



Mini-conférences 1 - Connaissance fondamentale des algues sargasses et des micro-organismes associés

Basic knowledge on *Sargassum* and overview of the current results from the 2017 cruises

Frédéric Ménard, IRD

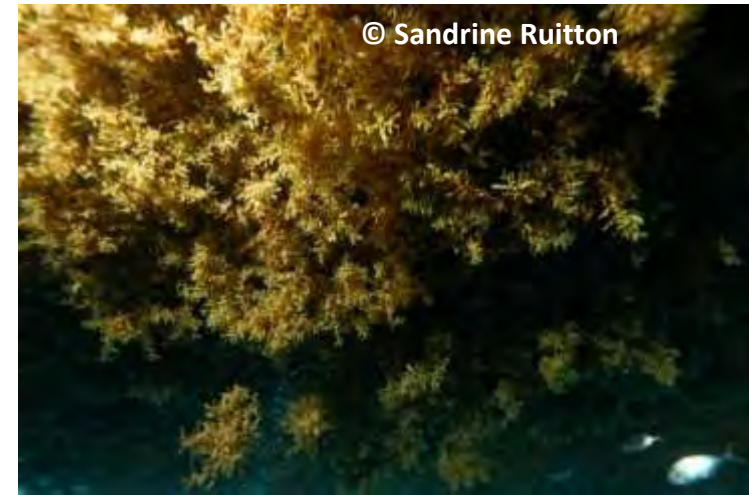
Directeur département scientifique OCEANS

frederic.menard@ird.fr

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What about *Sargassum*?

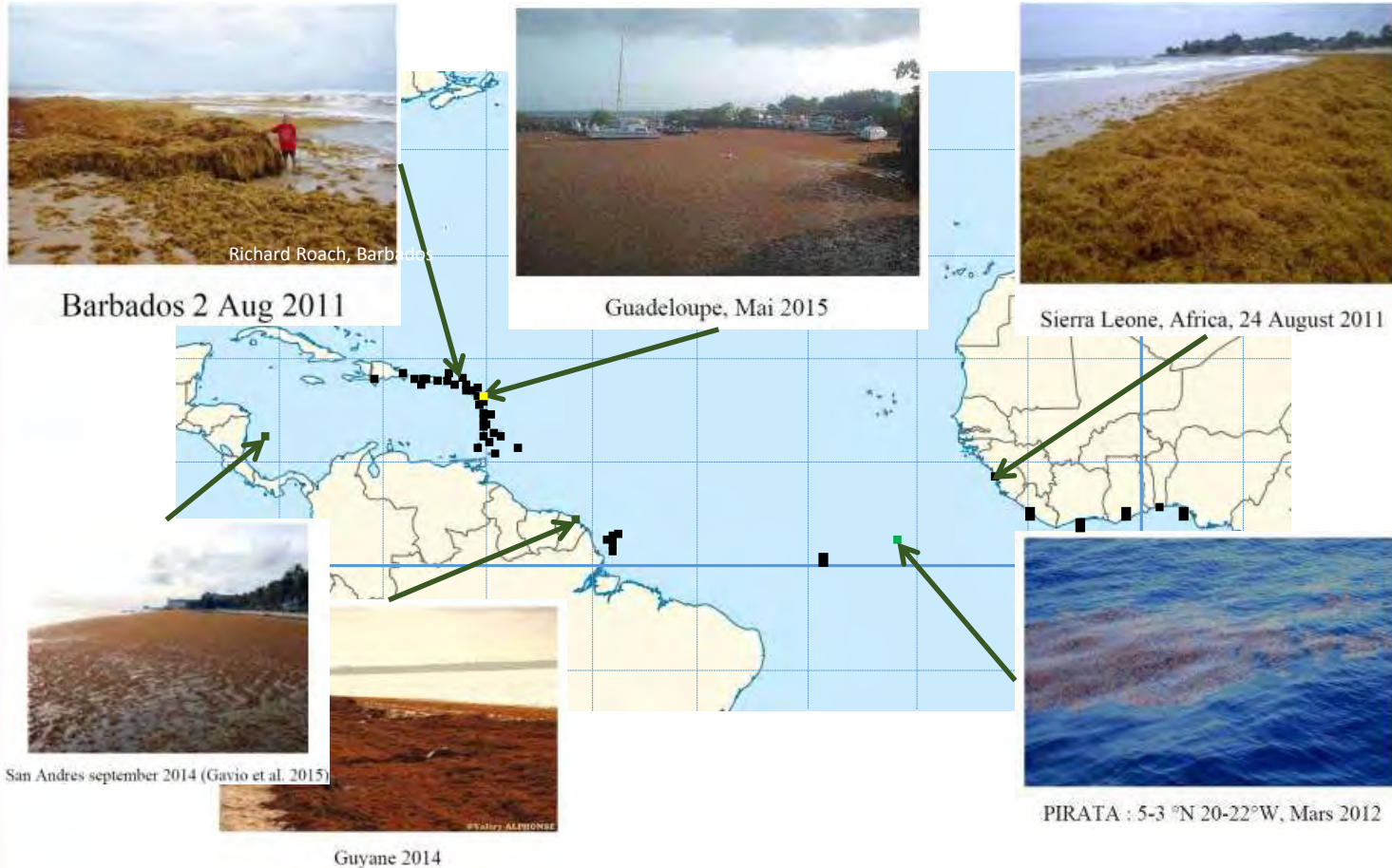
- **Brown algae** generally attached to rocks along coasts
- Neither harmful nor toxic
- Two **pelagic** species *Sargassum fluitans* et *S. natans* (biological cycle in the open sea)



