

Interreg
Caraïbes



UNION
EUROPÉENNE

Fonds européen de développement régional

SARG'COOP
Programme caribéen de coopération de
lutte contre les algues sargasses



Sargassum distribution and abundance reveal a World Heritage

Paulo Horta
Professor
Universidade Federal de Santa Catarina

24/10/2019



Sargassum is the main builder of Southern Atlantic Marine Forests

- Threats – Pollution and overfishing



Brazilian golden tide event

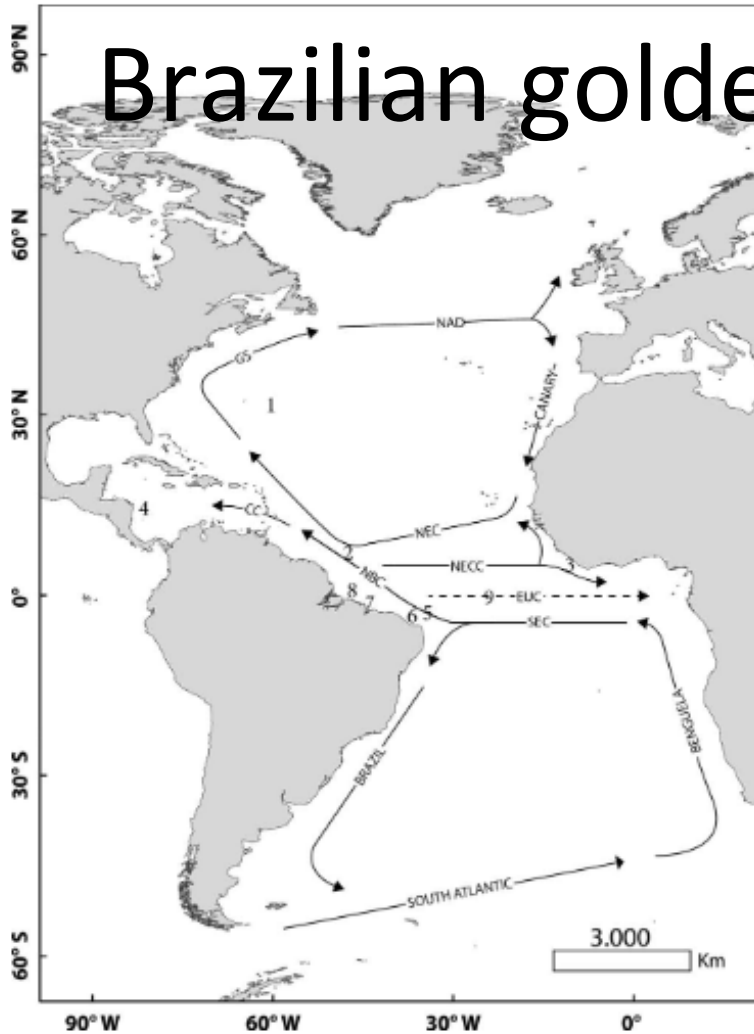
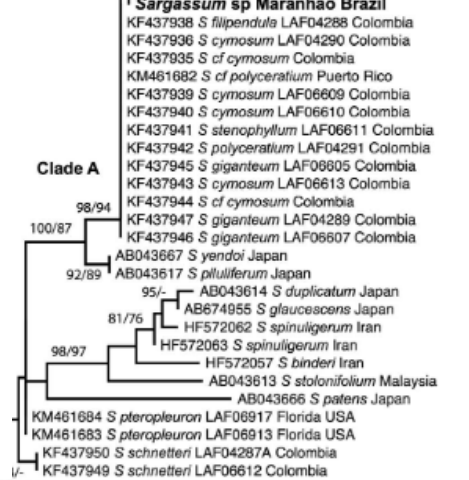


Fig. 1. Atlantic Ocean map and main oceanic currents. The numbers

Fig. 1. Atlantic Ocean map and main oceanic currents. The numbers represent the chronological occurrence of floating *Sargassum*. 1. Sargasso Sea (Gavio & King 2011); 2. Offshore northern Brazilian coast (Széchy *et al.* 2012); 3. Sierre Leone to Ghana (Johnson *et al.* 1974); 4. San Andrés Bay (Gouveia *et al.* 2010); 5. Fernando de Noronha Archipelago (present study); 6. Fernando de Noronha Archipelago (present study); 7. Maranhão (present study); 8. São Pedro e São Paulo Archipelago (present study); 9. São Pedro e São Paulo Archipelago (present study). CC, Caribbean Current; EUC, Equatorial Undercurrent; GS, Gulf Stream; NAD, North Atlantic Drift; NBC, North Brazil Current; NEC, North Equatorial Current; NECC, North Equatorial Countercurrent; SEC, South Equatorial Current.

