



CARIBAEA
INITIATIVE

First Caribaea Initiative Research and Conservation Workshop

Special focus

Animal invasive species in the Antilles: the relevance of scientific research to conservation

In association with CNRS RTPI “Caraïbes”



Tuesday, March 22 - Thursday, March 24 2016

Fort de France, Martinique

Centre International de Séjour

ABSTRACTS



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Animal invasive species in the Antilles: the relevance of scientific research to conservation

Tuesday, March 22 - Thursday, March 24 2016

Fort de France, Martinique

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PROGRAM

22 March

8:00-9:00 Registration

9:00-9:30 Welcome

M. Louis Boutrin (SM/PNRM), Prof. Justin Daniel (CRPLC, Université des Antilles), Prof. Pierre-Michel Forget (MNHN, RTPI CNRS Caraïbes), Prof. Frank Cézilly (Caribaea Initiative)

Morning Session

Chair : Henri Vallès

Special focus

Animal invasive species in the Caribbean: the relevance of research to conservation

9:30-10:30 Invited talk

Scientific prediction and management of invasive species

Brian Leung, Department of Biology, McGill University, Canada

10:30-11:00 Coffee break

11:00-12:30 Contributed papers

The Lionfish Caribbean Control Strategy

Jean-Philippe Maréchal & Ewan Trégarot

Invasive Vertebrates in Cuba: knowledge and its value for conservation

Rafael Borroto-Pàez

Going Feral: Managing invasive ungulates in Montserrat

Laura Bambini

12:30-14:00 Lunch



Afternoon session 1

Chair: Frank Cézilly

14:00-15:00 Invited talk

Small Islands, Big Impacts: The Consequences of Tackling Invasive Alien Species in the Caribbean

Jenny Daltry, Fauna & Flora International, Cambridge

15:00-16:00 Contributed talks

Protecting Critically Endangered Sea Turtles from Invasive Predators in the Caribbean

Luis Cruz-Martinez

Predation on nesting sea turtles by small Indian Mongoose in Guadeloupe

Antoine Chabrolle

16:00-16:30 Coffee break

Afternoon session 2

Chair: Jean-Raphael Gros-Désormeaux

16:30-18:00 Contributed papers

Invasive pests in vegetable and fruit crops: examples in the Lesser West Indies and actual risks

Philippe Ryckewaert

Contribution de la FREDON à la surveillance des espèces exotiques envahissantes (EEE) à la Martinique

Rémi Picard

Pest and predator arthropods of banana cropping systems in Martinique

Dominique Carval

*Preliminary results reporting the presence of the exotic swimming crab *Charybdis hellerii* (A. Milne Edwards, 1867) on the coast of the Martinique, French Lesser Antilles (Crustacea, Portunidae)*

Romain Ferry

Ecological and evolutionary genomics in the Caribbean: examples from aquatic biodiversity

Etienne Bezault



23 March

8:00-8:30: Registration

Morning session

Chair: Sophie Arnaud-Haond

Special focus

Animal invasive species in the Caribbean: the relevance of research to conservation

8:30-10:30 Invited talks

Tales of Invasion and Evolution: Cane toads and their parasites
Crystal Kelehear, Smithsonian Tropical Research Institute, Panama

Animal invasive species in the Antilles: Conserving species and sites of International Importance in the Caribbean UK Overseas Territories
Lyndon John, RSPB, Saint Lucia

10:30-11:00 Coffee break

11:00-12:30 Contributed talks

Primates Tracking Primates: Spatial ecology and zoonotic disease epidemiology of St. Kitts African Green monkeys
Christa A. Gallagher

Island extinctions and invasions of terrestrial vertebrates since 5000 years: archaeozoological advance in the French West Indies
Sandrine Grouard

The Giant African Snail and other invasive molluscs in the Caribbean
Angela Fields

12:30-14:00 Lunch

Afternoon session 1

Chair: Pierre-Michel Forget

General session

14:00-16:00 Contributed talks

*Ecology and conservation of the white-breasted trasher (*Ramphocinclus brachyurus*) in Martinique*
Steven Son



*Ecology and conservation of Audubon's shearwater (*Puffinus lherminieri lherminieri*) from the nature reserve of Sainte-Anne islet (Martinique)*

Carine Prêcheur

*Population dynamics and behavioural ecology of the Zenaida Dove, *Zenaida aurita*, on the island of Barbados*

Frank Cézilly

*Phylogeography and genetic differentiation between *Loxigilla noctis* and *L. barbadensis* in the Lesser Antilles*

Sophie Arnaud-Haond

16:00-16:30 Coffee break

Afternoon session 2

Chair: Thierry Perez

16:30-18:00 Contributed talks

*Differences in the ecomorphological relationships between mainland and island *Anolis* lizards*
Anthony Herrel

What bones tell us - 5 000 years of Human impact on lizards from the Guadeloupe islands
Corentin Bochaton

*Histopathological survey of late stage embryonal mortality in leatherback sea turtles (*Dermochelys coriacea*) in St Kitts West Indies*
Kristine Hill

18:00-21:30 Cocktail Reception & Dinner at the Centre International de Séjour Martinique

It is our pleasure to invite all registered participants to our cocktail reception followed by a dinner at the Centre International de Séjour in the evening after the workshop.



24 March

Morning session

Chair: Etienne Bezault

General session

9:00-10:30 Contributed talks

The PACOTILLES campaign: patterns of marine diversity and connectivity in Lesser Antilles

Thierry Perez

État des lieux de la biodiversité animale et de la faune sauvage en Haïti

Wilson Celestin

How big are your parrotfish? The value of simple size-based parrotfish metrics for coral reef management

Henri Vallès

10:30 - 11:00 Coffee break

11:00-12:30 Round table discussion

What the Caribaea Initiative can do for you (and what you can do for the Caribaea Initiative)

12:30 - 14:00 Lunch



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Scientific prediction and the management of invasive species

Brian Leung¹

¹ *Department of Biology, McGill University, Montreal, QC. H3A 1B1, Canada*

Abstract

The science of biological invasions has increased in sophistication over the last decade. I will provide a broad overview of the current thinking in biological invasions, and link these concepts to management, providing examples from both terrestrial and aquatic systems. In particular, our understanding of the processes underlying biological invasions help to identify opportunities for intervention, and allow prediction as a key deliverable of science. In the real world, there are challenges to conservation efforts – particularly, limited time, limited information and limited resources. As such, I will use risk analysis as a conceptual framework, and discuss the tools and approaches available to make predictions and assess risk. Combined, science can provide advice on prioritization (i.e., which species, which locations, which management actions), and provide insight into whether different policies are worthwhile.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

The Lionfish Caribbean Control Strategy

Jean-Philippe Maréchal*^{1,2} and Ewan Trégarot³

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² School of Biological Sciences, King Henry Building, University of Portsmouth, Portsmouth, PO1 2DY, UK

³ Observatoire du Milieu Marin Martiniquais, 14 rue Chery Rosette, Fond Lahaye Schoelcher 97233 Martinique, French West Indies

* Référent national poisson-lion pour les ministères des Outre-mer et de l'Ecologie, du Développement Durable et de l'Energie. Représentant de la France au Caribbean Regional Lionfish Committee.