- ✓ **Float freely** in the ocean and can accumulate in **dense aggregations**
- ✓ Common in the **Sargasso Sea**, the *golden floating rainforest* (between 30°N & 60°W)

BUT...

Since 2011, **new strandings** of pelagic *Sargassum* reported on the coasts of the **Caribbean, northern Brazil, French Guiana and West Africa**



Threat for local biodiversity and **economic losses** associated with beach deterioration & impact on **fisheries** and **tourism**
Does not occur every year **with the same intensity**

Two oceanographic cruises in 2017 (~ 10 000 km)

Caraïbe cruise
June – July 2017
25 days
13 scientists

Transatlantic cruise
October 2017
20 days
8 scientists



1 000 km

Species identity responsible for the massive strandings is incomplete

- High **plasticity** in *Sargassum* species
- **Three morphotypes** reported from the new areas
- Sexual reproduction not observed (clonal species)

Species delineation studies using morphology and genetics

- Two or more taxa? *Sargassum natans*, *S. fluitans* + new species?
- Phylogeny investigation

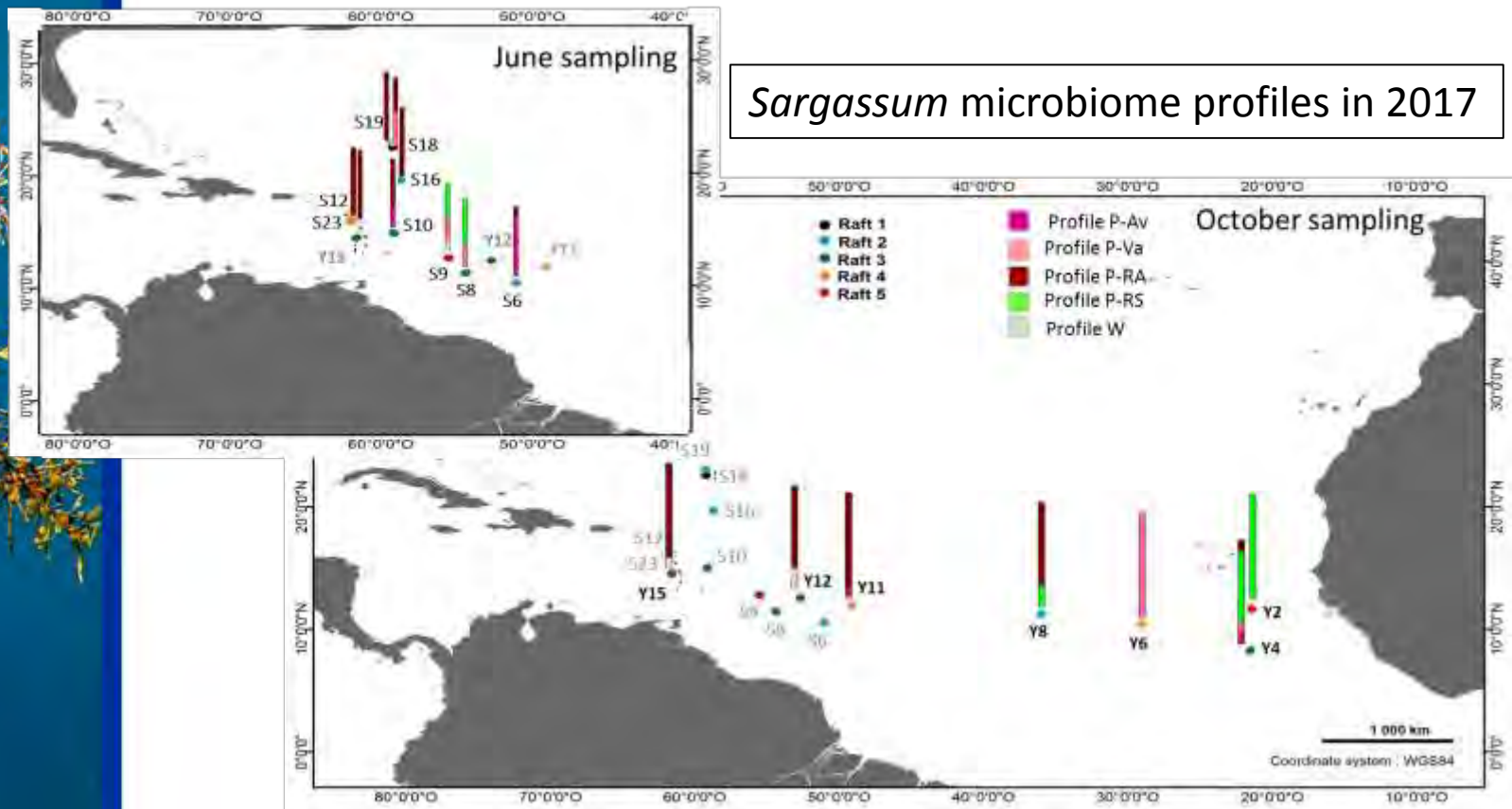
Connectivity at the Atlantic-scale

- Genetic diversity within and among aggregations
- Reproductive mode within rafts
- Dispersion by ocean currents and wind