- KM461681 *S. polyceratum* LAF03947 Panama
- KM461679 *S. natans* LAF06437 Gulf of Mexico USA
- KM461678 *S. natans* LAF06919 Gulf of Mexico USA
- KM461675 *S. fluitans* LAF06920 Gulf of Mexico USA
- KM461674 *S. fluitans* LAF04276 North Carolina USA
- KM461673 *S. filipendula* LAF04275 North Carolina USA
- KM461672 *S. filipendula* LAF04256 Panama
- Sargassum* sp MTS14 Rio de Janeiro Brazil**
- Sargassum* sp MTS29 Rio de Janeiro Brazil**
- Sargassum* sp 03 Fernando de Noronha Brazil**
- Sargassum* sp 06 Fernando de Noronha Brazil**
- Sargassum* sp 07 Fernando de Noronha Brazil**
- Sargassum* sp 533 Fernando de Noronha Brazil**
- Sargassum* sp SF01 Para Brazil**
- Sargassum* sp SD04 Para Brazil**
- Sargassum* sp SD02 Para Brazil**
- Sargassum* sp SF04 Para Brazil**

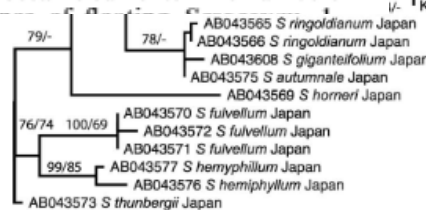


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The floating *Sargassum* (Phaeocyceae) of the South Atlantic Ocean – likely scenarios

MARINA NASRI SISSINI^{1*}, MARIA BEATRIZ BARBOSA DE BARROS BARRETO², MARIA TERESA MENEZES SZÉCHY², MARCOS BOUÇAS DE LUCENA³, MARIANA CABRAL OLIVEIRA⁴, JIM GOWER⁵, GANG LIU^{6,7}, EDUARDO DE OLIVEIRA BASTOS⁸, DANIELA MILSTEIN⁹, FELIPE GUSMÃO⁹, JOSÉ EDUARDO MARTINELLI-FILHO¹⁰, CICERO ALVES-LIMA¹¹, PÍO COLEPICOLI¹¹, GABRIEL AMERKA¹², KWIKU DE GRAFF-JOHNSON¹³, LUDIANE GOUVEIA¹⁴, BEATRIZ TORRANO-SILVA¹⁴, FÁBIO NAUPEL¹⁵, JOSÉ MARCOS DE CASTRO NUNES¹⁵, JOSÉ BONOMO BARRETTI¹⁶, LEONARDO RIBEIRO¹⁶, RAFAEL RISSMENA-RODRIGUES¹⁷, THAYANA JEREMAS MELLO¹⁸, LETICIA VIEIRA COSTA LOTUF¹⁷ AND PAULO ANTUNES HORTA¹



0.02

Fig. 2. Maximum likelihood phylogram based on ITS2 data set. Numbers on branch nodes are maximum likelihood/Neighbour-Joining bootstrap values. Scale bar represents the number of substitutions. Names in bold are sequences from material collected in Brazilian waters. Sequences of the Panama and Colombia materials are from the Atlantic side.

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The floating *Sargassum* (Phaeophyceae) of the South Atlantic Ocean – likely scenarios

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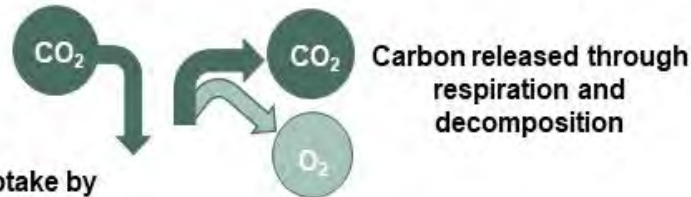
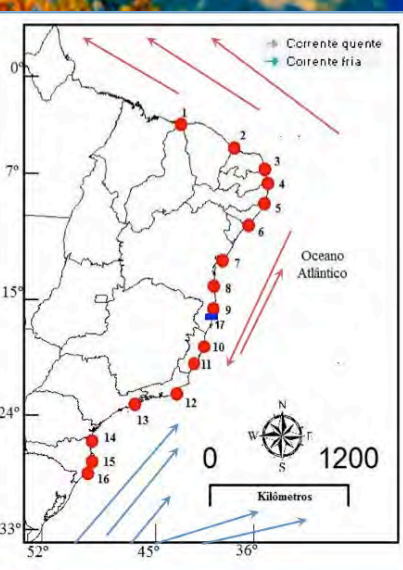


