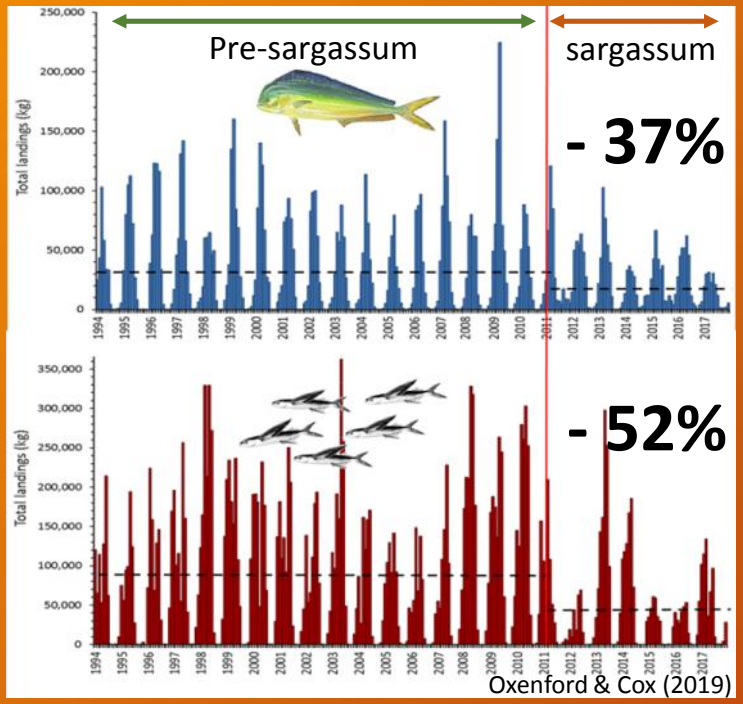
Mahon et al. (2007)

Dolphinfish

FISHERIES

- Access to boats and fishing grounds challenging
- Affects gear performance and catches

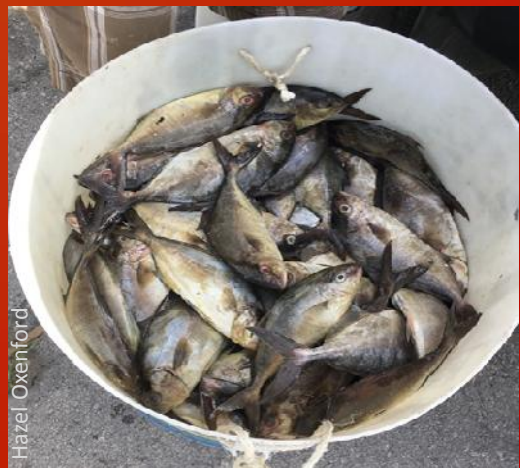
Flyingfish



Dolphinfish

Baby dolphinfish

Almaco jacks



FISHERIES

Negative Impacts

At landing sites
- Boat access very difficult
- Hard to maneuver boats

At sea
- Fishing gear less effective
- Engines overheating
- Loss of speed and steerage

Fishing disrupted
- Fewer days at sea
- Fish behaviour changing
- Lower catches
- Target species changing

Socio-economic Challenges

- Loss of harvest and post-harvest earnings
- Market changes (higher prices, new species, changing seasons)
- Profits lower (maintenance and fuel costs higher, catching less)

Multi-sectoral impacts
ENVIRONMENT

Critical ecosystems

- Coral reefs
- Mangroves
- Seagrass meadows
- Sandy beaches

Ecosystem services of reefs

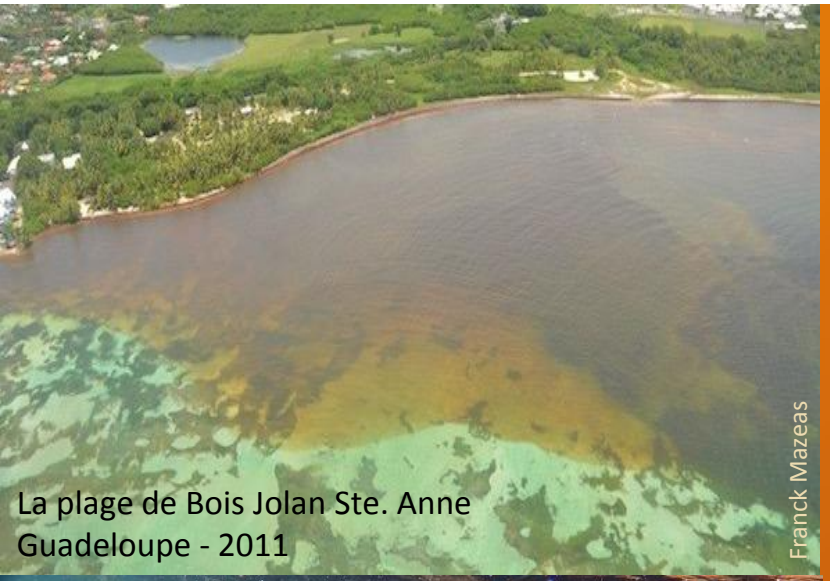
- Fisheries, dive tourism, shoreline protection
  > US$ 4.5 bill per year