Sargassum-related microbiome

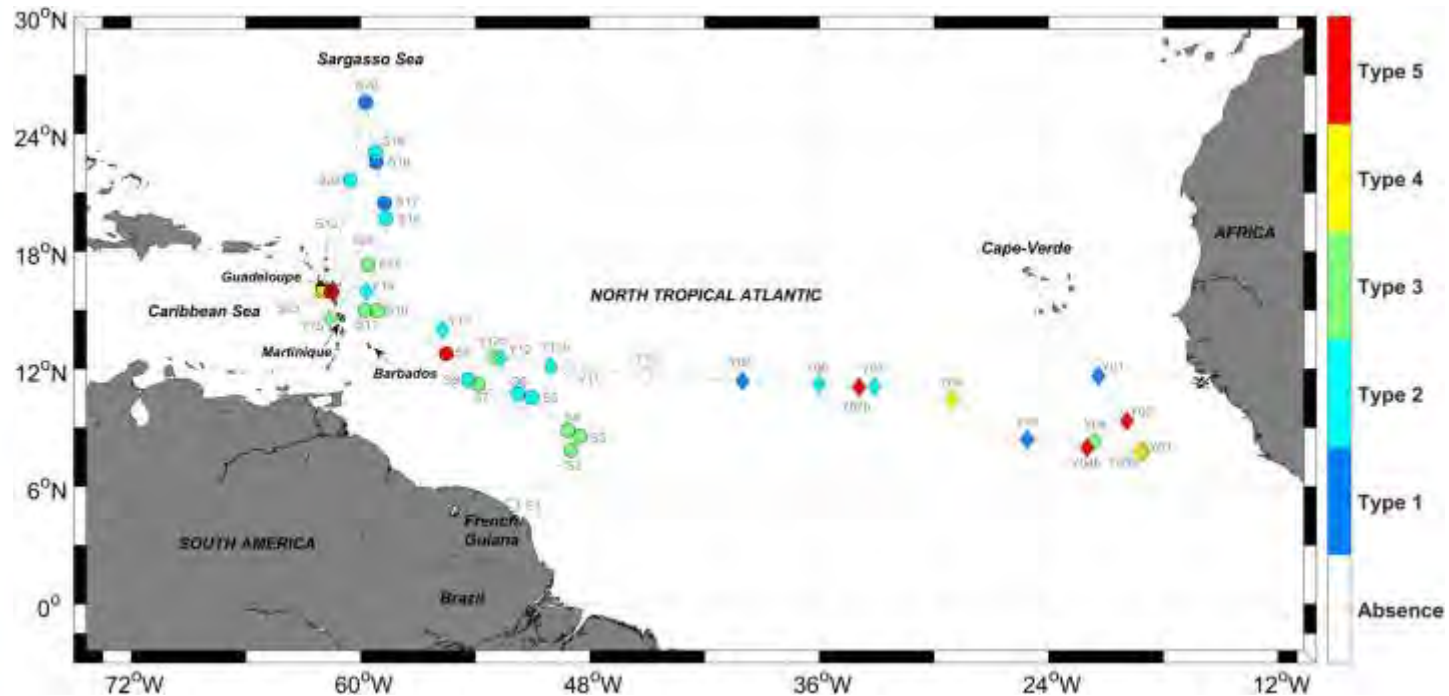
- *Sargassum* have a rough texture and sticky mucus, which favor the colonization of **microorganisms**
- **Differences** between water- and *Sargassum*-related microbiomes
- Identification of 4 bacterial assemblages **geographically related**



