



BOOK OF ABSTRACTS

Second Caribaea Initiative Research and Conservation Workshop

**In association with Ross University School of Veterinary Medicine (RUSVM)
and the RTPI CNRS-INEE “Caraibes”**



Wednesday, May 31 - Saturday, June 03 2017
Marriott Resort
Frigate Bay, St Kitts





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ABSTRACTS

First steps in the study of demography of the lizard *Anolis homolechis* in contrasting habitats of West Cuba

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Abstract

The study of the dynamics of natural populations is essential for the conservation, sustainable use, regulation and for the understanding of the evolution of the species. The lizard *Anolis homolechis* is a common Cuban endemic species, widely distributed on the island. Because there is a lack of information about the biology of the populations of this species, we proposed to investigate the effect of biotic and abiotic factors on the spatial and temporal variations of the size, structure and growth of some of its most contrasting populations. Using a capture-marking-recapture method, we will be able to compare three populations of a conserved habitat in the natural reserve Sierra del Rosario with three populations of suburban areas of the Havana City, as a sample of a damaged area. Even if there is a large literature about demography in lizards around the world, few studies have detailed the ecological factors that determine the dynamics of lizards' populations by comparing populations of the same species. Since the beginning of the PhD thesis, in January 2017, a working group has been organized to select localities for monitoring lizard populations. We still have started to mark individuals in some of these localities.



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ABSTRACTS

Contribution to the assessment of the specific diversity of benthic macrofauna of aquatic ecosystems of Haiti in a conservation perspective

Chévelie CINEAS

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Abstract

Although the taxonomic diversity and the abundance of benthic macroinvertebrates are two major bioindicators of the quality of freshwater ecosystems, little is known about spatial variation in freshwater macroinvertebrates assemblages in Haiti. Still, the country has a very dense hydrographic network, with more than 158 rivers and 70 stagnant bodies of water. In this context, we introduce a new study project aimed at assessing the specific diversity of the benthic macrofauna of the aquatic ecosystems of Haiti. To that end, 12 water bodies (6 rivers and 6 stagnant water bodies) located in different geographical locations will be sampled according to the XP T 90-333 norm (AFNOR). Large and deep watercourses will be discarded because of their difficult access and logistic constraints. After sampling, the specimens will be fixed in alcohol (95°), sorted out, and identified at the species or family levels in the laboratory, using morphological characters. Molecular identification will be conducted for unidentified specimens. At the time of sampling at each station, physico-chemical parameters such as substrate nature, flow velocity, depth, pH, turbidity, conductivity, MES, DCO, DBO5 will be recorded. This project is intended to last for 3 years (2018-2020). Results will provide starting knowledge about the specific richness of the benthic macrofauna of Haitian aquatic ecosystems, possibly forming the basis for a species determination guide. The influence of physical parameters on species richness and relative abundance will also be assessed.



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Contribution to the study of the white-crowned pigeon in the Caribbean region: *Census and Genetic analysis of the guadeloupean population*

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Abstract

The White-crowned pigeon (WCP), *Patagioenas leucocephala*, is a Caribbean-endemic columbid species of both patrimonial and cynegetic interest. This species is currently classified as “near threatened” in the IUCN red list, whereas it is considered as “Endangered” in Guadeloupe since 2012. In 2016, it has been added in the 3rd appendix list of the SPAW protocol of the Carthage Convention. This implies for the participant countries to take conservation actions in favour of the listed species.

Despite a decrease of abundance at the scale of Caribbean region, the WCP has been more and more frequently observed by ornithologists in Guadeloupe over the last 3 years, suggesting an increase in local population size. In this respect, it seems important to study the status of this species in Guadeloupe, but also across the entire Caribbean region. My research project aims at establishing a census method for this species in Guadeloupe and at studying both population dynamics and genetic diversity from the local island scale to the scale of the Caribbean region, combining field and molecular ecology methods. We first estimated the abundance of WCP using two detection methods: the “passive method”, consisting in detecting birds from their spontaneous vocalizations or other behaviours betraying their localisation, and the “call-broadcast method”, consisting in broadcasting vocalizations of this species in order to induce behavioural responses, especially by males, through vocalization or other behavioural responses. In addition, through genetic analyses from mitochondrial genes, we are aiming at estimating the diversity and structure of the Guadeloupean population of white-crowned pigeons, as well as the origin and movement of individuals among population at the scale of Caribbean region.



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ABSTRACTS

The role of green zones as a refuge for wildlife in the urban environment: the case of the Martissant Park in Port-au-Prince, Haïti

Jean-Marry Exantus

Caribaea Initiative, Port-au-Prince, Haïti

Abstract

Since the Rio Convention, adopted in 1992, the principle of maintaining biodiversity has been central to the various conventions and the various principles of sustainable development. However, the role of biodiversity in maintaining ecosystems and providing services to humans is not yet integrated into the collective consciousness. This assertion is particularly relevant in the case of human populations living in urban areas. However, such environments constitute a complex and dynamic mosaic of biotopes, offering multiple habitats to many species of animals and plants, as exemplified by the Martissant Park, one of the few green zones of Port-au-Prince. Located at the southern entrance to the capital of Haïti, the area, that covers about 17 hectares, was declared a public utility by a presidential decree on June 29, 2007 and was recently transformed into a National Urban Park by another presidential decree of April 7, 2017. The purpose of this mainly wooded area is to conserve and develop the natural resources that are there for the benefit of the community, education, tourism and scientific research.