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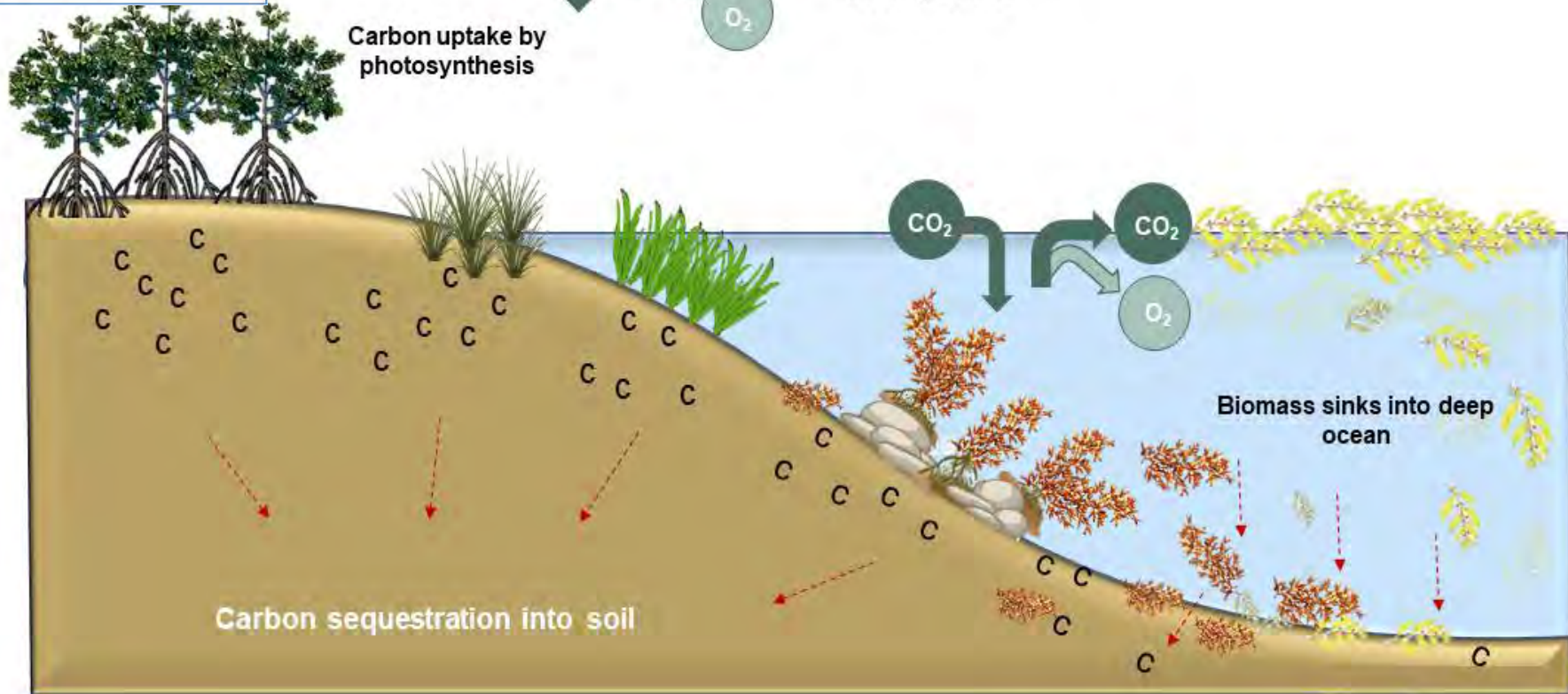
2014 - 25 tons
2015 - 150 tons

Sargassum bloom: is it a problem or opportunity?