Burke et al. (2011)

Multi-sectoral impacts
ENVIRONMENT

- Smothers habitat
- Removes oxygen
- Releases toxic gases
- Nutrient overload

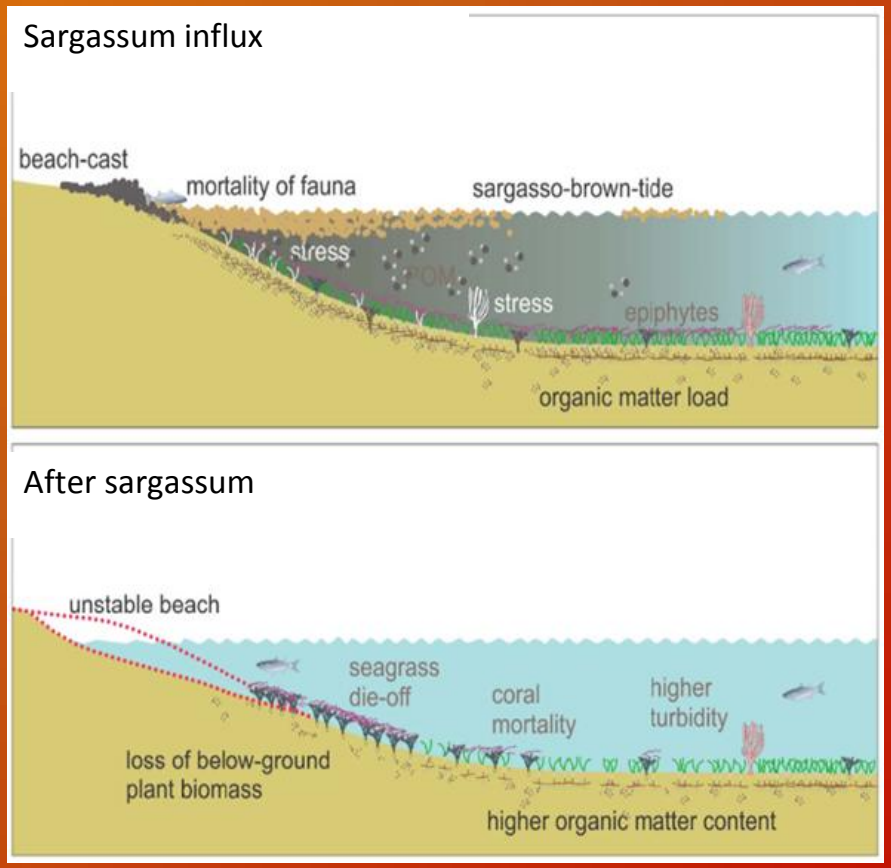
ENVIRONMENT



La plage de Bois Jolan Ste. Anne
Guadeloupe - 2011

Franck Mazeas

Hazel Oxenford



Van Tussenbroek et al. (2017)

ENVIRONMENT

Drill Hall turtle nesting beach
Barbados - June 2018

- Turtle nesting sites
  - Beach erosion
  - Access clogged
  - Temperature?
  - Microbial environment ?
- Turtles and marine mammals drowned

- Beach sand lost
  - Clean-up
  - Death of seagrasses

ENVIRONMENT

Negative Impacts

Socio-economic Challenges

- Loss of ecosystem services
- Dependent livelihoods at risk
- Increased cost of coastal management

Significant damage to beaches

- Beach erosion

Degrading water quality

- High levels of nutrients
- brown tannins
- bacteria
- Low oxygen
- Toxic H_2S

Damaging critical habitats

- Smothers/chokes coral reefs, seagrasses, mangroves

Affecting endangered species

- Drowning turtles and marine mammals
- Blocking turtle hatchlings from reaching the sea
- Changing turtle nest environment

Multi-sectoral impacts
HEALTH, TRANSPORT, FINANCE…

Negative Impacts

Human health issues with H_2S inhalation
- Closure of coastal schools and businesses
- Investment in monitoring

Disruption of marine traffic (ferries, cargo etc)