An inventory of the park's vertebrate fauna was recently carried out at different periods of the year according to the biological cycle and the taxonomic groups inventoried. Appropriate materials and methods were used for each group of animals studied, such as active search, sound recording and / or audio stimulation, random walks and trapping. The wildlife of Martissant Park contains a total of 46 species of wildlife, divided into 31 bird species, 10 reptile species, 2 amphibian species, 3 mammal species. Sixteen (16) of the 46 known species in Martissant are endemic to Haïti, 7 species of birds, 7 species of reptiles and 2 species of amphibians. Finally, the Martissant Park is a space of revalorization and requalification of the district of Martissant. It plays environmental, urban and social roles. It maintains the ecological balance while maintaining biological diversity. It is an area of shelter or accommodation of several animal species. To this end, further research and more pragmatic measures should motivate the management and protection of the biodiversity of Martissant Park.



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ABSTRACTS

Do coral-dwelling and sponge-dwelling *Elacatinus prochilos* differ in their ability to perform cognitive tasks?

Kristie Alleyne

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Abstract

Many species of fish are able to use complex cognitive processes to acquire information from other individuals and use them in different social and ecological contexts. However, differences in the ecological context among individuals within the same species can affect their performance under the same experimental conditions. *Elacatinus prochilos* (broadstripe cleaning goby) can be found on two different microhabitats, i.e. corals and sponges, and adopts different feeding strategies depending on whether it lives on corals or sponges. On corals, they are obligate fish cleaners, whereas on sponges they are opportunistic cleaners that predominately feed on sponge-gleaned organisms. This use of different habitats within the same species has resulted in changes in their social environment and may generate differences in an individuals' preference for experimental objects and in their motivation to participate in various cognitive tasks.

The aim of this study was to assess if there are intraspecific differences in preference and motivation between sponge-dwelling and coral-dwelling *E. prochilos* individuals during cognitive tasks. *E. prochilos* from sponges and corals were collected and kept in individual aquaria. For preference determination, gobies from each habitat were randomly assigned to one of two tasks: a spatial task (side preference) and a cue task (pattern preference). In the spatial task, gobies were given the choice of feeding on two different sides of the aquarium (right or left). In contrast, in the cue task, gobies were given the choice of feeding on two plates with different banding patterns (horizontal or vertical). To assess the gobies' motivation to participate in the experiments, the time taken for an individual to leave the holding area and the time taken to contact a plate were recorded. In addition, whether the goby ate from one or both plates after contact was also recorded. Results obtained showed that there were no significant differences in either the preference or the motivation assessments when comparing coral-dwellers and sponge-dwellers. Thus applying this experimental design to compare the cognitive ability between phenotypes should exclude preference and motivation bias.



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ABSTRACTS

Determinants of Habitat use by the Cleaner Goby *Elacatinus prochilos*, in Barbados

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Abstract

The Broad striped goby (*Elacatinus prochilos*), is a facultative cleaner fish common on Caribbean reefs. As a cleaner, it consumes ectoparasites from client fish, thereby contributing to maintain reef fish health. *E. prochilos* is known to occupy both basket sponges and live coral. In basket sponges, they live in large groups characterised by dominance hierarchies, whereas on corals they live as singles or couples. Diet of individuals also differs depending on their habitat, as sponge dwellers consume mainly sponge-gleaned organisms, whereas coral dwellers feed primarily on client fish ectoparasites. Fitness consequences of choosing between corals and sponges and whether there is a preference for either habitat remain unclear. Furthermore, there is great need for basic demographic data on the broad striped goby, including timing and magnitude of settlement peaks, average life span and potential for small-scale movement between coral and sponges. This study seeks to provide a more complete picture of the causes and consequences of choosing between sponges and corals, by monitoring gobies and their habitat use over a year. To obtain information on goby abundance, size structure and distribution, two 60m x 20m plots on a fringing reef on the west coast of Barbados, will be mapped and periodically monitored over a year. To obtain information on habitat use, habitats which are used disproportionately throughout their life span will be identified and characterized and potential ontogenetic shifts (recruits, juveniles and adults) in habitat use will be identified. Finally, to assess the effect of habitat use on fitness, growth rates of tagged individuals will be determined by periodic size measurements as well as by monitoring survivorship and diet; these data will be compared between sponges and corals. Furthermore, these data will be complemented with periodic behavioural observations of focal individuals, to compare conspecific interactions between habitats and evaluate the role of such interaction on fitness. Overall, this study will expand our understanding of the proximate and ultimate drivers of habitat use in a species with flexible life history strategies.