Abstract

During the past 20 years, Indo-Pacific lionfish (*Pterois volitans/miles*) have invaded the western Atlantic, Caribbean and Gulf of Mexico, and have already caused measurable declines in native Atlantic reef fauna. Under the 24th General Meeting of the International Coral Reef Initiative (ICRI) in 2010, an *ad-hoc* Regional Committee was created as a Caribbean response to lionfish invasion (the Regional Lionfish Committee) with two major objectives: 1) develop a regional control strategy to guide the collective response at the regional scale and 2) elaborate an action control guide. A publication "*Invasive Lionfish: a guide to Control and Management*" was circulated in 2012. The workshop on Lionfish Invasion Control Strategy, held in 2012 to prepare the regional strategy, examined two objectives: Minimise the negative impact of lionfish in the Caribbean through regional cooperation and Encourage collaboration and coordination to reach a consensus on social, economical and environmental local actions. The regional strategy was then released in February 2013 as guidelines to assist countries in the Caribbean to develop their own local action plan. A Lionfish web-portal was created in 2014 providing multi-media training tools, updates on new findings, forum. Following the presentation of the international overview of the strategy, I will focus on the French Antilles strategy and the local situation of lionfish populations in the French islands.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Invasive vertebrates in Cuba: knowledge and its value for conservation

Rafael Borroto-Páez¹

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Abstract

The Cuban archipelago is an important part of the Caribbean hotspot, with approximately 4000 islands and cays, about 50 percent of islands in the Caribbean. Present vertebrates include 729 species, with 621 native, and 252 (40.5%) endemic. An analysis of bibliographic sources for Cuban vertebrates, history and protected area management plans of introduced vertebrates, and extensive fieldwork around the archipelago demonstrates 167 vertebrates (21.2 %) were introduced after 1510 via human mediation with principal pathways being food consumption, use as pets, hunting, with several accidental introductions. Results reveal that 108 vertebrate species are now established in Cuba with 93 species considered invasive (35 mammals, 18 birds, 12 reptiles, 1 amphibian and 27 fishes) with different levels of negative interactions or impacts, on nature and the human environment. A comprehensive inventory of introduced and invasive vertebrates in the Cuban archipelago is presented with documented historical records, population sources, dispersal pathways, introduction events, current status of distribution, and impact description. The last 54 years (the revolutionary period) are associated with the majority of introductions (86); however, an important number of the invasive vertebrates with the most negative impacts were introduced after 1510 in the initial colonization period. Deficiencies in information are also presented, as well as references to high public tolerance and information gaps related with interactions, effects and impacts relations of invasive vertebrates to conservation and protected areas. This information is important to protected area management, biosecurity, public health, agriculture, and could be a baseline for future research. The review contributes new knowledge that is critical for use in conservation plans, biodiversity management, control and eradication campaigns and to establish prioritization, as well as for national and international agencies and databases. Additionally, it alerts management authorities as to specific pathways of introduction for proactive action, to avoid potential introductions.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Going Feral: Managing Invasive Ungulates in Montserrat

Laura Bambini¹, Gerard Gray¹ James Daley¹, Calvin Fenton¹, Stephen Mendes¹, Lyndon John², Elizabeth Radford²

¹ *Department of Environment, Ministry for Agriculture, Trade, Lands, Housing and the Environment, PO Box 272, Brades, Montserrat. bambinil@gov.ms*

² *The Royal Society for the Protection of Birds, The Heath, Sandy, SG19 2DL UK.*

Abstract

Evacuation of the south of Montserrat at the start of the volcanic crisis in 1995 forced people to abandon their livestock. The surviving animals found refuge in the now uninhabited volcanic exclusion zone, creating a source population that encroaches on the Centre Hills Protected Forest Area, the last remaining contiguous forested area in Montserrat. The Centre Hills are home to internationally important biodiversity, and invasive alien species has been identified as a major threat to species of conservation concern found there, as well as the wider ecosystem functioning. Efforts to control the feral livestock in Montserrat have focussed on lethal culling using firearms, and monitoring of the populations using camera traps. Over 900 animals have been culled since 2009, mostly goats and cattle. Following the start of the intensive culling effort, a network of camera traps identified a drop in animal numbers and a change in their behaviour. Attempts have been made to improve livestock husbandry practices, but challenges remain in this area. Efforts are now underway to implement more robust monitoring of feral livestock to inform management action, and permanent vegetation plots will be established to track rates of forest recovery.



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ABSTRACTS

Small Islands, Big Impacts: The Consequences of Tackling Invasive Alien Species in the Caribbean

Jennifer C. Daltry¹

¹ *Fauna & Flora International, The David Attenborough Building, Pembroke Street, Cambridge, CB2 3QZ, United Kingdom*

Abstract

The wildlife of the Caribbean Islands have suffered exceptionally high extinction rates. Of all extinctions recorded worldwide since 1500, 10% of birds, 38% of mammals and over 65% of reptiles were from this region. Invasive alien species (IAS) such as mongooses and cats are partly or entirely responsible for over 60% of these. As alien species continue to spread, an alarmingly high percentage of Caribbean species have declined in number. However, a large and growing number of local, national and international organisations have begun controlling and even eradicating IAS in this region, with some remarkable results.

This presentation will explore some of the diverse methods being used to combat IAS on Caribbean islands, and the impact this work has had on native wildlife. Among the best documented examples concern Eurasian rats (*Rattus rattus* and *R. norvegicus*), which have been removed from approximately 40 Caribbean islands using rodenticide. Studies from Antigua have shown that after eradicating *Rattus rattus*, endemic lizard populations have tripled and seabirds have increased by between five- and 20-fold within 10 years. On Anguilla's Dog Island, bird populations tripled within two years of rats being eradicated. Removing vertebrate IAS from small islands has also enabled vulnerable species to be successfully reintroduced, for example the Critically Endangered Antiguan racer (*Alsophis antiguae*) has been reintroduced to three islands and the Saint Lucia whiptail lizard (*Cnemidophorus vanzoi*) to two islands after removing rats, mongooses and other IAS.

This encouraging progress is tempered by the overall escalating numbers of IAS in this region, facilitated by movements of people and cargo and, in some cases, hurricanes. Saint Lucia, for example, now has at least 350 IAS. Because eradicating every species is impossible with existing technology and resources, many Caribbean countries are taking steps to prevent exotic animals, plants and other organisms from entering in the first place.

For many Caribbean animals, offshore islands offer safe havens where IAS can be excluded most effectively. In Anguilla, for example, Endangered Lesser Antillean iguanas (*Iguana delicatissima*) have



been translocated to offshore cays to protect them from alien green iguanas (*Iguana iguana*). This is not a solution for every country or species, and I suggest that some Caribbean states should seriously consider creating 'mainland islands': areas enclosed by pest-proof fences where native wildlife can thrive.

To conclude, the Caribbean has made great strides over the past 25 years to halt and even reverse the decline of certain species threatened by IAS, and there are exciting opportunities to do much more. As this presentation illustrates, however, more research is needed to (a) identify and understand the pathways and impacts of IAS, (b) inform and evaluate IAS management policies and actions, and (c) convince funders, decision-makers and the wider public that addressing the problem of IAS is necessary and well worth investing in.



First Caribaea Initiative Research and Conservation Workshop

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Protecting Critically Endangered Sea Turtles from Invasive Predators in the Caribbean

Cruz-Martinez, Luis¹; Agostini, Tara¹; Stewart, Kimberly¹; Bergfelt, Don¹; Sithole, Fortune², Knobel, Darryn¹

¹Center for Conservation Medicine and Ecosystem Health, Ross University School of Veterinary Medicine. St. Kitts and Nevis, West Indies

²One Health Center for Zoonoses and Tropical Medicine, Ross University School of Veterinary Medicine. St. Kitts and Nevis, West Indies.

Abstract

In the island of St. Kitts and Nevis in the Caribbean, the small Indian mongoose (*Herpestes javanicus*) predated on nests and hatchlings of critically endangered hawksbill and endangered green turtles. Mongooses are one of the 100 worst invasive species and they are responsible for extinctions and population declines of wildlife in the Caribbean and other locations where they were introduced. With this project we will provide an immediate benefit for critically endangered sea turtles, while obtaining baseline data for managing an invasive predator. By characterizing reproductive features of mongooses we will obtain important information for future research on non-lethal methods for fertility control. From a series of trapping of mongooses from the sea turtle nesting sites along with fitting a proportion of individuals with VHF telemetry collars, we will obtain data on population ecology that will be critical to understand population trends, habitat range and movement patterns. By testing for rabies virus antibodies and for *leptospira* spp. we will assess the potential of mongooses as reservoirs of these important zoonotic diseases. We will investigate on the social dimensions (public's knowledge, attitudes and practices) of invasive species management and wildlife conservation that will be instrumental for designing outreach and education efforts. This will also ensure public support that is a determinant concept for success and sustainability in future mongoose population control programs. Finally, the data generated of these various aspects will be critical for future research on wildlife conservation, animal welfare and invasive species management in St. Kitts and other regions in the Caribbean. This is a multidisciplinary project that is currently underway and we will present an update of the main findings during the workshop.