Carbon uptake by photosynthesis

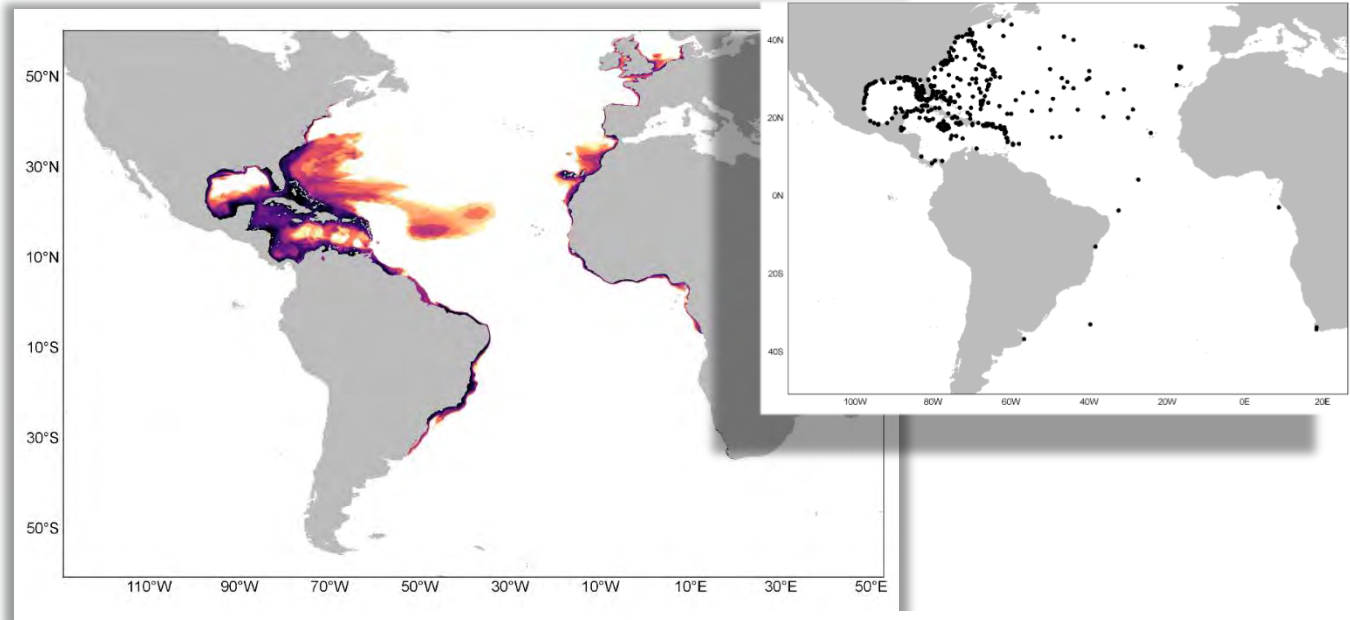
Carbon released through respiration and decomposition



Carbon sequestration into soil

Biomass sinks into deep ocean

Niche suitability



Variables/Unit

Relative contribution (%)

Iron ($\mu\text{mol.m}^{-3}$)

Salinity (PSS)

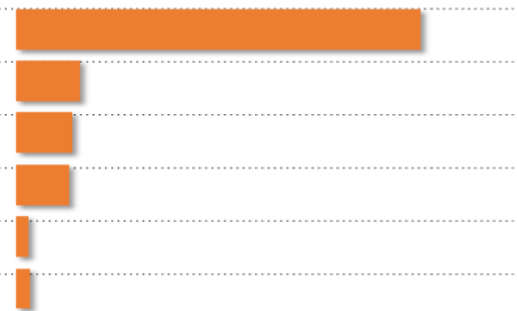
Temp.Min ($^{\circ}\text{C}$)

Nitrate (mol.m^{-3})

Temp.Max ($^{\circ}\text{C}$)

Phosphate (mol.m^{-3})

0 25 50 75








Sargassum relative potential importance




Geographic extent
Million hectares
(ha)

Mean global estimate of above ground biomass
(Total Million Mg.ha)