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ABSTRACTS

Post-Biopsy Wound Repair in *Dichocoenia stokesii*

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Abstract

Dichocoenia stokesii is a prevalent coral in the Caribbean. *Dichocoenia stokesii* reach maturity at 3 to 8 years of age and longevity is thought to be greater than 10 years. According to Richardson the populations of *Dichocoenia stokesii* are growing but they are not reproducing; therefore, populations are not maintaining and continue to decline.

Microscopic pathology of boulder hard corals like *Dichocoenia* is typically assessed using histology of a ~3cm core biopsy from the coral colony. Researchers may not use histopathology during field investigations of coral disease because of concern that the biopsy process may be damaging to the colony. Yet, there are few studies which describe wound healing in biopsy sites. It is thought that stressed corals are considered to be less capable of healing, and that biopsy wounds may be subject to predation, or colonization by pathogens or competing organisms. Moreover, histopathologic investigations of coral diseases are limited by our poor understanding of basic coral responses to injury. The aim of this study is to describe the features of wound healing in *Dichocoenia stokesii* and to document the extent to which a biopsy-induced wound typically heals in this species.

The *Dichocoenia stokesii* that were biopsied are located in White House bay, St Kitts. A total of eight biopsies were taken from 7 corals. Core biopsies were performed using a hammer and 2.5cm diameter stainless steel pipe, sharpened at one end. The biopsy sites were then observed on a biweekly basis.

By 2 weeks, most corals had developed a zone of bleaching +/- tissue loss up to .5cm thick around the biopsy wound. 3/7 corals additionally had erosion of the skeleton in these areas, consistent with tissue loss at the wound margins. By 4 weeks, the skeletal wound beds of all corals were filled with sediment and algal growth to varying extents and a fine brown line developed at the tissue interface. The biopsy wound appears to grow up to .5cm in diameter in the 2 weeks' post biopsy, potentially indicating the marginating coral tissue is injured by the technique, although predation may be a contributing factor. Post-biopsy disease or competition have not yet been observed. The brown line of demarcation seen at 4 weeks' post biopsy may represent early regeneration of the coral tissue (coenenchyme). It is unclear if the foreign material which eventually covers exposed skeleton will interfere with or facilitate migration of regenerating coral tissue. Wound sites will be monitored long term for healing success, and histological evaluation of regenerating sites will be pursued.



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ABSTRACTS

Macroscopic pathology of *Orbicella annularis* and *O. faveolata* in St. Kitts

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Abstract

The *Orbicella annularis* complex (*O. annularis*, *O. faveolata* and *O. franksi*) is an important framework group of corals on western Atlantic reefs. It comprises around 15% of all scleractinian corals in St. Kitts and Nevis. There are no detailed reports on the health status of the *O. annularis* complex around St. Kitts, particularly in shallow coastal areas where some of the largest colonies are found. The objective of this study was to systematically describe and categorize the macroscopic pathology and progression of lesions observed in *Orbicella* colonies in St. Kitts. We identified and tagged colonies of *O. annularis* (n=19) and *O. faveolata* (n=29) showing macroscopic lesions on 6 different shallow coastal reefs off St. Kitts. The lesions were categorized according to gross morphology including focal chronic tissue loss with marginal brown or yellow pigmentation (n=36), focal brown pigmentation +/- intralesional foci of chronic tissue loss (n=18), focal to diffuse bleaching (n=13), and other (n=4). Tagged corals were monitored over a period of 25 weeks in the autumn/winter using GPS and laminated maps, and were photo-documented every 2 weeks. Based on initial observations, lesions comprising focal chronic tissue loss with marginal bleaching and yellow pigmentation appear to be the fastest progressing, resulting in rapidly expanding areas of partial colony mortality. Bleaching was first observed in October of 2016, when sea temperatures were higher than historical values. They started regaining their normal color by January 2017. Histopathology is presently underway with the aim to more comprehensively diagnose the diseases of St. Kitts' *O. annularis* and *O. faveolata*.



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Porcine and recombinant zona pellucida vaccines as immunocontraceptives for donkeys in the Caribbean

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Abstract

Immunocontraception has been investigated as an alternative to hormone manipulation and lethal methods of fertility control in wildlife for almost 30 years. Porcine zona pellucida (pZP) and its derivatives have been shown to utilize an animal's immune system to prevent pregnancies temporarily and reversibly in multiple species. The efficacy and practicality of its use has been successfully exploited in controlling feral equid populations in the Southwestern United States and is now being investigated in feral donkey populations in the Caribbean. Despite being a popular pack animal and tourist favorite on tropical islands, donkeys are now outgrowing their resources after being largely replaced by farm equipment and motor vehicles, and are allowed to reproduce unchecked. In the Galapagos archipelago, population control programs resorted to lethal means of removal to conserve the biodiversity of the ecosystem, as introduced herbivores were leading to permanent destruction. This study investigated pZP vaccination as a method of practical and humane population control in feral donkeys (*Equus asinus*) in the Caribbean. In addition, the study investigated a novel recombinant zona pellucida vaccine (recZP) as an alternative for fertility management.