In situ and satellite observations of *Sargassum* aggregations

Ody et al. 2019 PLoS ONE

- High variability in raft shapes and sizes → a **five-class typology**

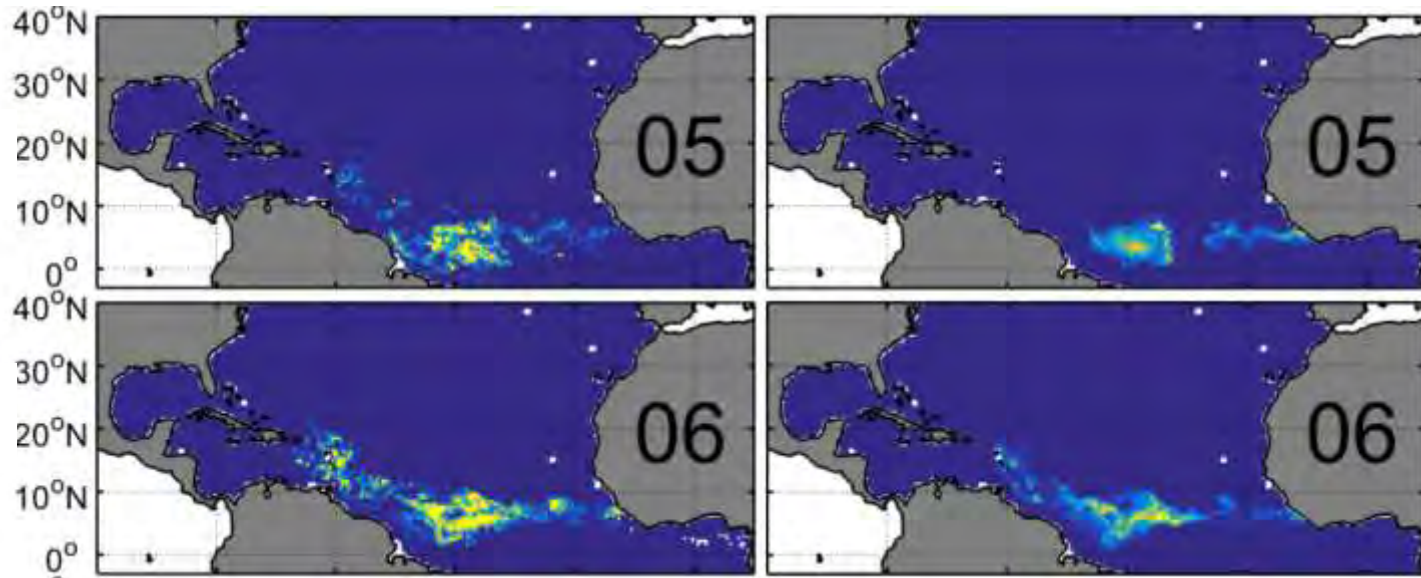


- Large-scale match between *in situ* and satellite observations
- *Sargassum* aggregations off Brazil and near the Caribbean Islands **in summer**
- Accumulation near the African coast **in autumn**
- Satellite data capture **nested scales** of aggregation