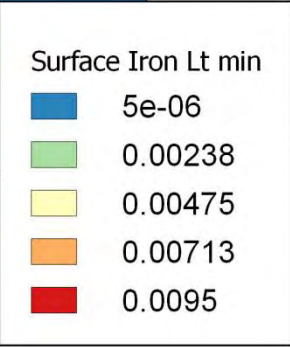
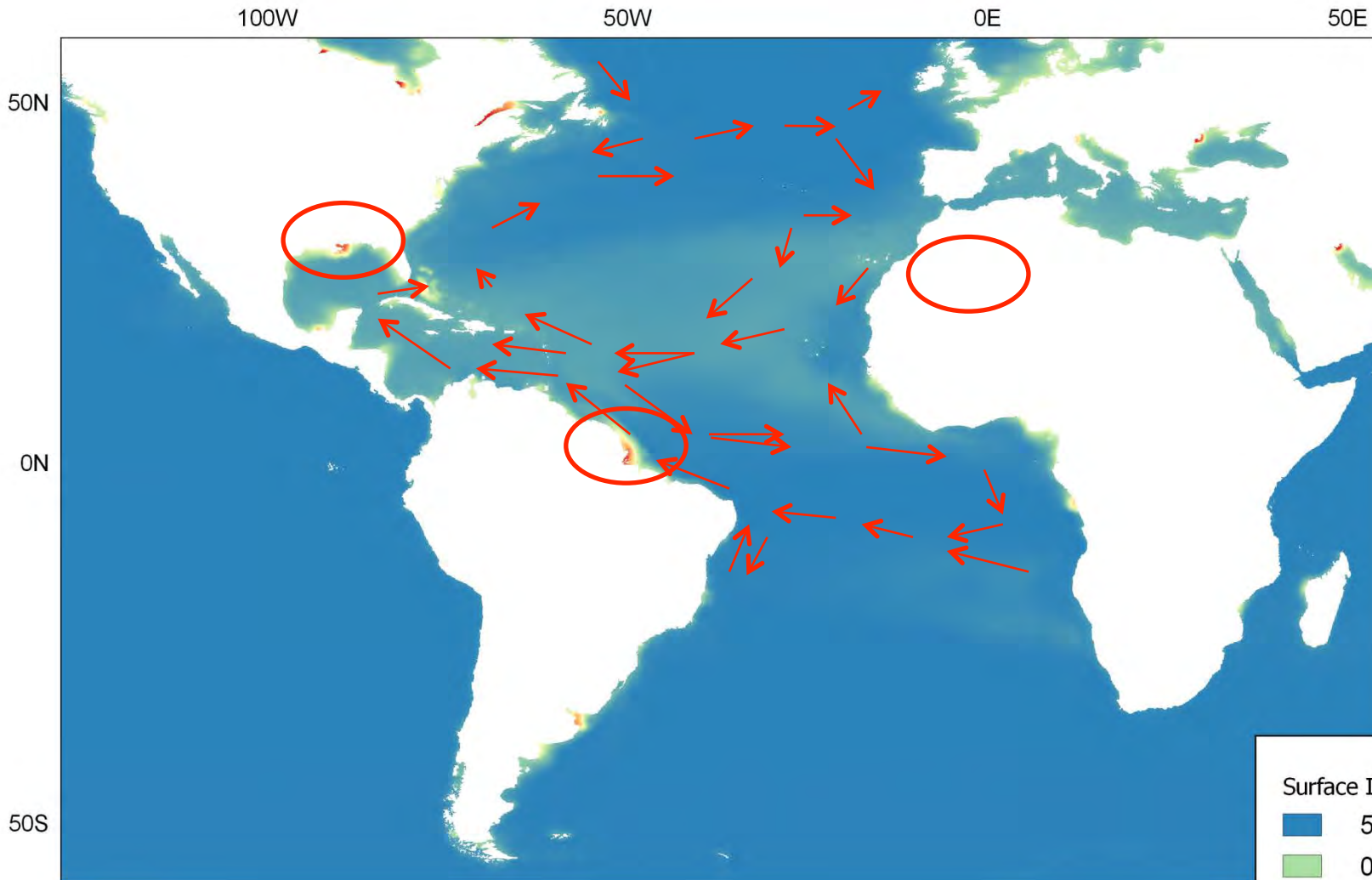
Mean global estimate of carbon stock in above ground biomass
(Total Million MgC)

	 Mangrove	 Salt marsh	 Seagrasses	 Benthic <i>Sargassum</i>	 Floating <i>Sargassum</i>
Geographic extent (ha)	13.80–15.20	2.20–40.00	17.70–60.00	50.01–110.41	200.00 – 330.11
Mean global estimate of above ground biomass (Total Million Mg.ha)	16.60–627.00 *	22.00–120.00 **	0.001–0.75 ***	0.80–1.47	60.00–82.58
Mean global estimate of carbon stock in above ground biomass (Total Million MgC)	5,617–6,187	570–10,360	4,260–8,520	14.01–161.70	4,210–9,265

 Benthic + Floating
400
80
10,000



Iron on the surface



Currents

Climatic Change
DOI 10.1007/s10584-012-0485-6

Patterns of change in sea surface temperature in the North Atlantic during the last three decades: beyond mean trends

Fernando González Taboada · Ricardo Anadón →



Likely scenario

- Global stressors
 - Ocean warming
 - Ocean acidification
- Local stressors
 - Trophic changes
 - Continental runoff
 - Agriculture
 - Deforestation
 - Dam
 - Mining

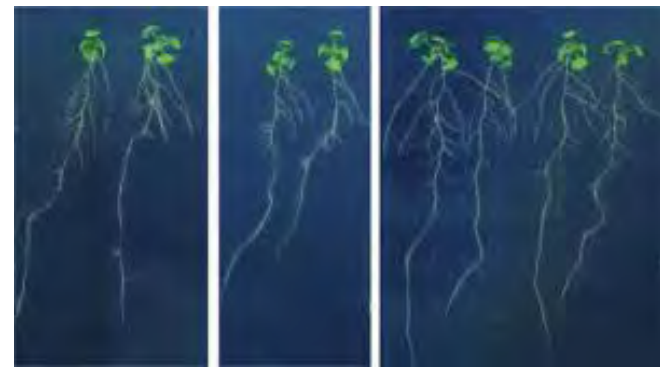


Sargassum bloom: it is a problematic opportunity!