Twenty-five feral female donkeys of proven fertility were captured on Nevis and transported to Ross University School of Veterinary Medicine (RUSVM). All animal protocols were approved through RUSVM IACUC review. Jennies allocated to Group 1 (n=9) received a recZP vaccine in complete Freund's adjuvant (CFA) and thereafter two booster vaccines in incomplete Freund's adjuvant (IFA) 5 weeks and in sterile saline 10 weeks later. Jennies allocated to Group 2 (n=8) received a pZP vaccine in CFA and one booster in IFA 5 weeks later. Those allocated to Group 3 (n=8) received an initial injection of CFA and second injection of IFA 5 weeks later and acted as controls. All treatments were administered intramuscularly by injection into the left and right gluteal muscles (1st and 2nd injections), and the left pectoral muscles (3rd injection in Group 1). Trans-rectal ultrasonography was performed weekly on each jenny to monitor ovarian and follicular development and cyclical reproductive activity. Five weeks after the final injection, one jack was placed with each group of jennies. Estrus detection, mounting behaviors, and breeding were recorded when observed. Weekly trans-rectal observations were continued to visualize the reproductive tracts and ovaries and to identify pregnancies. Jacks were rotated through the groups every three weeks.



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All donkeys were cycling normally prior to injection with obvious estrus signs detected when in proximity to a jack. Three months after the final injection, 7/9 (77%) jennies in Group 1 and 6/8 (87%) jennies in Group 2 had no detectable follicular development nor estrus signs. No pregnancies were found in either of the treatment groups at sixteen weeks post-treatment. In contrast, 8/8 (100%) donkeys in the control group are pregnant and all have follicular development.

Both pZP and recZP vaccines were shown to be effective as non-hormone based contraceptives with potential for application in fertility management programs in donkeys. Further investigation into the mechanisms and full duration of action in these vaccines may benefit future population control programs for feral donkeys in the Caribbean.



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Effective Grant-making to Caribbean Civil Society for Biodiversity Conservation

Olivier Langrand

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Abstract

The Critical Ecosystem Partnership Fund (CEPF) is a global program that provides grants to non-governmental organizations (NGO) so they can conserve the most biologically diverse yet threatened ecosystems, the world's biodiversity hotspots. The Caribbean Islands is one of the 36 terrestrial biodiversity hotspots recognized worldwide. The Caribbean Islands Biodiversity Hotspot is under the pressure of serious threats including habitat destruction and fragmentation, invasive alien species or climate change.

Through a bottom-up process involving the consultation of many stakeholders from governments, private sector actors, academic institutions and civil society groups, a strategy for the investment of CEPF in the Caribbean was released in January 2010. Following the formulation and adoption of the Caribbean Ecosystem Profile, CEPF started an investment in October 2010 that ended in July 2016. A total of US\$6.9 million have been invested in eight different countries and at the regional level. With the support of a Regional Implementation Team selected competitively in the region, (Caribbean Natural Resources Institute - CANARI) a portfolio of 77 grants (30 small grants and 47 large grants) has been funded through 68 civil society organizations. 78% of the fund committed has benefited local and regional Caribbean organizations.

During this first five-year investment, conservation impacts have included:

- The improved management of 25 Key Biodiversity areas (KBA) covering 593,967 ha;
- The contribution to the creation of eight new protected areas covering 11,496 ha;
- The contribution to the establishment of two sustainable funding mechanisms;
- The establishment of nine public-private partnerships mainstreaming biodiversity conservation;
- The improved protection of dozens of IUCN Red Listed species including the contribution to the rediscovery of thought-to-be extinct endemic amphibian species.

After this initial five-year investment phase, CEPF is currently updating the ecosystem profile of the Caribbean Islands Biodiversity Hotspot considering important changes that have emerged in the past seven years in this region.



Building on a strong foundation of conservation results obtained during its first phase, CEPF will re-engage in a five-year investment phase in the Caribbean starting in 2017. Strategic directions for the investment will be defined as part of the profiling process, but will certainly consider:

- Support Caribbean NGOs in the implementation of plans and strategies developed for protected area management, incorporating climate resilience and sustainable rural livelihoods;
- Strengthen partnership across civil society and with private sector partners and other user of natural resources;
- Encourage further knowledge sharing and regional collaboration to scale up impact on conservation of biodiversity, climate change, invasive alien species and sustainable rural development.

CEPF look forward to contributing to the conservation of the unique biodiversity of the Caribbean Biodiversity Hotspot through the reinforcement of local and regional civil society groups.



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Fish tales

Of islands and continents, the story of Caribbean freshwater fishes

Dawn A. T. Phillip

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Abstract

The Caribbean basin is considered one of the world's biodiversity hotspots, attracting researchers from far and wide. Yet, with only a few exceptions, its freshwater fauna is relatively poorly studied. This is an attempt to tell the story of the freshwater fishes of the insular Caribbean: from whence did they come, how did they get here. Like the people of the region, the fishes can be traced to sources far and wide, and reflect a history with connections within the wider region, and lands across the oceans. Once established in the islands what roles have these species adopted, and what are the past, current and emerging events that help to shape this assemblage. What is the outlook for this group of animals, and how can we help protect our heritage?



