

CARIBBEAN SCIENCE & INNOVATION MEETING

Coopérer sur les problématiques communes aux territoires caribéens



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ABSTRACTS BOOK

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CARISCIENCE



ANALYSIS OF WHOLE GENOME SEQUENCE DATA ON A TROPICAL ADMIXED CATTLE BREED, THE CREOLE CATTLE OF GUADELOUPE.

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Abstract: The Creole cattle of Guadeloupe is a local breed originated from various admixture event, of European taurine, west African taurine and indicine ancestries. It evolved under natural selection in tropical environmental conditions for 5 century, and was also influenced by traditional management practices. It represents therefore a good model for studies on adaptation to the tropics. The genome of 23 sires representative of the population has been sequenced, at a mean depth of 18X. These data were analysed in order to detect genetic variants (SNP and structural variants), present in this population. A total of 33 billion of SNP, among them 10% of new SNP were detected. A total of 13000 structural variants were also detected, among them 685 confirmed in more than half of the samples. Various analyses were performed on these variants, including their functional annotation, identification of genes and pathways associated with these variants. A comparison with other breeds from various origins was performed, in order to identify common or specific variants. An analysis of selection signatures reveals 474 regions with a significative selection signal. The main results of this study will be presented during the symposium. They highlight the importance of some genomic region that may explain the physiological mechanisms that can be involved in adaptation to tropical environment and their underlying variation.

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SCIENTIFIC COOPERATION IN THE CARIBBEAN: QUEEN CONCH (MOLLUSCA) AS INDICATOR OF CLIMATIC CHANGE

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Abstract: The queen conch, *Strombus (Lobatus) gigas* (Linnaeus 1758) is a marine gastropod mollusk. This is an endemic species from the Caribbean Sea, it is present in the water of 37 countries of the Caribbean Sea. It is a valuable marine benthic invertebrate of significant commercial importance in the Caribbean, with an important export trade worth millions of US dollars. The main international markets for conch meat are the USA (79% of the trade) and the French West Indies, with 20%). Also, conch is also consumed locally and its shell and other products sold as curios to visiting tourists in the Caribbean. However, populations have been depleted throughout the Wider Caribbean by overfishing. This species is indexed in Appendix II of CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora). The aim of this work was to show results of a scientific collaboration in the Caribbean with various Universities, showing the effect of climatic change on abundance of larvae in this region, in the process of shell calcification and concentration of pollution by microplastics in various sites from the Caribbean.

BIOEFFICACY OF ALGAL EXTRACTS AS BIOELICITORS IN HORTICULTURAL CROPS

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Abstract: The bioefficacy of algal extracts obtained from *Ascophyllum nodosum* and *Sargassum filipendula* for plant growth stimulatory and bioelicitor activities in tomato and sweet pepper was evaluated. Foliar applications of 0.5% seaweed extracts have resulted in significant reduction of disease incidence caused by the pathogens, *Xanthomonas campestris* pv. *vesicatoria* and *Alternaria solani* in tomato and sweet pepper under greenhouse and field conditions. Treatment with seaweed extracts significantly improved plant growth parameters including plant height, leaf number, root and shoot dry biomass and chlorophyll content. Treated plants produced significantly higher fruit yields. An investigation into the mechanism of disease resistance and growth induction revealed the effect of the extracts in elevating defense-related enzymes including phenylalanine ammonia lyase, peroxidase, polyphenol oxidase, chitinase and β -1,3-glucanase, as well as the levels of total phenolic compounds and upregulation of genes involved in defense responses and hormonal synthesis. Both crop plants treated with extracts had significantly higher expression levels of the PINII and ETR-1 marker genes compared to controls. This was coupled with the increase in gene transcripts involved in auxin (IAA), gibberellin (Ga2Ox), cytokinin (IPT) synthesis and several proteins involved flowering regulation, which would have possibly contributed to enhancement of plant growth and yield and disease resistance.

SHARING TRADITIONAL AND ACADEMIC KNOWLEDGE FOR SUSTAINABLE CARIBBEAN LIVESTOCK FARMING: THE SCIENTIFIC DIMENSION OF RETRO-INNOVATION

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Abstract: There is a growing concern about the lack of adoption of some technologies at the farm level. The context, as a whole, may influence the successful use of innovations. The transfer of technology policy is criticized, particularly in tropical regions, for its inadequacy to the sociocultural context of the livestock farming system (LFS). Meanwhile, livestock keepers have steadily accumulated indigenous experiences that have built resilient LFS. Some of them have contributed to the design of innovations, through specific and adapted scientific trials, where researchers have tested the hypothesis: how to put science into farmers' long-standing sustainable practices? Results show synergistic interactions between traditional and academic knowledge. Among others are :

- using the very traditional male effect practice for small ruminant, is studied as an alternative and efficient reproduction management increasing the herd productivity without any hormonal treatment;
- feeding animals with by-products in crop-livestock farm unit is empowered through technological process that deliver pellets combining these sources on the basis of their nutritive and agronomic characteristics;
- managing the land and pasture resources through traditional tethering practices has become a very relevant and valid experimental tool to assess intake at pasture ;
- dividing the livestock offspring between owners and breeders (known as “di moitié”) is the key principle used between donors (NGO's or foundations) and landless farmers known as sharing gift animals with others in order to implement LFS.

In order to implement innovations that fit into the local LFS context, we should:

- analyse in terms of human values, the causes leading to the rejection of certain other traditional practices in an official context, whereas in an unofficial context, they are relevant for local farmers;
- implement collaborative studies between farmers and researchers in a win-win approach, thus strengthening capabilities to innovate ;
- improving organizational cultures and behaviours and fostering networks and linkages.

FIFTY YEARS OF RESEARCH IN ANIMAL PRODUCTION IN MARTINIQUE: LESSONS FOR AGROECOLOGICAL INNOVATIONS.

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Abstract: For fifty years, the team URZ has been supporting Martinican livestock production (MLP) through varied actions (research on station, on farms collaborative trials, training, expert missions, etc.). This has led to a strong partnership with professional organizations and decision-makers in Martinique.

Here are some actions that have generated (→) feeding (FS), genetic (GP) and labelling strategies:

1) for feeding :

- nutritional value of tropical fodders → designing grazing systems with large and small ruminants associated or not ;
- forage conservation (hay and round wrapped bales) → support a hay production subsector ;
- feeding with banana (silage or fresh fruits) and pineapple byproducts → creation of cattle fattening units.

2) → genetic policy programs :

- established from the 1990s for sheep and from 2000 for Brahman cattle owing to :
- a 20 year-assessment of performances and genetic variation (reproduction, growth, health);
- an effective and coherent partnership: expert missions, technical reports (application for national accreditation; databases analyses), methodological supervision (qualification grid, creation of selection centres).

3) for meat labelling studying :

- interactions of FS and GP to address the meat quality of Martinican ruminants
- → use of local feedstuffs with OvinMartinik (a past 3 year-project) ;
- → generating a Martinican project for Brahman sector (on-going) ;
- A feasibility study to valorize the feral Creole pig.

Close partnership with stakeholders, recognition of the realities of agrosystems, surveys of farmers and value chain agents, collaborative *in-situ* researches among breeders are all elements showing the societal dimension taken up by this work.

Optimisation of local genotypes rearing, enhancement of local feed resources, integration of crop and livestock activities, remediation of health problems through integrated models are also at the forefront of agroecological practices in MLP.

URZ and partners enhanced local technical skills and know-how, exploit the full potential of local resources and promote better farm's functioning, some economic 'niche' and improve food autonomy.

ADSORPTION OF HEXAVALENT CHROMIUM FROM WATER USING ACIDIC ACTIVATED CARBONS FROM SARGASSUM SEAWEED.

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Abstract: Since 2011, Massive amounts of sargassum seaweed *Sargassum spp* (*Sargassum fluitans* and *Sargassum natans*) invade regularly, the coasts of more than 18 countries and islands in the Caribbean causing environmental damages, health hazard during their decomposition, and high negative impacts on economic activities such as fishery and tourism. The development of valuable materials from this huge amount of biomass, preferably at low cost is a challenge to beat this environmental problem. This work reports on the successful exploitation of *Sargassum spp* by the production of carbon materials. The activated carbon produced from Sargassum was chemically activated using phosphoric acid (H_3PO_4) at different ratios Sargassum:acid in a pilot muffle furnace, and biochar was prepared by pyrolysis. They were utilized as adsorbents for the removal of Cr(VI) from aqueous solution.

Adsorption experiments were carried out varying various experimental parameters such as contact time, temperature, initial chromium ion concentration and carbon dosage. Adsorption results obtained for Sargassum activated carbon (S-AC) and sargassum biochar (SB) were compared with those of the commercial activated carbon (SUPERCAP-BP10). The optimum efficiency for SB and S-AC shows that the removal of Cr(VI) with these carbon materials produced from sargassum seaweed have an interesting potential when compared to the superporous commercial activated carbon. The kinetic studies showed comparable results for SB, S-AC and SUPERCAP-BP10 indicating that the production of activated carbon from Sargassum seaweed could be used in the development of a new adsorbent for water treatment. Moreover, the valorization of Sargassum seaweed is considered for the development of capacitive deionization units, that could be a reasonable short and long-term solution for this environmental issue. Further studies must be performed to evaluate the physical and chemical characteristics of these porous carbon materials and their promising use in the development of supercapacitors and capacitive deionization units.

ANTIOXIDANT ACTIVITY, LYMPHOCYTIC CELL CALCIUM INFLUX MODULATION AND HEPATOTOXICITY EVALUATION OF AQUEOUS *TINOSPORA CRISPA* EXTRACTS.

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Abstract: In French West Indies, the prevalence of diabetes was evaluated for the more than 16 years old people, in 2013 at 11% in Guadeloupe and at 10% in Martinique (1). Previously, in all overseas French territories, the occurrence of type 2 pathology was evaluated at 96% (2). An investigation of practice of care in CHBT hospital in Guadeloupe reported in 2010 that *Tinospora crispa* (L.) Hook.f. & Thomson was the most hypoglycemic traditional medicinal plant known by patients affected by Type 2 diabetes (3). This medicinal specie has been reported to possess antioxidant activity and significant immunomodulatory effects but all mechanisms have not yet been explored (4,5).

This work report for the first time *in vitro* antioxidant data for specimens harvested in Guadeloupe and evaluation of the modulation of calcium influx in lymphocytic cell, one of the mechanism of immunomodulation. Results of HepG2 cell viability estimation after an exposition to organic fractions of aqueous extract confirm the absence of toxicity.

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FOMALINK: A COLLABORATIVE PEDAGOGICAL PROJECT IN THE CARIBBEAN

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Abstract: This presentation presents an educational Caribbean project based on the collaborations between various actors. The Formalink project, supported by the Investissement d'Avenir Program (PIA), has been set up in 2018 and will run until September 2021. It has been created thanks to a partnership between a research laboratory in science education: The Resources and Research Centre of Education and Formation (CRREF); and an academic service of the academy of Guadeloupe: The Academic Delegation to Educational Digital (DANE). The objectives are to create pedagogical experimentations linked with the sustainable development in which collaborations between schools located in different contexts are established. The experimentations are also based on the integration of educational technologies. Formalink therefore concerns different areas of the Guadeloupe archipelago: Grande-Terre, Basse-Terre, Marie-Galante, Les Saintes and Saint-Martin, and students from elementary schools to college. The pedagogy relies on the hypothesis that collaborations between students from two different contexts enable the collective construction of more complex conceptions about a studied object, especially when it is related to sustainable development issues. These pedagogies also include students' local context and promote motivation and learning. The collaborations focus on multiple levels: between the DANE and the CRREF; between researchers, teachers, and the rectorate; between teachers from different schools and disciplines; between students from different schools and sometimes different levels, and occasionally between local sustainable development actors and the educative sphere. This project aims to convert the discontinuity of the territory (different islands) in an asset for science learning, thanks to collaborative work and digital technology. By their sensitivity to the context, the tools created as part of this project may be later transferred to other geographical contexts.

METABOLIC RESPONSE TO ORAL GLUCOSE TOLERANCE TEST PERFORMED IN NEUTRAL AND WARM ENVIRONMENTAL TEMPERATURE.

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Keywords: Metabolism, Climate, Physiology, Diabetes, Health, Environment, Hormones, Glycorregulation

Background and objective. Hot environments are associated with substrate shift during exercise in healthy humans and impaired glucose metabolism at rest [1], at least in the short term. This is relevant for physiological and clinical purposes, in particular since the demonstration of a relationship between the age-adjusted incidence of diabetes and outdoor temperature [2]. The aim of this study was to explore the contribution of key gluco-regulatory hormones and biomarkers in this altered glucose tolerance.

Methods. The effects of ambient temperature on glucose tolerance and its determinants were assessed with a 3-hr oral glucose tolerance test (OGTT) performed at 22°C and 31°C. Participants were 19 healthy young women (n=7) and men (n=12) from a student population. All study procedures were approved by the Human Subject Review Committee (CPP13-018a/2013-A01037-38). The protocol was registered in EudraCT (2013-003206-25) and ClinicalTrials (NCT02157233). Plasma glucose, insulin and cortisol were analyzed within 2 hours on a Cobas 6000 automatic platform (Roche, Mannheim, Germany) (<c501> module for glucose and <e601> module for insulin and cortisol) after centrifugation. Other plasma samples were aliquoted after centrifugation at 1600×g for 15 min at 4°C and frozen (-80°C) for further analyses. Interleukin-6, pancreatic peptide and growth hormone concentrations were measured from frozen aliquots using Enzyme Immunoassay kits and according to the manufacturer's protocols (ThermoFisher Scientific, Waltham, USA).

Results. Blood glucose concentration was affected by the environmental temperature (P=0.03 for the higher values in warm compared to control environment), as well as by time (P<0.001), but the temperature x time interaction was not significant (P=0.12). The significantly greater glucose response in warm environment was also evidenced by glucose AUC (904±151 vs. 721±89 mmol/l·180 min at 31°C and 22°C, respectively, P<0.001).

There was no significant effect of environmental temperature on insulin, growth hormone or pancreatic polypeptide concentrations (all P>0.17). The cortisol response to glucose load was reduced 30, 60, 90 and 120 minutes after the glucose load at 31°C compared with 22°C (P=0.001). The interleukin-6 concentration was also lower in the session at 31°C (P=0.043).

Conclusion. We confirmed in a population of heat-acclimatized healthy young men and women that a glucose load elicits an exaggerated increase in blood glucose in a warm environment, which was a novel finding in the female and heat-acclimated participants. We conclude that none of the biomarkers explored in this study varied significantly under the influence of ambient temperature in a way likely to explain the larger increase of blood glucose in a warm environment.

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COCCOLOBA UVIFERA IS PANTROPICALLY FOLLOWED BY SCLERODERMA SPP. DUE TO PSEUDO-VERTICAL TRANSMISSION.

Bâ A.

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Abstract:

Coccoloba uvifera (Polygonaceae), named seagrape, is a Caribbean beach fruit tree introduced pantropically to stabilize coastal soils. In its native area in Guadeloupe (French West Indies), seagrape is associated with 15 ectomycorrhizal (EM) fungi including *Scleroderma bermudense*. Molecular barcoding showed that seagrape mostly or exclusively associates with *Scleroderma* species (Basidiomycota) that were hitherto only known from Caribbean seagrape stands. Population genetics analysis with microsatellites markers showed that fungal populations *S. bermudense* from Senegal where seagrape is introduced are little differentiated from the Caribbean ones, separated by thousands of kilometers, suggesting a relative recent introduction. Moreover, a scanning microscopy electron analysis showed that seeds carry *Scleroderma* spores, probably because, when drying on beach sand, they aggregate spores from the spore bank accumulated by semi-hypogeous *Scleroderma* sporocarps. Seagrape displays two predispositions for co-introduction, namely its specificity (making it irresponsive to local EM fungi) and its unusual pseudo-vertical transmission of *Scleroderma* spores aggregating on seeds. This explains when seeds germinate, seedlings of seagrape are spontaneously colonized by *S. bermudense* in nursery and plantation without the need to bring fungal inoculum.

Key words: Seagrape, Ectomycorrhiza, co-introduction, exotic trees, plantations

CARIB-COAST CARIBBEAN NETWORK FOR COASTAL RISKS RELATED WITH CLIMATE CHANGE

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Abstract: Exposed to extreme cyclonic episodes and the progressive rise of sea level in relation with climate change, the coastlines of the Caribbean are subject to natural hazards such as coastal erosion and marine inundation. The associated risks relate mainly to the safety of goods and populations, but also to the tourism economy linked to the maintenance of beaches and the natural heritage of these interface environments where biodiversity is particularly rich (mangroves, coral reefs, meadows).

The CARIB-COAST project is based on the principle of efficient networking. Its ambition is to pool, co-build and disseminate surveillance approaches, coastal risk prevention and adaptation to climate change. It has an international partnership: BRGM, IFREMER, ONF, IRD, SPAW-RAC, CNRS, UWI, IMA, CARICOOS, MonaGIS and ACS.

The program is divided into 4 work packages: the coordination of the project and the Caribbean partnership, the implementation of a modelling platform for hydrodynamics, based on a Caribbean measurement network, for the simulation of present-day and future coastal hazards, the development of a Caribbean network for monitoring coastal erosion and mitigation using natural ecosystems and the development of tools to assist decision-making, exchange, training and sensitization of Caribbean stakeholders.

Carib-Coast is funded by the EU INTERREG CARAIBES program.

AGROECOLOGICAL BREEDING OF SMALL RUMINANTS: HOW RNA-SEQUENCING DATA CAN PROVIDE GENOMIC VARIANTS FOR RESISTANCE TO INTERNAL PARASITISM.

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Abstract: The gastrointestinal nematode infections are considered as one of the major constraints in small ruminant production especially in tropics. The negative impact of the drugs classically used to control these infections, on soil biodiversity coupled with concerns over the presence of residues in animal products led some states in the world to advocate a significant reduction of the use of chemical molecules in animal production. In contrast, genetic selection for resistant animals is a potential sustainable control strategy in accordance with the agroecological concepts. Genetic selection based on phenotypic traits such as faecal egg count (FEC) has been successfully used; however, FEC is an indirect measure of resistance which implements a certain degree of uncertainty. The measurements of FEC is also time consuming and costly as it requires animals to be challenged with parasites. On the other hand, selection using information from the genome could provide a faster and more sustainable tool in breeding for gastrointestinal nematode resistance. Advances in molecular genetics have led to the identification of several molecular genetic markers associated with genes affecting economic relevant traits. In this study, the variants in the genome of Creole goats resistant or susceptible to *Haemonchus contortus* were discovered from RNA-sequencing. We identified SNPs, insertions and deletions that distinguish between the resistant and susceptible group and we characterized these variants through functional analysis. The T cell receptor signaling pathway was one of the top significant pathways that distinguish the resistant from the susceptible group with 78% of this pathway genes having genomic variants. These genomic variants are expected to provide useful resources especially for molecular breeding for gastrointestinal nematode resistance in goats.

INNOVATIVE OPTICAL GEOPHYSICAL INSTRUMENTS AT THE END OF PLURIKILO-METRIC FIBERS FOR MONITORING VOLCANIC AND SEISMIC HAZARD IN HARSH ENVIRONMENT.

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Abstract : The most powerful sources of geohazard (earthquakes, volcanoes, tsunamis, landslides), associated with potentially high risk, are often located in remote areas, deep in the earth, far offshore, high on mountains or volcanoes, with difficult or dangerous access for real time monitoring. Yet, one needs to get as close as possible to these sources of catastrophic events, for detecting the weak signals related to the loading process and the growth of the main instabilities, and for a fast and accurate assessment of the characteristics of an ongoing catastrophic event.

In such challenging environment, commercial instruments with electronics at the sensor have a high cost of maintenance (Meuros for repair of offshore and deep boreholes sensors), they present numerous difficulties for long term and safe powering, and face high lightning strike hazards, in particular on volcanoes or with long electrical cables.

To overcome these difficulties, our group (IPGP-ESEO) has conceived, constructed, and qualified a high performance optical seismometer operating at the end of long, plurikilometric optical fiber. The sensor has no electronic component, and is therefore extremely robust and insensitive to high temperature nor EM field. The control system is operating at the other end of the fiber, processing the signal produced by Fabry-Pérot interferometry at the sensor level.

We first qualified this instrument on land, in 2012; then, a marine version of it near Brest, in 2018. And in September 2019, we successfully installed an optical seismometer at the top of La Soufrière de Guadeloupe, with a 1.75 km cable going down to the control system connected in real-time to the Observatory (OVSG). We plan an installation 5 km offshore Les Saintes (Guadeloupe) in 2020. Many other sites in the Caribbean might benefit from such instruments, which can be adapted to other measurements than vibrations.

DIABETES, COMPLICATIONS, LIMIT CYCLES AND OBESITY

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Abstract:

Diabetes is a chronic disease that affects an important part of the world population. The population of diabetics patients grows significantly in a lot of countries and it is, with its complications, an important cause of death.

Since diabetes has no cure, it is important to minimize health problems raised by this disease and its propagation. In these last years, many studies have been conducted on diabetes disease with the aim of improving the quality of life and the cost of this disease.

In this talk, we develop two approaches. In the first one, from a model that examines diabetics with and without complications, we associate an optimal control problem. We show that there is no cyclical behavior between the group of diabetics with complications and the one without complications, and that the associated equilibrium point exists and is a saddle point. Then, in a second approach, we build a new model of diabetes disease on which we are also highlighting obesity. On this model, we started to study the equilibrium points in order to establish their stability.

Keywords: diabetes, optimal control, Pontryagin's maximum principle, limit cycle, equilibrium state, Hopf bifurcation theorem.

ECO-ACOUSTICS SURVEYS OF FISH BIODIVERSITY AND IMPACT OF ANTHROPOGENIC NOISE IN GUADELOUPE

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Abstract: There is a strong link between the physical, topographic, ecological and biological features of marine ecosystems and the acoustic features they produce. The sounds produced by the living organisms (biophony), as well as the sounds produced by human activities (anthropophony) and the sounds produced by abiotic factors (geophony), contribute to the acoustic complexity of marine environments. These real sound signatures are characteristic of different habitats. As an example, coral reefs habitats located less than one kilometer apart have specific signatures that can be used by larvae of many organisms during recruitment to locate and move towards their preferred habitats, or to avoid less suitable ones.

The alteration and destruction of coastal areas in the Caribbean, and particularly nurseries, will therefore go hand in hand with the modification of associated acoustic cues. Without reliable acoustic cues and the ability to navigate or communicate effectively, the diversity and stability of marine populations and of the coral reef environment as a whole will be at risk. If long series of monitoring of larval recruitment, identification of nursery areas and fish populations are available for coral reefs, on the other hand, the consideration of anthropized environments and the effects of human development on coastal biodiversity remains rare.

We will present preliminary results of a first of its kind and ongoing study conducted along the coast of Guadeloupe and based on passive acoustic monitoring, i.e. the installation of autonomous microphones in the environment, aiming to improve the understanding and management of ichthyological populations. We will particularly focus on the diversity of vocalizations of remarkable fish species and the use of acoustic indices to characterize different sites facing different stressors.

DEVELOPING AN ECOLOGICAL AND CONSERVATION GENETICS RESOURCE CENTER AND NETWORK IN THE CARIBBEAN

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Abstract: The biodiversity hotspot of the Caribbean region has been greatly influenced by the high heterogeneity of the islands and their ecosystems, therefore explaining the diversity of their associated fauna and flora. On a one hand, this island system represents a great natural model to study the dynamics of biodiversity and the underlying ecological and evolutionary mechanisms. On the other hand, this very dynamic system appears as highly sensible to environmental perturbations (e.g. biological invasion, anthropogenic pollution, climate change...), raising the concern of the conservation of the Caribbean biodiversity.

Nowadays, with recent technological developments, genetic and genomic methods provide unprecedented capacity to study biodiversity for ecologist as well as for conservationist, as to measure genetic diversity and its structure at species or population level, to estimate reproductive regime or effective population size, investigate mechanisms of selection and adaptation, to identify species and community or to detect the presence of target species based on non-invasive samples as well as environmental-DNA (eDNA).

Considering the great importance to enhance the study and the management of Caribbean biodiversity, there is an increasing need to develop the capacity for conservation genetics/genomics approaches at the regional level. However, despite an overall interest for biodiversity conservation, there is still across the different islands/states of the Caribbean a high heterogeneity of capacity to access such methods. Therefore, we are proposing to build up an ecological and conservation genetics center, based at the Université des Antilles, in close connection with local and regional research partners, and allowing to develop a scientific network within the Caribbean Islands in order to be able to perform the broader range of conservation genetics/genomics applications at the regional scale.

CHARACTERIZATION OF BACTERIAL ECTOSYMBIONTS COLONIZING GILLS AND ENDOPHRAGM OF TWO CRABS : *ARATUS PISONII* AND *UCA RAPAX*.

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Abstract: We describe the interactions between bacterial ectosymbionts and two mangrove crabs: *Aratus pisonii* (Sesarmidae) and *Uca rapax* (Ocypodidae). These crabs belong to the order Decapoda and to the infra-order Brachyura known as "real crab". Specimens were collected in Guadeloupe on mangrove trees *Rhizophora mangle* for *A. pisonii* and from the mangrove mud for *U. rapax*. Ectosymbionts were observed using SEM and TEM colonizing gills and endophragm for all individuals investigated. No intracellular bacteria could be observed. For *A. pisonii* and *U. rapax* four different bacterial morphotypes were distributed throughout the surface of gill discs and on the endophragm according to SEM views. Symbionts did not cover the entire surface of gill discs. They formed patches irregularly distributed while they formed a uniform bacterial biofilm which covers the entire endophragm. DNA extractions from gills and PCR using universal 16S primer sets were performed. The PCR products have been used for metagenomics analyses confirming that several bacterial species are involved per crab species. Most of them belong to Alphaproteobacteria and Bacteroidetes group, all bacteria involved represent a new genus or a new species. Analysis of metagenomics must be thorough, to find out the real relationships existing between host and symbionts.

ULTRASTRUCTURAL ANALYSIS OF BACTERIAL ECTOSYMBIONTS COLONIZING GILLS AND ENDOPHRAGM OF VARIOUS FAMILIES OF MANGROVE CRABS

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Abstract: We investigate several species of crabs belonging to 4 families: *Aratus pisonii* (Sesamidae), *Uca rapax* (Ocypodidae), *Cardisoma guanhumi* (Gecarcinidae), *Ucides cordatus* (Ocypodidae), *Gecarcinus lateralis* (Gecarcinidae), and *Callinectes sapidus* (Portunidae). These crabs belong to the order Decapoda and to the infra-order Brachyura known as "real crab". *A. pisonii*, *U. rapax*, *U. cordatus* and *C. sapidus* are found in mangrove, all of them are semi-aquatic except *C. sapidus* which is exclusively marine. *G. lateralis* can be found around mangrove areas but live in general on sand. We observed ectosymbionts colonizing gills and endophragm of all specimens investigated by using Scanning Electron (SEM) and Transmission Electron (TEM) Microscopes. Each species presented gills which are organized into several gill discs. On gill discs, several bacterial morphotypes covering the gill discs were observed for each individual examined. According to TEM observations, no intracellular bacteria were observed. In *A. pisonii*, two layers of different bacterial morphotypes overlap the gill's epithelium while for another species only one layer was observed. However, despite the environment plurality, all crabs studied here presented ectosymbiotic bacteria, which means they have an interest to collaborate with such bacteria. The relationships between these two partners could have several roles as a protection from toxic compounds from mangrove sediment where *U. rapax* live for example. Symbionts can also participate to host nutrition. More investigations are needed to better define these relationships.

CHLORINE ISOTOPIC COMPOSITION OF THERMAL SPRINGS ALONG THE LESSER ANTILLES ARC AND FUMARoles FROM LA SOUFRIERE DE GUADELOUPE

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Abstract: Chlorine is moderately soluble in magmas, highly soluble in waters and, unlike most other volatiles, is considered chemically non-reactive. Such unique combination of geochemical features can be used to inimitably characterize the origin of magmas, their differentiation, degassing and interaction with liquids. Chlorine stable isotope compositions ($\delta^{37}\text{Cl}$) of Earth's reservoirs have been used for 10 years to constrain the origin of Cl in arc magmas [e.g., 1-4], and only recently used in volcanology, as tracers of magmatic degassing and/or subsurface gas/liquid interactions [5-6].