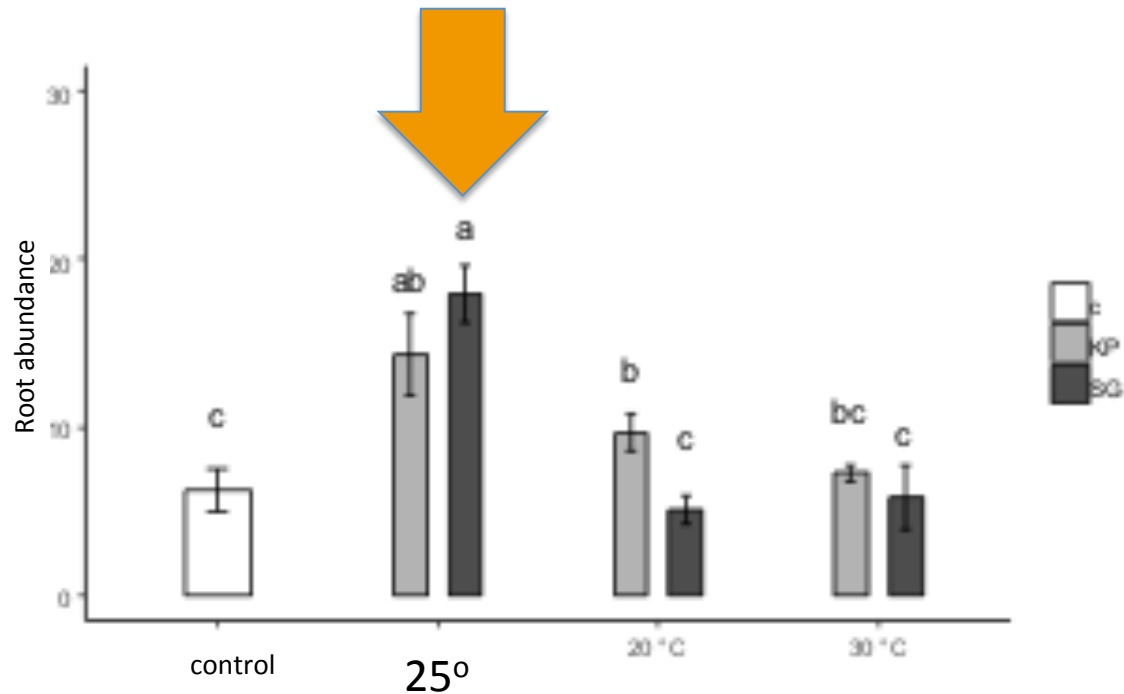
- Goods
 - Agriculture
 - Biotechnology
- Services
 - Raft, biological connection
 - Carbon sink

Sargassum goods and services should provide tools to solve regional negative socio-environmental-economic consequences

Applied initiatives



“Bio fertilizer” - *Arabidopsis thaliana*



If we have more roots we should reduce runoff, soil erosion, and ocean fertilization