Implications for national GDP
- Loss of earnings in tourism sector
- Loss of earnings in fisheries sector
- Substantial costs for continued clean-up
- National insurance claims for loss of earnings
- Loss of property values
- Loss of ecosystem services

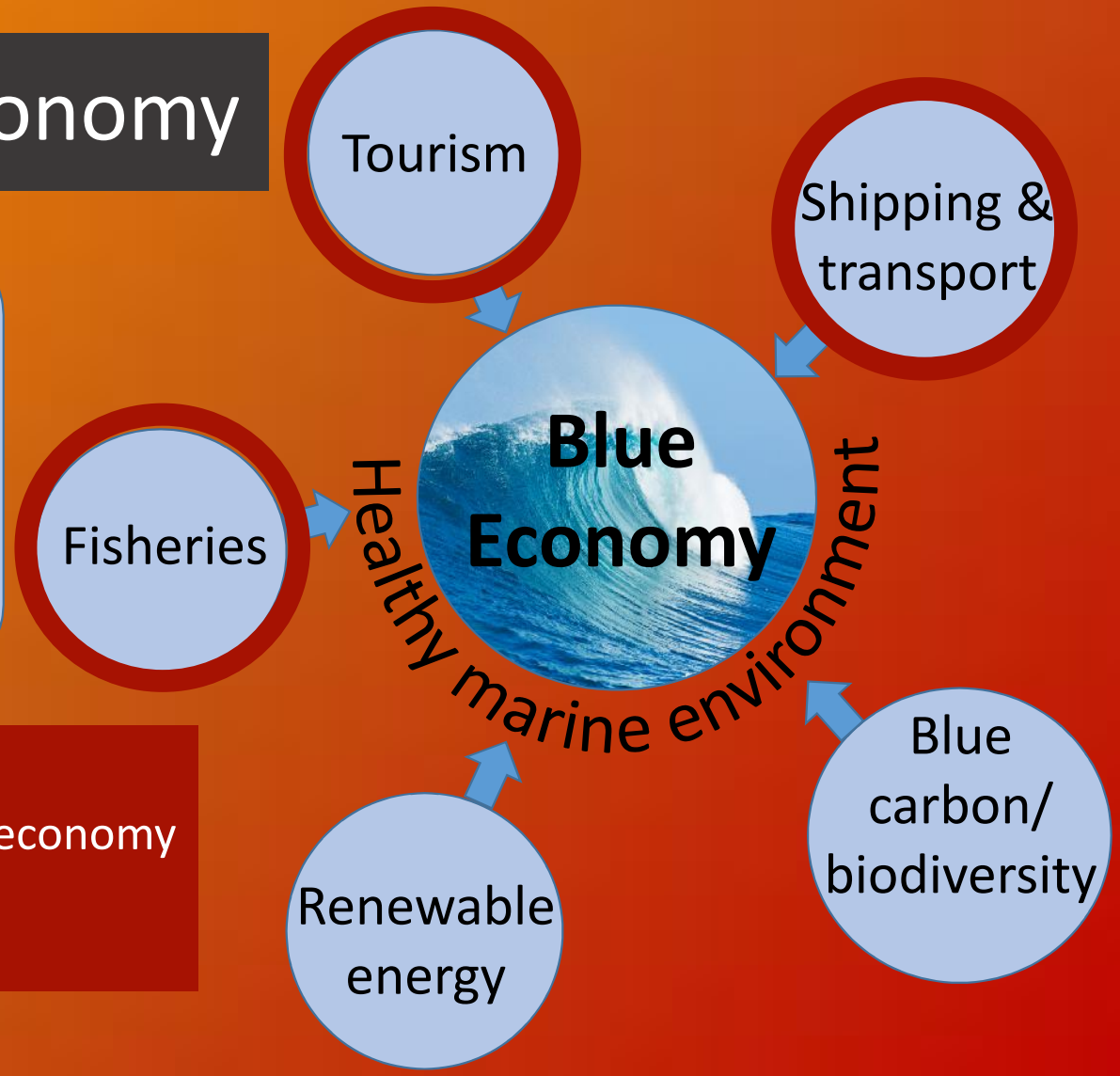
Threat for a blue economy

Blue Economy

Sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem [*World Bank*]

Currently sargassum is:

- Damaging foundation of the blue economy
- Negatively impacting key sectors
- Costs of coping are unsustainable



Opportunity: Scope for innovation

Mitigation (removal):

- Retention booms
- Boom maintenance
- Collection barges
- Conveyor belts
- Grabs, mechanized rakes

Opportunity: Scope for innovation

Potential uses:

- Biogas
- Bioplastics
- Agricultural fertilizers
- Animal/fish feed ingredient
- Specialized food dishes
- Personal care products
- Paper, textiles, art material
- Building materials
- Bioremediation
- Carbon sequestration …..