In order to constrain the sources and fate of Cl associated with arc volcanism, this study reports $\delta^{37}\text{Cl}$ signatures of thermal springs from several locations along the Lesser Antilles arc (West Indies): la Soufrière de Guadeloupe; Boiling Lake, Valley of Desolation and other locations (Dominica); and LiaMuiga (St-Kitts). The studied samples show wide ranges of temperature (22-92°C), pH (3-8), Cl content (10-2000 ppm), Cl/Br ratio (100-1000) and $\delta^{37}\text{Cl}$ value (-1‰ to 0‰). These results unravel that magmatic Cl displays negative $\delta^{37}\text{Cl}$ values, close to -0.7‰, all along the arc, that is consistent with a slab-derived origin.

For further constraining local magmatic and hydrothermal processes at la Soufrière de Guadeloupe, we report: *i/* $\delta^{37}\text{Cl}$ data on recently collected gases (mean temperature of 97°C, $\delta^{37}\text{Cl}$ up to +8‰); and *ii/* a 15 years record of the summit acid pond (Tarissan, pH = -0.8 to +0.8; [Cl] = 1-15 wt.%, $\delta^{37}\text{Cl}$ decreasing from +0.3 to -0.9‰). We quantify that more than 90% of the HCl escaping the large hydrothermal system of La Soufrière is likely lost via scrubbing over subsurface water condensation on its way up to the surface. More broadly, we suggest that for locations where the magma $\delta^{37}\text{Cl}$ is known, the $\delta^{37}\text{Cl}$ value of the emitted gas is a quantitative tracer for scrubbing of water-soluble gas species.

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CRUSTAL “V” SHAPE FRACTURING IN NORTHERN LESSER ANTILLES FOREARC: RELATION WITH THE LOCAL SEISMIC HAZARD.

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Abstract: The Lesser Antilles subduction zone shows a peculiar trench / arc convexity from Martinique, in the South, where the subduction is frontal, to Anguilla, to the North, where the plates convergence obliquity is greater than 50°. The forearc of this convex margin displays varying and complex tectonic structures including poorly documented prominent “V” shaped sedimentary basins and spurs. This margin segment is also characterised by a smaller recent seismic activity possibly related to the local margin architecture. Therefore, a better understanding of these structures is critical to constrain local seismic hazard.

High resolution Bathymetric, Low Frequency Multi-Channel-Seismic (MCS) and Wide-Angle-Seismic (WAS) data recorded during ANTITHESIS 1 and 3 Oceanographic campaigns, provide a pseudo-3D insight into shallow to deep margin structure and allow us to decipher the deformation of the NLA forearc domain since early Eocene.

These data suggest a 3-steps margin tectonic history:

1- Frontal subduction along a straight trench (Cretaceous sup. - Paleocene): Parallel to the trench extensional faults system resulted from basal erosion.

2- Margin bending (Eocene - Oligocene): Margin bending probably caused by Bahamas Bank Collision triggered an along arc extension phase responsible of N40° - N50° V-shaped fracturing, which structured the Basins-and-Spurs system.

3- North-westward increase in convergence obliquity (Miocene - Present-day): In the Northern and highly oblique Puerto Rico - Virgin Island (PRVI) margin segment, left-lateral strike-slip systems, as the Anegada passage and the Bunce fault for instance, are likely to result from strain partitioning. In contrast, in the Northern Lesser Antilles (NLA) margin segment, to the south of the Anegada Passage, tectonic deformation is dominated by N100° - N110° active extensional faults system. We thus discuss (1) the role of subduction of recent topographic ridges, fluids flow and dip variation of the slab in normal faults reactivation (2) the relation between the NLA margin architecture and local seismic hazard.

EXPERIMENTAL ASSESSMENT OF ZIKA VIRUS MECHANICAL TRANSMISSION BY *Aedes Aegypti*

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ABSTRACT:

The pandemic emergence of several mosquito-borne viruses highlights the need to understand the different ways in which they can be transmitted by vectors to human hosts. In this study, we evaluated the propensity of *Aedes aegypti* to transmit mechanically Zika virus (ZIKV) using an experimental design. Mosquitoes were allowed to feed on ZIKV-infected blood and were then rapidly transferred to feed on ZIKV-free blood until they finished their meal. The uninfected blood meals, the mosquito abdomens, as well as the mouthparts dissected from fully and partially engorged mosquitoes were analyzed using RT-qPCR and/or virus titration. All the fully engorged mosquito abdomens were ZIKV-infected, whereas their mouthparts were all ZIKV-negative. Nonetheless, one of the partially engorged mosquitoes carried infectious particles on mouthparts. No infectious virus was found in the receiver blood meals, while viral RNA was detected in 9% of the samples (2/22). Thus, mechanical transmission of ZIKV may sporadically occur via *Ae. aegypti* bite. However, as the number of virions detected on mouthparts (2 particles) is not sufficient to induce infection in a naïve host, our results indicate that mechanical transmission does not impact ZIKV epidemiology.

EVALUATION OF THE ADAPTATION OF CITRUS POLYPLOID (ROOTSTOCKS/VARIETIES ASSOCIATIONS) TO WATER DEFICIT.

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Abstract: Huanglongbing (HLB) is a bacterial disease caused by the phloem restricted bacteria *Candidatus liberibacter* spp. In Guadeloupe, the disease has been present since 2012 and is responsible of the eradication of most of the orchards. In the field, trees in water deficit condition are more sensitive to the disease. Various studies showed that tetraploid (4x) rootstocks confer a better adaptation to drought condition. Also, recent work of CIRAD showed that triploid (3x) Tahiti lime are more tolerant to HLB than the respective diploid (2x) Mexican lime. Thus, we initiated a study to verify whether the use of 4x rootstocks in association with 3x lime can improve tree adaptation to water deficit. 2x and 3x limes grafted onto 2x and 4x rootstocks were evaluated. Physiological and biochemical traits were investigated. Preliminary results suggest that 4x rootstock confer a better tolerance to the scion. Also, better detoxification seems to occur in the triploid scion. This experiment will be coupled to gene expression studies in roots and leaves.

POPULATION GENETIC STRUCTURES OF TWO CLOSELY-RELATED, CARIBBEAN ENDEMIC COLUMBID SPECIES, THE SCALY-NAPED PIGEON, *Patagioenas squamosa*, AND THE WHITE-CROWNED PIGEON, *P. leucocephala*

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Abstract: Island-endemic Columbidae species are particularly vulnerable to environmental degradation, extreme climatic events, and competition with and predation by exotic species. The situation may be even more critical in the case of game species, where legal hunting and poaching can severely affect population dynamics. Here we document for the first time the genetic structure of two closely-related, Caribbean-endemic Columbidae species, of patrimonial and cynegetic interest, the Scaly-naped Pigeon and the White-crowned Pigeon, over a large part of their ranges, from Puerto-Rico to Martinique and, from Florida to Martinique, respectively. Our results, based on mitochondrial DNA and microsatellite markers, show an absence of genetic differentiation between sampling sites, suggestive of a relatively high migration rate between islands. In other words, our results highlighted there could be one large population, for both species, at the regional scale. We discuss the relevance of this finding in relation to management and conservation issues.

CLIMATE CHANGE AND CONSEQUENCES OVER THE FRENCH ANTILLES (C3AF PROJECT): VERY FINE SCALE NUMERICAL MODELING OF HURRICANE GUSTS, SURGES AND TSUNAMIS

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Abstract: Because of their geographical location, Lesser Antilles islands are particularly exposed to climatic and coastal hazards (tropical cyclones, rainy events, floods, erosion, storm surges). The interdisciplinary collaborative C3AF project (Climate Change and Consequences over the French Antilles) funded by the ERDF (European Regional Development Fund) aims at studying trends and hazards associated with climate change in the French Antilles.

Small mountainous Caribbean islands are characterized by a remarkable variety of coastal environments (coral reefs, mangroves, cliffs, etc), a complex topography and strong variations of land cover over areas less than 50km-wide. These features are poorly represented in most atmospheric and wave-surge models due to insufficient horizontal resolution. This issue may induce large biases in risk management and prevention in Lesser Antilles islands.

The results presented here aim to address this issue with numerical models adapted to the complexity of small tropical islands.

The hurricane Maria 2017 effects in Guadeloupe are analyzed with the WRF (Weather Research and Forecasting) gust model used at 280m-90m resolutions and the SCHISM (Semi-implicit Cross-scale Hydroscience Integrated System Model) surge model used at 25m-1m resolutions. These two models were calibrated and evaluated with atmospheric and oceanic local observations recorded during the 2017 cyclonic season.

Hundreds of synthetic cyclones were also simulated to determine the surge risk and its evolution in the future climate. They are based on the 15 km-scale climate projections from the ARPEGE model and on the expected sea level rise of 80 cm at the time horizon 2080. The tsunami hazard evolution (surge, arrival times of the waves) was also examined using short-range scenarios (Caribbean subduction) and long-range scenarios (La Palma volcano collapse). This very fine scale numerical methodology applied here for Guadeloupe could also be used in other small territories of the Caribbean region.

DEVELOP INTEGRATED CROP-LIVESTOCK-TREE AGROSYSTEMS FOR TERRITORIALIZED FOOD SYSTEMS AND FOOD SOVEREIGNTY FOR SMALL ISLAND DEVELOPING STATES.

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Abstract: Rethinking food systems is an important lever in the fight against climate change and food insecurity. Small island developing states should focus on territorialized food systems rather than global food systems. The choice of integrated crop-livestock-tree agrosystems would make food systems more sustainable while making them more resilient to climate change.

Keywords: Food system, Mixed farming system, Agroforestry

Introduction

The increase in food insecurity in the world is challenging the choice of globalized food systems based mainly on intensive agriculture, market economy and free competition. In addition, these systems contribute significantly to global warming (IPCC, 2019). Climate variability in relation to global warming is reported to be one of the main factors behind the recent increase in hunger and severe food crises around the world. All dimensions of food security (availability, access, utilization and stability) are affected with collateral consequences of malnutrition (poor child nutrition and care, poor health, environmental degradation through overexploitation) (FAO, 2018). Food security and nutrition in Small Island Developing States in the world are of particular concern with chronic under-nutrition rates ranging from 10 to 70% (FAO, 2016). In these countries, national production contributes 30 to 40% to food demand (FAO, 2016) as well as in the Outermost Regions of Europe (ORs: Guadeloupe, Martinique, Reunion Island...). SIDS and the ORs have decided to make the fight against food insecurity a priority with the implementation of national action plans on food and nutritional security. The option taken is to strengthen resilience in the agriculture and fisheries sectors to the adverse effects of climate change, ocean acidification and natural disasters.

Global Food System *versus* Territorialized Food Systems (TFS)

TFS would be the most relevant to reduce food insecurity in SIDS and ORs because their biophysical and socio-economic context does not allow them to withstand international competition in agriculture (Rastoin, 2015) unless they develop niche products (CTA, 2012). In addition, food systems based on international trade in food minimize the ecosystem services expected from agrosystems and increase the carbon footprint of food. SIDS and ORs have similar constraints: small populations and markets, small family farms, high population densities that require original development of agricultural land to reconcile high biomass production and sustainability, limited financial resources, public policies favouring export production and other sectors of activity (service), vulnerability to natural disasters and external shocks, agricultural supervision and research poorly adapted to small farms; high dependence on international trade. SIDS' growth and development are often affected by the high cost of shipping and air transport as well as the difficulties in creating market economies. The impact of natural disasters on the economies of Caribbean countries is much greater than in other SIDS and is mainly due to the intensity of hurricanes (storms), which have increased in recent years.

Integrated crop-livestock-tree systems (ICLTS) to produce food sustainably

ICLTS integrate crops, livestock and trees. Most of the farms currently practicing ICLTS in the tropics are small family farms whose architecture is based on the optimal use of space, the enhancement of biodiversity and the association of different plant species. This allows positive interrelationships between and within wood-trees, food-trees, multi-purpose crops and livestock and recognizes the response of biological resources to the environmental constraints. Plant and animal resources are retained on the basis of their adaptation to the environment. The design of these systems was mostly based on empirical knowledge. ICLTS combines positive properties of agroforestry system and mixed crop livestock farming system which makes them more resilient to the impacts of climate change, and they have a higher mitigation potential than current farming systems and provide more ecosystem services. These agro-system properties are particularly important in the coming years. Really, climate change results in temperature increase with severe heat and drought waves across the world. The incidence and virulence of pests and diseases also increase with increasing temperatures. Tree-based systems have a potential for contributing to the adaptation to these climate change effects. The deep root system of trees, exploring a larger volume of soil compared to arable crops, give them an advantage in water and nutrient uptake during drought periods. Tree-based systems reduce runoff, and increase soil cover and porosity, thus leading to increased water infiltration and retention in the soil. Consequently, moisture stress during low rainfall periods is reduced. In addition, tree-based systems generally create a favourable microclimate for associated crops and livestock. The wider biodiversity favoured by trees can be valued to provide multiple services in the farming systems. However, in the island context where space is limited, the choice of trees is a real challenge. While providing the services described above and valuing local biodiversity, it is desirable that the tree also provide food.

The interest for integrating crop and livestock activities is to provide a double flow of biomass (feed and organic fertilizers),

with mutual services from the crop system to the animal system - and vice-versa - that can be used to benefit crop and livestock productions, leading to greater farm efficiency, productivity or sustainability. In this scenario, dual plants (Food-Feed, Food-Feed-Fuel) have a definite advantage. This group contains plants such as grain legumes (Pulses). The value of pulses in food cultures around the world is well known. However, the use of legumes in of important or local grain legumes have lagged behind roots, tuber and cereal crops.

Beyond their architecture, ICLTS are based concepts de **climate-smart agriculture** (Lipper *et al.*, 2014) and **ecosystem services** (INRA, 2017). Climate-smart agriculture is based on the following assumption: the multifunctionality of trees, crops and livestock, the enhancement of local biodiversity and a better balance between productivity and adaptation are key factors to enhance agroecosystem adaption and resilience while improving their contribution to climate change mitigation.

How to converge on integrated crop-livestock-tree

It is necessary, in a first step, to develop our knowledge of these ICLTS via an international network on this subject taking into account the context of SIDS. Multi-actors and transdisciplinary research projects need to be planned to identify ecological functions and processes, detect context dependencies and extract management rules that are applicable to these agro system. Lessons learnt from these systems will allow a better balance between human and animal nutrition objectives, a greater recycling of the resources produced, and a strong potential of GHG emission mitigation. Some biotechnical, economic and social barriers, that it is necessary to identify, limit the adoption of ICLTS.

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MODELING FLOW VARIATIONS IN A HYDROLOGICAL STATION IN GUADELOUPE IN PREDICTION OF FLOOD RISKS

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Abstract: We consider a stochastic differential equation (SDE) in order to model flow variations from data observed in a hydrological unit located in Guadeloupe, French West Indies. The objective is to take into account the random nature of flows due to different environmental factors and then perform analytical or numerical calculations. Due to likelihood techniques associated with a generalized Black-Scholes model with jumps, we have developed a statistical inference that provides tools to test whether the SDE-based model corresponds correctly to reality. The case studied corresponds to a variable whose fluctuations are associated with a Wiener process and a Poisson process. The distributional properties of the solutions of this SDE are presented. Illustrations are also available from data generated from scripts written using the R programming language.

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NATURAL'S MOLECULES USED AS GREEN CORROSION INHIBITORS.

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Abstract :

The laboratory of materials and molecules in aggressive medium (L3MA) try to use biodiversity in the Carib to answer local issues. One of the research focus is the utilization of natural molecules as green corrosion inhibitors.

The corrosion is an interaction between the metal and the medium around. This interaction can lead to degradation of metal's properties, and may require the replacement of the piece. To protect metals and alloys like steel against this corrosion, different way exist. Employment of corrosion inhibitors is one of them. Various corrosion inhibitors like organic or inorganic compounds can protect metal forming a protective layer. In fact they can be adsorbed on the metal or forming an insoluble complex on the metal surface. The structure of the inhibitive molecule has an important role into the efficacy of molecules. Presences of double bonds, heteroatoms like oxygen, nitrogen or sulfur can be directly correlated with a high efficiency. Previous study highlight alkaloids as a class of natural molecule containing oxygen, nitrogen, and double bond inside their structure acting as natural corrosion inhibitor with high efficiency. Electrochemical measurements like impedance spectroscopy or polarization curves are employed to determine the efficiency of these extracts or molecules.

The L3MA focus last years on the acidic medium (hydrochloric acid 1M), and a lot of alkaloidic extracts shows very good efficiency (< 90% at the concentration tested).

NANOPLASTIC CONTAMINATION OF MANGROVE MEIOFAUNA COMMUNITIES

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Abstract: The PEPSEA project (Nanoparticles of plastic in the environment: source, impact and prediction) evaluates the life-cycle of microplastics and nanoplastics (MNP) in Guadeloupe (French West Indies) in two mangroves differently contaminated by plastic from *i*) North Atlantic gyre or *ii*) local waste production. Reduced water circulation between mangrove tree roots potentially contributes to contaminant sedimentation providing the opportunity to estimate the impact of MNP in the local benthic biota. Due to its small size and sediment habitat, meiofauna can accumulate MNP and represents a path of contaminant transfer to higher trophic levels. The objective of the study was to evaluate contamination of meiofauna community in mangrove sediment. Nanoplastic particles were identified using pyrolysis-GCMS. Mass spectrometry of meiofauna samples shows smaller and more abundant peaks of small size commercial plastics potentially due to aged plastic with PVC plastic type proportionally more abundant in sample.

Keywords: benthic, sediment, contamination, Guadeloupe, meiofauna, nanoplastic

NLRP3 INFLAMMASOME ACTIVATION AND MITOCHONDRIAL ROS PRODUCTION IN PLATELETS OF SS and SC PATIENTS

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Introduction:

Sickle cell disease (SCD) is characterized by a chronic hemolytic anemia, painful vaso-occlusive crises and chronic inflammation partially resulting from platelet activation. Several signaling pathways of platelet activation conduct to the transmembrane P-selectin expression. Some of them could activate NLRP3 (nucleotide-binding domain leucin-rich repeat and pyrin-containing receptor 3) inflammasome and to caspase-1 activation.

Many danger signals can activate NLRP3 including reactive oxygen species (ROS). Mitochondria produce most of platelets ROS (ROSm), and platelets mitochondria are dysregulated in sickle cell disease due to complex V inhibition. In sickle cell disease (SCD) patients' platelets, mitochondria-mediated ROS production is increased owing to the inhibition of complex V.

Objectives:

The aim of our study is to determine if NLRP3 inflammasome is activated in the platelets of SCD patients and to identify the mechanisms of its activation.

Patients and Methods:

Venous blood samples of SCD patients (SC and SS genotype) at steady state and healthy controls were collected in the sickle cell center of the University Hospital of Guadeloupe. Platelets were isolated and P-selectin expression, NLRP3 inflammasome activation and ROSm were evaluated by flow cytometry using anti-CD62P APC antibodies, FAM-FLICA and MitoSox Red probes respectively.

Results and discussion:

Compared to the AA group, we detected increased ROSm and CD62P+ platelets levels in the SS group, in agreement with previous reports. ROSm level also tended to be increased in SC, but not the percentage of CD62P-positive platelets. Surprisingly, FAM-FLICA+ platelet level tended to increase only for SC, but not for SS patients, when compared to AA subjects.

The percentage of SC platelets containing activated caspase-1 tended to be increased, which suggests for the first time, the activation of the NLRP3 inflammasome in this form of SCD. Moreover, the high level of hemolysis in SS patients may, at least partly, explain the high ROSm level and so the SS platelets activation observed.

Conclusion:

Collectively, our preliminary results suggest that platelets activation in SCD could result from different mechanisms according to SCD genotype and could partially explain the difference of clinical presentations between SS and SC patients. Further studies are warranted to confirm our findings.

THE WATER-STRIDERS (HEMIPTERA, HETEROPTERA) INHABITING MANGROVE ENVIRONMENT OF GUADELOUPE.

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Abstract: The insects studied are part of the Hemiptera order and have the ability to move on the surface of the water. We present here the comprehensive report of marine water-strider species from Guadeloupe coastal habitats. The mangrove of Guadeloupe is particular as its coastline is composed of a single species of mangrove tree (*Rhizophora mangle*). Its terrestrial and marine fauna is well described but the insects belonging to the order of Hemiptera has not yet been studied. They move in small groups on the surface of the water at the limit between the sea and mangroves trees.

Thanks to several sampling campaigns, it is now possible to present the distribution of marine Hemiptera in the "Grand-Cul-de-Sac-Marin" of Guadeloupe. Integrative taxonomy including barcode analysis (COI Cytochrome Oxydase I gene) was carried out to identify the species collected. Five different species (from 3 genera) have been observed: *Rhagovelia plumbea* (Ulher, 1894), *Rheumatobates imitator* (Ulher, 1894), *R. mangrovensis* (China, 1943), *R. trinitatis* (China, 1943), and *Limnogonus franciscanus* (Stål, 1859). *Rhagovelia plumbea* is mainly present in small isolated islets, but it is also found on mangrove coasts with *Rheumatobates trinitatis*. These two species seem to be exclusively marine. In estuaries with mangrove, two species are present: *Limnogonus franciscanus* and *Rheumatobates imitator*. *Rheumatobates mangrovensis* has only been observed in fresh water, at the mouth of the river Grande-Rivière à Goyave.

In the future, it would be interesting to focus on the physiology and/or metabolism of these insects in order to better understand their biology and involvement in the mangrove food chain.

FIRST LIVE STRANDING OF PLEUSTONIC SEA-SKATER HALOBATES MICANS (INSECTA : HEMIPTERA : GERRIDAE) IN WEST-INDIES

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Abstract: Sea-skaters (Insecta: Hemiptera: Gerridae) are the only marine insects to be pelagic, on all the oceans of the globe, between 40°S and 40°N, part of the marine pleuston. In the Caribbean Sea and Atlantic Ocean, only one species is recorded, *Halobates micans* Eschscholtz, 1822, believed to live offshore, and replaced by other marine Hemiptera such as Veliidae *Rhagovelia* spp. on shore ecosystems.

For the first time, in association with the arrivals of sargasses, *Halobates micans* was observed in Guadeloupe Island, in coastal situation, literally stranding on the rocky shore of the East of Grande-Terre. Their association with *Sargassum* algae is discussed. They supposed also to associated with plastic debris. Marine insects are poorly studied elements of the marine ecosystem and their ecology is quite unknown, particularly in the Caribbean region.

PALEOGEOGRAPHIC RECONSTRUCTIONS OF THE NORTHERN LESSER ANTILLES DURING THE NEOGENE (24-2 MA)

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Abstract: During subduction the upper plate undergoes differential vertical motion, uplift and subsidence that build or destroy emerged lands and sedimentary basins. Consequently, the paleogeography can deeply change on the long term. In the frame of the ANR GAARANTI we reconstructed the paleogeography of the northern Lesser Antilles during the Neogene because it is an unknown, potential area for the migration of terrestrial fauna toward the Greater Antilles during this time. We investigated the Saba Bank, Kallinago Trough, Walichi Plateau and Anguilla Bank. Onshore, we conducted new biostratigraphical, sedimentological and structural studies in Anguilla, Saint Martin and Tintamarre islands. Offshore, we studied the new seismic profiles acquired during the AntiThesis 2014 and GARANTI 2017 cruises and the sedimentary rocks dredged during the GARANTI campaign. Combined with previous published works, we provide onshore-offshore correlations that allow to reconstruct the evolution of the sedimentary basins of northern Lesser Antilles through the Neogene. We provide paleogeographic map that illustrate the changes in the distribution of the emerged lands and sedimentary basins. A severe differential uplift occurred during Oligocene-earliest Miocene, responsible for the emergence of unsuspected hundreds- km long islands and deep and narrow basins, providing a possible land connection between the Lesser Antilles and the Greater Antilles. Minor uplifts are also recorded during late Burdigalian, earliest Langhian and early Pliocene with emerged archipelagos composed of km- wide islands. Drowning episodes are found during late Aquitanian-Burdigalian, Langhian-Messinian, early Pliocene. During Neogene, vertical motions were coeval with discrete normal faults trending NE-SW and WSW-ESE indicating N-S extension parallel to the trench. Extension and uplift are related to the stretching of the Caribbean Plate during the progressive curvature of the trench, controlling the potential landbridges for terrestrial fauna migrations between South America and the Greater Antilles.

Exploring the symbolic and medicinal plants from the French West Indies as source of novel neuroprotective agents.

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Abstract: Through an ethnobotanical and an ethnopharmacological-TRAMIL surveys, we document and describe medicinal and symbolic plants uses of the inhabitants of French West Indies (Guadeloupe and Martinique). Plants represent an intangible immaterial cultural and biological heritage that deserves to be listed for their preservation. In attempting to promote local ethno-botanical/-pharmacological shared knowledge and the major role played by plant use, an exploration of the surveys' data by pharmacological and biochemical analyses was developed. To test functional activity of the extracts, we used animals that express 40 glutamines (poliglutamines or polyQs) in frame with a yellow fluorescent protein (40Q::YFP) in muscle cells. Proteins carrying long tracts of polyQs have tendency to unfold and collapse into aggregates, that eventually become macroscopic inclusion bodies. This is the case of huntingtin, the protein that causes Huntington disease, when the N-terminal end carries 36 or more glutamines. Therefore, in 40Q::YFP animals, we can follow polyQ aggregation, which happens in an age-dependent manner.

To analyze such events we count inclusion bodies under a dissecting microscope equipped with fluorescence. The first results confirm that the ethnopharmacological and ethnobotanical data can be a remarkable source of bioactive molecules against diseases with high incidence as anti-Alzheimer.

KARUBIONET: A NETWORK FOR A BETTER COLLABORATION AND STRUCTURING OF BIOINFORMATICS IN GUADELOUPE (FRENCH WEST INDIES) AND THE CARIBBEAN

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Abstract: Sequencing and other biological data are more and more available at a lower price. Mutual tools and strategies are needed to analyze the huge amount of heterogeneous data generated by several research teams and devices. Bioinformatics represents a growing field in the scientific community globally. This multidisciplinary field provides a great amount of tools and methods that can be used to conduct scientific studies in a more strategic way. Coordinated actions and collaborations are needed to find more innovative and accurate methods for a better understanding of life surrounding us. A great variety of organizations is contributing to KaruBioNet. This network includes scientists from Institut Pasteur Guadeloupe, Université des Antilles, INRA, CIRAD, CIC, Inserm, CHU (Central Hospital) Pointe-à-Pitre/Abymes, and Région Guadeloupe. The purpose of this group is to foster collaboration and mutual aid among people from different disciplines (biology, computer science, health informatics, biostatistics, mathematics, chemistry, epidemiology, ecology, etc...) using a 'one health' approach, for a better comprehension and surveillance of humans, plants, or animals health and diseases. The KaruBioNet network particularly aims to help researchers in their studies related to metagenomics, proteomics, genomics (or other 'omics'), but also more general aspects concerning biological data analysis, integration and interpretation. This interdisciplinary network is a platform for discussion, sharing, training and support between researchers, engineers and students interested in bioinformatics and related fields. Starting from a little archipelago in the Caribbean, we envision to facilitate exchange with other Caribbean partners in the future, knowing that the Caribbean is a region with a non-negligible biodiversity which should be preserved and protected. Joining forces with other Caribbean countries or territories would allow to strengthen scientific collaborative impact in the region. Finally, KaruBioNet could potentially evolve by collaborating with other Caribbean territories, and give rise to another greater network tentatively called KariBioNet.

THE FIRST STEPS TOWARDS THE REALIZATION OF ENERGY FROM OCEANIC WAVES IN JAMAICA

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Abstract: Jamaica a medium sized island of 1022km of coastline located in the Greater Antilles Arc of the Caribbean has made significant strides in achieving its goal of 50% renewables on the electricity grid by 2030. The renewable energy sources harnessed by the country at this moment includes: wind, solar and hydro. Presently some consideration has been given to exploiting the power from the waves that constantly wash ashore the islands coastline. This study aims to highlight the behaviour of the sea state of the water mass surrounding the island. Access to this information should allow officials and investors to make a more conscious decision on the applicability of this green energy source.

The study uses a combination of in-situ (NOAA/NDBC buoys), satellite (altimetric) and modelled data (NCEP/NOAA/WW3) to develop an understanding of the behaviour of the main wave variables: significant wave height (H_s), wave period (T_p) and wave direction (θ_m) both spatially and temporally. All of which are necessary to create a comprehensive picture of the wave energy potential of Jamaica. The study also highlights an investigation into the distribution of H_s , T_p , and θ_m datasets provided by NDBC buoys, NCEP/NOAA/WW3 simulation and Jason 1&2 satellites. Finally each of these variables provided by the datasets was divided into four geographic sectors (NE, SE, NW, SW) and there distribution scrutinized.

The results show that the SE coast of the island produces the best waves conditions ($H_s > 1.5\text{m}$ and $T_p < 7.5\text{s}$) equivalent to 10.089kW/m. The best periods for production are in the order May-July, February-April and November-January, with May-June affected by tropical storms and hurricanes. The assessment carried out on the variables from each dataset showed that the variables in question were from a population with similar distribution.