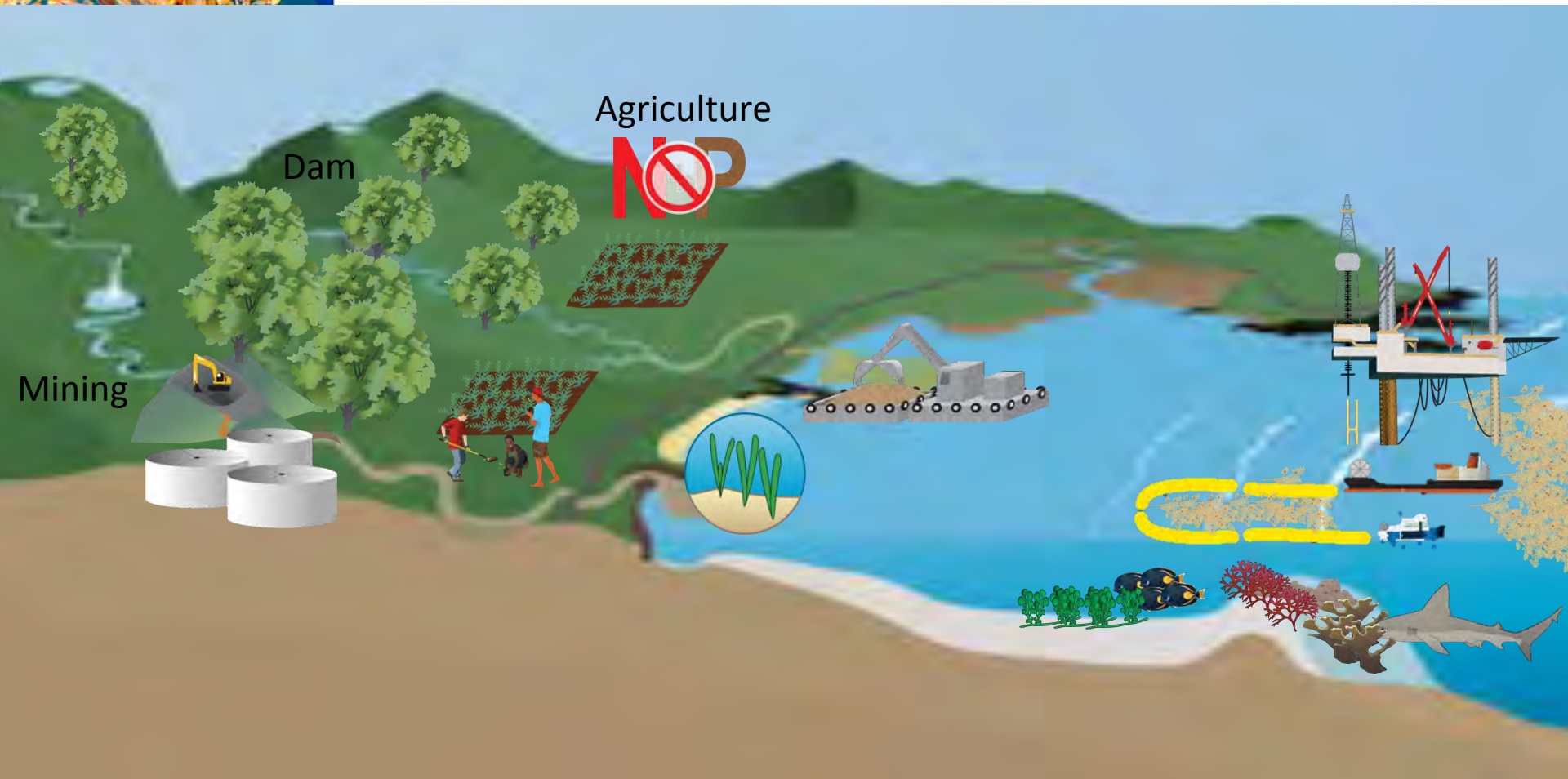
Land use evolution



Management omissions have high socio-economic and environmental costs



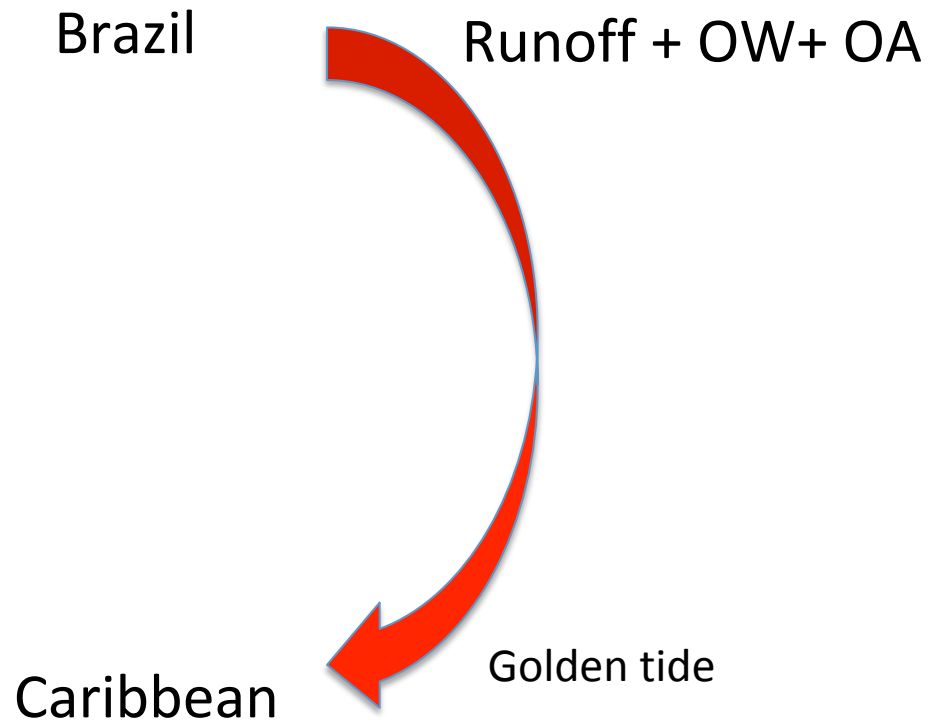
Solutions in different scales



Link Science and Management

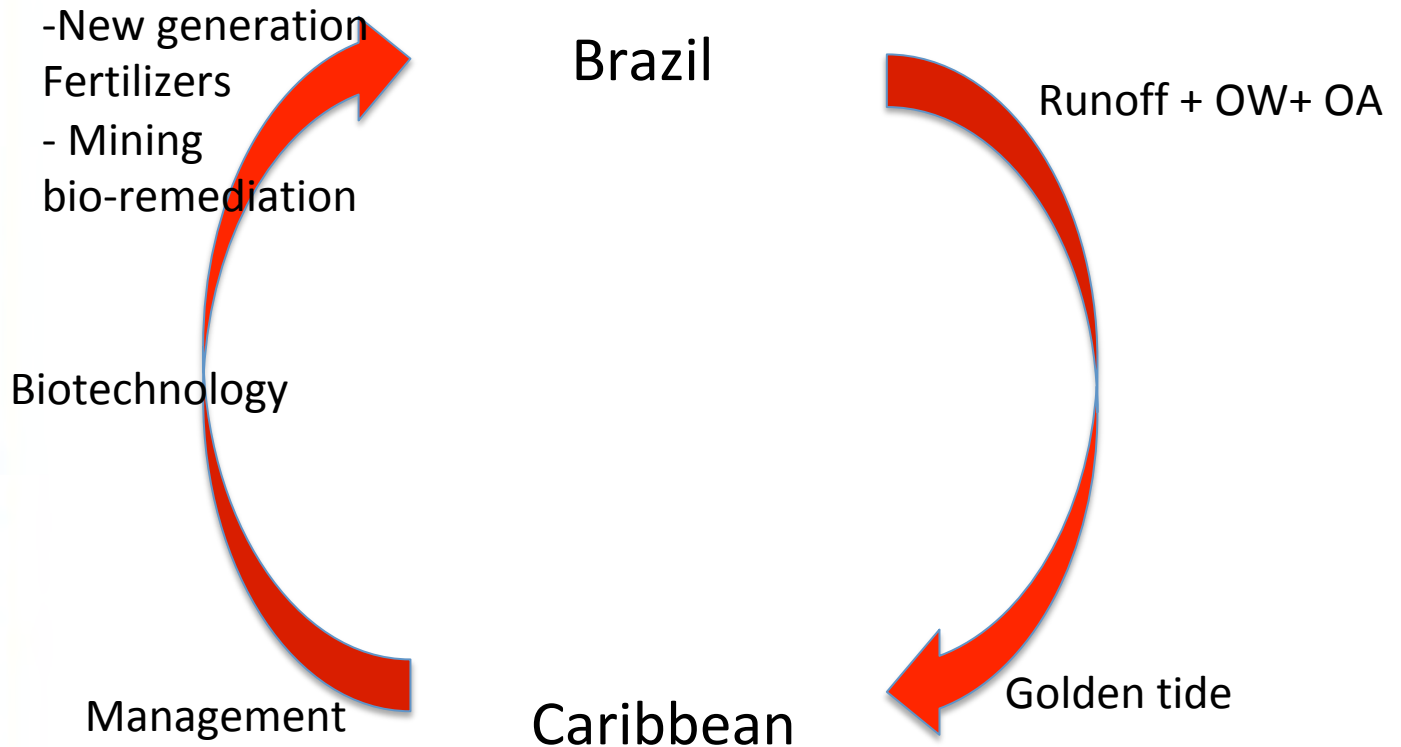


Now...The problem



New transnational program

Nature-based solutions



New transnational program

Nature-based solutions

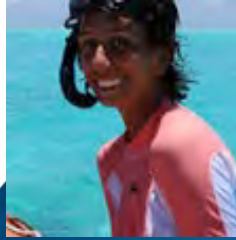


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Marina Sissini
msissini@gmail.com

Thank you



Lidiane Gouveia
lidi_pel@hotmail.com

Brazilian workgroup

Marina Sissini (UFSC)
Lidiane Gouveia (UFSC)
Giulia Burle (UFSC)
Gabrielle Koerech
(UFSC)
Leila Hayashi (UFSC)
Mariana Cabral de
Oliveira (USP)
Inara Regina (USP)
Fanly Fungyi Chow Ho
(USP)
Cícero Alves- Lima (USP)
Pio Colepicolo (USP)
José Eduardo Martinelli-
Filho (UFPA)
José Marcos de Castro
Nunes (UFBA)
Maria Teresa Menezes
Szechy (UFRJ)
Thayná Mello (ICMBio)
Fernanda Arentz
(MARINHA)
Paulo Horta (UFSC)



email: pauloantuneshorta@gmail.com