Validating the passive transport of algae along the year

- Satellite-derived *Sargassum* distribution
- Particle tracking (model) to simulate the drift of *Sargassum*
- Velocity fields from operational oceanography model (MERCATOR)

May
2017



June
2017

Satellite observations

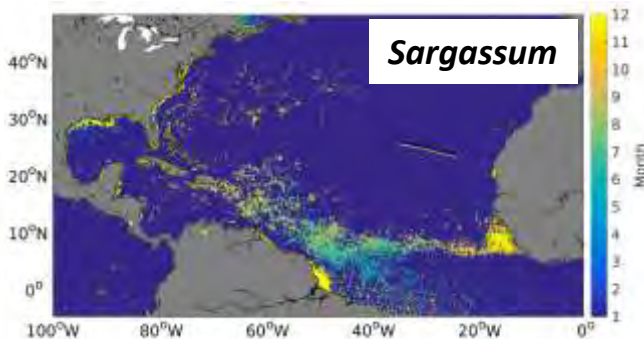
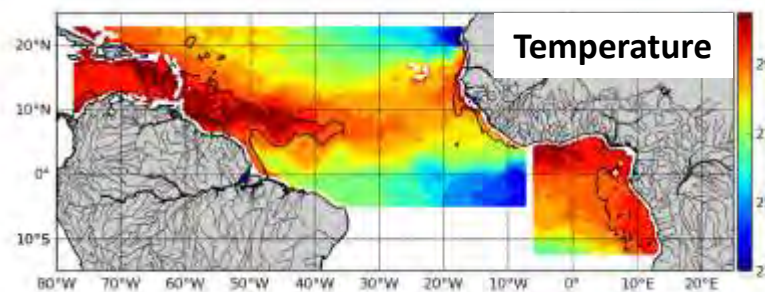
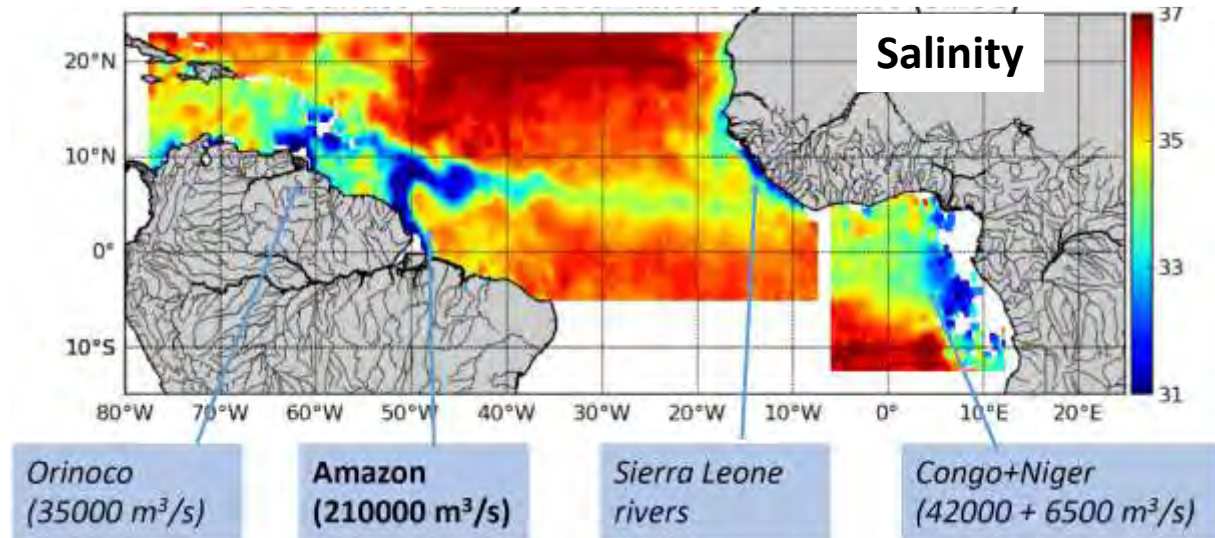
Particle tracking