FROM SUGARCANE TO CARBON NANOSPHERES FOR TRIBOLOGICAL APPLICATIONS

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Abstract: Friction and wear phenomena are the main causes of the decrease in performances and durability of mechanical systems. The use of tribology, defined as the science that studies the phenomena of friction, wear and lubrication, is essential and constitutes an important economic issue.

It is the role of lubrication to minimize friction and protect surfaces from wear. The strategy used to reduce these phenomena is to introduce a lubricant between the sliding surfaces. This lubricant can be solid, liquid or gaseous, and must prevent direct contact between surfaces, with specific properties such as friction reduction, anti-oxidizing or antiwear action.

Pure lubricating bases (mineral or synthetic oil) cannot provide all protective functions, so that additives are added to improve their reducing properties of friction and wear. New lubrication strategies use dispersed nanoparticles in lubricants. The approach is to supply the sliding contact with solid particles, which can instantly form a protected low shearing tribological film. This work focuses on the synthesis of new friction reducer additives from local biomass, in order to produce ecofriendly lubricants. These new carbon phases are obtained using the spray-pyrolysis technique^[1] with sugarcane from local biomass. It consists in nebulizing a solution of saccharose in the form of micro-droplets, transported to a tubular oven heated at temperatures ranging from 800°C to 1000°C, in order to obtain carbon nanospheres.

The first results have permitted to evidence the effects of synthesis conditions (oven temperature, catalyst concentration and carrier gas pressure), on the nanoparticles morphology, using scanning electron microscopy. Raman spectroscopy gives us information about the graphitization degree of the carbon phase^[2]. The effect of an annealing process on these particles is studied in order to improve the nanospheres tribological properties.

OVSG'S INSTRUMENTAL NETWORKS

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Abstract: For monitoring the seismicity of the arc of the Lesser Antilles and the Soufrière de Guadeloupe volcano OVSG implements various networks of instruments. Some, such as the seismological network, have several decades of existence and others that rely on the most modern available techniques (muon telescopes, MultiGas detectors, measurement of ground temperatures through fiber-optic...) are currently being implemented at the OVSG.

Their development and integration, as well as their long-term reliability represent the most strategic technical issue of the observatory, considering:

- difficulties and challenges related to the tropical climate
- logistic issues
- the broad spectrum of data collection and acquisition frequencies

Here we review existing OVSG's networks, recent developments and short- to medium-term perspectives.

ATMOSPHERIC CONTRIBUTION TO CATIONS CYCLING IN HIGHLY WEATHERED CATCHMENT, GUADELOUPE

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Abstract: The important fertilizing role of atmospheric dust, and particularly African dust, in subtropical rainforests is increasingly recognized but still poorly quantified. To better evaluate dust input into the Caribbean basin, we sampled Critical Zone compartments of a small forested andesitic catchment in Guadeloupe (soils, parent rock, atmospheric dust, plants, soil solutions, stream and rain water).

Our results show that the soil/regolith was built on pyroclastic deposits, but, because of extreme leaching, it has lost its original andesitic signature and inherited an exogenous atmospheric signature. Only the chemical weathering of the deposited dust can provide nutrients to the ecosystem. The cationic mass balance at the catchment scale, as well as the Sr isotopic signature of plants, show that cation and Sr fluxes are of atmospheric origin only and that original andesitic bedrock no longer participates in nutrient cycles.

At the soil-plant scale, the cationic nutrient fluxes provided by vegetation are major compared to input and output fluxes of the catchment. The annual Ca, K, Sr and Mg fluxes within the vegetation are, respectively, 31, 28, 20 and 3 times greater than the exported fluxes at the outlet of the basin. The residence time of nutrients in the vegetation is 16 years for K and close to 45 years for Sr, Ca and Mg. These results emphasize the highly efficient vegetative turnover that dominates the nutrient cycle in our studied catchment.

This first characterization of biogeochemical cycles in the Guadeloupean rainforest suggests that the forest community of the studied area is sustained by a small near-surface nutrient pool disconnected from the deep andesitic bedrock. We also demonstrated that, even with efficient nutrient recycling, Saharan dust plays a significant role in maintaining ecosystem productivity in Guadeloupe over long time scales.

Keywords: Atmospheric deposit, Saharan dust, cationic nutrient recycling, Sr isotopes, Critical Zone.

CHARACTERIZATION OF SILICA PRECIPITATION FROM BOUILLANTE GEOTHERMAL WATER (GUADELOUPE, FWI) AND SYNTHETIC SOLUTIONS

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Abstract: The development of renewable energy is critical for energy transition to a less carbon-intensive and more sustainable energy system. At Bouillante in Guadeloupe, the geological context is suitable for the development of high-temperature geothermal energy. A geothermal power plant with an installed capacity of 15 MW produces 8% of the island's electricity needs and ongoing development projects should achieve an installed capacity of 45 MW. But hot geothermal fluids generally contain various dissolved species (Si, Zn, Pb, etc.) which can form scale deposits during their cooling and lead to a loss of efficiency for geothermal power plants. Amorphous silica is the major scaling problem observed on Bouillante geothermal power plants.

Dixit et al. (2016) led a detailed on site study on the effect of temperature and pH on the kinetic of silica precipitations from Bouillante geothermal water. The data were modeled to estimate the kinetic parameters useful for predicting and preventing silica precipitation during fluid exploitation, particularly at temperatures lower than 160°C, or during reinjection. Thereafter, in the CARPHYMCHEAU project (2016-2019), the effect of salt species (CaCl₂, MgCl₂, FeCl₃, AlCl₃) on silica polymerization was investigated on both Bouillante geothermal water and a set of synthetic solutions representatives of typical geothermal waters encountered in volcanic context. These additional data must enable us to propose a predictive model suitable to a wider range of geothermal waters in volcanic context.

Besides the modeling of silica precipitation, we are also working on the valorization of raw silica, which can be extracted from geothermal waters, as a byproduct of electricity production since that can help to increase the cost-effectiveness of geothermal plants. The physicochemical characterization of this geothermal silica shows that it can be used as an adsorbent for the treatment of natural waters or an adjuvant in cementitious matrices.

CONSERVATION AND MANAGEMENT OF AN ANTHROPOGENIC SYSTEM OF GREAT ECONOMIC IMPORTANCE AFFECTED BY A COLONIZING SPECIES: THE WATER HYACINTH (*EICHHORNIA CRASSIPES*)

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Abstract: The county council of Guadeloupe created in 1988 the largest fresh water reserve (Gaschet) to allow the development of agriculture in the driest area of this island. This artificial water body has an area of 115 hectares with a capacity of 2.7 million m³. The water hyacinth appeared in Gaschet at the end of 2010. Currently, it is the predominant aquatic plant species. The development this invasive plant according to the criteria of IUCN (2008) and DEAL (2013) is a matter of concern.

The objective was to characterize: its current expansion and the effect of the season on the biomass stock present on the pond. It also determined the growth potential of this species, and its impact on the water resource.

According to the literature, this species has a strict vegetative reproduction in Guadeloupe. Our results also show that the area covered by living hyacinth was halved during the dry season with a total biomass decreased from 1,425 tons to 713 tons. Monitoring of juvenile growth revealed that the growth of young plants was 2 times higher in a closed environment, invaded by hyacinths, than in an open environment. Results from greenhouse experiments indicated water losses by evapotranspiration from mature hyacinth of 898 g/d/plant, corresponding to 277,000 m³ of water lost in 4 months (ie 10% of the water resource of the pond).

The physical extraction of the plant in Gaschet will be planning at the end of the dry season with mechanical collection. The compost will be a means of economic recovery, but it is also capable to accumulate pollutants. Further studies are therefore still necessary to determine How best to manage the water hyacinth in Gaschet (phytoremediation, carbon energy or organic matter for crops).

CIRCULATING MICROPARTICLES RATES DECREASED BY PHYSICAL ACTIVITY IN ADULTS WITH OBESITY

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Background and objective. Long regarded as cellular debris, extracellular vesicles (EV) have proven to be important vectors of biological information involved in intercellular communication. There are three types of EV released by all types of cells : apoptotic bodies released by budding of cells undergoing apoptosis ; microparticles (MP) bud from plasma membrane ; and exosomes formed during fusion of multivesicular bodies are expelled from cells by exocytosis (1). Indeed, because of the many factors they carry up and transfer to their target cells (nucleic acids, hormones, signaling molecules ...) they contribute to adaptations of organism. However, their circulating levels have been identified as significantly increased and correlated with chronic inflammation in various pathologies such as diabetes and cancers (2,3). In previous studies, we have shown that EV were also increased in obese patients and would be the conveyors of many factors involved in metabolic dysfunction (4). Physical activity known to reduce excess weight and low grade inflammation has also been identified to decrease some types of EV (epithelial and pro-angiogenic) in normal weight patients. We hypothesized that circulating EV would decrease as a result of regular physical activity in patients with obesity.

Method. A four-month walking program was proposed to around 40 patients (BMI>30kg.m⁻²). Physical activity level was measured using a pedometer associated with a heart rate monitor (Polar®). MP were isolated by differential centrifugations from plasma taken before (PRE) and after (POST) the program. Vesicles quantification was performed by a flow cytometer (Beckman Coulter®).

Results. Number of steps has significantly increased at the end of this period, associated by an improvement in their physical capacity (figure A). Quantification of MP by flow cytometry showed their significant decrease following physical activity but did not allow to identify the cell origin contributing to this important decrease (figure B).

Circulating MP decreased after the physical activity program. Number of steps were assessed by pedometer before (PRE) and after (POST) walking program. Results are expressed in number of steps by hour (A) ; Circulating MP were quantified by flow cytometry from PRE and POST plasma free platelet (B). *P<0.05

Conclusion. We have demonstrated that regular physical activity can decrease the levels of these pathological biomarkers. It would be relevant later to perform a qualitative analyze of these MP.

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FROM SUBSISTENCE TO MULTI-PERFORMANCE: RETHINKING THE CARIBBEAN HOMEGARDEN AS AN INNOVATIVE MODEL IN MODERN AGROFORESTRY

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Abstract: Subsistence farming on small plots, often located near the house (the so-called homegarden, HG), is a strong feature of rural life in the Caribbean islands. It closely resembles the subsistence cultivation of Latin American areas that have been classified as a subcategory of tropical agroforestry systems (AFS, Nair 1985). In this study we test the hypothesis that these ancient family HG fall within the modern and integrative definition of agroforestry recently proposed by the World Agroforestry Center (2016).

The study comprises, i) ancomprehensive (?) review of literature (n = 135) dealing with the main concepts of AFS or diverse case studies in Latin American regions or other tropical reviews (x references) and ii) a 5 year-field work carried out in the French Antilles during 6 sessions of diverse surveys with farmers (n = 342).

A brief historical perspective indicated that the first HG practionners were the slaves who often grew their own food on the unused - sometimes marginal and degraded - , lands near the plantations. Food supplies and other services were important in adapting to their harsh living conditions before and even after abolition. The fact that these systems (HG or AFS) are still an essential part of land use and household survival has been frequently mentioned in recent literature. Their main features are described in this review.

The field research aimed to analyze the different components of the system (trees, crops, livestock) to provide a functional diagnosis and suggest characteristics of the Caribbean HG in it's various biophysical and socio-economic dimensions. Their multiperformance, and ecosystemic services, were qualified.

Based on all the characteristics of the Caribbean synthesized from literature and field data, we have hypothesized their contribution as mixed tree-crop-livestock systems to this new concept of modern agroforestry. Ongoing studies are testing their multi-performance (productive, environmental,...) through the prism of the integration of their subcomponents.

NANOAGGREGATES OF CHLORDECONE AND β -HEXACHLOROCYCLOHEXANE WITH CYCLODEXTRINS AS AN ALTERNATIVE FOR POLLUTED WATER TREATMENT

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Abstract:

The mathematical modeling of the interactions pollutant-decontaminant agents is a tool of recent use to facilitate the management of hydric resources in the environment. The present work studies the interactions between two pesticides of high environmental stability that cause severe affectations to health: chlordecone (CLD) and β -hexachlorocyclohexane (β -HCH), with the most common cyclodextrins (α -, β -, and γ -CDs) and the formation of their nanoaggregates by guest-host complexation. The reaction of formation of these molecular inclusion complexes is addressed in this research, as well as the main types of complexes that could be obtained. The Multiple Minima Hypersurface methodology, quantum chemistry calculations based on the Density Functional Theory and a topological study of the electron density were employed in order to characterize the interaction space of the two pollutants with the symmetrical conformers of the three CDs. The Basis Set Superposition Error existent in the DFT calculations was mitigated using a thermodynamic cycle proposed by the authors. Finally for the β -HCH@CDs complexes a study of the charge distribution, charge transfer and dual descriptor was employed to elucidate the forces involved in the formation of these nanoaggregates. Three types of fundamental interactions were observed: total occlusion, partial occlusion and external interaction (non-occlusion). The more stable complexes were obtained when the γ -CD is the host molecule, as it was confirmed experimentally by means of spectroscopic results. These results suggest the utility of these complexes in the separation of these pollutants and the possibility of using CDs for the management, purification and treatment of water.

IN SILICO DEVELOPMENT OF NOVELS RADIOPHARMACEUTICALS FOR POSITRON EMISSION TOMOGRAPHY FROM INHIBITORS OF MECHANISTIC TARGET OF RAPAMYCIN (MTOR)

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Abstract: Rapamycin (also known as sirolimus) is a macrolide that in the past few decades have shown to be useful as an immunosuppressant and in other therapeutic applications. It is the natural inhibitor of mechanistic target of rapamycin (mTOR), a kinase protein that plays a key role as sensor of nutritional status at the cellular and organismal levels. Therefore, mTOR is a central node in the regulation of cells growth, proliferation and metabolism. In addition, 26 % of tumors are predicted to be potentially sensitive to its inhibitors, reason why it could be an interesting target for radiopharmaceuticals oriented to the diagnosis of several diseases. The aim of this work is to evaluate the utility of several compounds obtained from rapamicyn and its semi-synthetic analogues everolimus and temsirolimus as possible radiopharmaceuticals oriented to this protein. DFT calculations of these molecules were performed and further analysis of the dual descriptor, charges population and of the electrostatic potential surfaces were made. Molecular docking simulations were employed for evaluating the interactions of the protein with the studied candidates. DFT studies allowed the proposal of two strategy of synthesis of novel compounds based on electrophilic reactions. Molecular docking results give us the opportunity to eliminate those molecules that do not interact correctly with the target. Finally, it was obtained that compounds synthetized through the electrophilic addition reaction that employed ¹⁸F-selectfluor, as fluorinating agent, the interactions with the target proteins are conserved.

HOW TO COLLABORATE FOR A BETTER UNDERSTANDING OF THE SCIENCES IN THE CARIBBEAN

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Abstract: This proposal presents a pedagogical approach in which context effects are used in the teaching of environmental sciences. Within the project «Educational Technology for Contextual Teaching TEEC» - Technologies Éducatives pour l' Enseignement en Contexte – <https://teec.telug.ca/en/>), this pedagogy has been tested at an international level. The principle of this teaching practice is based on the fact that students conduct a collaborative inquiry in two different contexts. The working topics cover a wide variety of environmental concerns -in terms of biodiversity, renewable energies (geothermal) and in the agriculture sector (sugarcane, banana). This approach consists of selecting opposed natural contexts and multiplying the situations of collaboration between students in order to create a number of moments when context effects emerge. The modalities of these collaborations will be presented in relation with the underlying educational principles. These collaborations are strongly grounded in authentic and in-situ research situations (King, Winner and Ginns, 2011) as well as in educational technologies which use collaborative workspaces, different forms of videoconferencing, but also contextualized scriptwriting tools. This innovation has been tested in several environmental setting in a design-based research approach (Sandoval and Bell, 2004) in order to develop a context gap calculator. The model used could be presented and tested with different Caribbean countries.

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VALORISATION OF SARGASSUM SP AND MODELLING OF ADSORPTION OF EMERGING MICROPOLLUTANTS ON ACTIVATED CARBON.

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Abstract: Adsorption on activated carbons (AC) is a well-known, sustainable and low-cost process for removing micropollutants from water. This study aims (i) to valorize sargassum for the production of activated carbon followed by the adsorption of caffeine (Caf, a micropollutant seriously threatening aquatic environments) and (ii) to understand the associated adsorption mechanism by exploring interactions between micropollutants and acid groups in AC.

The precursor was firstly analyzed by thermogravimetric (ATG). The carbon preparation was carried out using H_3PO_4 as an activating agent and the impregnated precursor was pyrolyzed under N_2 atmosphere. The characterization of the prepared material was performed using N_2 adsorption and desorption isotherms (BET), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), Boehm titration and pH_{pzc} methods.

The best adsorption was observed for the following conditions: pH 4.0 solution, optimal residence time of 30 min, adsorbate concentration equal to 20 g L^{-1} . The adsorption equilibrium was evaluated from the adsorption isotherms at $25\text{ }^\circ\text{C}$, resulting in a R^2 coefficient of 0.902 for a maximum adsorption capacity equal to 212.07 mg g^{-1} (Langmuir model).

To better understand the interactions of Caf with the acidic surface groups of AC, Multiple Minima Hypersurface (MMH) methodology was used. Interestingly, the model fitted well the experimental results, which allow us to highlight how the electrostatic factor plays a decisive role in the adsorption process. Therefore, this preliminary work obtained on the valorization of these invasive algae, open up interesting prospects for water treatment in general.

UNESCO SCIENCE REPORT 2020: CARICOM's STI IS GROWING

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Abstract: Unesco publishes a report on the status of science in the world every five years and we are responsible for the CARICOM Chapter in 2020. This presentation will focus on the Socio-economic context of the countries and the region with respect to STI, important initiatives engaging STI for development as well as trends in higher education, publications, patents and high-tech exports.

HYDROXYUREA TREATMENT ABOLISHES PRO-INFLAMMATORY PROPERTIES OF SICKLE CELL ANEMIA PATIENTS' MICROPARTICLES

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Introduction

Sickle cell disease (SCD) is the first monogenic disease worldwide, with its two commonest forms noted SS (the most frequent and severe form) and SC. To date, hydroxyurea (HU) is the only drug known to decrease the frequency and the severity of the main SCD-associated complication: vaso-occlusive crisis (VOC). Vaso-occlusion occur following neutrophils adhesion to activated endothelial cells (ECs) of post-capillary venules, which triggers sickled erythrocytes trapping and finally ischemia. We recently showed that HU-treated SS patients exhibited a decreased phosphatidylserine (PS) exposure on their microparticles (MPs), 0.1 to 1.0nm-large extracellular vesicles.

Patients and Methods

Plasma MPs of longitudinally-followed SS patients, collected before (HU0) or 24 months after (HU24) HU treatment onset, were incubated with ECs at 7MPs/cell. After 2, 4 or 20 hours of incubation, we determined ICAM-1 level by flow cytometry, and sICAM-1 (ICAM-1 soluble form) level in the supernatant through ELISA. After a 4 hour-long incubation, we also incubated Alexa 488-labeled SCD neutrophils with ECs for 30 minutes, then we assessed adhesion level via fluorescence microscopy. Differences in protein expression were evaluated using a 2-way ANOVA followed by Sidak's test, while we used Wilcoxon's test to compare adhesion levels.

Results

At 4 hours, HU24 MPs decreased both ICAM-1 and neutrophil adhesion levels, when compared to HU0 MPs. HU0 MPs-induced ICAM-1 overexpression was abolished using annexin V to cap the exposed PS of these MPs. Moreover, sICAM-1 level was also decreased with HU24 vs HU0 MPs at 2 hours.

Conclusion

We recently showed that SS MPs were pro-inflammatory, when compared to AA MPs. Now we show that hydroxyurea abolishes this property via a previously unknown mechanism. Indeed, HU decreased MPs PS exposure, thereby decreasing induced ICAM-1 expression and so neutrophil adhesion level. We also identified a potential therapeutics, annexin V, which may prevent MPs binding to ECs.

BENEFICIAL MICROORGANISMS FOR CORALS (BMC) HEALTH: INVESTIGATION WITHIN *PORITES ASTREOIDES* DOMINANT CARIBBEAN CORAL REEF SPECIES MICROBIOME.

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Abstract: Corals have an important ecological role in maintaining the biodiversity of reef ecosystems. Since the 70'S, scleractinian corals cover percentage has greatly declined among Caribbean reefs, while, *Porites astreoides* species appeared to increase in abundance and became the most important component of coral reef communities throughout the Caribbean. Such resilient and adaptive potential of *Porites* members might be explained by a microbiome composition, which helps to protect them under changing environmental conditions or compromised health.

The Laboratory of Excellence (LabEx) CORAIL (Coral reefs in the face of global change) unites 9 French research institutions and 4 universities from across France and its tropical Overseas Territories to provide scientific expertise for the management and conservation of coral reefs. This LabEx funds the BENEFACT « Beneficial Bacteria for coral health and resilience » project. It aims to search culturable bacteria that would be beneficial for the massive coral *Porites* health. In particular, the antimicrobial activity of these bacteria that could be incorporated into the new concept "Beneficial Microorganisms for Coral (BMC)" (Peixoto *et al.*, 2017).

Collection were carried out in Guadeloupe, French Polynesia and New Caledonia between 2017 and 2019, on corals of the genus *Porites*. A total of 224 pure bacteria clone were isolated (morphological characteristics) in Guadeloupe, 60 in French Polynesia and 60 in New Caledonia. Two metabolic tests, antibiotic resistance and antimicrobial activity against marine pathogens, will help to identify putative beneficial bacteria candidate for the health of corals of the genus *Porites*. Moreover, molecular analyses will allow to (i) identify these bacteria species by 16S RNA gene sequencing, (ii) highlight the secondary metabolites potentially involved in colonization of pathogens while investigating (iii) the expression of *nifH*, *nirK*, *dmdA* genes, positively involved in nitrogen fixation, nitrite reduction and dimethylsulfoniopropionate degradation.

This original work triggered coral microbiome engineering (Van Oppen *et al.*, 2019) and the new "beneficial microorganisms for coral health" concept within coral reef research in the French overseas territories. Our findings concerning coral microbial-strategy therapy could contribute to improve the resistance and resilience of corals into Caribbean.

TICK-BORNE PATHOGEN DETECTION IN CARIBBEAN TICKS USING NGS AND HIGH-THROUGHPUT MICROFLUIDIC REAL-TIME PCR (DOMOTICK PROJECT).

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Abstract : Ticks transmit the greater variety of pathogens of public and veterinary health importance. The diversity of tick-borne pathogens in the Caribbean is little known. We report here on the detection of tick-borne pathogens in individual Caribbean ticks by using a combination of NGS and high-throughput microfluidic real-time PCRs.

Of 27,544 NGS contigs generated from 588 ticks collected in Guadeloupe and Martinique (*Amblyomma variegatum*, *Rhipicephalus microplus*), 1, 2 and 30% matched viral, bacterial and parasitic sequences, respectively. No known pathogenic viruses were detected. However, four new viruses were discovered, of which, one is a suspected human pathogen. Five bacterial genus were identified: *Rickettsia*, *Coxiella*, *Anaplasma*, *Borrelia* and *Ehrlichia*. At the species level, only *Rickettsia africae* (human) and *Anaplasma marginale* (bovine) were consistently detected. Two parasite genus were found, *Babesia* and *Theileria*, but only *Babesia bigemina*, a bovine pathogen was further identified.

The prevalence of tick-borne pathogens was determined using the BioMark™ dynamic arrays allowing the simultaneous detection of 30 bacterial, 17 parasitic and 22 viral species in 94 individual ticks. Of the four interesting viruses found by NGS, one was preferentially found in *Amblyomma* (23%) while the others were preferentially in *Rhipicephalus* (30-90%, no differences between Guadeloupe and Martinique).

Rickettsia africae (96% *Amblyomma*), *Ehrlichia ruminantium* (5.1% *Amblyomma*) and *Anaplasma marginale* (4 to 40% *Rhipicephalus*) were the most detected bacteria.

Babesia bigemina (1 to 12% *Rhipicephalus*) and *Babesia bovis* (0.7% *Rhipicephalus*), *Theileria velifera* (25% *Rhipicephalus* and 42% *Amblyomma*) and *Theileria mutans* (1.5-2% in both ticks), all pathogens of bovine, were also identified.

Co-infections were frequent, with more than 10% and 2% of the ticks hosting 2 and 3 pathogens, respectively. Eleven and one ticks were infected with 4 and 5 different pathogens, respectively.

These results support the importance of these arthropods in terms of public and veterinary health.

A NEW UNCULTURED *THIOMARGARITA*-LIKE BACTERIUM FROM A TROPICAL SHALLOW-WATER MARINE MANGROVE ENVIRONMENT BECOMING THE WORLD'S LARGEST BACTERIUM.

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Abstract: *Thiomargarita* spp. have been described as chemolithotrophic bacteria, oxidizing sulfide into elemental sulfur, and encompassing the largest colorless sulfur-oxidizing bacteria (LSB) known in nature. The morphology of the originally identified species within this genus, *Thiomargarita namibiensis*, consists of spherical or ovoid cells surrounded by mucus forming linear chains. The cell diameter of this bacterium averages between 100 and 300 μm , but single cells have been reported to reach a diameter of up to 750 μm , rendering it the largest bacterium identified to date [1].

Tropical marine mangroves are ecosystems known to be sulfide-rich. While members of LSB have previously been identified in marine tropical mangrove soils, such as *Beggiatoa* spp. mats [2], *Thiomargarita*-like cells have not yet been described in these shallow-water environments (< 1 m depth). We here report a new *Thiomargarita* strain from a marine mangrove site, which can reach a length up to 20,000 μm (20mm), making it the largest bacterium ever described. This single large elongated cell is attached to sunken leaves of *Rhizophora mangle* in the Caribbean marine mangrove (Guadeloupe, F.W.I) and constitutes the first report of a *Thiomargarita*-like bacterium inhabiting a shallow tropical marine environment. We combined phylogenetic, hard X-ray and electron microscopic analyses to characterize this bacterial strain. Moreover, we analyzed the chemical environment, performing sulfide measurements and EDX cartography of a single bacterial cell, to evaluate the autotrophic nature of this novel species. We believe that our results yield new insights into large bacteria and their potential role in marine sulfide-rich environments, such as mangroves, providing an expanded view of *Thiomargarita* phylogeny, morphology and environmental distribution.

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GENOMICS, A POWERFUL TOOL FOR PRESERVATION OF DIVERSITY: THE CASE STUDY OF ASSIGNMENT OF PIGS OF MARTINIQUE BETWEEN CREOLE BREED AND CREOLE-LIKE BREEDS.

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Abstract: In Martinique, Creole feral pigs are living freely or captured and reared by traditional breeders in the mountains in the north and in the countryside. The Natural Park of Martinique (PNM) aims at preserving this local resource. Hence, an inventory of this population was performed. However, it is often difficult to discriminate real Creole vs Creole-like pigs based only on phenotypes. Because breeds are different at the genetic level, genomics can provide tools such as SNP chip to assign the animal to the breed to which he belongs to. A total of 67 animals (feral captured, semi-feral or pigs considered as Creole by their breeders) were genotyped using the porcine IlluminaSNP60 BeadChip. These genotypes were compared with available genotypes of seven breeds that are considered as possible founders of feral pigs of Martinique (Iberian, Large White, Landrace, Hampshire, Duroc, Pietrain and some Chinese breeds) and Creole pig breeds from several areas in the Caribbean. Results showed that the Iberian pig was the main component of the genetic admixture of the feral pigs of Martinique (24 % on average for K= 8 clusters), such as most of Creole breeds of the Caribbean. Our genetic analyses also allow distinguishing “Creole-like” pigs that look like Creole ones from animals that are real Creole pigs. Our results show that a panel consisting of 6 121 SNP is sufficient to distinguish Creole pigs from other breeds. The genomic tools are then powerful to analyse and discriminate the diversity of pig breeds, particularly in absence of genealogical information such in Creole feral pigs in the island of Martinique.

***KLEBSIELLA PNEUMONIAE* FROM HUMANS, ANIMALS AND THE ENVIRONMENT IN GUADELOUPE: FIRST INSIGHTS INTO GENOMIC.**

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Abstract: *K. pneumoniae* (Kp) represents nearly 10% of nosocomial infections in the Western world, including Guadeloupe, and is one of the most problematic multidrug resistant bacteria. Hypervirulent clonal groups of Kp are also responsible for invasive community-acquired infections, such as pyogenic liver abscess and meningitis. As the reservoir of clinically and epidemiologically prominent clonal groups of Kp is currently unknown, we expect to define the sources of human infections through an “One Health” approach.