Important considerations

Technical, scientific, regulatory:

- Forecasting supply
- Chemical composition of seaweed
- Public health hazard assessment (consumption, use, disposal)
- Means of conserving biodiversity
- Regulation of harvest (method and quotas)

When, where and how much?

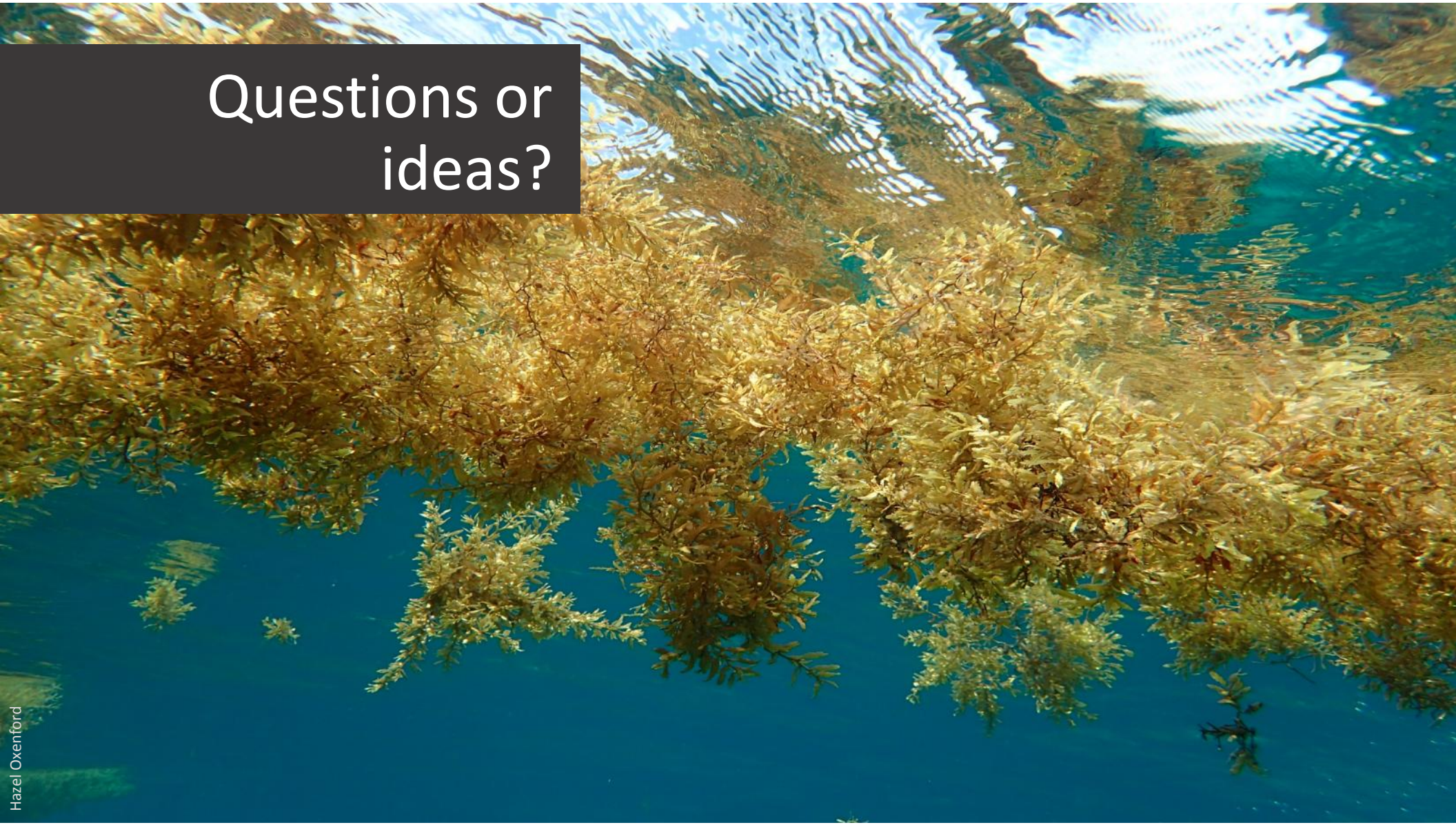
Protein, salt, minerals,sugar, bio-stimulants?

Pollutants (arsenic, chlordecone) and H_2S gas?

When to let live, where to collect?

Who gets what and how?

Questions or ideas?



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