Transport is the dominant driver of the seasonal evolution
Useful to forecast distribution several months in advance

Has the ocean's biogeochemistry changed?

- Rivers' influence on **temperature, salinity, nutrients**
- **Regional simulations** from biogeochemical circulation models

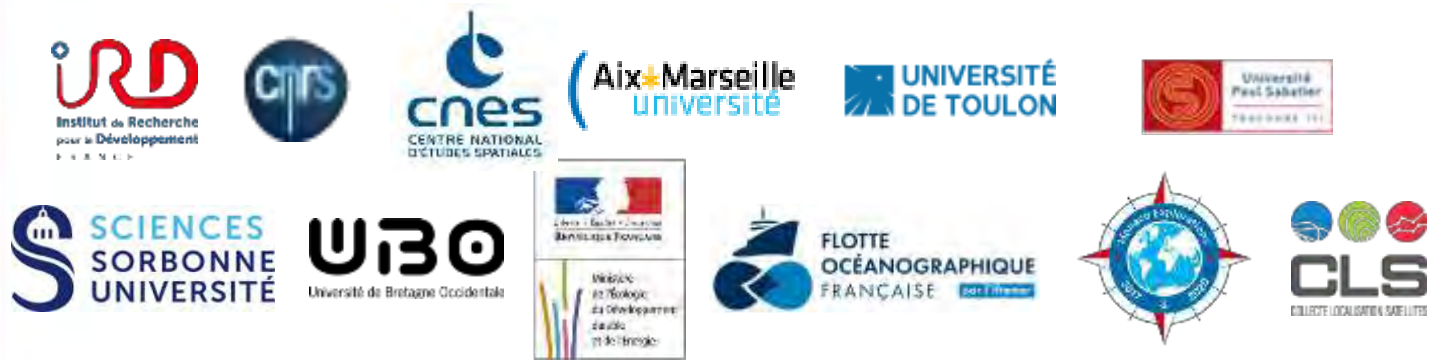


- Investigating possible **increase of N and P** Amazon transport (Djakouré et al. 2017, Wang et al. 2019)



CHALLENGES

- Spring-summer *Sargassum* blooms
 - ✓ A **variable** but **recurrent** phenomenon
 - ✓ **Limited prediction** capabilities
- A **wide ranging spectrum of factors** hard to predict
 - ✓ Anomaly of sea surface temperature
 - ✓ Greater nutrient supply from Amazonian basin and from tropical upwellings in the Eastern Atlantic
- Large-scale analysis of **environmental conditions**
 - ✓ Combine indices of *Sargassum* occurrence with biogeochemical ocean circulation models
- **Currents** (& wind) drive the distribution of *Sargassum*
 - ✓ Investigating the trajectories from open sea to the coasts
 - ✓ Implementing local circulation models
- **Controlled experiments** to estimate growth and mortality



Les Sargasses, un phénomène à l'échelle de l'Atlantique

Merci !