Since January 2018, 700 samples of fresh faeces or rectal swab from food-producing animals (cattle, pigs, poultry) and pets (cats and dogs), vegetables and water were investigated in Guadeloupe (French West Indies). After culture on selective media, identification antimicrobial susceptibility testing was performed. In addition, all the Kp isolates collected from human community- and nosocomial acquired-infections at the University Hospital of Guadeloupe were included.

A total of 582 strains from the different sources were isolated. We sequenced the genomes of 77 of them, selected with different antimicrobial resistance and virulence phenotypes. Phylogenetic analysis confirmed that Kp isolates identified by standard tests actually belong to three related species, which correspond to Kp, *K. quasipneumoniae* and *K. variicola*. Kp was the main species in humans and animals while *K. quasipneumoniae* and *K. variicola* were mainly isolated in the environment. With regards to antibiotic resistance, nosocomial Kp strains showed many resistance genes (*bla*_{CTX-M15}, *bla*_{KPC-2}), in contrast to community Kp and to environmental Kp strains. In addition, community hypervirulent Kp accumulated virulence genes (*ybt*, *clb*, *iuc*, *iro* and *rmpA*), unlike other strains. Despite the low number of Kp included, isolates from human (n=30), animal (n=3) and environmental (n=2) sources did not represent distinct subpopulations.

Further inclusions of strains (soil, vegetables) are in progress to identify reservoirs and modes of transmission of this pathogen from the environment and animals to humans.

ANTIMICROBIAL USE AND RESISTANCE LEVEL IN FOOD-PRODUCING ANIMALS IN GUADELOUPE

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Abstract:

The selection pressure related to the overuse of antibiotics in human medicine is responsible for the increasing of antibiotic resistance, but the animal world also plays a role in the global emergence of antimicrobial resistance. More and more infectious diseases circulating mainly in the animal world affect human populations. These zoonoses now represent a real public health concern, and the emergence of these diseases is accelerating.

In Guadeloupe, a French overseas department, studies on antimicrobial resistance are recent. Recent studies on animals show that antibiotic treatment selects resistances expressed or not by a large diversity of strains that can persist for more than one month after treatment and participate to the dissemination of resistance genes, potentially transmissible to other bacterial species, common to animals and humans (Sadikalay *et al.* 2018). The objectives of this project were (i) to gain better knowledge of antimicrobial use in pig, cattle and poultry food-producing animals and (ii) to evaluate the resistance level in this biotope.

A cross-sectional survey was conducted in 45 production farms. Antimicrobials practical uses were documented according to a declarative interview in face to face with the farmers between March to July 2018. Fecal sampling from 216 pigs, cattle and poultry were collected in farms and at slaughterhouse between January 2018 and May 2019. Samples selectively enriched were cultured for bacterial isolation, identification and antimicrobial testing.

Our results showed that few husbandries contributed to a moderate frequency of resistant ESBL-carrier pigs (4.7 %) and cattle (7.3 %). Nevertheless, high frequency of ESBL-resistance was observed in hen house (35.5 %) where breeder declared not to use third generation cephalosporines (³GC). Tetracyclines (TET) were the most prone to be administered, accordingly, high level of *E. coli* and *K. pneumoniae* resistant to TET were observed. This selective pressure leads to the persistence of resistance in animals until slaughter.

Our study reveals a rational antimicrobials use and resistance level in pig and cattle farming in Guadeloupe and also suggests that other mechanisms than ³GC selective pressure are involved in the emergence of this resistance.

INTRINSIC ABILITY OF CUBAN *Aedes aegypti* POPULATIONS TO TRANSMIT DENGUE, CHIKUNGUNYA AND ZIKA VIRUSES

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Abstract:

As many Caribbean countries, Cuba is greatly concerned by arboviral outbreaks associated to *Aedes aegypti* mosquitoes. Dengue is hyperendemic since several decades and Zika virus is causing numerous autochthonous cases since 2016-2017. Curiously, when Chikungunya virus was actively circulating in the Caribbean in 2013-2014, no autochthonous transmission of the virus has been recorded in Cuba despite the importation of chikungunya cases in the island. This epidemiological scenario could be possibly explained by the transmission ability of local mosquito populations regarding these viruses. However, the vector competence of local *Aedes aegypti* populations had never been examined. In this study, we evaluated for the first time the ability of two *Ae. aegypti* populations collected from Havana to transmit Zika, dengue and Chikungunya viruses. *Ae. aegypti* from Havana was able to disseminate and transmit all the three viruses with contrasted levels of dissemination and transmission. These results firstly suggest that the absence of Chikungunya virus is not linked to a refractoriness of local populations. Secondly, they evidence that low transmission efficiencies can sustain an important local transmission of dengue and Zika viruses, as witnessed by the number of clinical cases reported in the island.

REPTILES IN GUADELOUPE (FRENCH WEST INDIES) ARE A RESERVOIR OF MAJOR HUMAN *SALMONELLA ENTERICA* SEROVARS

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Abstract

A retrospective study was conducted to identify the risk factors associated with *Salmonella enterica* bacteremia in infants and children in Guadeloupe. The 171 patients with *S. S. enterica* infection seen between 2010 and 2014 included 155 (90.6%) with acute gastroenteritis, of whom 42 (27.1%) had concomitant bacteremia, and 16 (9.4%) with primary bacteremia. The most common *Salmonella* serovars were Panama (N = 57, 33.3% of isolates) and Arechavaleta (N = 28, 16.4%). Infection with the previous serovars was significantly associated with bacteremia in a multivariate analysis. A delay between onset of symptoms and hospital admission > 5 days (P = 0.01), vomiting (P = 0.001), and increased respiratory rate (P = 0.001) contributed independently to bacteremia in the multivariate analysis. Thus, if non-typhoidal infection is suspected, blood should be cultured and antibiotic treatment initiated in all all patients who meet these criteria.

With regards to the high prevalence of the serovars Panama and Arechavaleta, a study was performed to identify their reservoir. Between June 2011 and December 2014, feces from 426 reptiles and 50 frogs were investigated. The frequency of *S. enterica* carriage was 15.0% (n = 64) in reptiles but varied by species. The presence of Panama and Arechavaleta at low frequencies in wild reptiles (4.6% (n = 3) and 3.1% (n = 2), respectively) and pigs (7.5% (n = 5) and 1.5% (n = 1), respectively), suggests a broad host range, and humans may be infected by indirect or direct contact with animals. These serovars are probably poorly adapted to humans and therefore cause more severe infections. The unusual subspecies *houtenae* serovar 43:z4,z32:- was a major subspecies in wild reptiles (24.6%, n = 16) and humans (9.4%, n = 67) but was not recovered from warm-blooded animals, suggesting that reptiles plays a key role in human infection.

SINGULAR SOLUTIONS TO EQUATIONS OF FLUID MECHANICS AND DYNAMICS NEAR A HURRICANE'S EYE

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Abstract: During the last decades, much progress has been made concerning the prediction of hurricane tracks, but the dynamics near the hurricane's eye is still not very well understood. This motivates our study of solutions to fluid dynamics (Euler or Navier-Stokes equations) with vortex and shock-wave type irregularities, having in mind the wind field near the eye of a hurricane where it drops from its maximal value to (nearly) zero. We prove a new theorem concerning such solutions, which we can generalize to n dimensions. We elaborate our on earlier work showing how the hurricane's track can give information about dynamics near the eye, and reciprocally this can be used to predict the hurricane's track. Finally, we also deduce formulas for the asymptotic behaviour of the wind field as one approaches the wall of the eye.

INFLUENCE OF BREEDING SITES BACTERIAL COMMUNITIES ON *Aedes aegypti* MICROBIOME AND VECTOR COMPETENCE FOR DENGUE AND ZIKA VIRUSES.

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Abstract: *Aedes aegypti* is a human-biting mosquito highly abundant in Guadeloupe Island that has been locally involved in dengue virus (DENV) transmission since the 70's and more recently in a major Zika virus (ZIKV) outbreak. During immature stages, *Ae. aegypti* mosquitoes are exposed to a wide array of microbes from diverse aquatic habitats. Recent studies show that larval environment shapes microbial community structure in adult mosquitoes and can affect their capacity to transmit viruses. However, the interactions between *Ae. aegypti*, its natural microbiota and arbovirus transmission are still poorly understood since most reports have focused on laboratory-based experiments, where the microbiome used for mosquito rearing does not necessarily reflect the complex of bacterial communities associated to mosquito breeding-sites on the field. Hence, we exposed *Ae. aegypti* to contrasted aquatic habitats to evaluate the influence of a natural bacterial microbiome from breeding-sites water on (i) the bacterial microbiome associated with *Ae. aegypti* and on (ii) vector competence of the emerging adults for DENV and ZIKV. We found that bacterial communities from aquatic habitats influenced the microbiome associated to the corresponding mosquitoes. In addition, the vector competence experiments conducted on local *Ae. aegypti* showed differences on DENV and ZIKV transmission according to the breeding-site water used. Taken together, these results confirm the complexity of arbovirus-microbiome-mosquito interactions.

DO NOT FORGET RESEARCH AND INNOVATION MANAGERS!

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Abstract:

Caribbean higher education institutions (HEIs) are regarded as strategically important for the human capital development needs of the country to support economic growth, and are increasingly being called upon to lead in developing new products and services and improving existing ones for effective competition in the global economy, or for advancing the public good. In short, HEIs are being called upon to be more innovative. Drawing on research data and integrative scholarship, it will be argued in this presentation that research and innovation management (RIM) is a pivotal value-adding function carried out by research managers, who perform a critically important *support role* to researchers in advancing the research and innovation agenda of contemporary HEIs and by extension the Caribbean region. Therefore, given this reality, it is further argued that Caribbean higher education administrators should not only ensure the delivery of innovation-centric curricula, but must also ensure that research and innovation management offices are established and provided with the requisite human, physical, and financial resources needed to be effective.

Keywords: Research management, innovation agenda

POTENTIAL USES OF BIOACTIVE COMPOUNDS FROM SARGASSUM

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Abstract: Pelagic *Sargassum* is brown algae that form large floating mats. In the last years, several episodes of unusual quantities of *S. natans* and *S. fluitans*, reaching the coasts of many of the islands of the Caribbean Sea, and countries in South, Central, and North America have been reported. *Sargassum* contains a range of biologically active compounds as phenolics, plastoquinone, phlorotannins, fucoxanthin, fucoidan, sargaquinoic acid, sulphated polysaccharide, sargachromenol, steroids, and flavonoids that showed significant therapeutic potential, suggesting *Sargassum* could provide novel functional ingredients for pharmaceuticals for the treatment and prevention of several disorders. In this work, the potential uses of bioactive compounds from *Sargassum* for human health are analyzed and the first results of ICIMAR in this field are discussed. Although seaweeds contain all 22 amino acids, they are generally rich in aspartic and glutamic acids, but limited in lysine, threonine, tryptophan, cysteine, and methionine. Nutritional studies have shown that algal proteins are generally comparable to vegetable ones, but the imbalance of amino acids may limit the applicability of *Sargassum* as a foodstuff. The proteins, peptides, and amino acids from seaweed have shown positive bioactive effects in the treatment of diabetes, cancer, AIDS and the prevention of vascular diseases.

The major polysaccharides of *S. natans* and *S. fluitans* are laminarin, mannitol, alginate, fucoidan and cellulose. Alginates are a major component of the cell wall of brown algae. They represent some of most important biomaterials for diverse applications, not only in the food and cosmetics industries, but also for biomedical applications. On the other hand, sulphated polysaccharides aids insoluble antioxidants, and they have been proposed as alternatives to the anticoagulant heparin. Fucans can also inhibit the virus infection of cells and parasite invasion, showing antimalarial activity as well as inhibiting another widespread parasite, *Toxoplasma gondii*. Considerable further research is required to identify the potential therapeutic benefits of *Sargassum*.

INVERTING THERMAL IMAGES TO REVEAL STEAM FLUXES AT LA SOUFRIÈRE, GUADELOUPE

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Abstract: Hydrothermal systems bring considerable quantities of heat and steam to the surface where it is liberated through fumarolic vents. Fumarolic output commonly accounts for the vast majority of degassing as is the case for La Soufrière volcano, part of the lesser Antilles volcanic subduction arc where fumarolic degassing is believed to comprise 98% of the total heat budget. In spite of its importance, there exists no systematic simple methodology to evaluate the heat and steam fluxes: the standard instruments for monitoring fumarolic activity, notably thermal cameras, cannot directly give this information; other techniques to measure heat flux such as boreholes that measure the subsurface temperature gradient are costly, difficult to implement and maintain and only give information at one spatial location.

In order to evaluate the fumarole flux, we propose a new method that involves the inversion of the observed fumarolic plume trajectories from thermal images. Our forward model is a 1D plume model that accounts for the effect of wind shear on plume rise. The modelling and inversion process has been validated against data from laboratory-scale experiments and the validated methodology is then applied to field data obtained using a thermal camera on La Soufrière volcano.

OBSERA: AN OBSERVATORY OF WATER AND EROSION IN THE ANTILLES

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Abstract: The Earth surface evolves under the action of geological, chemical, physical, biological and anthropogenic processes involving a wide range of time and length scales (from the meter and the second up to the thousand of kilometers and the million years). These processes control the evolution of soils, the shape of landscapes and the coupling between climate, tectonics and erosion. Understanding them requires to monitor experimental catchments over durations long enough to capture all the time scales involved.

The Observatory of Water and Erosion in the Antilles (ObsERA) was created in 2011 by the CNRS-INSU to address these problematics. Its objectives are:

- to investigate chemical and physical erosion, their feedbacks and their influence on the carbon and water cycles and the environment (soil development, rivers chemistry, etc.) in the peculiar context of a tropical volcanic island;
- to promote the development of new instruments and methods (including new isotopic tracers) for monitoring sediment transport by rivers and slope processes and characterizing the ecosystem dynamics;
- to investigate how extreme events (floods induced by heavy rains and tropical storms, earthquakes, ...) influence geochemical cycles (e.g. carbon cycle), denudation rates and landscape morphology.

In this aim, ObsERA monitors the evolution of environmental variables (e.g. rainfalls, river discharge, conductivity, suspended load, chemical composition of soils, rivers and rainfalls, ...) in 3 catchments located on Basse-Terre Island, a volcanic island of the Guadeloupe archipelago (Lesser Antilles arc). ObsERA also monitors the granulometry and the morphology of several river reaches using drone-acquired aerial images. These data are made freely available to the scientific community on the following web site <http://webobsera.ipgp.fr/>.

“CAREST”- CARIBBEAN NETWORK OF RESEARCHERS ON SICKLE CELL DISEASE AND THALASSEMIA: A REGIONAL ORGANIZATION FOR HEALTH PROMOTION AND RESEARCH.

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The genes responsible for sickle cell disease (SCD) and thalassemia entered the population of the Caribbean from West-Africa through slavery and from Asia with indentured laborers. Available data suggest a high prevalence of SCD in the Caribbean. However, prior to 2006, accurate SCD prevalence and epidemiological data were published for only a limited number of these countries and territories. These data were provided from newborn screening (NBS) programs implemented in Jamaica and in the French territories and from a prenatal diagnosis program in Cuba. Collaboration between medical and scientific Caribbean teams began to increase in 2006, leading to the founding in 2011 of the Caribbean Network of Researchers on Sickle Cell Disease and Thalassemia (CAREST). Considering that increase in life expectancy of SCD patients is mainly due to the implementation of NBS programs and early prevention of the major SCD complications, promotion of NBS and assistance for the establishment of sickle cell centers are the primary goals of CAREST. Actions to promote NBS have been carried out with various countries in the area (Antigua & Barbuda, Barbados, Dominica, Grenada, Haiti, Trinidad & Tobago, Saint Lucia). These NBS programs, as well as training sessions for health professionals to ensure optimal patient care are currently supported by funding from the Interreg V program (2014 – 2020) and Fond Regional de Coopération (FCR 2019-2020). Another important mission of CAREST is the driving of research projects to contribute to therapeutics progresses. Scientific collaborations involving Guadeloupe, Martinique, Jamaica, Cuba and Brazil for identifying markers of SCD severity have resulted in several publications, students training and PhD defences. The organization of regular Caribbean conferences allows the development of larger collaborations. Indeed, CAREST's presence which was limited to Caribbean islands has now been extended to the Greater Caribbean since the fifth conference of CAREST which took place in French Guiana in October 2018.

MODELING AND NUMERICAL SIMULATION OF SARGASSUM SPREAD ON MARTINIQUE COAST

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Abstract: A new marine hazard called the golden tide caused by sargassum (*S. fluitans* and *S. natans*), leads to successive massive groundings. These massive groundings have an economic, social and environmental impact on the Caribbean islands. Our approach consisted in examining satellite images that identified three areas, including two sargassum development source areas, one located off Brazil, the other in the Atlantic Ocean and the third a stranding area in vicinity of Martinique. Their presence frequencies were also determined. Sargassum displacement was estimated by forcing surface currents using Lagrangian approach. Thus, their propagation showed there is connectivity between sources areas and stranding area. A meta-population model was constructed to estimate the frequency of sargassum occupancy in three areas according to their growth in the source areas.

As a result, two scenarios were developed: first describes the growth of these algae as a function of the total amount of phosphate and nitrate available in source areas. A second also considers the amount of nutrients to illustrate the growth of sargassum under the possible effect of hurricanes on their movement in the Atlantic Ocean. It has been determined that the action of hurricanes combined with nutrient availability help to obtain a better estimate of the presence of sargassum in the different areas.

Keywords : Pelagic sargassum, Lagrangian transport, Modelling, Satellite detection, Grounding estimation

GEODYNAMIC OF THE LESSER ANTILLES BACK ARC DOMAIN; CONTRIBUTIONS OF THE GARANTI CRUISE, IN THE GRENADA BASIN

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The GARANTI cruise (Lebrun J.-F., Lallemand S. et al. 2017, R/V L'Atalante <https://doi.org/10.17600/17001200>) leads to acquisition of bathymetry, multichannel and wide angle seismic and rock sampling in the Grenada basin and the Aves ridge, west of the Lesser Antilles arc. As a tasks included in the ANR GAARANTI research program (<https://gaaranti.edu.umontpellier.fr/>), the cruise aim to bring geological constraints on paleogeographical evolution of the Lesser Antilles arc, the Grenada basin and the Aves ridge. This area evolves in a back arc position relative to the Lesser Antilles subduction zone since the late Cretaceous and is subject to large amplitude vertical motion including periods of emersion favourable to land animals and vegetables dispersion. Many different and controversial models has been proposed to explain formation of the remnant Aves Ridge volcanic arc during the late cretaceous - paleogene, and origin of the eastward arc migration to the Lesser Antilles following opening of the Grenada back arc basin during the early Neogene. Our data sheds light on basement structures, architecture of the sedimentary covers, and time constraints from seafloor rock samples and sismostratigraphy correlations from deep drills.

We focus our investigations in the south where the Grenada basin is the deepest to constrain the tectonic development and timing of the Aves Ridge eastern margin rifting and development of the deep Grenada basin toward oceanisation. In such a context, vertical motions along the shoulder of the rift and in the basin can reach several thousands of meters in amplitude. From latitude of Montserrat to that of St Vincent we prospect the transition between the shallow and the deep Grenada Basin. The crustal structures in the basin are compared to that of the fore-arc to constrain the tectonic heritage and its role in accommodating the deformation (including vertical motion) imposed by the subduction on the upper plate. To the north of St Kitts and Nevis, where time constraints are complemented by our work on land over sedimentary fore-arc islands we explore the evolution of tectonic in the upper plate at the transition between the Lesser and the Greater Antilles. There, development of the northern caribbean plate boundary during the late Paleogene - early Neogene deeply affected the over-riding plate. This event is perfectly recorded in the sedimentary cover and allow to precisely describes the tectonic evolution prior, during and after this major event, including of-course, vertical motion with amplitudes of several hundreds to thousands meters.

SARGASSUM ARRIVALS TO DOMINICAN REPUBLIC AND THE CARIBBEAN: HOW TO DEAL WITH THE PROBLEM WITH A LOCAL APPROACH?

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Abstract: The global environmental changes have diverse and combined causes, coming from different actors and operating on multiple scales. One of the problems that has affected the coastal areas of our region since 2011 is the arrival of sargassum, with the consequent accumulation and decomposition of massive amounts of brown algae *Sargassum natans* and *Sargassum fluitans*. Here we analyze the consequences of this phenomenon in Dominican Republic and the Caribbean. Among the environmental effects, mortality of fishes, turtles and marine mammals has been observed. The accumulation and death of large quantities of macroalgae on the coast causes an increase in the chemical and biochemical oxygen demand, anoxia and the generation of toxic gases, such as hydrogen sulfide and methane that are harmful to human health and other organisms. This alters the quality of the sand and affects the organisms that inhabit these coastal ecosystems such as beaches and mangroves. From a socio-economic point of view, massive deposits of Sargassum have had great negative impacts on the productive activities (tourism, fishing, maritime transport) of the communities that live on the coasts. Since Sargassum's arrivals have a regional reach, the Caribbean cooperation must be developed to find the right scientific answers and ensure ecologically friendly management. An alternative is the search of local solutions, which begin with the collection of Sargassum at sea and its subsequent evaluation as an economic resource, according to the possibilities and interests of each territory. Among the options to be assessed, we can mention: the use as biomass for power generation, the production of activated carbon, biofertilizer or as feed for livestock independently or in integral formulations. Finally, it is possible to evaluate the obtaining of other products such as alginates, widely used in various industries, and liquid biofuels.

Agricultural co-conception in Guadeloupe for shared innovations.

AgroEcoDiv research and technical consortium

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Abstract: The agricultural landscape of Guadeloupe is defined by the great diversity of its production systems and farms. This is linked to the history of the territory, the socio-economic characteristics of a European archipelago located faraway in the Caribbean basin, and the constraints generated by the specific bioclimatic characteristics of island systems located in humid tropical environments. To date, Guadeloupe agriculture is characterized by a very large number of microstructures: 84% of farms have less than 5 ha of agricultural land used (RGA, 2000). These small areas make monocultures or specialized livestock farming unsustainable. On the other hand, they can be exploited very efficiently in mixed crop-livestock system by relying on a family labour force and more or less integrated workshops. These agrosystems are part of an agroecological approach, although there is room for improvement. This multifunctional agriculture fundamentally responds to the challenges of the territory and must make it possible to achieve food sovereignty objectives (currently less than 50%), contribute to spatial planning, create wealth to support economic dynamism, maintain and develop activity and employment, and preserve natural natural (including biodiversity) and cultural heritage.

In this context, the **AgroEcoDiv** project aims to design, in an innovative way, and with an agro-ecological approach, efficient and resilient agricultural production systems for the territories of Guadeloupe. The aim is to identify the brakes and levers to innovation and increased integration of the components of the production systems studied.

The **AgroEcoDiv** project is structured in four axes, (o) participatory governance (i) understanding agricultural dynamics in Guadeloupe, and analysing the potential of the agricultural sector in terms of territorial resilience, (ii) characterising and managing the diversity of biological functions, and processes that can be mobilised in crop and livestock systems, and (iii) designing and evaluating diversified systems that combine scientific and secular knowledge. The project brings together the scientific expertise of INRA, CIRAD and the University of the Antilles, ranging from life sciences to human and social sciences. It also relies on technical research platforms and open multi-stakeholder engineering systems.

In order to ensure that the solutions envisaged are as relevant as possible to farmers' needs, the project co-designs the innovations developed with the stakeholders and experiments with participatory governance. Participatory, collaborative, intervention-research and contextualized research practices are developed with researchers in management sciences. Thus, **AgroEcoDiv** explores and co-constructs, with all the actors (farmers, development technicians, researchers, political leaders,...), generic knowledge that can be mobilized in various territories and production systems. De novo design tools are also used to model optimized operations.

As a first step, the project intensified its interactions with stakeholders (seminars, surveys, technical committees) in order to integrate their vision and expectations on improvements to polyculture-livestock systems in Guadeloupe's territories. To this end, the consortium has set up an innovative governance system (axe o), consisting of a Steering Committee that involves the stakeholders in the management and programming of the project, and a scientific committee whose role is to support researchers in the necessary distance, in the context of collaborative research, from the field, and to support them in their reflexivity activity and scientific programming. In addition, this Committee strengthens the logic of knowledge production, and transdisciplinary animation, to produce actionable knowledge. The project results are available to a wide audience on the project website (<http://www6.inra.fr/agroecodiv-guadeloupe>).

As a second step, the consortium is formalizing a research-intervention system to co-design innovations in the farming environment in the Nord Grande-Terre region. Problems were raised by farmers: managing water resources, working on farmers' commitment, creating appropriate functional organisations, proposing appropriate mechanisation, promoting sustainable agriculture, producing protein-rich feed locally for animals, thinking about the future of cane production... After prioritizing these in consultation between farmers and researchers, on-farm experiments will be set up to test innovations resulting from profane hybrid research knowledge. Innovative communication supports this step, to ensure the influence of the approach and the dissemination of the innovations produced: technical seminars, forum theatre, film, opinion articles for the local press, technical sheets, serious games...

This project is financed by funds allocated by the Guadeloupe Region and European ERDF funds.

ADSORPTION OF DIAZEPAM ON ACTIVATED CARBON: UNDERSTANDING POLLUTANT-ADSORBENT INTERACTION AT NANOSCALE LEVEL

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Abstract: The contamination of water with persistent organic compounds, like pharmaceuticals, is a problem of global concern. Among often found active compounds in water bodies it can be cited the benzodiazepines, the most prescribed anxiolytics in the world, been the Diazepam (DZP) one of the most representative compound of this pharmacological family. Adsorption on activated carbons is among the most used secondary processes for the removal of these contaminants from polluted waters. In the present work, the adsorption of DZP on activated carbon (AC) SUPERCAP BP10 was experimentally studied and a theoretical analysis of the interaction of DZP with acidic groups (hydroxyl and carboxyl) was also carried out, to explain the pollutant-adsorbent interactions at nanoscale. The adsorption isotherms of DZP on AC at different pH and temperature were determined. The maximum adsorption value was 659.4 mg DZP/g_{AC}, which was reached at a pH value of 7 at 25 °C. In theoretical calculations, a coronene with a functional group in the edge was used as a simplified model of AC to evaluate the influence of surface groups (SG) in the course of adsorption. The optimization of all structures by Density Functional Theory was done using M06-2X functional. The Quantum Theory of Atoms in Molecules was used to characterize the interaction types. The studied systems present mainly dispersive interactions between DZP and SG of AC.

DEGRADATION OF DIAZEPAM IN SYNTHETIC SOLUTIONS AND WASTEWATER BY HIGH FREQUENCY ULTRASOUND, GAMMA RADIATION AND UV RADIATION (ARTIFICIAL AND SOLAR)

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Abstract: The growing industrial development in the pharmaceutical sphere associated with human well-being is related to a higher consumption of chemical products, increasing the presence in the environment of new polluting compounds. Different studies report the presence of various drugs in surface and groundwater, where pollution comes from manufacturing and inadequate disposal of these products from a defocalized emission through excess excreted by human consumption. One of the main problems with this type of pollutant is its resistance to conventional wastewater treatment processes, so it is essential to go to other technologies that allow its elimination, such as advanced oxidation processes. In this work the degradation of aqueous solutions (synthetic and real) of diazepam (DZP) was studied by high frequency ultrasound, gamma and UV radiation, intensified with hydrogen peroxide and Fenton reagent. The optimal ultrasonic power and working frequency were 30.6 W and 862 kHz, respectively; the adsorbed doses of gamma radiation varied between 0.1-5 kGy for gamma and a lamp of 254 nm and 11 W of power was used in UV. The integration of each process with the Fenton reagent guarantees the total elimination of the drugs at 5 minutes in the synthetic matrix and more than 90% in real wastewater. A decrease in COD and BOD5 of wastewater was achieved with 89.2%, 82.1% below the limits required by NC-27-2012.

MOBILIZING TROPICAL PLANTS AS A SUSTAINABLE ALTERNATIVE TO THE ISSUE OF ANTHELMINTIC RESISTANCE IN SMALL RUMINANTS

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Abstract

In Guadeloupe (FWI) breeders of small ruminants have to face with gastro-intestinal nematode (GIN) resistance against synthetic anthelmintics, a worldwide problem which led to high production losses. The INRA URZ specific integrated method for humid tropics to control GINs, includes the use of anthelmintic plants. At least 71 plants were found to be available in Guadeloupe to treat worms in animals. Among these plants, some contain condensed tannins (CT) that are bio-reactive complex plant secondary metabolites. Protein-CT interaction could result in affection of ruminal fermentation, allow availability of amino-acids and induce a gastrointestinal nematicidal action in ruminants.