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Bridled Quail-Dove Population Assessment on St. Eustatius

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Abstract

The Bridled Quail-Dove (*Geotrygon mystacea*) is a bird of high conservation concern that is endemic to the Eastern Caribbean. To date, few quantitative population assessments have been conducted and local and regional conservation status is unknown. Nevertheless, quail-dove populations are thought to be declining, despite classification as a species of Least Concern by IUCN. In this presentation, we provide a population assessment of the quail-dove on St. Eustatius. Line-transect surveys were conducted at the Quill National Park in May-June 2016. Distance sampling and repeated count methods were used to estimate detection probability (i.e., quail-dove availability and observer perceptibility), density (number of quail-doves ha⁻¹), and population size (number of quail-doves in a survey region covering 165.5 ha). Detection mode (aural vs. visual) was the most important detection covariate. Detection probability was 1 for aural detections and 0.346 ± 0.053 SE for visual detections within 30 m of line-transects. Overall, detection probability was 0.383 ± 0.097 SE, accounting for quail-dove availability and observer perceptibility components. Distance sampling and repeated count methods provided similar results. Overall, density was 4.505 ± 0.937 SE (CV = 0.208) and population size was 746 ± 155 SE (95% CI = 496, 854). Because the quail-dove is mainly a ground-dweller that exclusively inhabits middle to upper elevations in the National Park (mean = $298.2 \text{ m} \pm 32.5$ SD), we consider this population to be threatened by habitat degradation and predation. Therefore, we recommend collecting count, capture-recapture, and telemetry data to develop integrated population models; and monitoring to estimate abundance trend and evaluate the outcomes of control management actions (e.g., goats, cats, and rats).



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Contribution to the study of the White-Breasted Thrasher *Ramphocinclus brachyurus* in Martinique

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Abstract

An irreplaceable wealth of biodiversity is concentrated in a small, unstable portion of the planet, and its preservation appears to be very important. In particular, Caribbean species appear to be particularly vulnerable to population extinction, due to insularity and the strong anthropization of their environment. We present here preliminary results (obtained in cooperation with the Parc naturel régional de la Martinique) of a research program on the population biology and behavioural ecology of a very rare and Caribbean endemic species, the White-Breasted Thrasher *Ramphocinclus brachyurus*. Overall, we captured in 2016 38 White-Breasted Thrashers including 17 individuals in the Reserve and 21 individuals outside of the Reserve. We observed a male biased sex ratio, with females being in better body condition than males. The prevalence of infection with blood parasites was low, with only two infected individuals. Through recording the intensity of vigilance behaviour while feeding on the ground, we found that capture effort increased with increasing vigilance rate suggesting that human disturbance and/or predation could affect foraging effort. We discuss our results and present avenues for future research in relation to conservation actions that could be implemented in the future.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Connectivity of Populations and Gene Flow in Tobago's Queen Conch *Lobatus gigas* (Linnaeus, 1758) population

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Abstract

Tobago's queen conch fishery has seen a continued decline in productivity since the 1970s due to a lack of proper monitoring and management. With unregulated and unmonitored harvesting, Trinidad and Tobago remains unable to report on the status of the queen conch fishery, leading to the continuation of poor management.

Focusing on juvenile stages, the dispersal of local conch resources at larval stages via current flow can also be a key factor in its depletion, taking into consideration the magnitude of currents found in and around the Tobago coastal region. As such, it is necessary to determine the population's genetic structure, and to further identify whether there is indeed the potential for larval transport of Tobago's conch stock via existing current patterns.

This study provides an improved understanding of connectivity of queen conch populations throughout the Caribbean, specifically in relation to population structures of queen conch in Tobago and their gene flow. It examines the potential for larval transport with the goal of testing the null hypothesis that geographically separated *Lobatus gigas* populations are genetically linked, by analysing gene flow as a means of differentiating the conch populations.

Very little research has been done regarding Trinidad and Tobago's conch population, so this study will serve as a first look into the genetic population structures, and possibly give new insight into better approaches that facilitate more effective management of the resource. It also constitutes a first step in understanding the queen conch metapopulation structure, which will in turn, call for more local actions for the recovery and conservation of Tobago's populations.

KEY WORDS: *Lobatus gigas*, queen conch, connectivity, gene flow, Tobago



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Input from capture–mark–recapture methods to the understanding of population biology

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Abstract

CMR methods were originally developed by population demographers to estimate parameters for which there was no satisfactory alternatives, in particular survival. These methods evolved greatly with well-identified stages: incorporation of different states (multistate models), then incorporation of uncertainty in states (multievent models). These developments allowed to tackle new questions (e.g. accession to reproduction), and so in a more refined way (role of experience in breeding propensity). Nowadays, this tool permits to address questions as diverse as trade-offs, behaviour, epidemiology,... virtually any area of population biology where the knowledge of the current situation is insufficient because the role of the past cannot be ignored. I will illustrate with concrete examples.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Fish social behaviour as a conservation issue