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ABSTRACTS

Predation on nesting sea turtles by small Indian Mongoose in Guadeloupe

Antoine Chabrolle¹, Cyril Cottaz²

¹ Guadeloupe Sea Turtles Recovery Action Plan Coordinator e National Hunting and Wildlife Agency

² Master 1, Master 1, Management and Biodiversity Conservation, Britany University in France

Abstract

Sea turtles are protected species emblematic of Guadeloupe. However, the threat analysis as part of the French West Indies Sea Turtle Restoration Plan shows a growing phenomenon of predation of marine turtle eggs by an invasive species: the small Indian mongoose *Urva auropunctata*. In Guadeloupe, 78% of turtle nests were predated by the small Indian mongoose in the inventory conducted in June 2015 on the coast of Port-Louis, Grande-Terre.

Of predation limiting means have been tested in the field, including the protection of spawning by grids, preventing the small Indian mongoose to come dig up the eggs or by asking lures repellent effects, supposed to encourage this small mammal to gradually change its feeding preference for eggs. A trapping campaign was also conducted in order to study the ecological consequences of eradicating this species in a given sector. It seems unlikely that populations of sea turtles can be maintained at a stable level in time with the current level of nest predation observed in Guadeloupe.



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Invasive pests in vegetable and fruit crops: examples in the Lesser West Indies and actual risks

Philippe Ryckewaert¹

¹ CIRAD/CAEC, 97232 Le Lamentin, Martinique

Résumé

Depuis plusieurs dizaines d'années, les Petites Antilles subissent des introductions de nouvelles espèces d'insectes ravageurs, qui peuvent provoquer des dégâts importants aux cultures. Le premier exemple concerne le *Thrips palmi*, arrivé au milieu des années 1980, et qui a causé beaucoup de pertes sur les cucurbitacées et l'aubergine. Le deuxième exemple est celui du développement au début des années 1990 du biotype B de l'aleurode *Bemisia tabaci*, très polyphage, et qui est aussi vecteur de virus très dommageables sur la tomate. Le dernier exemple considère l'arrivée du psylle asiatique des agrumes, *Diaphorina citri*, qui transmet la grave maladie du Greening à ces arbres depuis quelques années dans ces îles. Pour les deux premiers, nous avons constaté toutefois une forte diminution des populations au bout de quelques années, qui semble due à l'action de leurs ennemis naturels, rendue possible par une réduction de l'utilisation des insecticides. Cependant, avec l'augmentation des échanges mondiaux, notamment commerciaux et touristiques, d'autres espèces nuisibles peuvent arriver dans les Petites Antilles comme les mouches des fruits ou la teigne de la tomate *Tuta absoluta*.

Abstract

Since many decades, the Lesser Antilles undergo introductions of new insect pest species, which can provoke significant damages on crops. The first example concern the *Thrips palmi*, arrived at the middle of 1980's, and which have caused a lot of losses on cucurbits and eggplants. The second example is the development at the beginning of the 1990's of the whitefly *Bemisia tabaci* B biotype, very polyphagous, and which is also a vector of highly damaging viruses on tomato. The last example considers the arrival of the Asian citrus psyllid, *Diaphorina citri*, which transmitted the severe Greening disease to these trees since a few years in these islands. For the two first, we have however found a strong decrease of populations after a few years, which seems due to natural enemies action, made possible by a reduction of insecticide use. However, with the increase of global exchanges, notably commercial and touristic, others pest species can arrive in the Lesser Antilles as fruit-flies or the tomato pinworm *Tuta absoluta*.



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Contribution de la FREDON à la surveillance des espèces exotiques envahissantes (EEE) à la Martinique

Rémi Picard¹

¹ FREDON Martinique, Route du lycée agricole, Croix-Rivail, 97224 Ducos

Résumé

L'union européenne vient de se doter d'une réglementation spécifique relative aux espèces exotiques envahissantes (EEE) qui devra être mise en œuvre à la Martinique en 2017. Néanmoins, un certain nombre de mesures visant à prévenir l'introduction, surveiller et gérer les EEE sont déjà en œuvre dans l'île avant cette date. C'est le cas dans le cadre du dispositif relatif aux « organismes nuisibles réglementés » pour la protection des végétaux qui a déjà bénéficié à la prévention et la gestion des EEE. Au centre de ce dispositif depuis 1958, la Fédération Régionale de Défense contre les Organismes Nuisibles (FREDON) de Martinique est une structure professionnelle au service de l'administration et des détenteurs de végétaux, professionnels et particuliers. Créée pour assumer des campagnes de luttes collectives comme celles organisées deux fois par an contre les rongeurs allochtones, elle est également impliquée dans la surveillance biologique du territoire.

Son rôle correspond à celui de « médiateur de la surveillance » tel que défini par Giovanni PRETE (2008), en « favorisant la coopération par l'articulation de différents mondes sociaux, dans lesquels elle a su construire des relations de confiance et mobiliser dans le temps des compétences techniques et une capacité d'empathie ». Cette médiation s'illustre par une implication à tous les niveaux de la gestion de crises liées à l'introduction d'organismes exogènes :

- Préventivement, par la réalisation de campagnes de sensibilisation aux risques ainsi que par l'appui apporté aux agents de l'autorité responsables des contrôles aux points d'entrée dans l'île.
- Lors de la surveillance, en accompagnant les agriculteurs dans la gestion de leur culture, en offrant un service de diagnostic phytosanitaire aux professionnels et aux particuliers et en réalisant sur le terrain des prospections confiées par l'administration.
- Lors de la détection, par un regroupement de ressources humaines et matérielles unique en Martinique et une collaboration directe avec les instances scientifiques de référence en France comme les laboratoires de la santé des végétaux de l'ANSES ou le Muséum Nationale d'Histoire Naturelle.
- Lors de tentative d'éradication comme ce fut le cas suite à la découverte du champignon responsable de la cercosporiose noire du bananier *Mycosphaerella fijiensis* en mobilisant en urgence et en coordonnant des moyens humains exceptionnels en 2010.
- Lors du contrôle des espèces introduites, par la lutte collective comme ce fut le cas pour les escargots géants africains *Achatina fulica*, *Limicolaria aurora* et *Archachatina marginata* dans les années 1990 ou par la réalisation d'expertises, de formations et l'organisation de forums sur la lutte contre les rongeurs allochtones.



Une rétrospective des premières détections à la Martinique d'organismes allochtones au cours des dix dernières années met en évidence l'importance du phénomène d'invasion biologique dans l'île. Elle illustre la diversité des modes de détection, des acteurs impliqués ainsi que la disparité des réponses données. Enfin, elle constitue un élément de réflexion important dans la perspective de la déclinaison du règlement européen sur les EEE en Martinique et en vue de l'adoption par la France, d'ici le 2 janvier 2017 d'une liste des EEE préoccupantes pour la Martinique.

Abstract

The new European Regulation (EU) 1143/2014 about prevention and management of the introduction and spread of IAS (Invasive Alien Species) should be applied in Martinique in 2017 with a specific list of IAS of concern edited for this island. This communication is a feedback on plant protection field from a field actor of the island. The actual monitoring system on "Regulated Harmful Organisms" allows benefits for IAS prevention and control. The regional federation of protection against pests (FREDON) plays an important role in this system from prevention to collective pests control. This role can be likened to the "surveillance mediator" role as defined by Giovanni PRETE (2008), "fostering cooperation by the articulation of different social worlds in which it was able to build relationships of trust and mobilize in time technical skills and a capacity for empathy".