A preliminary study was conducted in order to evaluate *in vitro* the effect of several CT types, against various chemical-resistant strains of the parasite *Haemonchus contortus*. CT from 8 plant species from 6 botanical families, were first extracted using acetone/water (3:7; v/v) and analyzed by LC-MS for CT content, polymerisation degree, procyanidin/prodelphinidin and free flavanol determination. CT extracts were assayed *in vitro* for their bioactivity against the larval exsheathment of the infective L3 stage of 5 various chemical-resistant strains of the parasite *Haemonchus contortus*, using up to 5 concentrations and 3 repetitions with Phosphate Buffer Sample (PBS) as control.

The results indicate that CTs can be used to control anthelmintic resistant parasites (EC50 from 1.36E-6 to 1mg.mL⁻¹), but with varying efficiencies (9 to 100% efficacy) and decreasing with the multi-resistance of the strain (- 44% efficiency between the most resistant strain and the most sensitive to CT). This variability may be related to the structural complexity of the condensed tannins, the presence of other active compounds in the plant extracts, but also to the nature of the parasite resistance, which could affect the tannin-protein interactions.

Keywords : Condensed tannins, Gastrointestinal nematode, *Haemonchus contortus*, Anthelmintic resistance.

Guad3E project, implementation of an innovative method for fish and crustacean identification in Guadeloupe: the environmental DNA metabarcoding.

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Abstract:

GUA3E project has been launched in 2018 by the National Park of Guadeloupe in partnership with the private company SPYGEN. Two independent consultants have been involved from the early stage of the project. The project is funded by the European Regional Development Fund, the two partners and the water agency of Guadeloupe.

The environmental DNA (eDNA) metabarcoding is an innovative technology based on searching for traces of DNA in the environment (water, soil, biofilm...) enable the monitoring of key taxonomic groups. This technology has been successfully implemented in French Hexagon since 2011, in aquatic ecosystems, where it's a relevant method of the monitoring of rare or secretive species, including fish, crustaceans, amphibians, mammals or bivalves. Thanks to its ease of implementation, the method can also be used to reinforce ecological surveillance operations.

Guadeloupe is well known for its extraordinary biodiversity but also for the numerous threats that weight upon it, such as exotic and invasive species. Environmental conditions are roughly different in Guadeloupe compared to French Hexagon (short and turbulent streams, intense UV radiation, oligotrophic waters, high temperature and relative abundance of crustaceans). . The aim of the GUADE project was thus to test the eDNA metabarcoding method for the inventory of fish and crustaceans in Guadeloupe and compare the results with the traditional method of species inventory: the electric fishing.

The second aim of the project was to create a reliable reference data base for local species' sequences for these two taxonomic groups, which is a critical factor of the quality of the results.

Two campaigns were conducted in February and July 2019. Eighteen sites (located on nine rivers) were studied. On each site, electric fishing and eDNA sampling (3 replicates) were performed. The samples were sent to Spygen laboratories where they were analyzed.

The results of the first campaign are displayed. They show a good correlation between the inventories obtained by the two methods, meaning eDNA method could be successfully implemented in Guadeloupe.

EXPLORING THE LINK BETWEEN HYDROTHERMAL ACTIVITY AND AQUATIC BIODIVERSITY IN THE CARIBBEAN RIVERS

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Abstract: Caribbean's rivers have a very original functioning due to their organization built around powerful altitudinal fluxes: material flows of terrestrial origin that have been shown to support the aquatic food webs and also biological flows between rivers and sea operated through the rivermouths that are needed to complete the life cycles of diadromous species living therein...to sum up, a very strong upstream/downstream subsidiarity. To date, few studies have taken into account the impacts of hydrothermal resurgences on freshwater macrofauna (crustaceans and fish) living in the Caribbean rivers. The data obtained highlight the interactions that may exist between river chemistry variability induced by fossil hydrothermalism and the aquatic community structure within a watershed (rivière Grande Plaine, Guadeloupe). The chemistry of the river watershed was characterized using classical analytical chemistry methods, such as ion chromatography and molecular absorption spectrometry. Based on a population dynamic approach, crustacean and fish communities were quantified in terms of « resident communities », which is an innovating aspect of this work. Chemical and biological variables were then coupled with statistical analysis. The results show a strong compartmentalization of fish and crustaceans resident communities in the river catchment, mainly explained by the variations in pH and dissolved silica content. Hydrothermal resurgences seemed to be an extremely structuring element in this river at the time of sampling, and this work opens up research hypotheses, particularly concerning the composition of the main producer of autochthonous organic matter, the epilithic biofilm, in systems submitted to hydrothermal influences.

Keywords : fossil hydrothermalism, river chemistry, resident communities, pH, dissolved silica.

**TROPHIC INTERACTIONS BETWEEN *PSEUDOSPHINGX TETRIO* LARVAE AND
ALLAMANDA CATHARTICA.**

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The larval caterpillar *Pseudosphinx tetrio* is a species that feeds specifically on two plants belonging to the family Apocynaceae. The genus *Allamanda* and *Plumeria* contain largely of shrubs or flowering trees which are grown throughout the tropical region including many parts of India. These plants are well known for their potential to be used as medicinal agents to cure infections, digestive diseases, anti-inflammatory and antipyretic action, anti-tumour potential, anti-oxidant properties etc. The present research highlights the interaction between the caterpillar and these poisonous plants without any impact on its health.

Keywords: *Pseudosphinx tetrio*, *Allamanda cathartica*, chemical ecology, phytochemistry

Study of antidiabetic properties and chemical composition of two *Phyllanthus* species usually consumed by Guadeloupean: *Phyllanthus amarus* Schum. & Thonn. (1827) and *Phyllanthus debilis* Klein ex Wild. (1806)

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Abstract: Many people worldwide use plants, alone or in combination with their antihyperglycemic drugs, to manage their type 2 diabetes mellitus [1][2]. Most researches on therapeutic properties of herbs are carrying out on methanolic or ethanolic extracts [3]. However, these studies are not representative of the population consumption habits. For the first time, a study was performed with specimens of the two mostly used species in Guadeloupe: *Phyllanthus amarus* and *Phyllanthus debilis*. The chemical composition of aqueous infusion of dried aerial parts were evaluated in relationship to antidiabetic mechanisms occurring at the level of glucose homeostasis in cultured hepatocytes (H4IIE) and muscle cells (C2C12). On the one hand, the extracts of *P. amarus* showed a significant activity in glucose uptake on muscle cells with an increase of 23.11 ± 3.84 % whereas it was no significant for *P. debilis* (13.4 ± 3.28 %). On the other hand, the same extracts of *P. debilis* showed stronger inhibition of hepatocellular G6Pase activity (65.88 ± 4.28 %), close to the action of insulin (64.29 ± 4.59 %), than *P. amarus* extracts (34.6 ± 1.45 %).

The comparison of their chemical composition demonstrated the presence of polyphenols, especially hydrolyzable ellagitannins, involved in their antidiabetic effects.

Only four molecules were common to both species, galactaric acid lactone, gallic acid, 5-O-(E)-caffeoyl galactaric acid, a new compound found for the first time in both species, and geraniin. The study of the antidiabetic activity of geraniin, which is predominant in *P. debilis*, showed a significant inhibition of G6Pase (60.67 ± 2.33 %) whereas no significant activity was observed for glucose uptake. These results suggest that this compound greatly influence the antidiabetic effects of the *Phyllanthus* crude extracts.

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GEOHERITAGE AND THE CONSERVATION OF NATURAL GEOLOGICAL SITES OF INTEREST IN GUADELOUPE, FRENCH WEST INDIES

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Abstract: In 2002, the law for a Democracy of Proximity was voted by the French parliament. It stated that the State takes care of the conception, the animation and the evaluation of the Natural Heritage. This heritage shall include all ecological, fauna, flora, geological, mineralogical and paleontological items of interest. For the Geoheritage, that is to say the geological sites of natural or human-related interest, Guadeloupe (French West Indies) was chosen as a test territory. Indeed, its geology is very rich and very peculiar, with a lot of variation. It includes for example a carbonate plat-form, living and fossil coral reefs, mangroves, on-shore and submarine thermal springs, a great variety of volcanic deposits, tropical erosion features typical of limestone's (karsts) and an active volcano. Since 2003, several sites in Guadeloupe have been referenced and described. In 2015, all these sites had been validated at the national level and entered into a national database (IGeotope). This inventory is meant to be permanent and a living collection. Since in 2018, the DFA chapter (Guadeloupe-Martinique) of the Caribbean Academy of Sciences is re-evaluating the previous outcrops descriptions for adding new information to the sites. In the meantime, the CAS also starts working on new descriptions with the particularity of adding human related sites (Mazabraud, 2019). This project should be ongoing for four to five years. When finalized, a territorial geo-heritage catalogue reveals itself a powerful tool for policy making and education (Martin, 2013). Despite the need to inventory the underground for resource purposes (water, mining) that has motivated geological research for centuries, such an inventory is meant to be used for protecting areas of natural interest, for teaching and for developing tourism (Renau and Peissier, 2018).

Keywords: Geoheritage, Natural sites conservation, Environmental policy, Geo-tourism

THEORETICAL STUDY OF ORGANOCHLORINATED PESTICIDES INTERACTION WITH ACIDIC AND BASIC FUNCTIONALIZED ACTIVATED CARBON AT DIFFERENT pH CONDITIONS

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Abstract: A theoretical study of the influence of acidic (hydroxyl and carboxyl) and basic (pyridine, primary, secondary and tertiary amine) surface groups (SG) on activated carbon (AC) model on chlordecone (CLD) and β -hexachlorocyclohexane (β -HCH) adsorption is presented, in order to help understanding the adsorption process considering pH and hydration effect. A coronene molecule, with the functional groups under study, in the edge were used as a simplified model of AC. Multiple Minima Hypersurface methodology was employed to study the interactions of CLD and β -HCH with SGs on AC using PM7 semiempirical Hamiltonian. A further re-optimization of obtained structures was done for pesticide-AC complexes by means of Density Functional Theory. The Quantum Theory of Atoms in Molecules was used to characterize the interaction types using the Nakanishi criteria. As results, the best conditions for the adsorption of CLD and β -HCH on AC with acidic SGs are in the pH range between 5 and 9, and the interactions are governed by dispersive interactions of chlorine atoms of the pollutants with the graphitic surface and by electrostatic interactions with COO^- and O^- groups and water molecules. For basic SGs, the results showed a greater association of both pesticides with the primary amine in comparison with the pyridine, secondary and tertiary amine in the absence and presence of water molecules, and this behavior increase at acidic pH conditions where the amines and pyridine are protonated. As conclusion significant associations of acidic SGs with CLD suggest a chemical sorption at slightly acidic and neutral pH conditions. On the other hand, the interactions of both pollutants with basic SGs on AC are similar with the physisorption process. Finally, an increase in carboxylic SGs content is suggested to enhance CLD and β -HCH adsorption onto AC.

FROM " A POISONED GOLD " TO " A DAZZLING GOLD " : THE TRANSFORMATION OF SARGASSO BY THE ARTISTS' EYES.

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Abstract: The massive presence of sargasso since 2011, "*represents not only an environmental and economic disaster but a real threat to human health*" (Resiere 2018), and gives rise to various treatments, physical and symbolic, the most obvious of which are political and sanitary. More unexpectedly, forms of artistic engagement in the public space have emerged in parallel with collective and individual mobilizations contributing to the translation of the nuisance as well as hopes of valorisation.

Photographers, performers, video artists, comedians, have established a plural and paradoxical relationship with these sargasso, polysemic and hybrid objects. Thus the sargasso is described as "*inspiring*" by a Martinican slammer, and allows "*a writing track*". All art forms are represented and different popular cultural places and moments, such as the Carnival period, become conducive to the display of these non-neutral appropriations in Caribbean culture. The artist raises the question of "living with" and allows us to transform our view of the territory invaded by these brown algae. It makes it possible to envisage, at least in the collective imagination, a metamorphosis of the sargasso from "*poisoned gold*" into "*dazzling gold*" as wrote the artist Louisa Marajo on a poem.

This communication proposal offers to question artistic approaches and artifacts both as political acts and aesthetic gestures. The premise is to insert them as part of the mechanism for telling the story of the ecological phenomenon. The importance of art in approaching the problem cannot be overlooked: we are witnessing the emergence of these forms of interpellation in the public space and the integration of artists into the process of reflection on the representation of nature and its risks. In this context for example, Barbadian artist Nadia Huggins was invited to the *Understanding Risk conference* (May 2019) at the University of the West Indies.

THE IMPACT OF NATURAL DISASTER RISK ON THE BANKING SECTOR: EVIDENCE FROM HURRICANES IN THE CARIBBEAN

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Abstract: Natural disasters bring about considerable destruction, with potentially rising future risk brought about by climate change. While immediate and unconstrained access to finance is necessary for recovery following a natural disaster, such shocks can lead to credit market breakdowns, which may hinder an economy from regaining growth or deepen and prolong existing recessions and push countries into poverty. There is however, a paucity of evidence on natural disasters and finance. We construct a panel of quarterly banking data, and historical losses due to hurricanes for the Eastern Caribbean to econometrically investigate their impact on the banking industry. Our results suggest that commercial banks experience negative shocks to both assets and liabilities following a hurricane. The fall in deposits and other liabilities is possibly related to withdrawals for financing clean-up and recovery as well as the inability of banks to rollover short-term debt. Banks respond to the negative funding shock by reducing lending and other investments. The credit contraction is explained by a combination of reductions in bank lending to households, lending to non-residents, and interbank lending. The results therefore suggest that the withdrawal and use of deposits rather than an expansion in credit appears to play a significant role to fund post hurricane recovery in the region. This points to the importance of an active reserve requirements policy on deposits which could be heightened during hurricane seasons and lowered in response to hurricane strikes and during normal times. More specifically, central banks could increase reserve requirements during hurricane seasons and lower them during normal times or in response to hurricane strikes. This is especially important given the possible increase in the frequency and intensity of hurricanes related to climate change, since bank stability and performance may be even more negatively affected in the future.

DETERMINATION OF THE MECHANICAL PROPERTIES OF RED BLOOD CELLS IN SICKLE CELL DISEASE BY MEANS OF AFM TECHNIQUE

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Abstract: Sickle cell disease (SCD) is the most frequent genetic disease in the West Indies and in France. This disorder is caused by polymerization of the abnormal hemoglobin S which results from the substitution of an acid glutamic by a valine at codon 6 of the beta globin chain. Polymerization of deoxygenated hemoglobin S induces formation of long stiff rod-like fibers which force the red blood cells to take over a wide variety of irregular shape. SCD patients exhibit life-threatening complications such as chronic anemia and vaso-occlusion events due to the loss of red blood cell (RBC) deformability and increase of RBC adherence to endothelial cells [1]. In this study, the mechanical properties of the red blood cells are investigated by atomic force microscopy. For this purpose, the cells are immobilized on glass lamella coated with poly-l-lisine in order to increase RBC adherence. All the experiments are performed in presence of phosphate buffered saline (PBS). Red blood cells were imaged with silicon nitride probe with nominal spring constant of 0.06 N/m whereas the mechanical measurements were performed with silicon tips colloidal particle with nominal spring constant of 0.035 N/m. More than 150 mechanical tests have been performed on each sample in order to have reliable statistical data. All force/deformation curves were analyzed with PUNIAS (Protein Unfolding and Nano-Indentation Analysis Software), a custom-built semi-automatic processing and analysis software. To calculate the young modulus, we used Sneddon's modification of the Hertz model for the elastic indentation of a flat and soft sample by a stiff sphere [2]. Four different groups of patient were analyzed, AA, AS, SS and SS with hydroxyurea treatment. The results show that the SS red blood cells are stiffer than AA cells, whereas we do not observed any difference between AS and SS cells. We also observed a decrease of the young modulus for the patients treated with hydroxyurea.

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EFFECT OF CT DIVERSITY, SYNERGY AND PELLETING TREATMENT ON *IN VITRO* ANTHELMINTIC ACTIVITY AGAINST *HAEMONCHUS CONTORTUS*

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ABSTRACT

Condensed tannins are known to have anthelmintic properties and can be used in an integrated approach to control gastrointestinal induced pathologies of small ruminants.

Pelleting condensed tannins-rich plants allows their availability during the whole year and facilitates their use by farmers. Several authors have shown that condensed tannin profiles differ between plant species and anthelmintic activity can be influenced by the chemical structure of the condensed tannins. To evaluate the effect of condensed tannin diversity, the pelleting process and the combination on anthelmintic properties, this study was conducted on three tropical condensed tannins-rich plants with different tannin profiles using two *in vitro* assays : the larval development inhibition assay and the larval exsheathment inhibition assay. HPLC profiles and free flavan-3-ol determination were performed on extracts of condensed tannins from plants and pellets.

Results showed that anthelmintic properties were dose-dependent and varied according to condensed tannin profiles. A synergistic effect was found only for larval exsheathment. Different compositions of condensed tannins and free flavan-3-ols in the extracts could explain those effects. Pelleting decreased the efficacy of the extracts but did not cancel the anthelmintic activity.

Keywords : Condensed tannins, larval development, larval exsheathment, pelleting process, synergistic effect, *Haemonchus contortus*.

PROTEGER: AN INNOVATIVE ECOLOGICAL ENGINEERING PROJECT FOR RIVERBANK PROTECTION IN GUADELOUPE

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Abstract: To guarantee the safety of property and people, Guadeloupe local authorities must carry out work to protect the banks of watercourses and gullies. In most cases, these constructions are made of pure or concrete riprap. Although these civil engineering techniques are well managed and sometimes indispensable, they have a strong negative impact on the functioning of riparian ecosystems. In relation to civil engineering, soil bioengineering represents a softer and more respectful option, from an environmental and landscape perspective, and is also generally less expensive. Soil bioengineering is both an old and innovative solution based on nature: its implementation imitates effective natural models to control and prevent erosion.

In the West Indies, the natural flora of riverine network system has hardly been studied and local species are still not used extensively in the work of protecting watercourse. The lack of knowledge of riparian ecosystems in Guadeloupe led to the emergence of the “Proteger” project in 2015 to promote soil bioengineering techniques on riverbank of this territory. The first phase of this project (2016-2018) aimed to identify the thirty local species most suited to maintain riverbanks. Trees, shrubs, ferns and herbs owning to different riparian ecosystems were therefore selected.

The second phase of the project (2019-2022) consists of control propagation of these species, in order to feed bioengineering works.

Three different interconnected experimentations concerning germination ability, stem cuttings propagation, growth and development of seedlings of the selected species have been designed on a complex conceptual framework.

Because stem cutting propagation is widely used for bioengineering works and because it represents a low cost, fast and effective way to obtain plant material, we conducted a first experiment aiming to evaluate the stem cutting propagation potential of twenty-six ligneous species. This communication presents cutting ability of these Antillean riverine forest species.

SOLICITING HYDROTHERMAL SYSTEMS: THE CASE OF LA SOUFRIÈRE OF GUADELOUPE (FWI) UNREST

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Abstract: We have re-assessed the main physicochemical features of the hydrothermal system of La Soufrière of Guadeloupe (FWI) andesitic volcano. A careful analysis of different techniques adopted historically for gas sampling and analysis by OVSG has allowed us to extend the use of our modeling and of gas thermobarometers as back as possible to the last 20 years, also including data from the 1976-77 phreatic eruption. Our aim was to track the evolution of P-T conditions of the gas equilibrium zone within the hydrothermal system. Our results show that long-term fluctuations characterize the behavior of the hydrothermal system in relation to injections of more magmatic deeper-sourced fluid into the hydrothermal system. These oscillations may lead to P-T excursions around and over the critical point of water, which destabilize the hydrothermal system. Whether such long-term increases reflect an oscillating behavior of the deep source injecting fluids upward, or are due to the modulation determined by the volcano structure via the many structures dissecting the edifice and relaxing the accumulated tensions, is matter of the ongoing investigations. Nevertheless, available data show that the recent unrest phase recorded between February and the end of April 2018 (Moretti et al., submitted; see also OVSG-IPGP reports) was due to the temperature increase and pressure build-up of the hydrothermal system, which originated a rapidly occurring (in the order of days) but sharp peak in monitored geochemical quantities. Therefore, scenarios that could lead to the sudden decompression of critical fluids must be considered in monitoring strategies and risk analysis.

MULTIGAS SURVEY FROM LOW-T° FUMARoles IN A TROPICAL ENVIRONMENT. EFFECTS FROM INTERNAL AND EXTERNAL FORCING: EXAMPLE FROM LA SOUFRIERE DE GUADELOUPE (FWI).

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Abstract: Fumarolic gas survey of dormant volcanoes is fundamental because the compositional and flux changes in gas emissions have actually been recognised as signals of unrest or even precursors of eruptions on several dormant volcanoes in hydrothermal unrest [1-5].

Here we report on the chemical compositions (CO₂, H₂S, SO₂, H₂) and mass fluxes of fumarolic gas emissions from the low-temperature (from 97° to 104°C) volcanic-hydrothermal system of La Soufrière de Guadeloupe (Lesser Antilles). These data, since 2017, are acquired from portable MultiGAS (measurements performed monthly) and two permanent MultiGAS stations (4 automated 20' measurements per day). These MultiGAS data are discussed along with other geochemical and geophysical parameters monitored at OVSG, such as the complete chemical gas composition sampled by Giggenbach bottles, fumarole temperature and volcanic seismicity in order to track the deep-sourced magmatic signal and detect potential signs of unrest [6].

However, dealing with the MultiGAS data in a low-T fumarolic system in a tropical environment is not straightforward due to external forcing. Hence, interpretation of the observed chemical changes must consider the dynamics of (i) scrubbing processes by the hydrothermal system and the perched volcanic pond [7], (ii) rainfall and the groundwater circulation (i.e. rainy vs non-rainy seasons, extreme events), (iii) water-gas-rock interactions [7], (iv) plume condensation, (v) sulphur deposition and remobilization, and (vi) gas-atmosphere chemical interaction.

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GAARLANDIA LAND-BRIDGE VS LESSER AntILLES DISPERSAL PATHWAYS – COUPLING SUBDUCTION DYNAMICS AND EVOLUTIONARY PROCESSES IN THE CARIBBEAN DOMAIN.

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Abstract: The purpose of the GAARAnti project is to unravel couplings between deep Earth dynamics and evolutionary processes through an innovative and original multi-disciplinary study combining Earth and Life sciences. This innovative approach will reconcile biological and geological clocks and timeframes through the combined use of radiochronological methods, biostratigraphy and phylogenetic inferences, to constrain the Cenozoic paleo-biogeography of the Antillean arc. The GAARAnti project will generate novel collaborative works between geologists/marine geophysicists and biologists/paleontologists and new results by constraining the pattern, timing, and dynamics of biodiversity in Lesser Antilles at the Cenozoic scale. This will in turn allow untangling biotic and geological constraints that forced such history. In the frame of the ongoing debate about the Tertiary origin of terrestrial organisms of the Greater Antilles, GAARAnti will focus on the role of subduction dynamics onto the evolution of emergent areas as a promoter or an antagonist of the terrestrial faunas dispersal. Although it is now widely admitted that most components of Antillean terrestrial communities originated from South and Central America, the mechanisms (dispersal *vs* vicariance) responsible for the observed evolution and its precise timing are still highly debated. Previous studies have mainly addressed this question through Earth sciences or Life sciences separately. We are confident and deeply believe that our innovative and original multi-disciplinary approach within the GAARAnti project will generate major advances in the knowledge of Cenozoic Antillean biodiversity dynamics.

PUBLIC NATURAL DISASTER EMERGENCY RESPONSE SYSTEMS IN CARIBBEAN SMALL ISLAND DEVELOPING STATES- A TRINIDAD AND TOBAGO CASE STUDY

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Abstract: The occurrence of natural hazards in the Caribbean continues to result in disastrous effects for many islands, notwithstanding sustained efforts by domestic and external agencies to promote risk reduction and improved preparedness. Trinidad and Tobago faces a moderate to high level of exposure to potentially catastrophic effects from a strong earthquake, and is also exposed to storm surges and flooding risks. This paper examines the public natural disaster response systems in Trinidad and Tobago for evacuation, provision of shelters and communication with the public during a disaster event. The study extends to the opinions of members of the public on the adequacy of these systems and any impact which disaster experience may have on such opinions. Research on natural disaster emergency response suggests that lack of public understanding or trust in disaster response arrangements can hamper their effective execution. The study is based on interviews with disaster management agencies and a survey of individuals across the island of Trinidad. The analysis covers the structure of the mechanisms, reliability of the arrangements and dissemination of response arrangements to the public. The findings point to gaps in the formulation, testing and dissemination of these emergency arrangements. The results suggest areas for priority focus that may improve execution during the chaos of an actual major natural disaster event. These priority areas may also be instructive for other Caribbean SIDS where similar weaknesses may exist. Recommendations are offered for the refinement of natural disaster response measures and engagement of the public before a natural disaster situation develops. Improvements in the adequacy of these systems can work towards a reduction in the scale of adverse disaster outcomes, particularly those related to the health and safety of persons.

KEYWORDS: Caribbean SIDS, natural disasters, response systems, Trinidad and Tobago

**CONTRIBUTION OF THE CARIBBEAN ANIMAL GENETIC RESOURCES (CARARE)
BIOLOGICAL RESOURCES CENTER TO THE CONSERVATION AND VALORISATION OF THE
LOCAL BREEDS OF LIVESTOCK.**

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Abstract: The endemic biodiversity, also in domestic species, represents a very useful resource for research and for the development of economic activities in agriculture. In the French West Indies, the different livestock species include a variety of local breeds, known as Creole breeds. These breeds have developed very original features, since the introduction of the first specimen 5 centuries ago, in relation with their origin, the selection pressure of their natural environment and the influence of traditional agricultural practices.

The Biological Resource Center CARARE (Caribbean Animal genetic Resources), has been created in 2006, in order to fulfil two distinct missions: i) to preserve original biological samples for the purpose of investigation programs of the local research teams; ii) to maintain the genetic diversity of the local breeds, by the conservation of reproductive material.

A total of more than 30000 samples are stored in the facilities of the BRC CARARE, separated in "genomic" material (blood, tissues samples) and reproductive material (sperm, embryos). Several research programs have been implemented thanks to this BRC.

It also contributes to the preservation and valorisation of the genetic diversity of the local breeds, in complementarity with the management programs based on *in vivo* / *in situ* conservation in nucleus herds or on private breeder herds.

DEVELOPING CONTEXTUALIZED EDUCATIONAL TOOLS AND RESOURCES FOR THE STUDY OF BIODIVERSITY IN MIDDLE AND HIGH SCHOOLS OF THE FRENCH WEST INDIES

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Abstract: The insular Caribbean is one of the most important hotspots of biodiversity in the world. The preservation of this invaluable natural heritage relies largely on the attitudes of local people towards biodiversity, especially among the younger generations. In this respect, scientific education in middle and high schools is particularly important. In the French West Indies, like elsewhere, the teaching of biodiversity would be even more effective if framed in a local context. However, most textbooks in life sciences written in French mainly rely on examples taken from animals and plants living in the French continental area, and are therefore poorly relevant for the teaching of biodiversity in the context of the Lesser Antilles. In order to improve on this situation, *Caribaea Initiative* (a Caribbean-based environmental and educational NGO) recently launched a new educational project, with funding support from the *Agence Française pour la Biodiversité*. It mainly consists in producing, in close connection with teachers from middle and high schools, new educational tools under the form of booklets illustrating key concepts and process about biodiversity and the environment, using examples taken from animals and plants living in the French Lesser Antilles, and, more generally, in the insular Caribbean. This project constitutes a unique opportunity for studying the contextualisation of teaching of life sciences in the Caribbean.

NATURAL *WOLBACHIA* INFECTION ACROSS GUADELOUPE MOSQUITO POPULATIONS.

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Abstract: Mosquitoes have the potential to transmit a large variety of pathogens to humans and other vertebrate hosts. No effective technique has been found to properly control and reduce the density of mosquito populations in a sustainable manner. Endosymbionts, particularly *Wolbachia*, represent a promising alternative to control medically important mosquito species and reduce their disease transmission capacity.

The presence of *Wolbachia* endosymbionts was screened in mosquito populations of Guadeloupe Island (French West Indies). Mosquitoes were collected across 39 sites that were representative of major biotopes in Guadeloupe and were categorized into natural, rural and urban landscapes. Natural and rural landscapes showed higher mosquito species diversity when compared to urban landscapes. The presence of *Wolbachia* was revealed by *real-time PCR* in six mosquito species belonging to five genera: *Deinocerites*, *Culex*, *Mansonia*, *Ochlerotatus* and *Uranotaenia*. *Wolbachia* was detected in mosquitoes collected at sites attributed to the three landscape categories. However prevalence of *Wolbachia* infection was heterogeneous among mosquito species and collection sites. Phylogeny based on *Wolbachia* surface protein (*wsp*) sequences showed that *Wolbachia* isolates from field collected mosquitoes were distributed across three major clades belonging to *Wolbachia* supergroups A and B. Some of the *Wolbachia wsp* sequences represent new haplotypes.