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Abstract

Traditionally, fishes have been viewed as rather primitive vertebrates, with rather limited cognitive abilities. This view has been challenged in recent years due to a variety of studies. With respect to brain anatomy, it has been shown that all vertebrates share a highly conserved network of brain regions/nuclei that is used for social decision-making. In addition, behavioural observations and experiments have revealed the existence of a variety of 'sophisticated' cognitive processes in fishes. For illustration I will largely focus on our research on interspecific mutualisms involving collaborative hunting between groupers and partner species as well as marine cleaning mutualism. Collaborative hunting is disappearing due to overfishing of groupers at least in some areas of the Red Sea. Interaction patterns and underlying strategic sophistication in cleaning mutualism is severely threatened by climate change. I will present data from Lizard Island, Great Barrier Reef, that document how recent major perturbations – cyclones in 2014 and 2015 as well as coral bleaching due to the 2016 El Niño event – has changed fish densities and as a consequence key aspects of this mutualism. The study illustrates how evolutionary theory, together with ecological and behavioural data may help us to better understand how anthropogenic threats, including climate change, may affect the functioning of ecosystems.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Novel parasites of invasive lionfish from the Eastern Caribbean and their potential use as biological tags

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Abstract

Lionfish from the genus *Pterois* are native to the Indo-Pacific, but have been rapidly increasing in numbers in the western Atlantic and Caribbean Sea since they were accidentally released into the marine environment in the mid-1980s. They are now recognized as one of the most significant invasive species throughout the entire Caribbean region and their high numbers and feeding behavior are having a serious impact on coral reef biodiversity. Little has been documented about pathogens and parasites from these fish in their invasive Atlantic range, therefore, the aim of this study was to evaluate parasite load from fish that have been removed from the waters around St Kitts and neighbouring islands.

Lionfish were speared by divers in St Kitts and taken directly to the laboratory for necropsy. All organs were examined for signs of gross pathology and fresh tissue preparations made to screen for the presence of microparasites using a compound microscope. Tissues that were observed to contain potential pathogens or parasites were prepared for histological examination and also preserved for DNA analysis, to assist in identification. Frozen samples were also obtained from the islands of St Lucia, St. Eustatius and Dominica. These were tested for the presence of myxosporeans in the liver, gallbladder and bile ducts using previous described PCRs.

Two microparasites were observed in lionfish from St Kitts that are currently being identified. Apicomplexan gamonts were observed in the urinary bladder, but no sporulated oocysts were present. Mature spores of a myxosporean were found in the gallbladder of some fish in St Kitts, which had a *Zschokkella*-like form. This data will be presented and discussed with respect to histopathological findings and initial microparasite identifications from both St Kitts and neighbouring islands.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Lionfish impact in St. Kitts, West Indies: what are they eating?

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Abstract

Lionfish native to the Indo-Pacific have recently been damaging ecosystems and reef wildlife as invasive species in the southeastern U.S. and the Caribbean. They have been shown to be voracious predators, negatively impacting the native fish populations in multiple locations where they have spread in the Caribbean (Albins and Hixon 2008). Because of differing fish community structures and environmental factors across geographic locations, it is essential to know which groups of fishes are being preferentially eaten in order to effectively manage these invasive fish. Using lionfish (*Pterois volitans/miles* complex) speared by divers from multiple dive sites around St. Kitts, lionfish stomachs were removed to identify prey items to the lowest taxonomic level possible. Some of the contents can be identified morphologically using dichotomous keys, while others are very digested and require DNA barcoding: we looked at the cytochrome oxidase 1 (CO1) gene to identify to the species or genus level (Côté et al 2013; Valdez-Moreno et al 2012). Molecular analyses were also used to confirm uncertain morphological identifications. The lionfish and any items in its stomach were measured: Total Length (TL) for whole fish, or maximum length along the spine for heavily digested items. For each collection site, depth, time of day, and habitat were recorded: ecological factors and lionfish length were statistically assessed in relation to the size, number, and species of prey items identified. Stomach content amount varied from zero to at least fifteen fish in one stomach. Seven families of fish (Acanthuridae, Gobiidae, Holocentridae, Monacanthidae, Mullidae, Pomacentridae, and Scaridae) ranging in length from 0.9 to 9.9 centimeters, along with multiple invertebrate taxa, were found. This suggests an opportunistic or generalist feeding strategy, which is in line with previous studies of lionfish diet. Additionally, the presence of shrimp in multiple stomachs may indicate a nocturnal eating habit. Assessing the damage that these invasive species may have on St. Kitts' ecosystems, whether by depleting juvenile fish populations or competition with native predators, may encourage the public and governments to take action or even help determine if anything can feasibly be done to ameliorate the effects. Therefore, this study has the potential to be useful for fisheries and conservation management planning.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Social behavior variation in Caribbean cleaning gobies