A retrospective of the first detections in Martinique of alien species, as part of these activities over the past decade highlights the importance of the phenomenon of biological invasion in the island. It illustrates the diversity of detection modes, the actors involved and the disparity of responses. Finally, it is a relevant consideration in view of the prevention and Management of the introduction and spread of IAS of concern for Martinique.



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ABSTRACTS

Pest and predator arthropods of banana cropping systems in Martinique

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³ CATIE, Departamento de Agricultura y Agroforesteria, 7170, Cartago, Turrialba, 30501, Costa Rica

Abstract

Ecological intensification of agrosystems, by increasing the vegetal diversity, is a promising way of development of sustainable agriculture. As demonstrated by several studies, increasing vegetal diversity in agrosystems may lead to an increase of predator abundance and, in turn, to a decrease of pest abundance. Here, we present the actual knowledge on the generalist arthropod predators of banana agrosystems in Martinique, and their response to vegetal diversity. We particularly focus on ants and the dermaptera *Euborellia carai-bea*. To date, we counted 27 ant species belonging to 5 subfamilies in banana agrosystems. We found that the ant communities are driven by 7 dominant species which are the dark rover ant *Brachymyrmex patagonicus*, the crazy ants *Nylanderia fulva* and *Paratrechina longicornis*, *Pheidole fallax*, *Pheidole jelskii*, the fire ant *Solenopsis geminata* and the little fire ant *Wasmannia auropunctata*. Apart from *P. fallax* and *P. jelskii*, these dominant ants are all invasive species with a strong impact on native communities since we found a quadratic relationship between the abundance of these dominant ants and the diversity of ant communities in banana agrosystem. However, we evidenced the existence of a negative correlation between the abundance of these dominant ants and the abundance of the major banana pest, the banana weevil *Cosmopolites sordidus*, suggesting their implication in the regulation of this pest. Similarly, we demonstrated that the dermaptera *E. carai-bea* was a predator of the banana weevil, targeting more probably the egg and larval stages of the pest. Yet, we did not found a positive effect of vegetal diversity on predator abundances, probably because highly-perturbed agroecosystems favor these dominant species. We even found a negative relationship between the abundance of *E. carai-bea* and the presence of a cover crop in the banana agrosystems, leading to a lower regulation of damages of banana weevil larvae on the banana rhizome.



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ABSTRACTS

Preliminary results reporting the presence of the exotic swimming crab *Charybdis hellerii* (A. Milne Edwards, 1867) on the coast of the Martinique, French Lesser Antilles (Crustacea, Portunidae)

Romain Ferry^{1,2}, Joseph Poupin³, Yan Buske⁴ and Juliette Smith¹

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³ *Institut de Recherche, Ecole navale et groupe des écoles du Poulmic, CC 600, 29240 Brest Cedex 9, France, joseph.poupin@ecole-navale.fr*

⁴ *Association Flabellina, Résidence Les Tuileries, Entrée Romane B27, Rue des Ixoras, 97 229 Anse Mitan, LES TROIS ILETS.*

Abstract

Charybdis hellerii (A. Milne Edwards, 1867), native from the Indo-West Pacific, was introduced in the western Atlantic Ocean in the late 1980s, likely through transport of larvae in ballast water of ships. Although this species has been already recorded in several countries of the western Atlantic, such as Florida, Cuba, Venezuela, Colombia and Brazil, there was still no formal reporting for the Lesser Antilles.

In January 2013 *in situ* observations and collected samples have confirmed for the first time the occurrence of the exotic swimming crab *C. hellerii* in Martinique, French Lesser Antilles. A sampling technique to assess the density of this species is presented with preliminary information on its distribution and preferred substrates. This invasive species seems to spread rapidly around the Island. Its abundance must be regularly monitored in order to measure its impact on marine ecosystems.

Key words: Brachyura, Portunidae, *Charybdis hellerii*, nonindigenous species, invasive species, geographic expansion, Martinique, French Lesser Antilles Island.



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ABSTRACTS

Ecological and evolutionary genomics in the Caribbean: examples from aquatic biodiversity

Etienne BEZAULT¹

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Abstract

The Caribbean region, constituted of the Greater and Lesser Antilles archipelagos, represents a hotspot of biodiversity, due to the high heterogeneity of the islands and ecosystems (including tropical forests, rivers, mangroves, seagrass-beds and reefs) and therefore the diversity of their associated fauna and flora. This island system represents a great natural model to study the dynamics of biodiversity and the underlying ecological and evolutionary mechanisms, especially in the context of colonization, adaptation, and diversification. Nowadays we have unprecedented capacity to bridge and analyze large-scale ecological and genetic data, even in non-model organisms, to lead to more integrative interpretations. The rise of Ecological and Evolutionary Genomics, with the generalization of molecular marker genotyping and especially the NGS technologies, provides the opportunity to develop genomic-level analysis in non-conventional model organisms (*i.e.* species without previous genome sequenced and/or not being a classical genetic laboratory model) as well as conducting such analysis at individual to population and even community level (*e.g.* overall or targeted genome (re-)sequencing, high density screen for polymorphism, transcriptome & differential expression analysis, meta-genomic & barcoding...). This allows employing genomic approach for studying the organisms constituting the most pertinent models to understand a particular ecological, evolutionary and/or environmental question. Caribbean aquatic fauna exhibits some extremely interesting organisms to study the dynamics of biodiversity, as taken from ongoing and prospective projects from our lab. Far from replacing more traditional ecological approaches, the development of genomics should be conducted complementarily in an environmental, Biodiversity conservation and management context.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Tales of Invasion and Evolution: Cane Toads and Their Parasites

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Abstract

Invasive species are a major threat to biodiversity, ranking second only to habitat loss in this respect. The mechanisms by which their impacts are exerted are diverse and encompass competition with native species, modified predator-prey dynamics, and altered parasite and pathogen communities, including the spread of emerging diseases. While substantial effort has focused on evaluating the impacts of invasive species, less is known about what drives their success and how the parasites and pathogens they contain influence the health of native and introduced populations. The “enemy release hypothesis” (ERH), has been proposed to explain how release from native competitors, predators, and parasites facilitates success in a new environment. The role of parasites in regulating or diminishing wildlife health is becoming more apparent. However, the ERH remains to be fully tested, particularly in invasive vertebrates. The invasive cane toad, *Rhinella marina*, previously *Bufo marinus*, is a toxic amphibian native to Central and South America but has been introduced around the globe. Because of its extensive invasion history, unparalleled documentation of introductions, high population densities, and status as a model species for amphibian research, the cane toad provides an ideal system in which to test the impacts of parasites and diseases on the fitness of invasive species. Translocations of small numbers of animals from their native range to successive new ranges creates a series of bottlenecks whereby parasite and host immunogenetic diversity may be sequentially reduced as the introduced species gets further removed from its native range. Parasite release may directly benefit introduced species due to a physical absence of parasites affording an immediate fitness benefit to uninfected individuals. However, when parasites catch up with their hosts, opportunities for disease outbreaks can occur. My research investigates the influence of parasitic nematodes on cane toad health throughout an ongoing invasion. Further, I investigated the parasite life history traits that facilitate the simultaneous invasion of a parasitic nematode. This research will enhance our understanding of the factors that facilitate species invasions (both freelifing and parasitic) and the role of parasites in regulating wildlife health.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Animal invasive species in the Antilles: Conserving species and sites of International Importance in the Caribbean UK Overseas Territories