The presence of *Wolbachia* in Neotropical mosquito species is expected to trigger new research on the control of mosquitoes and the pathogens they transmit. In mosquitoes, *Wolbachia* is able to reduce the fitness and pathogen transmission, thus being a potential target for population reduction and replacement strategies.

MAPPING THE CARIBBEAN SCIENTIFIC COLLABORATION. CAN MOBILITY OF RESEARCHERS HELP?

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Abstract: Caribbean communities were mobile long before European colonization and their modes of production and culture were evolving by frequent exchanges among the Caribbean islanders and the Northern coast of South America. However, the region has not fully benefited by the advent of the five Technological Revolutions since 1771. Moreover, in the last two decades of the XX century, the Caribbean Small Islands Developing States (SIDS) were severely affected by the migration of their tertiary educated population towards the developed world, a trend that continues today.

Bibliometric approaches have been used to identify not only the brain drain, but also how the contemporary knowledge is created through the international network of scientific collaboration. In this study we use the Scopus bibliographic database to analyse the scientific output and international collaboration of the 13 Caribbean SIDS in the period between 2000 and 2018.

The main scientific collaborator of the region as a country is United States, except for Cuba, which is Spain. Consequently, North America, Europe and the Caribbean islands share the higher proportion of co-authoring articles. In terms of institutional representation, the University of West Indies has, in aggregate, the highest output with 11,497 documents from 11 out of 13 SIDS. The main contributor as a country is Jamaica (5018), followed by Trinidad and Tobago. A group of high output academic institutions are University of Havana (4979), followed by Universidad Central de Las Villas, Institute of Tropical Medicine Pedro Kouri and the Centre of Genetic Engineering and Biotechnology, all of them in Cuba and with no significant collaboration with the rest of the region.

In previous bibliometric studies we found that the scientists working abroad has the potential to become agents for development of the home country and region, diversifying the scientific collaboration.

LESSONS LEARNED FROM THE 21ST AUGUST 2018 M_t 6.9 EARTHQUAKE IN TRINIDAD

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Abstract: On 21st August 2019 evening, Trinidad was rocked by an M_t 6.9 magnitude earthquake occurring north of the Paria Peninsula. It is the largest magnitude event of the past 250 years and resulted in minor damages on buildings at the north of the island and significant deformation on the ground at the southern part. Analysis of data from the Port of Spain Strong Motion Network reveals that the level of structural damage in the capital is between the expected ranges, while structures built without engineering inspection suffered more severe damage. At the south area of Los Iros, significant ground deformation led to the destruction of agricultural farms and ponds, while an area prone to landslide slumped to the coast. Ongoing research shows the area subjected to lateral spreading due to the prolonged duration of the earthquake. The UWI SRC collected more than 1000 citizen reports through the online “Did You Feel It?” module and the Citizen Seismologist Project, revealing the spatial distribution of perception of shaking. Macroseismic intensity map shows a normal distribution of the ground shaking decreasing with distance. A social media poll a year later shows that citizens responded to the violent shaking with prayers and fear, while a lot were concerned about their family and caught by surprise. The low level of damage created the false impression to a lot of citizens throughout the country that the building stock is of high quality, when compared to other areas with similar magnitude events (e.g. Haiti, 2010), not taking into account the geometrical parameters of the different events.

MEIOFAUNA *VERSUS* MACROFAUNA AS FOOD RESOURCE IN A TROPICAL INTERTIDAL MUDFLAT.

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Abstract: Evaluations of the functioning of benthic marine food webs could be improved by quantifying organic matter fluxes from the meiofauna to higher trophic levels. In this study, we measured the simultaneous ingestion of meiofauna and macrofauna by common dwellers of a tropical intertidal mudflat on the coast of Amazonia. The meiofauna and macrofauna (tanaid) communities of a tropical intertidal mudflat of French Guiana were separately enriched with ¹⁵N and ¹³C, respectively. The enriched preys were then used as tracers during feeding experiments with common predators of different sizes and feeding mechanisms: a Portunidae crab (*Callinectes bocourti*), a Penaeidae shrimp (*Farfantepenaeus subtilis*) and a Gobiidae fish (*Gobionellus oceanicus*). In feeding experiments with all predators except crabs, feeding rates increased with the availability of meiofauna and macrofauna food sources. The ability of consumers to ingest their food selectively was evaluated by calculating the differences in the ratio of macrofauna to meiofauna between the *i*) ingested material and *ii*) that available in the environment. Larger predators showed a higher degree of preferential macrofauna ingestion than smaller predators, consistent with the optimal foraging theory. For large predators, the meiofauna would be important only during early life or in the absence of large food items.

INCENTIVIZING AND PROTECTING INNOVATION – THE DEVELOPMENT OF A CARIBBEAN INTELLECTUAL PROPERTY OFFICE

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Abstract: Intellectual Property law, particularly patents, is one of the most vital tools for encouraging and protecting scientific innovation. A patent provides a time-limited monopoly on a novel, inventive idea, in exchange for a disclosure of information. Securing a patent gives potential investors confidence that the concept being researched/developed is protected against unauthorised use for a fixed term, thus allowing the investment to be recouped. In the Caribbean, patents are an essential tool for protecting regional innovation that may be susceptible to misappropriation by foreign entities. A patent is also an asset that can be licensed to generate revenue streams to support future research.

Patents are territorial in nature, and thus need to be applied for in each jurisdiction where protection is sought. Presently, the underdeveloped approach to registering intellectual property rights in the Caribbean hinders advancement and entrepreneurship. This is because filing must be done in person, through each jurisdiction's intellectual property office, which is expensive and time-consuming.

This presentation will explain the value of patents to scientific research and enterprise, and propose a centralised, online Caribbean patent system. While the European Union centralised patenting system can serve as a model, this presentation seeks to develop a framework suited to the needs and resources of the Caribbean.

AGING OF POLYETHYLENE TEXTILES FOR THE DESIGN OF MOSQUITO-PROOF SHIELD ADAPTED TO TROPICAL ENVIRONMENT

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Abstract: This study is part of a project initiated by the ARS (Agence Regional de la Santé) in Guadeloupe to fight against the spread of the mosquito *Aedes aegypti* in the past years. These mosquitoes are responsible for several major tropical diseases outbreaks such as the dengue fever, Chikungunya and more recently Zika. The finality of this project is to design and manufacture a mosquito-proof shield product to prevent larvae of mosquitos to develop in rain recuperation reservoir and thus to reduce the mosquito population and the infection risk. Such screening needs to be mechanically resistant and durable under our tropical environment.

In this work, we investigate two polyethylene nets, i.e. PEB (Black color polyethylene) and PEG (Green color polyethylene). These materials offer a high flexibility, are water permeable and have small enough meshes to prevent mosquitoes to reach the water contained in the reservoir. Artificial aging of these polymeric materials was realized using an accelerated UV aging chamber, the ARTACC whereas natural aging was performed either in Bandol (south of France) or in Guadeloupe. The chemical degradation of the polymer has been characterized by IRTF spectroscopy by following the evolution of the carbonyl ratio and oxidative index at the wavelength of 1715 cm^{-1} . The mechanical properties have been measured using of a universal traction testing machine.

We found that the mechanical properties of the PEG material dropped by 80% after 32 days of accelerated aging. The IRTF analysis showed a progressive chemical degradation during the aging process. In the case of the PEB, no mechanical loss was observed after 62 days of artificial aging indicating a good chemical stability. For this PEB material, the black color is due to the presence of carbon black additives. These additives are responsible of the high absorption rate in the infrared spectrum and prevent the determination of the carbonyl ratio and the oxidative index. Natural aging data are in good agreement with these results. After 6 months of natural ageing no mechanical modification was observed for PEB samples or PEV in Bandol. For PEV samples aged in Guadeloupe a 25% dropped of the mechanical strength was observed leading to an accelerated factor close to 9.

These combined results clearly indicate that PEB is the best net candidate for durable mosquito-proof shield.

MULTI SCALE AGING STUDY OF COPOLYMER PP/PE MATRIX IN TROPICAL ENVIRONMENT.

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Heading

Tropical climate is characterized by high temperatures, high relative humidity and solar irradiation up to 200kWh/m² [1]. Such conditions are extremely aggressive for polymeric materials in terms of aging and durability. Moreover international standards for lifetime prediction of most polymeric materials are developed for continental or temperate regions and therefore, often conduct to underestimate the material lifetime in tropical environment. This misestimation contribute to the high plastic waste generation for the Caribbean region which was estimated to be around 1.5 million tons per year in 2010 [2]. Use of durable materials would contribute to reduce the amount of wastes and therefore would generate savings for local actors. The aim of this study is to develop a fast characterization technique to predict polymers durability using nanomechanical tests. Commercial thick PP/PE copolymer samples were aged using an artificial aging chamber. Chemical degradation was monitored by Infrared Spectrometry and the surface topography was studied by Scanning Electron Microcopy (SEM). Nanomechanical properties were determined by continuous stiffness measurement (CSM) with indentation depths of 2 and 15 μm . Elastic modulus at macroscale was determined by Dynamical Mechanical Analysis (DMA). Oxidation was detected after 3 days of aging process whereas surface cracks were detected between 6 and 10 days of aging. Elastic modulus measured at nanoscale on the exposed faces increased from 1.35 ± 0.04 GPa at 0 days of aging to 3.6 ± 0.2 GPa at 44 days. An exponential decrease of the Young's modulus with depth was observed at nano scale. The perturbation zone reached a depth of 1300 μm at 44 days of aging. A Voigt model was used to calculate the Young's modulus of the whole sample. This calculated parameter was then compared to the macro Young's modulus deduced from DMA tests. A good correlation was observed at macro and nano scales as long as macroscopic defects such as cracks appeared. This work shows that nano indentation is a suitable technique to detect early stage degradation of polymers and therefore a powerful tool to predict durability of materials

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STUDY BY FLUORESCENCE MICROSCOPY OF THE ARCHITECTURE AND MORPHOLOGY OF FRICTION REDUCTION FILMS DEPOSITED BY TRIBO-ASSISTED TECHNIQUE.

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Abstract: The tribo-assisted technique is a method recently developed to deposit a thin film of a lubricant material on a surface of varied geometry. This technique uses a wiper to deposit, in a tribological contact whose physicochemical conditions are favorable, the lubricant material on the surface to be treated. The deposit can be made in dry or in the presence of liquid

To improve the performances (durability, transferability, mechanical resistance ...) of the films deposited by this technique, we investigated on the morphology and the architecture of a lubricant films of MoS_2 and hBN deposited in the presence of the dodecane.

This study was carried out in the static contact at the end of the deposit in order to eliminate the liquid film entrained in the contact during the friction.

Mapping of the contact area in dodecane thickness using in situ fluorescence spectrometry are carried out and they highlight the presence or no of liquid in the static contact. These analyzes are carried out for load values supported by the contact of 10 N, 5 N, 2 N and 0.5 N in order to evaluate the compactness and rigidity of the films in the applied load range.

This microstructural study carried out on the films at the end of the deposit reveals that those formed of MoS_2 nanoparticles are compact and have a very smooth surface resulting from the packing of particles in the form of small lamellae; which gives them a good tribological performance, whereas those formed of h-BN nanoparticles are porous and have a rough surface resulting from the stacking of more rigid particles.

INVESTIGATING NORTHERN LESSER ANTILLES STRAIN EVOLUTION DURING EOCENE

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Abstract: Upper plates in subduction zones are prone to record slab dynamics as their strain pattern, uplift-subsidence records and volcanic arc activity accommodates variations of slab parameters in terms of dip, density and rheology. The ANR GAARAntI aims at tracking the timing of land emersions and submersions along the Lesser Antilles subduction zone, which is key to understand the long-term mechanical behavior of this subduction zone. In particular the strain history of the northern Lesser Antilles realm, that makes the junction with the Greater Antilles, needs to be better constrain in order to elaborate paleogeographic models. In this study we combined onshore (structural and geological mapping, PMag sampling, absolute dating and biostratigraphy) and offshore investigations (seismic profiling from the 2017 GARANTI Cruise), we evidence an unprecedentedly described episode of Mid-Eocene shortening, south of the Anegada Trough. Moreover, we present new paleomagnetic data from the island of St. Barthélemy, indicating a Post Oligocene $\sim 25^\circ$ counterclockwise rotation that we interpret as an accommodation of trench curvature. After a restoration of the Cayman Trough to the Mid Eocene, the regional compressive structures are interpreted to be the eastward propagation of the compressional domain that accommodated the N-S shortening triggered by the collision of the Bahamas Bank. A crustal-scale cross section drawn from the forearc to the backarc across the thrusts allows us to discuss the origin of crustal thickening, magmatism and tectonics, in the study area.

CHARACTERIZATION OF *EHRlichia RUMINANTIUM* MEMBRANE PROTEIN, ERGA_CDS_01230 AND ITS ROLE IN ADHESION TO THE HOST CELL.

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Abstract: Outer membrane proteins participate to pathogens adhesion to host cells and therefore often mediate cell infection. Such is the case for *Ehrlichia ruminantium*, an obligate intracellular bacterium that is transmitted by ticks and responsible for cowdriosis, a fatal disease of domestic and wild ruminants. Several experimental vaccines were developed, but the great genetic and presumably antigenic diversity of *E. ruminantium* make difficult to obtain an effective vaccine against all strains present in the field. In order to propose novel strategies to control cowdriosis, the interaction of *E. ruminantium* with its host cell, particularly the associated adhesion mechanisms must be first deciphered. A membrane protein of *E. ruminantium*, ERGA_CDS_01230, a probable iron transporter, initially identified by proteomics approaches in our group, was here studied for its role in host cell adhesion. The recombinant protein was expressed with post-translational glycosylation modifications and tagged GFP/Histidine in *Leishmania tarentolae*. Using cell biology approaches, we show that recProt01230 is able to adhere to bovine host cells and interacts with proteins from the cell lysate and the "membranes/ organelles" sub-fraction. Furthermore, recProt01230 does not adhere to heparan sulfate but other membrane polysaccharides seem to play a role in *E. ruminantium's* adhesion to the host cell. Indeed, preliminary experiments have shown that degrading dermatan sulfate and chondroitin sulfate at the cell surface is associated with a reduction of the number of bacteria in the host cells. Moreover, CDS ERGA_CDS_01230 is over expressed at early stages of infection when bacteria begin to attach to their host. So, our results show the implication of ERGA_CDS_01230 in the adhesion of *E. ruminantium* to host cells. ERGA_CDS_01230 also induces a humoral response in the vaccinated animals. In conclusion, ERGA_CDS_01230 could be a new promising target for vaccine or therapeutics development.

FIRST DESCRIPTION OF ENDOCRINE DISRUPTOR IN GUADELOUPE MARINE GASTROPODS: WHAT ARE THE RISKS ?

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Abstract: TBT has been reported as one of the most concerning pollutants, in aquatic coastal systems, (although TBT-based antifouling paints had been banned worldwide in September 2008), since the levels detected in the environment are capable of inducing deleterious effects on the biota. Imposex is characterized by the development of masculine sexual organs in neogastropod females. The deformity 'imposex' is the growth of a penis and/or vas deferens in female of gastropods. Quantification of TBT by chemical analysis in water or sediment is very onerous, therefore imposex as a tool to detect contamination by organotin compounds is often used.

This study reports the first record of imposex observed in gastropod from areas with high shipping activities in Guadeloupe littoral (« Ilet cochon, marina of St Francois and riviere sens and harbor of deshaies »). We report imposex on 3 species of marine gastropods (*Purpula patula*, *Thais deltoidea*, *Strombus pugilis*).

For *Purpula patula* It has been showed that « deshaies » is more impacted with a 71 % of imposex, then Ilet cochon (28%) and Saint Francois (7%). The marina of « riviere sens » show no imposex. The results of « marina of deshaies » suggesting a higher contamination by the TBT.

However, a sensibility different has been observed for those species. On the site « Ilet cochon » *Strombus pugilis* showed 65% of imposex whereas *P.patula* had 28%. Thus, it is obvious that the present TBT contamination in Guadeloupe influences the multiplication of marine gastropods and could affect the other areas of the Caribbean Sea. Nevertheless, some dosages TBT and a higher sampling should be carry out to complete our conclusions. Further studies will be conducted to assess the use of gastropod as a bioindicator species.

CIRCULATION OF ANTIBIOTIC RESISTANCE GENES BETWEEN BACTERIA FROM DIFFERENT ORIGINS

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Abstract: An environment affected by anthropogenic activities can play an important role in the spread and concentration of antibiotic resistant bacteria. Under antibiotic selection pressure, exchanges of antibiotic resistance genes (ARG) can occur between bacteria from human, animal and environmental reservoirs. However, these processes are still poorly understood. This work aimed at focussing on the wastewater treatment process, which is a hotspot for selection and emergence of antibiotic resistant bacteria and constitutes a favourable interface for circulation of ARG between bacteria from the different reservoirs.

Between 2018 and 2019, extended spectrum β -lactamase producing *Enterobacteriaceae* (ESBLE) (*Enterobacter cloacae* complex, *Escherichia coli* and *Klebsiella pneumoniae*) were isolated from 266 patients at University Hospital of Pointe-à-Pitre (Guadeloupe). Simultaneously, urban and hospital wastewaters were analysed at different steps of waste treatment and 120 stool samples were collected from animals living near the hospital sewers and the wastewater treatment plant. *Enterobacteriaceae* were characterised according to their antibiotic resistance profile. Strains with the same antibiotic resistance profile belonging to a particular human-environment-animals continuum were analysed using whole genome sequencing.

We isolated a total of 905 ESBLE (292 from humans, 348 from wastewater and 265 from animals). The frequency of ESBLE carriers was important in wildlife and domestic animals living nearby polluted environments (70%). A first genome-based comparison was carried out on 30 ESBL producing *E. coli* isolated during this study and compared to ESBL producing *E. coli* collected in farms (n=12). Antibiotic resistance gene *bla*_{CTX-M-15} was frequent (17/42). IncFII type was the most common plasmid (15/42). *E. coli* ST131 was found on the clinical samples only (n=4). One cluster with wastewater and animal isolates differed by ≤ 5 single nucleotide polymorphisms.

These first results suggest that animals living near sewers and wastewater treatment plants are subjected to antibiotic resistance pressure and some bacteria and antibiotic resistance genes could be closely related.

ENVIRONMENTAL RESERVOIRS OF ECC CLUSTER VIII IN GUADELOUPE, FRENCH WEST INDIES

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Abstract: Species of *Enterobacter cloacae complex* (ECC) are widely distributed in the environment and are part of the gut microbiota of both animals and humans. *Anolis marmoratus*, an endemic and anthropophilic lizard of Guadeloupe, is a natural carrier of ECC and in particular of strains resistant to third generation cephalosporins (3GCR). Bacteria belonging to this complex are also major opportunistic pathogens which draw attention by their involvement in nosocomial infections and the emergence of multidrug resistant clones. Using *hsp60* genotyping, ECC is divided into 12 genetic clusters (cluster I-XII) and a loosely knit group (cluster XIII). Strains belonging to clusters III, VI and VIII are prominent in human infections.

We collected ECC strains (n=155) isolated from different sources (anoles, environment and clinical samples). We characterized these strains according to their antibiotic resistance phenotypes. Nearly 28% of strains sampled from environment and anoles were resistant to 3GC. This specific resistance was related to the overexpression of the AmpC cephalosporinase. We identified the cluster for each strain by using *hsp60* genotyping. Cluster VIII was predominant in *A. marmoratus* feces (n=37, 38.9%) and in water catchment (n=10, 45.6%).

We sequenced 58 strains of C-VIII (33 from clinical isolates: 26 from France and 7 from Guadeloupe, and 25 from anoles). A Maximum likelihood analysis based on core genome alignment revealed a clear split of isolates into two main clusters depending on sources: the first one clustering most of clinical samples together (from France and Guadeloupe, n=29) but also 5 strains isolated from anoles. The second cluster was mainly constituted by strains from anoles (n=20) and by 4 clinical samples.

These results suggest first that bacteria resistant to third generation cephalosporins exist in environmental reservoirs in Guadeloupe. Moreover, exchange of ECC C-VIII strains may happen between human and anoles within a One Health approach.

Contributions of the Caribbean Animal Health Network (CaribVET) to the improvement of animal health cooperation and disease surveillance and control capacities.

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Abstract: The Caribbean, situated at the crossroads of the Americas and Europe, includes highly contrasted territories threatened by the emergence/re-emergence of pathogens and climate change. Disease surveillance and control within the Caribbean has historically been difficult requiring a regional strategy to strengthen national epidemiological surveillance systems and reduce health risks. The Caribbean Animal Health Network (CaribVET) is an impact-oriented, scientifically driven and participatory regional network aiming at improving animal and veterinary public health in the Caribbean. Officially endorsed by the CARICOM Secretariat and recognized by the World Animal Health organization, it garners the efforts of 47 partners: veterinary services, universities, research institutes and regional/international organizations. It is a model of integrated research and surveillance and of a two-ways communication platform between the national and the regional levels, and between science and policy.

In this paper, we present 2012-2018 main achievements of CaribVET

1. Animal and zoonotic disease emergency preparedness: a regional preparedness plan for Highly Pathogenic Avian Influenza was implemented in 2015-2016 addressing key aspects of emergency preparedness and response. The network was able to leverage regional projects and fundings to quickly address an evolving threat.

2. Development of core competences within the Ministries contributing to strengthen significantly national surveillance/control systems: more than 70 health professionals from 12 Caribbean countries were trained in basic epidemiology, diagnostic, biosecurity, Geographic Information System, risk-based surveillance, and “One Health” following capacity building programmes led by partner projects that contributed to strengthened cross-border communication and collaboration in the region overall.

3. New scientific knowledge on tick-borne pathogens diversity and abundance in the Caribbean thank to the Domotick Project.

Capitalizing on those experiences, CaribVET now prepares for African Swine Fever and aims at reducing within the next decade the vulnerability of the livestock sector by reducing risks of disasters (natural, sanitary) using a One Health approach

PROMOTING THE ANTIOXIDANT POWER OF *PSIDIUM GUAJAVA L.* THROUGH EXTRACTION OPTIMIZATION AND CHARACTERIZATION OF LYCOPENE, ONE OF ITS MICRONUTRIENTS.

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Abstract: The aim of this study was first to optimize the extraction and characterization of lycopene, a carotenoid, derived from a tropical fruit, *Psidium guajava L.*, and then to demonstrate its health benefits through its antioxidant power. An extraction procedure was used to reach depletion and a high yield of lycopene, thus minimizing the use of organic solvent. An excellent carotenoid purification was obtained by HPLC-VIS (470 nm) detection in isocracy with a mobile acetonitrile/methanol/tetrahydrofurane phase. The characterization of this pigment has been confirmed by FT analysis. Therefore, we developed an adapted DPPH test to lycopene, which allowed to evaluate its EC50, thus classifying this micronutrient among the good antioxidants. From these results, we can suggest that pink guava (*Psidium guajava L.*) grown in the West Indies and particularly consumed raw or cooked, contain high levels of lycopene and these results corroborate the health benefit effect of guava and guava-derived products.

Reference :

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EFFECTS OF LONG-TERM STARVATION ON SOME KEYS METABOLIC PATHWAYS IN SULFUR-OXIDIZING ENDOSYMBIOTIC BACTERIA OF THE BIVALVE *CODAKIA ORBICULARIS* (LINNAEUS, 1758).

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Abstract

The lucinid *Codakia orbicularis* (Mollusca: Bivalvia) is found in the shallow water seagrass beds of *Thalassia testudinum* in the Caribbean Sea. Their gills are colonized by a sulfur-oxidizing endosymbiotic gamma-proteobacteria. These bacteria oxidize sulfur compounds to generate energy used to fix carbon dioxide to create organic components *via* the Calvin Benson cycle, in order to provide metabolic substrates and energy to their host *C. orbicularis*.

In starvation condition, the bivalves were placed in artificial seawater without sulfur and organic components. In these dramatically conditions, nutrients for the both host bivalves and endosymbiotic bacteria are limited. Interestingly, in a previous proteomic study, it has been shown an over-expression of proteins involved in glycogen metabolism during starvation condition. This suggests that bacteria produce glycogen which can be use by bivalves.

In order to investigate the effects of starvation on the metabolism of endosymbiotic bacteria, we we selected some genes involved in glycogen metabolism and in some key metabolic pathways. We analyzed by qRT-PCR the relative expression of genes in 5 bivalves in normal condition compared to 5 bivalves kept 1 or 2 months in starvation respectively. We aimed *glgA*, *glgC*, *galU*, *glgP* for glycogen metabolism; *rbcl1*, *rbcl2* for glucose synthesis metabolism; and *aprA*, *dsrA*, *soxB*, *fccB* for sulfur metabolism.

The results showed an over-expression of *galU* during starvation and no expression was detected for *glgA* and *glgC* suggesting an activation of glycogen producing by UDP-Glucose pathway. Nevertheless, glucose synthesis metabolism seems to be down-regulated (decreased expression of *rbcl1*), whereas for sulfur metabolism, only *dsrA* was expressed and up-regulated. These results are preliminary, and we are currently conducting a global transcriptomic study in order to identify the set of genes and metabolic pathways affected during a long-term starvation in this marine symbiotic model harboring sulfur-oxidizing bacteria.

GROWTH OF DECHLORINATING BACTERIA IN ENRICHMENT CULTURES, DERIVED FROM CONTAMINATED SOIL AND SEDIMENT FROM GUADELOUPE THAT DECHLORINATE HEXACHLOROCYCLOHEXANE ISOMERS.

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Abstract: Hexachlorocyclohexane (HCH) isomers are polychlorinated organic compounds of environmental concern. A mixture of different HCH isomers (α , β , δ and γ), known as technical-grade HCH and γ -HCH (lindane) were extensively used as pesticides in banana plantations in the French West Indies. HCH molecules are chemically stable. Beta-HCH, is the most difficult isomer to degrade in both water and soil. HCH isomers can be subjected to microbial biodegradation. However, to date, the anaerobic biotransformation of HCH isomers is not well characterized. The growth of specific bacterial genera involved in the dechlorination of HCH isomers has yet to be demonstrated.

We aimed to identify the bacterial populations that grow as a result of the dechlorination of α -HCH and β -HCH. Dechlorination products were measured and liquid culture was sampled for DNA extraction as well. Previous sequencing studies had identified *Dehalobacter* and *Geobacter* as candidate dechlorinators in the α -HCH and β -HCH enrichment cultures. *Dehalobacter* is known to be a genus capable of dechlorinating β -HCH. Thus, we performed quantitative Polymerase Chain Reaction (qPCR) to track the growth of *Dehalobacter* during the dechlorination of β -HCH and α -HCH. We will perform qPCR for *Geobacter* as well.

The final stable products of the dechlorination of α -HCH and β -HCH were benzene and monochlorobenzene (MCB). For the α -HCH cultures, the relative abundance of *Dehalobacter* increased from 2.18% \pm 1.9% on day 0 to 34.66% \pm 7.6% on day 63. For the β -HCH cultures, *Dehalobacter* increased from 1.21% \pm 1.1% on day 0 to 13.52% \pm 4.8% on day 63. So far, we can conclude that *Dehalobacter* spp. are involved in the dechlorination of these isomers. We expect to have the qPCR results for *Geobacter*. It is conceivable to have both *Dehalobacter* and *Geobacter* involved in the dechlorination of α -HCH and β -HCH. Knowledge on the microorganisms that can dechlorinate HCH isomers is essential for the application of potential bioremediation approaches.

EVIDENCE FOR EXTENSIVE ANAEROBIC DECHLORINATION AND TRANSFORMATION OF CHLORDECONE FROM SOIL MICROCOSM FROM GUADELOUPE STUDY AND COMPARISON WITH FIELD SAMPLE.

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Abstract:

The use of chlordane as the active ingredient in pesticide formulations has resulted in extensive pollution of large land areas in the French West Indies. These areas were treated with pesticides to control the banana black weevil. Although the use of these pesticides is currently banned, chlordane strongly adsorbs to soil and is highly recalcitrant due to its complex bis-homocubane structure.

In order to investigate the biodegradability of chlordane, microcosms were constructed anaerobically from chlordane impacted Guadeloupe soil and sludge. The microcosms were incubated and repeatedly amended with chlordane and electron donor (ethanol and acetone) over a period of 7 years. DNA was extracted from some of the microcosms, and the microbial community was analyzed using 16S amplicon sequencing (Illumina MiSeq).