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Abstract

Behavioral ecologists have been increasingly interested in social behavioral variation among individuals of the same population. Variation can be originated from deviations from an optimal phenotype of increased fitness or, alternatively, when more than one phenotype is under positive selection. Understanding the underlying mechanisms related to behavioral variation and its fitness consequence for individuals are important in order to be able to distinguish between these two processes. In the facultative goby species *Elacatinus prochilos*, variation in habitat use is correlated to changes in social behavior, diet and frequency of cleaning interactions. Individuals living in corals and other substrates are usually found in pairs or small groups and depend mostly on cooperative cleaning interactions with client reef fish for feeding. On the other hand, individuals living in basket sponges are organized in larger groups with dominance hierarchies and feed mostly on micro-organisms living inside the sponges' tissue. In this study, we aim to understand the proximate and ultimate causes of social behavior variation in *E. prochilos*. We are integrating ecological and behavioral data obtained from the field and laboratory experiments with neural, endocrine, and genetic information obtained with new technologies that allow the study of non-traditional model species directly from the field. First results showed a sex related difference in behavioral flexibility and cognitive performance in sponge-dwellers. We found no significant differences between cleaners and sponge dwellers in whole-body cortisol levels or brain Arginine-Vasotocin and Isotocin levels. Next steps include the continuation of cognitive tasks, introduction of social competence tasks and brain morphology analysis. By studying the proximate and ultimate causes of social behavioral variation in *E. prochilos* we expect to provide a better understanding of the evolution of cooperative behavior in animals.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Investigation of embryonal and hatchling mortality in St. Kitts' leatherback (*Dermochelys coriacea*) sea turtles

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² St. Kitts Sea Turtle Monitoring Network

Abstract

Leatherback sea turtles (*Dermochelys coriacea*) are the largest sea turtle in the world and are listed as vulnerable on the International Union for Conservation of Nature's Red List. They face many threats to survival throughout their range including fisheries, habitat loss, and pollution. The average hatch success for leatherbacks worldwide is around 50%. Thus, sustained hatchling production is critical for population recovery and has become a global conservation priority for the species. In St. Kitts, hatch success typically averages from 5-10%, much lower than the global and regional average, and too low to maintain the population in the decades to come. The aim of our research is to determine the causes of embryonal death in St Kitts' leatherbacks.

A histopathological survey of non-emergent late stage embryos and hatchlings was undertaken in 2015-16 on St. Kitts two main nesting beaches. Pneumonia (12.5% prevalence) was observed in 5 nests, representing both nesting beaches and seasons. In all cases the pneumonia was associated with gram negative rod-shaped bacteria. Aerobic and anaerobic cultures failed to identify a predominant isolate, however *Pseudomonas sp.* was found in a number of nests in 2016. Hematopoiesis was consistently observed in the liver, lung, kidneys, spleen, and pericardium, and is likely a normal event in the late development of *D. coriacea*. Other lesions included renal tubular mineralization (25% prevalence) and muscle necrosis (11% prevalence). Bacterial pneumonia appears to be a significant cause of death in St. Kitts' leatherback embryos and hatchlings. Further investigation is warranted to determine the causes of the lesions identified in this study, and their impact on hatch success in the wider Caribbean.

Egg were also collected, from the same nests sampled in 2015 for histopathology, for trace metal testing (Pb, Mn, Fe, Hg, As, Mb, Zn, Cu, Cd, Ba, Be, Co, Cr, Ni, Tl, and V). Only Fe, Zn, Cu, Ba, As, and V produced values above the detection limits of the assay, but a strong correlation between these trace metals and hatch success was not detected. Egg concentrations of Fe, Zn, Cu, Cd, Mn, Pb, and Hg were higher in a Pacific and another Atlantic leatherback population, assessed by other studies. Based on the results obtained in this study, trace metal exposure does not seem to influence hatch success in St. Kitts. Future studies will evaluate concentrations of organic pollutants in eggs from the same nests evaluated by this study.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Fourteen Years of Sea Turtle Management, Health, and Conservation Education in St. Kitts – What Have We Learned?

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Abstract

The St. Kitts Sea Turtle Monitoring Network (SKSTMN) has been monitoring nesting populations of leatherback (*Dermochelys coriacea*) sea turtles since 2003 and foraging populations of hawksbills (*Eretmochelys imbricata*) and greens (*Chelonia mydas*) since 2004 in St. Kitts. Prior to the establishment of the SKSTMN and the subsequent development of its sea turtle outreach, management and health programs very little had been done to promote the conservation of sea turtle species and very limited data was available regarding sea turtle populations in St. Kitts. In addition to threats such as coastal development and pollution St. Kitts still has a harvest for sea turtles and historically these animals have primarily been viewed as an agricultural/consumable resource. Establishing baselines on population and health status was imperative in order to make informed recommendations for adjustment of regulations to protect these species. Additionally, the development of conservation education programs and alternative livelihood options were also a priority.

Female leatherbacks were sampled during nesting seasons and foraging juvenile hawksbills and greens were sampled throughout the year in the catch and release program. From 2005-2016, 259 leatherback females were assessed from seven different nesting beaches with a focus on their two primary nesting beaches, Keys and North Friars. From 2004-2016, 350 sea turtle captures via snorkel were recorded between 23 different capture sites. Juvenile foraging species represented included hawksbill (n=296), green (n=57), and loggerhead (*Caretta caretta*) (n=1). Following capture or during nesting, a general health assessment of each animal was conducted.