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Abstract

Invasive Alien Species (IAS) have been identified as one of the leading threats to global biodiversity recognized under the Convention on Biological Diversity (Article 8(h)). The International Union for Conservation of Nature, (IUCN) describes invasive species as “animals, plants or other organisms introduced by man into places out of their natural range of distribution, where they become established and disperse, generating a negative impact on the local ecosystem and species.”¹ IAS have had significant negative impact on human health, the economy and native ecosystems. The key pathways for IAS transmission i.e. Trade, Transport, Travel and Tourism –are significant to the Caribbean. Common characteristics of IAS include rapid reproduction and growth, high dispersal ability, phenotypic plasticity, and ability to survive on various food types in a wide range of environmental conditions.²

IAS impacts have been particularly significant for small islands globally including those of the UK Overseas Territories (UKOTs), therefore efforts at management of them have become mainstream conservation objectives. It is out of this impact that the study, “*Prioritizing islands for the eradication of invasive vertebrates in the United Kingdom overseas territories*” (Dawson. J. *et al*, 2014)³ was undertaken to determine strategic importance in the allocation of limited resources to achieve maximum conservation benefit. A total of 2,499 islands were included in the analysis and 85 invasive terrestrial vertebrates were found. Sixty six of the affected species are unique only to the UKOTs. The study identified offshore islands and cays of Anguilla, British Virgin Islands, Cayman Islands and Turks & Caicos Islands as important.

¹ http://www.issg.org/is_what_are_they.htm

² CABI. 2010. In a NutShell- Invasion of Alien Species”

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The RSPB recently completed a three year project entitled *Conserving Species and Sites of International Importance by the Eradication of Invasive Alien Species in the Caribbean UK Overseas Territories* funded by the *BEST Instrument*⁴. This project sought to develop capacity in the Caribbean UKOTs to manage IAS. The work was led by the RSPB in partnership with the National Parks Trust of the Virgin Islands (NPTVI), Jost Van Dyke Preservation Society (JVDPS), Anguilla National Trust (ANT), Department of the Environment (DOE) Montserrat, Turks and Caicos National Trust (TCNT), National Trust for the Cayman Islands (NTCI).

⁴ *The voluntary scheme for Biodiversity and Ecosystem Services in Territories of the EU Outermost Regions and Overseas Countries and Territories (BEST Initiative). BEST seeks to promote the conservation of biodiversity and the sustainable use of ecosystem services including ecosystem-based approaches to climate change adaptation and mitigation in the EU outermost regions and overseas countries and territories.*



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Primates Tracking Primates: Spatial ecology and zoonotic disease epidemiology of St. Kitts African Green monkeys

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Abstract

African Green monkeys (AGM) have inhabited the island of St. Kitts for nearly 400 years. They were imported into St. Kitts from Western Africa as a result of the slave trade sometime in the 1600's (McGuire 1974, Sade and Hildrech 1965). At about the same time, AGM were also introduced to Nevis and Barbados. Recent reports have demonstrated that AGM territory is expanding, and they now occupy other Caribbean islands including St. Maarten and Tortola. Presumably these monkeys have landed on these islands as a result of illegal trade by boat. On St. Kitts the population of AGM has thrived as they are highly adaptable and have no natural predators. It is believed by the local residents that the AGM outnumber the human population (>45,000); however conclusive studies on the population have not been performed. In St. Kitts, AGM are considered a pest species, and are responsible for significant garden and agricultural crop damage. There are abundant opportunities for humans to come in contact with these monkeys and potentially be exposed to their pathogens. This may occur due to peridomestic living between monkeys and people, the trapping of monkeys for the two local biomedical research facilities, and the use of captive AGM in the tourist industry. Due to the proximity in genetic makeup between the two species as well as the closeness of spatial habitat, AGM could pose a public health risk to the inhabitants and tourists of St. Kitts and other Caribbean islands.

Recent studies in St. Kitts have been performed to evaluate the spatial ecology and enteric viruses and parasites of the AGM. GPS/GMS tracking was used to gather data on different troops across the island's diverse habitats (peninsula scrubland, villages, and farmland). Studies on the rainforest habitat is planned, but has not begun. Data regarding AGM range, daily patterns of movement, and troop size were collected. The objective of the GPS tracking is to determine the current AGM population in St. Kitts and to document where and how frequently AGM habitats overlap with human ones, particularly food crops and water reservoirs. Fecal samples from GPS/GMS tracked, trapped, and captive AGM used in research and tourism were tested for potential zoonotic diseases. One sample (of 200) indicated that atypical rotaviruses might exist in the population. RNA-PAGE and subsequent RT-PCR confirmed the presence of picobirnaviruses in 15/265 samples. Both virus types have been rarely reported in simians and represent novel findings in the Caribbean. The zoonotic parasite, *Trichuris trichiura* was found in greater than 95% of all samples tested. Other zoonotic parasites seen in the feces include: *Giardia sp.*, hookworms, *Strongyloides sp.* and cestodes.



It has become increasingly apparent that this invasive species is problematic for agriculture as well as public health. It underscores the importance of implementing a transdisciplinary One Health approach in the mitigation of this wildlife species. These studies can be used to inform future policy for the management and control of AGM in St. Kitts and other Caribbean islands the monkeys now inhabit.

Literature Cited:

McGuire, M.T. 1974. The St. Kitts Vervet. New York: Karger.

Sade, D.S. and Hildrech, R.W. 1965. Notes on the green monkey (*Cercopithecus aethiops sabaesus*) on St. Kitts, West Indies. Caribbean Journal of Science 5: 67-81.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Island extinctions and invasions of terrestrial vertebrates since 5000 years: archaeozoological advance in the French West Indies

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Abstract

The invasive species on the islands and the decrease of the biodiversity are two main preoccupations in the Caribbean since the second half of the XXth century. Most of the studies take into account the allochthonous species. However, the sub fossil bones, as the last witnesses of the past biodiversity, illustrate mechanisms of biodiversity evolution under human pressure and through several waves of human migration since 5000 years BP. These include natural colonisations, intentional or chance introductions, extinctions or disappearances (often the endemic species) due to human activities (hunting and gathering, but also deforestation and other anthropogenic effects on the environment).

This presentation brings together results from zooarchaeological studies realized on three Caribbean islands: Saint-Martin, Guadeloupe and Martinique. It presents data on terrestrial vertebrate (mammals, birds, squamates, chelonians, and amphibians) replacement and translocation since 3000 years, in relation to human activities in insular environments during the Holocene.

The results show that within the large original diversity at the scale of the region, there is a partial turnover of the taxa surrounded by each human colonisation. Everywhere, at the island scale, human intervention causes an over-saturation of the specific richness curve in regard to the MacArthur and Wilson model, because of the numerous species introduced during each migration. However, in parallel there is a massive extinction of the indigenous and endemic species. At the scale of the archipelago, the globalization introduced everywhere the same lot of species for food, commercial, biological control, games, or pets. Consequently, this fact induced the normalisation of the species diversity.