Degradation products of chlordane were detected in all the biologically active microcosms. Observed products include monohydro- and dihydrochlordane derivatives ($C_{10}H_{10-n}O_2H_{n+1}$ $n=1,2$), as well as C_{10} - and C_9 - polychloroindene compounds ($C_9Cl_{5-n}H_{3+n}$ $n=0,1$) and carboxylic indene derivatives ($C_{10}Cl_{4-n}O_2H_{4+n}$, $n=0-4$) assumed to be "open cage" structures with significant dechlorination also characterized in other studies (1,2,3) but which are not present in sterile controls. Chlordane concentrations decreased in active microcosms. Results from microbial community analysis show enrichment of several organisms possibly involved in chlordane biodegradation. In two microcosms with no methanogenesis we see high relative abundance of *Desulfovibrio* and *Sporomusa*, while in two of the microcosms with methane production, we see enrichment of two highly similar *Anaerolineaceae* species (*Pelolinea* and *Leptolinea*), *Bathyarchaeota*, and two methanogens (*Methanoregula* and *Methanosaeta*). The metabolites identified in this study are also detected in the field, showing that a bioremediation process could be envisioned. Stimulation of dechlorination in farmer's fields can be considered by inducing reducing conditions with substrate addition and restricting oxygen entry.

RESPONSE OF LACTATING BLACKBELLY EWES TO FED PELLETS OF LEUCAENA LEUCOCEPHALA LEAVES WITH DRY BANANA FRUITS

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Abstract

The aim of the present study was to assess the impact of feeding pellets consists of 50% *leucaena leucocephala* leaves and 50% dried green banana fruits (*Musa paradisiaca*) (LBP) on lactating ewe's performance. To do this, twenty eight Blackbelly ewes \pm 48 hours postpartum were randomly assigned into four groups (7 animals/group) in individual feeding design. Treatments were as follows: T1 received 2kg of hay (control ration), T2, T3 and T4 received 1.5kg of hay plus 400, 800 or 1400g of LBP, respectively. The results revealed that total DM intake was significantly ($p>0.0001$) improved when level of LBP supplementation increased. Milk yield increased with LBP using ($p>0.0001$). Lambs daily weight gains were remarkably improved ($p=0.0044$) with high LBP supplementation level (T4=159.1 g/day). Ruminal ammonia-nitrogen (NH₃-N) concentration was significantly higher in T4 (199.8 mg/litre) than in the control group, with no-significant difference for rumen liquor pH. This study highlights that performance expected to be enhanced when pellets of *Leucaena leucocephala* leaves with dried green banana fruits added to lactating ewes' ration. The impact of feeding non-conventional sources by this technique on the animals' performance needs further investigation.

Keywords: *Leucaena leucocephala* leaves, dry green banana fruits, Blackbelly ewes, milk yield.

Introduction

The productivity of ruminants in tropics, limited by poor nutritional conditions that are characterized by highly lignified, lack of feed during drought and low digestible feed from poor or nitrogen limited native grass pasture. In tropical and subtropical regions, using non-conventional protein and energy sources could play an important role in livestock nutrition. *Leucaena leucocephala* is one of the main tropical shrub species which contains condensed tannin with potential to reduce methane emissions. Further, leucaena leaves were highly degradable in the rumen and could be used to improve rumen ecology (Piñeiro-Vázquez et al., 2018). Banana fruits have been identified as alternatives sources of energy in animal production systems with a sustainable approach. Therefore, this study was conducted to determine the response of feeding *leucaena leucocephala* leaves with dried green banana fruits in pellets form as an innovation technique to increase animal feed intake, with focusing on performance of tropical ewes.

Materials and methods

The present experiment was conducted according to the guidelines of the French Ministry of Agriculture for Animal Research, at the Plateforme Tropicale d'Expérimentation sur l'Animal (PTEA), Petit Bourg, Guadeloupe. Twenty eight lactating Blackbelly ewes were divided randomly into four groups using individual feeding group design. First group received 2kg of hay as a control ration. Second, third and fourth groups received 1.5kg of hay plus 400, 800 or 1400g LBP respectively. The offered hay based on an early regrowth of *Dichanthium spp.*. The chemical composition of the hay was 910, 120, 740, 470 and 70 g/kg DM for OM, CP, NDF, ADF and lignin content respectively. The equivalent values for *leucaena* were 910, 270, 390, 250 and 40 g/kg DM, in the same order. Green banana fruits OM, CP, NDF and starch were 950, 44, 120 and 696 g/kg DM, respectively. The amounts of refused feeds were recorded daily for all animals. Milk yield for each ewe (hand milking method) and lambs weight were measured at day 14, 21, 28 and 35 after lambing. Ewes' body weight (BW) and body condition score (BCS) also recorded at the 1st day then at the last day of the trial. The change of the BW and the BCS of ewes, from lambing to day 35, were calculated for each variable as the difference between both measurements. Rumen liquor samples were taken in the last day of the trial 6 hrs post feeding for rumen ecology parameters. The statistical analysis was performed using the MIXED procedure of SAS 9.2 release (SAS 2008).

Results and discussion

Table 1. shown the main results, the amount of hay intake (g DM/day) was differ between treatments. The highest value (1099.8 g DM/day) for T1 compared with other treatments ($p<0.0001$), in a way to cover nutrients requirements from the available feed source. Increasing the amount of LBP intake caused decrease of the intake. As a results of the variance between LBP and hay intake for treatments, the total DM intake values differs ($p<0.0001$) between treatments. T4 showed the highest total DM intake value being 114.5 then T3 = 85.6 and T2= 78.2 g DM/day per kilogram body weight^{0.75} (BW^{0.75}) with the lowest value for the control group=68.1 g DM/ day. As a consequence, the milk production (g/day) differed significantly between treatments. Hence, the lowest average milk production was observed for T1=218.3 g/day. Furthermore, disappearance

of significant difference between T2, T3 and T4 could be due to the variance of production within the same group. These results are in agreement with the results of Clavero and Razz (2003) the milk yield increased with 52.7% when goats had access to browsing *leucaena* 2 hrs/day compared with grazing pasture only (buffel grass). The changes of ewes' BCS for tested treatments showed a significant difference with linear increase for animals which received LBP in T2, T3 and T4 being 0.36, 0.42 and 0.62 respectively. Whereas, a decrease was recorded for the ewes' BCS in the control group = -0.04. The changes of ewe's body weight were higher in the T4= -9.62 kg, with no-significant difference between the other treatments. The offspring growth for the ewe's in T4 (159.1 g/day) reported the highest ($p=0.0044$) value compared with the other treatments T1, T2 and T3 being 102, 119.2 and 131.2 g/day respectively. Rumen ecology parameters indicated that mean values of ruminal pH were similar among the four treatments. However, ruminal $\text{NH}_3\text{-N}$ concentration was significantly different among treatments. The highest value was found in treatment with 1400 (g/head/day) of LBP and consecutively with 800, 400 and 0 of (g/head/day) LBP. Similar observations were recorded for rumen ecology parameters by Hung et al. (2013) who tested the effect of using 0, 150, 300 and 450 g/head/day of *Leucaena* leaf pellet beside rice straw.

Table 1. Least square means of feed intake and the other measured parameters for the experimental diets.¹

| Items | Treatments groups | | | | SEM | P-value |
|--|---------------------|--------------------|---------------------|--------------------|-------|---------|
| | T1 | T2 | T3 | T4 | | |
| Hay Intake g DM/day | 1099.8 ^a | 989.5 ^b | 783.4 ^c | 790.6 ^c | 222.2 | <0.0001 |
| TDM intake g/kg BW ^{0.75} | 68.1 ^d | 78.2 ^c | 85.6 ^b | 114.5 ^a | 14.6 | <0.0001 |
| Milk production gram/day | 218.3 ^b | 353.6 ^a | 412.3 ^a | 429.5 ^a | 135.7 | <0.0001 |
| BCS changes | -0.04 ^b | 0.36 ^{ab} | 0.42 ^{ab} | 0.62 ^a | 0.54 | 0.049 |
| Ewes body weight changes kg | -3.11 ^a | -1.30 ^a | -0.14 ^a | -9.62 ^b | 5.6 | 0.0192 |
| Lambs daily weight gain g/day | 102.0 ^b | 119.2 ^b | 131.2 ^b | 159.1 ^a | 32.4 | 0.0044 |
| Rumen liquor pH | 6.84 | 6.73 | 6.73 | 6.62 | 0.23 | 0.366 |
| Rumen liquor $\text{NH}_3\text{-N}$ mg/litre | 152.1 ^b | 153.2 ^b | 188.9 ^{ab} | 199.8 ^a | 34.6 | 0.0427 |

Means in the same row with different superscripts letters are significantly differ ($P<0.05$).

T1: Control group feed hay only ad libitum; T2, T3, T4: feed 400, 800, 1400 g /day pellets consists of 50% *leucaena leucocephala* leaves with 50% dried green banana fruits

Conclusion

The innovation of mixing protein and energy sources from non-conventional plants in pellets form provide a new way to increase feed intake and enhance animal performance. This research point needs further studies to clear the effects of using the tested non-conventional sources with more animal's number or in different production section.

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MOLECULAR INSIGHTS INTO THE HYPOXIC MEMORY OF SICKLE CELL ERYTHROCYTES

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Abstract: Research on sickle cell erythrocyte physiopathology is essential to improve treatment of sickle cell disease (SCD), a life-threatening haemoglobinopathy caused by genetic mutations of the β -globin gene. Homozygous SS and heterozygous SC are the most frequent forms of SCD.

Our laboratory is working on adenosine signalling, an important regulatory pathway controlling erythrocyte metabolism adjustment and release of O₂ to counteract tissue hypoxia. Leading to enhanced Hb deoxygenation, HbS polymerisation and red blood cell sickling, adenosine signalling is thought to be detrimental to SCD. A recent study has revealed that erythrocyte Equilibrative Nucleoside Transporter 1 (eENT1) acts as a key regulatory element of circulating plasma adenosine. This study further reported a reduced eENT1 expression occurring as an adaptation to high altitude. The molecular mechanism was shown to involve eENT1 ubiquitination-dependent degradation by the proteasome.

In view of these important findings, we sought to determine by Western blot and flow cytometry the expression level of ENT1 and total membrane protein ubiquitination of red blood cell samples obtained from HbSS and HbSC patients, and HbAS Sickle cell trait (SCT) subjects. HbAA erythrocytes were used as controls. Results showed a significant 1.5-2 fold-increase of ubiquitinated membrane proteins in erythrocytes of SS and SC patients but no significant difference in eENT1 expression. Our working hypothesis is that altered activity of the proteasome is responsible for the accumulation of ubiquitinated protein in absence of degradation.

Interestingly, our study also revealed that SCT erythrocytes display significant 1.5 fold-increase of ubiquitinated membrane proteins and ~0.25-fold reduction of eENT1. SCT is not regarded as a disease but a risk factor, in extreme situations, for a number of complications common to SCD, including sudden death, the most feared complication of SCT. Consequences of altered adenosine signalling on the pathophysiology of SCT erythrocytes deserve further investigation.

EFFECT OF WARM ENVIRONMENT ON THE SKIN BLOOD FLOW RESPONSE TO FOOD INTAKE

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Keywords: glycaemia, micro-vascular function, glycoregulation, heat, climate

Background and objective. Warm exposure highly demands on thermoregulation mechanisms, which is based on effectiveness of the microvascular function. The associations between microvascular function and metabolism in warm environment have received little attention in the literature, whilst alterations of carbohydrate metabolism in the warmth are well established [1]. The purpose of this study was to explore the microvascular function in response food intake in warm environment, as compared with control.

Methods. Twenty-four (12 females and 12 males) healthy, acclimated to warm environment and physically active participants were recruited. They participated in two sessions (warm: 31°C and control: 22°C presented in randomized order). The skin blood flow (SkbF) was measured before and after standardized food intake (FI) through the acquisition of perfusion signal by laser Doppler fluxmetry (Periflux System 5000) with local heating protocol.

Results. Glycaemia was higher in hot environment as compared with neutral ($P < .001$ in men and women), in agreement with previous publications [2]. Blood pressure was not affected by warm environment and FI (all $P > 0.11$). The SkbF was affected by the environmental temperature (all $P < .001$). The microvascular function was significantly affected by FI (all $P < .007$) with an attenuated both initial peak and plateau responses to local heating marked in control environment.

Conclusion. These results indicate a competition between thermo- and glycoregulation in a warm environment to the detriment of glucose homeostasis. This project is likely to contribute to the understanding of the contribution of the exposure to the warmth in the physiopathology of diabetes.

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INTERNATIONAL COLLABORATION IN RESEARCH OF THE MEDICAL POTENTIALITIES OF THE CARIBBEAN SARGASSO.

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Abstract: A considerable number of drug candidates is from marine bio-prospection and highlights the blue biotechnologies field. World Health Organization, aware of the serious global environmental crisis, encourages countries holding local species to do a pharmacological screening (bioprospection) work focusing on the current "4 global scourges": Cancer, AIDS, Alzheimer, Malaria. Since 2011, Martinique, a Caribbean island, is undergoing a massive seaweed *Sargassum* invasion (**Blunt et al., 2008**). Global climate change might have forced the Sargasso Sea to move further south, closer to the Caribbean Sea (**Velasco, 2015**). The species involved are *Sargassum natans* (SN) and *Sargassum fluitans* (SF). It is known that, among the more than 350 species of Sargasso around the world, many species contain biologically active marine natural products exhibiting various biological activities (**Yende, Harle, & Chaugule, 2014**). This project will aim to 1) Detect potential pharmaceutical uses (screening) of *Sargassum natans* and *Sargassum fluitans* on diseases widely spread in Caribbean, 2) Characterize the influence of *Sargassum natans* and *Sargassum fluitans* exposure on the evolution of the targeted pathologies 3) Sensitize the local authorities to the utility of fundamental research for the development and the attractiveness of Martinique.

The international teams engaged are experts in their respective area of research. This intimate collaboration between biologists and chemists provides an optimal interdisciplinary environment opening the perspective to rely biological activities to molecular identification and represents an opportunity for developing the research topic with high originality and novel concepts.

PHYLOGENETIC ANALYSES OF *MYCOBACTERIUM ULCERANS* FROM FRENCH GUIANA USING COMBINATION OF CORE AND ACCESSORY GENOMES

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Abstract

In South America, French Guiana is the only Buruli ulcer endemic area, even though the incidence remains low over the years, with a total of 245 cases reported between 1969 and 2013. In a previous study, we reported evidence for uncommon heterogeneity in *M. ulcerans* (usually characterized by a very low level of genetic variability) and we identified two main contrasted sublineages. Nevertheless, this study was based on classical molecular typing approaches which can sometimes lead to discrepancies in *Mycobacterium* classification.

To overcome these issues, and to move forward in the exploration of *M. ulcerans* genetic variability, we performed cgMLST (Core Genome Multi Locus Sequence Typing) using whole genome sequences of 25 *M. ulcerans* strains originated from French Guiana (n=5) and from other countries in the world where Buruli is endemic (n=20). Maximum likelihood phylogeny revealed a total of 5 lineages clearly delineated. As expected lineage L3 previously described by Doig *et al.* (2012) comprised all isolates from Africa and from Papua New Guinea and, lineage L2 includes Asian isolates from China and Japan. Concerning the lineage L1, Doig *et al.* initially proposed a clusterization of the *M. ulcerans* strains Mu_1G897 isolated in French Guiana with MPM isolates (Mycolactone Producing Mycobacteria: *M. liflandii*, *M. pseudoshotsii*, *M. shinshuense*), known to be pathogenic to ectotherms fishes and frogs. In our study, as we included 5 additional *M. ulcerans* samples from French Guiana that clearly clustered together, we were able to reveal for the first time an independent phylogenetic group called lineage L1.2, while MPM isolates were grouped into L1.1. Finally, the Mexican isolate and the strain Mu_FG102 recently identified in French Guiana constitute the lineage L4; this lineage was also characterized for the first time in this work using WGS.

CARTOGRAPHY OF FREE-LIVING AMOEBAE IN GUADELOUPE USING METAGENOMICS.Reynaud Y.¹, Ducat C.¹, Talarmin A.¹ and Marcelino I.¹

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Abstract: Free-living amoebae (FLA) are protists frequently found in water and soils. Some FLA such as *Naegleria fowleri*, *Acanthamoeba* and *Balamuthia* can cause rare but fatal encephalitis. They can also harbor human pathogens (bacteria, viruses and fungi). In 2008, *Nf* was responsible for the death of a 9-year-old boy who swam in a geothermal bath in Guadeloupe. Our group showed that (i) *Nf* can be found in most of these hot baths and (ii) soil is the origin of this contamination. Herein, we aimed at analyzing the diversity and distribution of FLA in soil using a targeted metagenomic analysis.

A total of 107 soil samples were collected from 27 sites, nearby water ponds, hot springs and rivers. DNA was extracted directly from soil samples or from FLA cultivated at different temperatures (30, 37 and 44°C). Metabarcoding studies were then conducted through FLA 18S amplicons sequencing; amplicon sequence variants (ASV) were extracted from each sample and taxonomy assigned against SILVA database using QIIME2 and SHAMAN pipelines.

Vermamoeba were detected in DNA extracted directly from the soil, but to detect other FLA an amoebal enrichment step is necessary. The cultures were mainly enriched with *Naegleria*, *Acanthamoeba* and *Vermamoeba*, at 37°C and 44°C. High differences in FLA diversity were observed between the 27 sites. *V. vermiformis* was by far the most represented species of FLA, being detected throughout the islands while the genus *Naegleria* was mainly found in Basse-Terre. Nevertheless, putative pathogenic *Nf* was also sampled in Grande Terre and in Les Saintes Islands. *Acanthamoeba* were mainly found in areas where temperature is approx. 30°C.

FLA are an unrecognized risk and our results clearly show that FLA are widespread in Guadeloupe, posing a potential threat (direct or indirect) on human health in Guadeloupe. Similar studies could be performed in neighbouring Caribbean islands.

IS THE BLUE OCEAN STRATEGY SUSTAINABLE? : THE CASE OF *SARGASSUM* RECYCLING COMPANIES IN THE FRENCH WEST INDIES AND FRENCH GUIANA.

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Keywords : Blue Ocean Strategy, Recycling, Corporate Social Responsibility, Sustainable Development, Marine Resources, Innovation

Abstract: This communication is the continuation of a first exploratory and qualitative research whose objective is to clarify the extensions of the Blue Ocean Strategy (Kim and Mauborgne, 2004). In the particular socio-economic, demographic and geographic context of the French West Indies and French Guiana, this concept seems to take into account the importance of deploying in a strong and coherent manner to all stakeholders (Delanon 2011) through *Sargassum* recycling. This alga considered as a scourge paradoxically now becomes a sustainable resource. The consideration of this alga in the strategic integration in some small and medium enterprises is linked to processes of:

- Value creation (definition of a new value curve)
- Innovation Management (strategic thinking)
- Identification of new outlets for sargassum products
- Creation of a strategic differentiation with new spaces on the markets

These research items are described in the approach of Kim and Mauborgne and we have to underline after a qualitative research that they are also formulated under the pressure of public authorities, environmental protection associations and the general public opinion. The stakeholders' pressure on organizations (Freeman 1984, Reynaud 2004) structuring the corporate strategy (Mathieu, 2007, Reynaud, 2010) is part of the application of the themes of Sustainable Development (Social limits of growth Meadows, 1972). Thus, the responses of the companies studied in relation to their environment (strategic contingency) will allow to deepen the following global question of our exploratory research: To what extent do the deployment axes of a Blue Ocean Strategy respect the requirements and the demands of Sustainable Development? Our methodology will therefore question the validity and the depth of strategic choices of *Sargassum* recycling companies in terms of Sustainable Development, items as stated by the major international organizations involved in this field.

BEDLOAD TRANSPORT IN VIEUX-HABITANT RIVER (GUADELOUPE FRANCE): STRESS THRESHOLD AND ANNUAL DURATION OF TRANSPORT

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Abstract: The physics of bedload transport has been investigated in artificial rivers, in natural rivers and by numerical simulations. These approaches demonstrated that bedload transport depends on diameter of pebbles and of the shear stress that acts on the river bed above a threshold stress. These parameters are difficult to estimate in natural rivers where the granulometry is spread out several tenths of centimeters and where the basal shear stress is very difficult to estimate. Three hundred meters of the alluvial portion of the Vieux Habitants River (Guadeloupe Island, French Antilles) have been imaged by drone once a year during 7 years. The hydrograph of the river was measured upstream at 2 km of the study area. An ortho-image at a resolution around 3 cm was computed from the images of each mission. The cobbles that were deposited or transported away between two acquisitions were mapped in a GIS. The volumetric density of deposited cobbles by classes of 10 cm for a diameter of 0.1 to 1m was reported against the maximum water flow of the river that occurred between two acquisitions. This volumetric density reflects the flow of transported cobble during the flood. The dataset shows that the volumetric density of deposited cobbles is very low when water flow is lower than 35m³/s. Above this value, the volumetric density of deposited pebble increases linearly with the flow. During the years of study, the hydrograph shows that the threshold for significant displacement was reached less than 0.03% of the time. Bedload transport occurs only during extreme meteorological events for cobbles with a diameter larger than 10 cm in a river such as Vieux-Habitants.

CARBON MATERIALS PREPARED FROM INVADING PELAGIC *SARGASSUM SPP.* FOR SUPERCAPACITORS ELECTRODES

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Abstract

Since 2011, substantial amounts of *pelagic Sargassum* algae wash-up along the Caribbean beaches and the Gulf of Mexico, hence leading to negative impacts into the economy and the environment of those areas. Hence, it is now crucial to develop strategies to mitigate this problem while valorizing such invasive biomass. This work deals with the successful exploitation of this *pelagic Sargassum* seaweed for the fabrication of carbon materials that can be used as electrodes for supercapacitors (Marie-Julie Pintor, 2013);(Encamacion Raymoundo-Pinero, 2009). A *pelagic Sargassum spp* precursor was simply pyrolysed at temperature varying from 600 to 900°C. Activated carbons were also prepared from sargassum natans by hydrothermal carbonization (HTC) pretreatment at 200°C during 24hours and chemically activated with KOH.

The resultant carbonaceous materials were then extensively characterized using different techniques, such as nitrogen adsorption for textural characterization, as well as, X-ray photoelectron, Fourier transform infrared spectroscopies and Scanning Electron Microscopy, to understand their structures and functionalities. The electrochemical properties of the carbon materials were also tested for their performance as supercapacitors using cyclic voltammetry, galvanostatic method and electrochemical impedance spectroscopy analyses.

Keywords

Sargassum, Supercapacitor, Energy storage, Carbons, Biomass, HTC

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HOW DOES CLIMATE CHANGE IMPACT ISLAND RAINFORESTS: FIRST MEASUREMENTS IN THE LESSER ANTILLES ARCHIPELAGO

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Abstract :Rainforests in tropical islands are characterized by high endemism and unusual structures. Canopies are lower than in continental areas with a similar climate, but the number of trees per hectare is much higher. It is likely that these structural attributes are due to the frequency of hurricanes but also more generally to some peculiarities of island climates.

Recent works show that in areas where plants are subject to seasonal drought, the metabolism of tropical trees negatively responds to rising temperatures and rainfall reduction. Given the particularities of island ecosystems, we wanted to study the behavior of forests growing in climates without true dry season.

The results obtained on four 1-hectare plots (4312 trees) show that during the last nine years, tree growth has accelerated and at the same time, tree mortality has increased - although the estimation of mortality is more uncertain. These joint trends reflect a significant acceleration in the turnover of tree stands.

The measurements carried out thanks to the "Forest Ecosystems Observatory" put in place since 2010, demonstrate that the Caribbean island rainforests are impacted by the current climate change and that they respond in a singular way. The results obtained do not provide information on changes in biodiversity or loss of endemic species, but they suggest that Lesser-Antilles rainforests are reducing their carbon storage capacity.

THE TROPICAL PLANT BIOLOGICAL RESOURCE CENTER OF THE FRENCH WEST INDIES: SERVING AGRICULTURE AND RESEARCH THROUGHOUT THE CARIBBEAN.

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Abstract

Plant genetic resources are instrumental in the adaptation of agriculture to social and environmental change. They are the backbone of research and breeding programs aimed at the development and transfer of new crop varieties best suited to consumers' needs and tastes and to new farming systems. To this aim, plant germplasm collections have been constituted worldwide. Securing such collections requires substantial human and financial investments that can prove difficult to maintain on the long run for small countries and territories such as most Caribbean countries.

In Guadeloupe and Martinique, INRA and CIRAD have constituted large plant germplasm collections of tropical crops over several decades. They joined forces in 2010 to create the Tropical Plant Biological Resource Center of the French West Indies (CRB-PT), which is affiliated to both institutions. Five collections are included in the CRB-PT.

The Banana collection includes 403 accessions representative of the world's banana diversity. It is maintained in the field and partly *in vitro*. Different kinds of banana are represented: plantain banana, cooking banana, dessert banana, ornamental banana and wild banana including *Musa acuminata* and *Musa balbisiana*.

The Yam collection contains 430 accessions which are maintained in the field with an *in vitro* duplicate backup. The main species represented are *Dioscorea alata*, *D. trifida*, *D. cayenensis-rotundata*, *D. Bulbifera* and *D. esculenta*.

The Mango collection contains 96 accessions, mainly of *Mangifera indicae* specie. 70 % of the genotypes are originating from different African countries. It is maintained in the field.

The Sugarcane collection includes 426 accessions from the CIRAD's breeding programmes and also commercial accessions from various countries. Seven species of *Saccharum* genus and one of *Elianthus* are preserved in the field. Some vulnerable accessions are also kept *in vitro*.

Located in Martinique, the Pineapple collection includes 517 wild and cultivated accessions representative of the world's pineapple diversity.

PRENATAL COUNSELING THROUGHOUT PREGNANCY: EFFETS ON PHYSICAL ACTIVITY LEVEL, PERCEIVED BARRIERS, AND PERINATAL HEALTH OUTCOMES: A RANDOMIZED CONTROLLED TRIAL

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Background: Physical activity during pregnancy has many health benefits. However, women report perceived barriers and overall the physical activity level is insufficient [1, 2]. Research has shown that advice and information provided by health professionals can influence the PA behaviors of pregnant women. This study assessed the impact of a counseling intervention offered in addition to routine pregnancy care on physical activity patterns. The secondary objective was to evaluate the impact on perceived barriers and perinatal health outcomes.

Methods: A randomized controlled trial was conducted in the Maternity Unit of the Guadeloupe Hospital. Ninety--six pregnant women were randomized to a control or intervention group (Figure 1). Fig. 1 Flowchart of participant progress. Data collected throughout pregnancy. Regular physical activity counseling was dispensed to the women in the intervention group, in addition to the routine prenatal visits, by trained healthcare providers. The physical activity level and the perceived barriers were assessed in each trimester. Outcomes for the perinatal health of the mother and child was measured throughout pregnancy and at delivery.

Results: A significant between--group difference was observed for some of the perceived barriers, in favor of the intervention group, for example, the feeling of insecurity when practicing PA was lower in the intervention group (i.e., $p=0.027$, $p=0.007$, $p=0.008$, respectively) in the three trimesters, as was weight related to pregnancy in the second trimester ($p=0.030$). There were no significant between--group differences for the major indices of physical activity, whether measured or reported, or for the outcomes for the perinatal health of the mother and child.

Conclusions: The intervention and control groups showed differences in their responses to questions about the perceived intra-- and interpersonal barriers, which can be interpreted as an improvement in response to the intervention. These results agree with the literature [3]. The intervention, which was provided as part of routine care, was unable to limit the decline in physical activity. In our study, a decline was evidenced in the control group even for that intensity category, but it was preserved in the intervention group. Sedentary activities are very low--intensity activities, with no demonstrated impact on health. This intervention not improving maternal/neonatal outcomes and confirm the challenge reported by others [4]. Future research should focus on the design of interventions that have a sufficient quantitative impact on perceived barriers in order to limit physical activity decline.

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FIRST DETECTION OF VORTICELID PARASITES (UNICELLULAR ORGANISMS) THAT COLONIZE THE GILLS OF THE MANGROVE CRAB *UCA RAPAX* (SMITH, 1870) FROM GUADELOUPE.

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Abstract: Vorticellids are eukaryotic organisms belonging to the order of the protozoan ciliates Peritrichida. It is a genus of a bell-shaped or cylindrical organisms that could live as free-living organisms or as parasites. They are present especially on submerged substrates, but can be found on the leaves and roots of aquatic plants, on filamentous algae. They have been also described attached to amphibians, fishes and gastropods. These parasites are present also in the gills of fishes or shrimps and very few studies described these parasites on crustacean gills.

The objective of this study was to characterize the parasites found attached to the gills of *Uca rapax* living in the mud of mangroves in various sites in Guadeloupe.