Finally, from the 32 mammal subfossil species (27 bats, 3 rodents, 1 manatee and 1 seal) occurring at the end of the Pleistocene / beginning of the Holocene and during the pre-Columbian time, only 13 species are still alive on these islands. Within the Chiroptera order, the diversity of sub-fossil bats indicates that at least 14 taxa are now extinct or disappeared, while representatives of the genus or species still exist in the Mesoamerican and Amazonian areas.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

The Giant African Snail and other Invasive Molluscs in the Caribbean

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Abstract

The spread of the giant African snail (GAS), *Lissachatina fulica* (Bowdich) within the Caribbean highlighted the risks that invasive molluscs pose to the region. This snail was first reported from Guadeloupe in 1984 but is now present in a number of other Caribbean islands including Barbados, St. Lucia, Antigua, and Dominica and also on mainland USA in Miami, Florida. Responses by Caribbean governments to the growing spread of *L. fulica* included public awareness campaigns as well as technical workshops targeted towards plant health inspectors and customs officers. These workshops were sponsored by USDA, IICA and FAO and facilitated by the Ministries responsible for Agriculture in the countries in which the workshops were held. In 2008, at their first meeting the Caribbean Plant Health Directors (CPHD) agreed to establish a Technical Working Group on the giant African snail, the mandate of which was to report to the CPHD on issues relating to control, management and biology of the snail. Strategies used against GAS in the region included manual collection and destruction of snails and the use of molluscicides, primarily metaldehyde but also iron phosphate-based baits. In Barbados a bounty on giant African snails was implemented in 2009 that to date has resulted in the destruction of just over 400 tons of these snails. These strategies contributed an indirect economic cost in addition to direct economic losses incurred due to crop damage. There was also an indirect cost in terms of loss of biodiversity as widespread use of molluscicides also killed endemic and native snails such as *Pleurodonte isabella* (Férussac) and *Bulimulus guadalupensis* (Bruguère). Within the region crop damage attributed to *L. fulica*, an opportunistic polyphagous pest, includes removal of the epidermis from stems of citrus, damage to the seedlings of beans, cabbage, pumpkin and sweet pepper, to blossoms and fruit of papaya and pumpkin, and to the leaves and young shoots of sea island cotton (*Gossypium barbadense*). The giant African snail also threatens public health as it can vector the rat lungworm, *Angiostrongylus cantonensis*, a nematode parasite that can cause cerebral angiostrongyliasis in humans. Other invasive molluscs of concern in the region include the snail *Zachrysis provisoria* (Pfeiffer), and the veronicellid slug *Veronicella sloanii* (Cuvier). *Z. provisoria* is native to Cuba while *V. sloanii* is believed to be native to Jamaica but both have been introduced to other islands in the region, where they are known to damage to leaves of garden plants and bark plant cuttings in plant nurseries. The aquatic snail *Pomacea canaliculata* (Lamarck), a pest of rice, is another invasive snail in the region that needs to be monitored. Both *Z. provisoria* and *P. canaliculata* are also vectors of the rat lungworm.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Ecology and conservation of the white-breasted thrasher (*Ramphocinclus brachyurus*) in Martinique

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Abstract

The White-breasted Thrasher (*Ramphocinclus brachyurus*) is a Caribbean-endemic bird species found only in the Lesser Antillean islands of Martinique and Saint Lucia. The population of the Martinique subspecies (*R. brachyurus brachyurus*) is restricted to the tip of the Caravelle peninsula, on a small territory. Once widespread throughout the island, the species was on the verge of extinction in the 1950s but managed to recover. Although, the creation of the Caravelle Nature Reserve in 1976 contributed to the protection of its habitat, the factors behind the slow population growth registered in the past decades and the present status of the population remain poorly documented. In particular, little is known about the influence of habitat fragmentation on social behaviour during reproduction and the health status of individuals.

Here we present a new research project on the population biology of the White-breasted Thrasher, focusing on spatial variation in nest-site selection, body condition, infection with blood parasites and vigilance behaviour while foraging (as a measure of stress and anxiety). We discuss the importance of data acquisition for the future management of the species in Martinique.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Ecology and conservation of Audubon's shearwater (*Puffinus lherminieri lherminieri*) from the nature reserve of Sainte-Anne islet (Martinique)

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Abstract

Management of declining seabird populations requires specific demographic diagnostics to monitor population trends, and to assess the effectiveness of the conservation actions undertaken.

Moreover, we know that marine conditions will further impact the survival of seabirds and that a thorough knowledge of their feeding areas and their feeding behavior are essential to the efficient management of this group of birds. In our study, we looked at the Audubon's shearwater colony considered threatened in the Caribbean but the demographic status was not known for the colony of the natural reserve of Sainte-Anne islets (Martinique). The general objective of this study was to respond to the concerns of managers for this poorly studied species. It first consisted in identifying key demographic parameters for the colony (survival by age, reproductive success, growth rates), evaluating the factors that influence population dynamics and the effectiveness of conservation actions implemented on the site. This demographic diagnosis showed that the population has experienced a slight phase of decline and then fairly significant growth in recent years, corresponding to a period where the rats were exterminated and the monitoring of colony reduced in order to limit the disturbance. However, the main factor explaining the increased population was the improved marine conditions favoring greater availability of prey, especially outside reproduction. The increase in adult survival, main parameter affecting the growth of the population, was then mostly explained by a positive effect of ocean surface water temperature variations (SST) out of reproduction and a positive effect the Amazon flow with a lag of one year. Secondly, this study allowed us to bring new knowledge on the ecology of the species in order to better understand the interactions between individuals and their environment, especially the marine environment for these pelagic species spending most of their time at sea. This has revealed that the Audubon's shearwater from Martinique has sedentary behavior with very limited regional distribution and the Lesser Antilles near the northern coast of South America. Its food niche is under the strong influence of riverine inputs of the Amazon and Orinoco, low salinity and high SST environments. The demographic diagnosis helped to highlight the positive impact of the establishment of the reserve and management actions. In addition, the foraging areas of Audubon's Shearwater from Martinique differ



from that of the Bahamas and this suggests a double management issue for the Caribbean subspecies in the Lesser Antilles and the Greater Antilles.

This new knowledge will help in guiding conservation action in the future but also emphasises the need to clarify the taxonomy of this species throughout the Caribbean, to better understand the population dynamics and to more accurately evaluate its threats at sea.

Keywords: population dynamics ; foraging ecology ; conservation ; Audubon's shearwater ; nature reserve of Sainte-Anne islet ; Martinique ; Amazon.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Population dynamics and behavioural ecology of the Zenaida Dove, *Zenaida aurita*, on the island of Barbados

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Abstract

Although, historically, long-term population studies of bird species have largely contributed to the development of population biology and behavioural ecology, they mainly concern species living in temperate areas. In contrast, there exists only a few long-term studies of tropical bird species. The Zenaida dove (*Zenaida aurita*) is a tropical columbid species found throughout the Caribbean Islands and the tip of Yucatán. The species shows reduced sexual dimorphism and is socially monogamous, with year-round pair bonding, territoriality and breeding. Here we present results from a long-term study of the Barbados population of Zenaida doves. In particular, we illustrate the importance of variation in body size, body condition and multilocus heterozygosity on social status, pairing patterns, and adult and juvenile survival. We discuss our results in relation to the conservation and management of the species.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Phylogeography and genetic differentiation between *Loxigilla noctis* and *L. barbadensis* in the Lesser Antilles

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Abstract

There exist today three distinct species of Antillean Bullfinches (genus *Loxigilla*): the Puerto Rican Bullfinch (*L. portoricensis*), the Greater Antillean Bullfinch (*L. violacea*), and the Lesser Antillean Bullfinch, (*Loxigilla noctis*), whereas the Saint Kitts Bullfinch, *L. portoricensis grandis* went extinct probably towards the end of the 19th century. Male Antillean Bullfinches are typically jet black with, depending on species, a variable amount of red on the throat, chin, eyebrows and undertail coverts. Females, on the other hand, show either a duller black or a brownish-olive and grey plumage, with little red. Variation in male coloration can also be observed between populations of the same species and, for instance, not less than nine subspecies of the Lesser Antillean bullfinch have been recognized on the basis of male plumage. However, one of them, *L. noctis barbadensis*, differs markedly from all the others by the total absence of sexual dichromatism. On the basis of some genetical and behavioural evidence, it has been recently recommended to consider the Barbados population of Lesser Antillean bullfinches as a separate species (Buckley & Buckley 2004). However the empirical evidence in favour of a reconsideration of the taxonomic status of *L. noctis barbadensis* remains limited. In particular, the occasional occurrences of partially or wholly black male bullfinches on Barbados suggests the presence in the population of immigrants from St Lucia or St Vincent. Alternatively, residual ancestral variation might be maintained within *barbadensis*. Here, using a panel of microsatellite markers specifically developed for *Loxigilla* (Arranz et al. 2012) and mitochondrial DNA, we examine the extent of genetic divergence between *L. barbadensis* and three different populations of *L. noctis* originating from Guadeloupe, Martinique and St. Lucia. In addition we provide information of the likely origin of black male bullfinch recently caught in Barbados. We discuss our results in relation to the taxonomic status of the Barbados population of Lesser Antillean bullfinches and the evolution of sexual dichromatism.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Differences in the ecomorphological relationships between mainland and island *Anolis* lizards