Material and methods

Uca rapax individuals were manually caught in a mangrove area called "Manche à eau". After unhooking these parasites from the gills, two experiments were done:

- Ultrastructural analysis by Scanning electron microscopy (SEM) and Transmission electron microscopy (TEM).
- Genomic analysis by extraction of the whole DNA, PCR amplification of 18S rDNA using the universal primer set (1F-5R) before cloning with the pGEM®-T Easy Vector Systems kit and sequencing.

Results

SEM analysis reveals the presence of a bell-shaped parasites containing stipes on their surface suggesting that they are vorticellids. No bacteria were observed on the bell but the stalks were covered by various morphotypes of bacteria. According to TEM analysis, many digestive vacuoles containing a lot of bacteria were observed. Phylogenetic analysis of the 18S rDNA sequences confirm that such parasites belong to *Vorticella*.

Conclusion

The results presented here show a high presence of vorticellids colonizing the gills of the crab *Uca rapax*. We allow for supposition that the proliferation of vorticellids on the gills is based on the bacterial epibionts colonizing the surface of gill filaments in this brachyuran species. Indeed, vorticella feeds on these symbiotic bacteria recently described from gills of crustaceans of the families Sesamidae; Gecarcinidae and Ucididae. On the other hand, no bacteria and consequently, no vorticellids were detected in individuals of the Coenobitidae family (hermit crabs).

INFLUENCE OF SOIL FERTILIZATION WITH COMPOSTED ORGANIC AMENDMENTS ON RESISTANCE DISSEMINATION IN CROP PRODUCTION

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Abstract:

The selection pressure related to the overuse of antibiotics in human and veterinary medicines is responsible for the increasing of antibiotic resistance, but the environment also plays a role in the resistance dissemination. In Guadeloupe, a French overseas department, organic amendments resulting from human and animal wastes are widely used in soils fertilization. The objectives of this project were (*i*) to evaluate the impact of organic amendments on the selection and the diffusion of antibiotic resistant bacteria (ARBs) and antibiotic resistance genes (ARGs) in soils and crop production.

The study was carried out over three vegetable crops sessions (cucumbers and sweet potatoes) on amended or non-amended plots. Two hundred and seven samples, including intrants, biosolids, soils and vegetables, were collected between March 2015 and February 2017. Samples were cultured on media with or without antibiotics. ARBs identification (isolation, count, antimicrobial testing, MALDI-TOF mass spectrometry), and ARGs molecular characterization: extended spectrum β -lactamase (ESBL), cephalosporinase (CASE) coding genes, sulphonamid and quinolone plasmidic resistances were performed.

Our results showed that enterobacteria concentrations were higher in poultry droppings than in horse feces or sewage sludge. Resistant enterobacteria were also more frequent in poultry droppings. After composting, the concentration of enterobacteria drastically decreased and resistant enterobacteria were only detected in one compost sample. Resistant enterobacteria were beneath our detection limit in soil and vegetable samples. Concerning the resistance genes, ESBL were more frequent in *E. coli* isolated from poultry droppings but resistance to sulfonamide was more frequent in horse feces. ESBL genes detected were different in poultry droppings (CTX-M1 mainly) and in horses feces (mainly SHV-12).

Our study confirms the efficiency of composting process to decrease the number of enterobacteria and to reduce the risk of antibiotic resistance diffusion in soils and vegetables. Our study also suggests that ARGs, conferring ESBL phenotype, are biotope specific and that the exchange of genes between biotopes may not be so easy.

CARIBBEAN MANGROVE SEDIMENTS AS ELECTROACTIVE BACTERIAL SOURCE FOR BIOELECTROCHEMICAL SYSTEMS.

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Key words: electroactive bacteria, mangrove sediments, microbial fuel cell

Abstract: The terms "bioelectrochemical systems (BESs)" include all devices able to transform chemical energy into electrical energy by the action of microorganisms. Those last belong to a specific community called electroactive bacteria (EAB). Organized in biofilm at the surface of a solid electrode, EAB are able to exchange electrons with conductive surfaces. Thanks to their unique extracellular transfer system, the first electroactive bacterial species discovered, as *Geobacter metallireducens*, were able to use iron or manganese oxides, naturally present in their environment, as the terminal electron acceptor in their metabolism process. Employed in an electrochemical cell, EAB acted as catalysts of the redox reactions. Since 2008, the research team L3MA worked on a particular BES which is microbial fuel cell (MFC). Via an electrical circuit connected to the cell, MFC harvests the electrons from the biodegradation of a fuel (organic compounds, ligno-cellulosic biomasses for examples). The main advantage of MFC lies in the generation of electricity that could be combined with bioremediation (COD, metal, pollutant removals). L3MA has demonstrated that mangrove is source of EAB. Indeed, mangrove environment has the physicochemical characteristics required to be sources of EAB: sedimentary soils, high temperature and high salinity. The objective of L3MA studies was to improve knowledge on mangrove EAB and their role in MFCs. Electrochemical and biological results were facing. The influence of a fuel supply (acetate) and the presence of an electrical connection of the bacterial biofilm support were evaluated. The maximal power of the MFCs, measured in a stable plate of electrical activity following an acetate addition as substrate, was 450 mW/m² of projected anode surface. The anodic potential switched from 400 mV to -400 mV during period without acetate and with acetate respectively. The formation of the anodic biofilm seems to be essentially influenced by the sediment with a similar diversity of bacterial community. The proteobacteria phylum dominated the ecosystem and was mostly composed by two genera: *Sulfurimonas* sp. and *Desulfobacter* sp.

EXPLORING THE ROLE OF FLORENDOVIRUS IN PLANT BIOLOGY.

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Abstract: Endogenous viral elements (EVEs) are viral sequences that were captured in the genomes of their hosts through active or passive horizontal gene transfer (HGT). In plants, most characterized EVEs originate from viruses in the family *Caulimoviridae*. EVEs from a yet unknown genus in the family *Caulimoviridae* were discovered recently and found to be distributed widely in almost all tracheophytes spanning ferns, gymnosperms and angiosperms. This new genus was named Florendovirus and there is so far no evidence that any of its member still exists under an infectious form.

The potential role of florendovirus EVEs in plant biology was investigated using a transcriptomic-based approach. A systematic search for transcripts containing florendovirus coat protein, movement protein, reverse transcriptase or RNAse H domain and host plant domains was performed on a total of 973 assembled transcriptomes originating from algae, ferns, club mosses, gymnosperms, monocots and dicots, using an annotation pipeline based on tblastx. Fused transcripts containing viral and host plant domains were found in 390 plant species, providing evidence that florendovirus genes are co-transcribed with host genes, including several genes involved in plant defense mechanisms. The results of these analyses will be presented and their implication on our understanding of the roles of florendovirus in plant.

IDENTIFICATION PIPELINE OF *ANAPLASMATACEAE* TYPE IV EFFECTOMES.

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Abstract: *Anaplasmataceae* family includes obligate intracellular pathogenic *Ehrlichia* and endosymbiotic *Wolbachia* bacteria. A key factor of bacterial pathogenesis and symbiosis with eukaryotic cells is the ability to evade the innate immune system and hijack the host cellular pathways. *Anaplasmataceae* use effector proteins (T4Es) to manipulate cellular processes in order to survive and proliferate.

It is still difficult to predict and study the repertoires of T4Es in *Anaplasmataceae*. Identifying such type IV effectomes is crucial to comprehend how the bacterium establishes symbiosis or pathogenesis. Deciphering bacterial interactions with mammalian or vector cells will foster development of alternative strategies to fight against the pathogen or prevent pathogen transmission by the vector. We propose a pipeline to identify T4 effectomes in *Anaplasmataceae*. We first use S4TE 2.0 software as a prediction tool for T4Es. The predicted effectors are confirmed using secretion assays in *Legionella pneumophila* and with cellular biology approaches. Then, we screen the effectome library for intracellular localization, for particular cellular phenotypes, and for protein partners or chromatin interactions. We then investigate for potential post-translational modifications of effectors after secretion (phosphorylation, truncation). Finally, we do phenotypic screening after ectopic expression in yeast. For each remarkable phenotype, the corresponding effector genes is silenced using PNA technology.

This computational based- medium-throughput screening of *Anaplasmataceae* type IV effectors will accelerate the dissection of bacteria-host mutualistic or pathogenic interactions and will highlight the evolutionary history shared by these bacteria. These results will promote the development of novel strategies to prevent vector-borne transmission of pathogens and alternative therapeutics

CARDIAC AND ENZYME ACTIVITY AS BIOINDICATORS FOR PESTICIDE EFFECTS IN FRESHWATER CRABS (*POPPIANA DENTATA*)

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Abstract: Pesticides are considered to indiscriminately impact non-target biota. Populations of non-target organisms, such as crabs, face a substantial risk from pesticide exposures since their distributions extend throughout aquatic systems impacted by agricultural activities. This work addresses such impacts through the use of the bioindicators, cardiac activity and neurotransmitter enzyme activity, with application on an indigenous crab species, *Poppiana dentata*. Crabs were subjected to exposure assays involving pesticides, administered in increasing concentrations. Cardiac activity was non-invasively measured and percent enzyme inhibition was determined through the immunosorbent assay technique. Enzyme inhibition notably increased (49.3% to 78.6%) with pesticide concentration and neurotransmitter enzyme activities were considerably lower in pesticide-exposed crabs, versus the control group ($p < 0.05$). Likewise, the cardiac activities of pesticide-exposed and control crabs were significantly different ($p < 0.05$), with the highest pesticide concentrations disrupting the cardiac patterns of affected crabs. Therefore, these findings support the usefulness of these bioindicators for demonstrating the physiological and biochemical effects of pesticides on non-target, freshwater crabs, such as *P. dentata*.

Key words: Bioindicators, cardiac activity, neurotransmitter enzyme activity, pesticide exposure, *Poppiana dentata*.

TRIPLOID LIME IS MORE TOLERANT TO HLB THAN DIPLOID LIME BECAUSE SPECIFIC PHYSIOLOGICAL AND ANATOMICAL TRAITS ASSOCIATED TO BETTER DETOXIFICATION PROCESSES.

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ABSTRACT: Considered a major issue in citrus growing, Huanglongbing (HLB), also known as Citrus Greening or yellow dragon disease, is a citrus bacterial disease. This disease is caused by the bacteria *Candidatus Liberibacter* spp that is spread by *Diaphorina citri*, also called citrus psylla. This stinging insect allows a rapid spread of tree disease trees by feeding on the leaf petiole. In the short term, the HLB causes a decline and the death of trees. In Brazil and Florida, the disease affects several million trees and thousands of hectares have had to be torn down. This disease affects the entire Caribbean basin including Guadeloupe and Martinique. After the bite leading to HLB infection, the reaction of the plant will result in the synthesis of callose in the pores of the phloem sieve cells thus leading to a stop of elaborated sap flow. Today, there is no pure resistance to HLB within the Citrus genus. However, the Tahiti limer (natural triploid variety, 3x) is much less affected by the disease (Gomez, 2008), other diploid varieties (2x) being very sensitive. Our study was to decipher the potential traits of tolerance to HLB related to polyploidy. Diploid (2x, *Citrus aurantiifolia*) and triploid (3x, *Citrus latifolia*) limes grafted onto diploid citrumelo 4475 (*Citrus paradisi* × *Poncirus trifoliata*) rootstocks were investigated when naturally infected by HLB or infected by grafting. The plant physiology, the anatomy, of leaf petiole were analyzed using Scanning Electron Microscope to observe callose deposition at sieve plate of the phloem, as well leaf starch content and detoxification enzyme activities in 2x and 3x leaves were investigated. The results of these experiments seem to show that 3x are more tolerant than 2x.

ASPECTS OF THE EMERGENCE OF ENVIRONMENTAL HUMANITIES IN THE CARIBBEAN

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Abstract: This paper intends to show how investigating the seaweed in the emergence of a new 21st century oceanic imagination resulting from sea level rise also leads to set up an assessment of the emergence of environmental humanities in the Caribbean highlighting how they relate to the work of Caribbean writers who have theorized the ocean as "the violent convergence of the environment and history" (DeLougrey).

Caribbean ecopoetics reveals the poetics of landscape elaborated through the works of 20th century Caribbean writers, which provide a re-envisioning of paradigms of self-definition and worldview. These poetics reveal the way in which the traumatic crossing of oceans intervenes in the definition of Caribbean peoples, notably in the works Derek Wescott and Edouard Glissant. Indeed, for Derek Walcott the sea is history. For Edouard Glissant, the landscape reminds us of those whose history has been shattered by the tragedy of the slave trade.

According to Steinberg, Caribbean aesthetics articulates ontologies of the sea that conceive the ocean as an element that is constantly reconstructed by nonhuman, biological and geophysical, historical and contemporary elements (Steinberg, 157).

Caribbean writers and critics have proposed various metaphors and concepts to theorize the Caribbean and its relationship with the world. The Caribbean as a repeating island (Benitez Rojo), the concept of the rhizome and the archipelagic thought of Edouard Glissant etc.

More recent work calls for a shift from the rhizome concept to the Sargasso concept as a model for conceptualizing transoceanic connections in the Black Atlantic (Pinnix). The Sargasso therefore emerges as an oceanic figure allowing a better understanding of links and losses, since the migratory Sargassum is capable of conceptually entangling disparate cultures, while taking into account the histories and gaps in the stories contained in the ocean abyss.

THE FUTURE OF ECONOMIC WELFARE: ANALYZING THE IMPACT OF HURRICANES UNDER CLIMATE CHANGE SCENARIOS

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Abstract: This paper investigates the impact of hurricanes on household economic welfare under future climate change scenarios. To this end, we use small area estimation technique to simulate our measure of welfare, consumption, for census households with our calculated estimates for hurricane wind damages that capture the type of building material which matters for poverty classification. For future risk assessments, we use synthetic tracks to run a hurricane wind field model for the geographical locations where households reside and then rely on estimated welfare coefficients to calculate out probabilities to predict future household outcomes under five different general circulation model (GCM) climate change scenarios. The results are indicative of policy instruments needed to counteract the future risk of welfare reduction.

SYNTHESIS OF CORE-SHELL LiNbO_3 @Au NANOPARTICLES AS MULTIFUNCTIONAL BIO-IMAGING AND CANCER PHOTOTHERMAL THERAPY PROBES

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Abstract: Advances in nanosciences and nanotechnologies during the past two decades have greatly progressed the therapies and diagnostic tools possible in medicine and biology today. Nanoparticles in particular, can exhibit enhanced optical, magnetic and other physico-chemical properties as a result of their size, shape and composition, and have been the subject of special interest in their application to targeted cancer therapy. This work presents core-shell nanoparticles, the core material being LiNbO_3 (LN) and the shell material being gold, designed for cancer cancer theranostics. LN is a non-centrosymmetric metal oxide, capable of the second harmonic generation (SHG) of light. This property allows for SHG imaging, whose wavelength tuneability, photostability and inherent high spatial resolution gives it an advantage over traditional optical microscopy probes that rely on fluorescence/luminescence [1]. Gold nanoshells can convert light to thermal energy when the incident light absorbed is resonant to its plasmon oscillation, inducing a localized temperature elevation of the surrounding media, which in cellular media can cause cell death [2]. In addition, the resonant plasmon band of gold shells can be tuned by varying the ratio of the shell to core particle thickness. This work reports on the synthesis of LN@Au core-shell nanoparticles using a seeded-growth chemistry protocol, the pH and Au salt concentration effect on the gold shell growth onto the core, and the tuning of the plasmon band to the NIR region. The gold shell growth process was characterized by UV-vis absorption spectroscopy, dynamic light scattering (DLS), transmission electron microscopy (TEM) and energy dispersive x-ray spectroscopy (EDS). Using a continuous wave laser, photothermal experiments were performed on the nanoparticles dispersed in water and the results are included in this work.

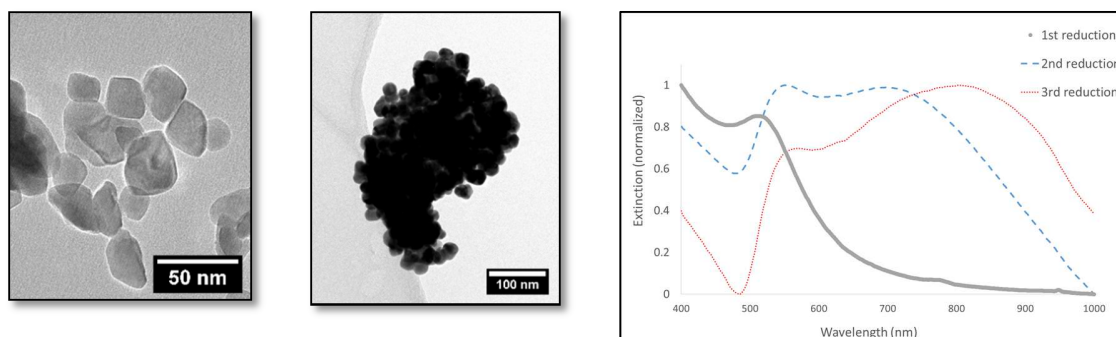


Fig 1: TEM image of the LN core nanoparticles (left) and the LN@Au core-shell nanoparticle (centre). Extinction spectra of the LN@Au core-shell nanoparticles at different stages of Au coverage on the LN core (right).

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QUANTIFICATION OF HEAVY METALS IN *SARGASSUM NATANS* AND *SARGASSUM FLUITANS* ARRIVED TO THE COASTS OF DOMINICAN REPUBLIC DURING 2019

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Abstract: *Sargassum natans* and *Sargassum fluitans* are brown algae with the ability to travel long distances through the ocean currents. The repetitive invasive episodes of *Sargassum natans* and *Sargassum fluitans* on the Caribbean coasts during the last years have become a first-order problem, threatening tourism and fishing. Therefore, appropriate solutions like taking advantage of algal biomass, are necessary. Furthermore, it is also known the capacity of these phaeophyceae to accumulate heavy metals, many of which exhibit remarkable toxicity and persistence in living organisms. The objective of the present research is evaluating the presence of heavy metals in the *Sargassum* of the Dominican coasts, using Atomic Absorption Spectroscopy (AAS) technique. Studied metals were cadmium, copper, chromium, nickel, lead and zinc; since these have been proven to be dangerous to health. However, the results indicate the levels of heavy metals in the *Sargassum* do not represent, a potential danger to health and the environment; opening the possibility to use algal biomass for various applications. In addition, it was evidenced there is not a significant difference between the metal biosorption of both species of *Sargassum* studied.

NOVEL VALORIZATION OF SARGASSUM'S EXTRACTS AND POST-EXTRACTION RESIDUAL MATERIALS AS SOURCES OF BIOACTIVE EXTRACTS AND NATURAL PRODUCTS, OF PRECURSORS FOR MATERIALS PREPARATION, OF ACTIVATED CARBONS AND MINERAL ADDITIVES

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Abstract: Today, substantial amounts of pelagic Sargassum algae beach along the Caribbean basin. The objective of this research is the exploration of the two main species of Sargassum present in Guadeloupe (*Sargassum natans* and *Sargassum fluitans*) as a source of natural products, and innovative biomaterials.

The first part of this work was focused on the methodological study of extractive treatment of both species of Sargassum. Several successive extractions were explored, working with three organic solvents hexane, dichloromethane and methanol, two different extractive times (24 and 48 hours), and at two temperatures (room temperature and solvent reflux temperature). The analysis of the relevance of each parameter was analyzed.

A metabolomic study, on targeted analyses of the polyphenolic content was developed in collaboration with the team of Professor David Wishard (TMIC laboratory, University of Alberta, Canada), identifying the presence of several natural polyphenols in both species. The study of the antioxidant is in progress in collaboration with the team of Professor Remi Nevière (Cardiopulmonary Functional Explorations) at the Centre Hospitalier Universitaire from Martinique.

In parallel, the extraction of alginates from the extractive residues was achieved, obtaining these natural polymers with an overall good yield.

Finally the algae residues post extraction was explored to developed innovative potential applications, as for example the production of active charcoal or mineral additives for geopolymeric materials.

CONTRIBUTION TO THE FORMULATION OF GREEN LUBRICANTS USING LOCAL BIOMASS

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Abstract: Friction and wear are the first causes of the decrease of the performances and the durability in mechanical systems. The role of lubrication is to minimize friction between the sliding surfaces to protect them from wear. Conventional liquid lubricants are constituted of a base oil and solid additives particles presenting specific properties, such as friction reduction and antiwear performances. The role of friction reducers is to ensure the lubricating performances in boundary lubrication regime. Commercial lubricants generally use graphite and petroleum-based oils because of their recognized lubricating properties, their stability and low cost. However, such lubricants induce health and environmental hazards due to their life cycle.

The aim of this work is to investigate the possibility to use local biomass in order to produce environmentally-friendly lubricants. Local vegetable oils are interesting candidates because of their inherent qualities like renewability, bio-degradability, non-toxicity. This work shows that such natural oils present better friction performances than petroleum-based ones. Then considering friction reduction additives, the tribological behaviour of activated carbons synthesized from biomass is evaluated and special attention is paid to the role of the carbon structure, in terms of morphology, size, porosity of the carbon particles on the friction properties of the additives. The tested activated carbons are obtained from either terrestrial (sugar cane bagasse, banana tree, etc.) or alga (sargassum alga) precursors. Very good friction performances are observed by selecting the adequate precursor and tuning the activation experimental conditions. Finally, the determination of the tribological properties of activated carbons/natural oils mixtures results in the first formulation step of our lubricant made from local biomass.

POLYGONAL FAULTS IN A SHALLOW MARINE HYDROTHERMAL SYSTEM: EXEMPLE OF TAHITI SPRING, BOUILLANTE BAY.

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Abstract: Polygonal Faults are ubiquitous features, characterized by covering large parts of basin with a typical polygonal pattern. In the last decade, different mechanical models for the generation of polygonal faults have been proposed; however, as they are commonly not directly observable, their formation remains a matter of debate. We found polygonal fault structures being exposed close to the surface in marine soft sediments at 5 m depth at the western coast of Guadeloupe. The structures are associated with fault-bound thermal springs and clearly visible at the sea bottom due to preferential precipitation of sulfur minerals and growth of cyano-bacteria. In a multidisciplinary study involving a team of hydrogeologists, marine micro-biologists, and structural geologists, we study the genesis of polygonal faults in this setting. We suggest that SiO₂ precipitation due to fluid flux from thermal springs increases the cohesion of the most permeable soft sediments. Dewatering of the underlying layers causes the formation of polygonal faults at a depth of <1 m. These polygonal faults then act as channels for hot fluids, resulting in accumulation of sulfur and the development of cyano-bacteria mat at the surface. This site is a unique worldwide exemple of actively degazing polygonal faults and offers the unique opportunity to study the formation of polygonal faults in situ. Furthermore, it provides views on how polygonal faulting may interact with the biosphere, shaping the environment for marine biota. These results have been obtained in the frame of GEOTREF program (See Lebrun et al., Poster), which is a multidisciplinary innovative platform for exploration and development of high-enthalpy GEOThermal energy in Fractured REservoirs. In that frame, this study contributes to a better understanding of fluid migration and drainage evolution.

SAHARAN DUST INPUTS TO NORTH-WESTERN ATLANTIC OCEAN WITH THREE YEARS TIME SERIES

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Abstract : North Africa, the largest dust source worldwide, accounts for 55% of global continental dust emission [e.g. Muhs et al., 1990]. These dusts can be transported over long distance, and significantly impact ocean biogeochemistry in the North Atlantic and the ecosystems of the North Tropical Atlantic Islands, after deposition through biogeochemical processes [Clergue *et al.*, 2015]. Yet, the inputs of Saharan dust to the North-Western Atlantic are not precisely measured.

In this work, we present time series of dust deposition performed in Guadeloupe. Atmospheric total deposition was continuously sampled on a weekly basis during three years (2015-2018). Airborne aerosol samples were simultaneously collected during the last 18 months of deposition sampling.

Deposition and aerosol samples were analyzed for major and trace elements including rare earth elements (REEs), together with Nd, Pb and Sr isotopes. Compositional analyses mathematical tool was used to study the elemental composition of trace elements and REEs. It showed (i) seasonal and interannual variations of deposition fluxes of major and trace elements, (ii) samples collected during different years present different trace and REEs compositions and also different Nd isotopic signatures, (iii) Saharan dust and sea-salt depositions can represent significant sources of nutritive trace metals (like Mo and Sr) which are important for ecology systems in North-Western Atlantic and Caribbean Islands, (iv) differences were also observed on Pb isotopic ratios between airborne aerosol and deposition samples collected simultaneously, which are likely due to human activities.

This long time series will help us to better assess the contribution and impact of Saharan dust to the biogeochemical cycle of trace metals in Western North Atlantic.

SARGASSUM WEED TO FEED: TRANSLATING SARGASSUM SEAWEED INTO VALUE ADDED PRODUCT THROUGH RESEARCH AND DEVELOPMENT.

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Abstract: Since 2011, there have been numerous reports of excessively large quantities of Sargassum seaweed accumulating along coastal areas and beaches of the Caribbean, Gulf of Mexico and Africa, creating devastating impact on the coastal ecosystem and local economies. Satellite data have shown that record-setting Sargassum blooms are to be expected. Large masses of *Sargassum* are already swamping beaches causing serious challenges for the tourism and fisheries industries. Apart from being unsightly, the decomposition of large masses of seaweed produces a foul sulfurous odor, attracts insects, entwine marine animals, interferes with tourist activities and obstructs boat engines and fishing equipment. Interventions to manage the large influx of Sargassum include mechanical collection with the use of cane and front-end loaders, as well as manual raking and piling of the seaweed along the shorelines. However, these have proven to be ineffective. The use of heavy equipment also poses serious threats to the stability of the coastline and existing marine life. As an alternative, the Scientific Research Council, Jamaica has embarked on research and development activities which seeks to evaluate Sargassum seaweed for its potential uses. The micro and macro nutrients content of Sargassum collected from various sites along Jamaica's costal lines were evaluated. Preliminary analysis revealed crude protein of 3.89%, fat of $0.15 \pm 0.01\%$, total carbohydrates of $62.59 \pm 0.35\%$ and fiber of $17.72 \pm 0.24\%$ for the dried Sargassum (*Sargassum natans and fluitans*) sample. The samples also contained significant amounts of essential minerals and trace elements such as; calcium ($454,000 \pm 1734$ mg/kg), potassium ($286,66.7 \pm 1537$ mg/kg), magnesium (9866.7 ± 642.9 mg/kg), sodium ($8,933.3 \pm 251.7$ mg/kg), iron (267.7 ± 8.5 mg/kg), manganese (43.8 ± 0.5 mg/kg), zinc (5.51 ± 0.02 mg/kg), and selenium (0.27 ± 0.04 mg/kg). Heavy metal analysis also revealed elements such as mercury (0.0084 ± 0.0001 mg/kg), cobalt (1.53 ± 0.03 mg/kg), cadmium (< 2.41 mg/kg), chromium (1.53 ± 0.4 mg/kg), lead (< 3 mg/kg), and arsenic (65.5 ± 2.17 mg/kg), with all except arsenic being below acceptable levels. The aim of the studies is to utilize the Sargassum in a way that is environmentally friendly and economically viable.

Keywords: *Sargassum*, Seaweed, Fertilizer, animal feed

USING LORA P2P NETWORK FOR AUTONOMOUS SEAWATER QUALITY MONITOR FOR GREEN POWERING DESALINATION PLANT

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Abstract: Scarcity of freshwater pushes countries impacted by climate change to investigate new sources of supply. Desalination plants powered by Renewable Energy can be the solution for tropical developing country. Collection and treatment of sea water to produce freshwater generates unbalance of the water mass. Management of an industrial plant, particularly those which work with intermittent energy, needs continuous and accurate monitoring. Observation is a key factor to determine the yield and energy cost reduction.

In case of a Reverse Osmosis Desalination Plant which pumps sea water to produce freshwater and brine as waste, the most important factor is the sea water quality. The design of a plant and its execution will depend on those factors and other factors such as ambient temperature and humidity.

Main needs for a good multi-probe observation system are the low energy consumption, simple monitoring and coverage a large marine area. For the sake of autonomy and ease of use, a functional and robust circuit can be setup using calibrated probes, micro-controllers and small-board computers. The use of programmable boards and connected probes are set up as 'nodes' to send particular data measured from the water body in this case, seawater. These nodes send the data using LoRa protocol to a 'gateway' to store or transfer them to a secured sever.

The data is measured at different time intervals, water depths and distances from the coastline to observe how said factors affect the measurements. The results from the data collected are used to compare ocean modelling and satellite data.

We present in this study the implementation of long range wireless autonomous sensor network and first validation tests. Results indicate good correlation between measure, modelling and remote sensor. LoRa P2P network allows at an affordable price continuous monitoring of remote areas with great autonomy and resilience.