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Abstract

Over the past decades, *Anolis* lizards have become a model for the study of convergence and adaptive radiations due to the manyfold radiation of species with similar morphologies in ecological similar niches. However, *Anolis* lizards have radiated extensively on the mainland of Central and South America with over half of the 400+ known species being found in continental settings. Recent analyses of ecomorphological relationships have shown that mainland and island species differ considerably. For example, for a given limb length Caribbean anoles run faster than their mainland counterparts. Conversely, for a given head dimension mainland anoles bite harder than Caribbean anoles do. These differences are thought to be due to differences in predation pressure on islands versus mainland ecosystems. Here we present data on muscle anatomy, performance, ecology, and behavior for over 50 species of *Anolis* and demonstrate that differences in performance are not due to differences in muscle properties, but rather in the size and shape of the skeletal elements. Caribbean anoles are however different from mainland anoles in their behavior, especially in males. Not only do male Caribbean anoles display more than do mainland anoles, they also move more. Moreover, sexual dimorphism in overall movement patterns observed in Caribbean anoles is not observed on the mainland where both sexes move little. Finally, significant differences in escape behavior are also observed between mainland and Caribbean anoles with mainland anoles relying more on crypsis than on flight. These results are in accordance with the idea of a higher predation pressure in mainland ecosystems and may explain the striking divergence in ecomorphological relationships between both radiations.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

What bones tell us - 5 000 years of Human impact on lizards from the Guadeloupe islands

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Abstract

A consensus now exists concerning the existence of an ongoing mass extinction crisis affecting all organisms due to human impact on the biosphere. However, quantifying the effect of such a crisis on terrestrial vertebrates can sometimes be problematic in the case of extinctions or morphological modifications that had occurred on unknown taxa. Such phenomena are frequent on islands because of the vulnerability of their endemic biotas that are often quickly eliminated by human habitat destruction and introduction of exogenous competitors and predators. The only solution to obtain information about extinct faunas is therefore to search for subfossil deposits containing osteological material, the last remaining evidence of their original condition.

This study focused on the subfossil lizards from the Guadeloupe archipelago. This archipelago is composed of six main islands from which 30 sub-fossil deposits containing non-ophidian squamate remains are studied. These deposits were both pre-Columbian human accumulations of consumed lizards and cave deposits mainly created by accumulation of regurgitated prey made by raptors, dated from the Late Pleistocene (30 000 B.P.) up to present. The goal of this work was to analyze the evolution of lizard species over time on these islands and investigate the impact of pre-Columbian (between 3000 BC and 1492 AD) and later European human populations on this fauna. To achieve this goal and to extract information from bones we used comparative anatomy, classic morphometrics and geometric morphometrics.

This communication will especially focus on the iguanas (*Iguana delicatissima* and *Iguana iguana*) and Marie-Galante anole (*Anolis ferreus*) before presenting a synthesis concerning all the lizards occurring in Guadeloupe fossil record. The main results concerning the iguanas are about the possible introduced status of *I. delicatissima* in Guadeloupe and the absence of *I. iguana* in all the



studied deposits, confirming the modern introduction of the later species. We also shed light on an impressive size diminution of *I. delicatissima* in Guadeloupe between pre-Columbian and modern times since past iguanas were about 20% longer in the same islands. Concerning Marie-Galante anoles, we observed a possible extinction of a distinct population of large specimens exceeding the size of the largest modern *Anolis ferreus*, and an apparent size stability of the main population of *Anolis ferreus* from Late Pleistocene until now. We also falsify the hypothesis of the possible past occurrence of a second anole species on Marie-Galante. In a more global way, we demonstrate that Guadeloupe lizards underwent a specific extinction rate between 50 and 60% during the last 300 years with the local extinction of three genera occurring in some (*Diploglossus* on Basse-Terre and Grande-Terre islands) or all (*Ameiva*, *Leiocephalus*) islands across the Holocene. Our results clearly indicate that further work on fossil fauna in the Lesser Antilles would be required for a better understanding of historical human impact on these faunas.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Histopathological survey of late stage embryonal mortality in leatherback sea turtles (*Demochelys coriacea*) in St Kitts, West Indies

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Abstract

Critically endangered leatherback sea turtles (*Demochelys coriacea*) have a low global hatch success of 50%, hence, protection of eggs and successful hatching are critical for population recovery. The aim of our research is to identify factors associated with embryonic death. In St. Kitts, hatch success typically averages from 5-10%. The Caribbean, as a whole, has a 49.14% success rate, based on studies conducted in Tobago, Costa Rica, and St. Croix, indicating St Kitts' success well below average. In St. Kitts, the majority of unhatched embryos in St Kitts are in an early stage of development, and around 15-20% are in a late stage of development. In 2015, postmortem examinations were performed on twenty late stage embryos and 3 hatchlings collected from 10 nests, representative of the two main nesting beaches in St Kitts. Occasionally embryos were observed to have miliary white nodular foci in the lungs. Otherwise, no gross abnormalities were observed. Histopathological evaluation revealed pneumonia affecting the majority of late stage embryos across both beaches. Pneumonia ranged from mild to severe, was predominately heterophilic, although there were cases with heterophilic granulomas, and the pattern varied from interstitial (n=19, 82.6%) to bronchopneumonia (n=4, 17.4%). All bronchopneumonia cases contained intralesional bacteria. Aerobic and anaerobic cultures failed to identify a predominant isolate. Factors predisposing to fetal bacterial pneumonia could include maternal flora, putrefaction of the nest environment, abnormal development of the fetal immune system, immunosuppression due to pollutant exposure, and primary viral infection. Further study is warranted to determine the impact of pneumonia on hatch success in Leatherbacks in the wider Caribbean region.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

The PACOTILLES campaign: patterns of marine diversity and connectivity in Lesser Antilles

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² *Écologie marine tropicale des océans Pacifique et Indien (ENTROPIE) IRD / CNRS / Université de la Réunion.*

Abstract

Coral reef ecosystems are unique high diversity ecosystems greatly valuable for the planet because of the goods and services they provide. However, these ecosystems are threatened by a variety of natural and anthropogenic disturbances. Since several decades, Caribbean marine ecosystems show signs of alteration. Coral reefs cover has decreased considerably (estimated 80% reduction) over the past 30 years, with a dramatic decline in coral populations of the genus *Acropora*. This massive decline is described as a unique event in the ecological history of these species. In the meantime, there is still a lack of knowledge regarding the species diversity of several important taxonomic groups, such as macroalgae or sponges which can dominate in terms of biomass and diversity numerous assemblages, thus shaping, together with corals, the Caribbean sea-scape.

In this context, the PACOTILLES campaign aimed at filling the gaps of knowledge in coral, algal and sponge biodiversity in the Lesser Antilles. Considering the fragmentation and geographical isolation of the Caribbean Arc, it appeared crucial to estimate connectivity between reefs/islands of the Lesser Antilles and to evaluate the role of this connectivity in the maintenance of species and ecological functions in order to provide guidelines for protecting and managing marine biodiversity and resources. Our main goal is to understand the evolutionary connectivity among the fragmented islands and reefs of Lesser Antilles, through the estimation of species and genetic diversities within each island/reef.

The campaign PACOTILLES took place between April and June 2015 across eleven islands of the Lesser Antilles and consisted of two trips. The first focused on the study of biodiversity and population connectivity of species known as generalist of fringing reefs, while the second was dedicated to the study of biodiversity and population connectivity of species typical of underwater caves of the Lesser Antilles.



Using three main stands representative of the benthic compartment (corals, sponges and macroalgae, whose functions differ in the ecosystem and are indicators of the health of coral reefs), the objectives of PACOTILLES were for each taxonomic group:

- to establish a taxonomic inventory throughout the eleven islands where knowledge remains patchy or non-existent,
- to estimate the cryptic diversity through integrative taxonomy (combining morphologic, genetic and metabolomic data),
- to complete the population sampling already available in some sites in the Caribbean for genetic analysis of population connectivity and evaluate multi-scales populations genetic diversity and structure among sites for these species,
- to contribute to the identification of endemic areas through different methods of biogeographic analyzes.

The biological material is presently being worked in the framework of several PhD thesis and collaborative scientific projects, so we here present only preliminary data obtained on coral connectivity, on the status of the red alga *Asparagopsis* and several new sponge species.



First Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

État des lieux de la biodiversité animale et de la faune sauvage en Haïti

Current Situation of Animal Biodiversity and Wildlife in Haiti

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Résumé

Quand Christophe Colomb débarqua dans l'île d'Haïti en 1492, il la décrivit comme un "paradis sur terre". L'histoire géologique de l'île, son relief très accidenté et la variabilité de sa température et de ses précipitations ont en effet conduit à la création d'une multitude de micro climats. Il en a résulté une grande biodiversité animale et végétale contenant un nombre élevé d'espèces endémiques et séparées en raison de leur isolement et adaptation à des environnements spécifiques. L'introduction des animaux domestiques comme les chiens, les chats, les rats, les chevaux, les bœufs et les cabris par les amérindiens, les espagnols et les français, la chasse des animaux sauvages ainsi que la longue et persistante déforestation ont contribué à une réduction significative des espèces sauvages de la flore et de la faune du pays. Dans le règne animal, des 25 mammifères terrestres et endémiques, seulement 2 existent aujourd'hui et sont en voie de disparition: le nez long *Solenodon paradoxus* et le zagouti *Plagiodontia aedium*. Un autre mammifère marin, le lamentin *Trichechus manatus* survit encore au large des côtes d'Haïti, mais en nombre restreint et n'est observé qu'occasionnellement. L'avifaune comprend quelque 229 espèces dont 75 sont résidentes incluant plus de 30 espèces endémiques parmi lesquelles une est unique à Haïti: le tangara à 4 yeux *Phaenicophilus poliocephalus* et 45 espèces sont aussi rares ou menacées. De plus, Haïti est un sanctuaire hivernal pour plusieurs centaines d'espèces d'oiseaux migrateurs de l'Amérique du Nord. Une grande population d'herpétofaune (reptiles et amphibiens) est aussi endémique à Haïti incluant plusieurs couleuvres inhabituels et d'autres serpents. Le crocodile américain *Crocodylus acutus* y est également présent: l'Étang Saumâtre, le plus grand lac naturel d'Haïti, ayant hébergé la plus grande population actuelle. Les ressources halieutiques des eaux néritiques et du plateau continental sous-jacent sont surpêchées, tandis que celles du talus sont plutôt peu accessibles, mal connues, mais potentiellement riches et peu exploitées. Les grands pélagiques océaniques offrent également des possibilités d'exploitation non négligeables. Par contre, certains poissons exotiques dont des espèces très envahissantes comme les *Tilapias sp*, introduits dans les eaux continentales, semblent occuper les niches écologiques de plusieurs espèces indigènes actuellement disparues, menacées ou en populations réduites. Comme effort de conservation, il a été procédé à la création de trois parcs nationaux au niveau terrestre: le premier en 1961 et les 2 suivants en 1983. En outre, quatre sites ont été aussi désignés en 1985 pour faire objet d'aires marines protégées sans aucune suite jusqu'à date. Il existe également quelques groupements associatifs de la société civile œuvrant dans la



protection et la conservation de la flore et de la faune en Haïti. Plusieurs lois relatives à l'environnement et à la protection des ressources naturelles ont également été promulguées, sans application effective. Enfin, Haïti fait face à une carence marquée en ressources humaines qualifiées et en institutions d'enseignement spécialisé dans le domaine de la gestion de la biodiversité animale et de la faune sauvage.

Abstract

When Christopher Columbus landed in Haiti in 1492, he described it as an "earthly paradise". Haiti's geologic history, its varied topography and variability of temperature and precipitation have created many eco-zones. As a result, a great biodiversity of animals and plants occurred, including a high number of endemic and separated species due to the isolation and adaptation to specific environments. The introduction of domestic animals such as dogs, cats, rats, cattle and goats by the Amerindians, Spanish and French, the hunting of wild animals and the long standing deforestation of Haiti's wildlands have contributed to a significant decrease of Haiti's wildlife. In the animal kingdom, of the 25 endemic land mammals once found, only 2 remain: *Solenodon paradoxus* and *Plagiodontia aedium*, and are threatened with extinction. Another marine mammal, the manatee *Trichechus manatus* still survives off the coasts of Haiti, but is now reduced in numbers and only occasionally observed. The avifauna accounts for some 229 species of which 75 are residents, including more than 30 endemic species with one: the black-crowned palm tanager *Phaenicophilus poliocephalus* unique to Haiti, and 45 species are also rare or threatened. In addition, Haiti is a winter home for hundreds of North America's migratory bird species. A great herpetofauna population (reptiles and amphibians) is also endemic to Haiti, including many unusual boas and other snakes. The american crocodile *Crocodylus acutus* is also present: the largest current population being niched in "Etang Saumâtre", the biggest natural and brackish-water lake of Haiti. The marine resources in neritic waters and the underlying continental shelf are overfished, while those of the continental slope are rather less accessible, not well-known, but potentially well-provided and underexploited. Highly migratory large pelagic fishes also offer significant opportunities for exploitation. Contrarily, some exotic fishes of which highly invasive species as *Tilapia sp.* introduced in inland waters, seem to take over the ecological niches of many native species now extinct, threatened or in reduced populations. As a conservative strategy, three terrestrial national parks were created: the first one in 1961 and the two others in 1983. Moreover, four sites were designated as a potential for marine protected areas in 1985, but no related follow-up has been carried out so far. There are also a couple of associative groups of the civil society involved in flora/fauna protection and conservation in Haiti. Several environmental related laws have been also enacted for natural resources protection without any effective enforcement. Finally, Haiti faces a marked lack of qualified human resources and specialized educational institutions in the field of animal biodiversity and wildlife management.





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ABSTRACTS

How big are your parrotfish? The value of simple size-based parrotfish metrics for coral reef management

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Abstract

Overfishing remains one of the most important and pervasive local stressors on Caribbean coral reefs and it can impair key ecological functions of reef fishes. Thus, in light of the worrisome trends of coral loss over the last decades, there is great need to develop simple indicators of the state of key ecological components of the coral reef ecosystem that are affected by fishing. Parrotfishes are a ubiquitous family of herbivore fishes of diverse body size, which play a key role as algal grazers in coral reefs, thus helping corals compete with algae for space. They are also heavily fished across the Caribbean region. In this communication, I review recent evidence supporting the value of simple size-based metrics derived from parrotfish assemblages as indicators for ecosystem-based fisheries management in the Caribbean. I first present two lines of evidence demonstrating a strong association between assemblage-level parrotfish body size and fishing pressure across a range of spatial-scales. Then, I provide evidence that assemblage-level parrotfish metrics uniquely allow for comparisons of trends derived using fundamentally different sampling methods. Finally, I present evidence of the existence of explicit reference points in assemblage-level parrotfish body size to help guide fisheries management on coral reefs across the Caribbean region.



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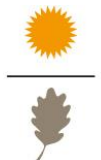
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