The primary conservation education program developed has been an annual Sea Turtle Camp initiated in 2007 to increase public awareness of the importance of sea turtles to the environment. The focus of this camp is to introduce participants to different types of endangered sea turtles that live and nest in and around St. Kitts. Many former participants return in subsequent years, which has emphasized the need to develop additional curriculum to build on the initial experience. The SKSTMN performed an outcome assessment of this program which included pre and post tests for 2015 and 2016 participants and a survey of parents of participants and former participants to determine if this program has positively affected participants and perceptions regarding sea turtles



and conservation; strengths and weaknesses of the program; and areas that could be further developed.

In the development of alternative livelihoods, turtle fishers in St. Kitts were assessed by the SKSTMN through a survey process to determine the status of sea turtle stocks in the St. Kitts area and to determine the feasibility of developing a local community based ecotourism project focusing on sea turtles. Based on the results of this survey, a Technician Program and Leatherback Ecotour Package were developed. Prior to the development and implementation of the ecotours, a representative survey was prepared and distributed to three target groups: local citizens, tourists, and residents. A tour package was developed according to the survey results and offered during leatherback nesting seasons from 2009-2014. In 2014, an outcome assessment of the ecotourism initiative was conducted.



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ABSTRACTS

Histological and Parasitic Assessment of White Sea Urchins (*Tripneustes ventricosus*) in Saint Kitts, West Indies

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Abstract

The white sea urchin (*Tripneustes ventricosus*) is one of the important grazers on the shallow beaches of Saint Kitts and other Caribbean islands. They are an important link in the marine ecosystem as they have complex relationships with other organisms as well. White sea urchins' eggs (gonads) are a well-known delicacy in Barbados and Japan; thus, the common name 'West Indian Sea Egg'. They have major aquacultural demands in the Asian, Mediterranean and Caribbean regions. Histopathological and parasitic research on the white sea urchins, especially in this region, is very limited. The aim of this study is to survey the gross anatomy, the histological sections and the parasitic population of the white sea urchin.

14 unhealthy-looking white sea urchins were collected by the coast of Cockleshell Bay and Timothy Beach in St. Kitts. Both the wild and albino type urchins were dissected right after collection. Tissue samples from the dissections were fixed in Davidson's Solution and were further processed for histology. Calcium based tissues were decalcified by using Delta FORM[®], before the histology slides were prepared. Smear impressions and wet mounts of different tissues were examined immediately.

From the gross dissection observations, spineless urchins generally had less ingesta contents in comparison to urchins without any spine loss. In gender comparisons, female gonads were a darker shade of orange than the male gonads which were duller and paler. Females, in general, were heavier than males which were heavier than the urchins that had little to no gonadal tissue. At least five to six types of ciliates were found in all types of wet mounts prepared; from the esophagus, gonads, intestines and coelomic fluid. In the histology of one of the sea urchins, a Digenean metacercaria was found in the muscle layer of the Aristotle's lantern. There was also an aggregate of rod shaped bacteria in one of the appendages of one of the sea urchins. The rest of the tissue samples are currently being processed.

Surveying the West Indian sea eggs has major human health significance as they are eaten raw. It is vital to understand the current health status of *T. ventricosus* by gathering a baseline histology survey and identifying their opportunistic parasitic populations. This information would be useful for better disease outbreak predictions and for the sea urchin aquacultural industry. This study could be followed by further research that could survey the bacterial populations of these species. Since the white sea urchins occupy a crucial niche, they can also serve as indicators of the overall health of the aquatic ecosystem.



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ABSTRACTS

Neotropical animal production for conservation on the Island of Trinidad, West Indies

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Abstract

Hunting permits and mandatory hunter return cards are employed by Trinidad, W. I. to capture the harvest; however, no data is verified by the regulatory authority. An average of 30 000 hunters register annually on the island to hunt an area of 2000 km² during the five month hunting period in Trinidad. Of all the hunting permits sold from 1994 to 2014, 52% were for hunting agouti (*Dasyprocta leporina*), 24% for lizards (*Iguana iguana*, caiman crocodiles and *Tupinambis* spp.), 7% for lappe/labba (*Cuniculus paca*), 5% for Red brocket deer (*Mazama Americana*) and 1% for collared peccary (*Tayassu tajacu*). Mean hunter harvests were 20 000 agoutis, 2 000 red brocket deer, 3 000 lappe/labba, 4 000 collared peccaries and 10 000 lizards. Animal production systems have been developed for the agouti, since it is the most popular game species in Trinidad and Tobago. This research is aimed at describing the key reproductive features of the female agouti to improve captive management and reproduction; with special focus on conservation of this Neotropical rodent. The female agouti had the potential to produce up to six young in captivity, with mammary functionality in all four pairs of teats. The estrous cycle was characterized through the evaluation of vaginal cells and blood serum analysis and was found to be 31 ± 2 days. Sustainable wildlife management is dependent on focused research on indigenous species of importance; for conservation as well as food sovereignty in the region.

Keywords: Neotropical animal conservation, wildlife farming, reproduction, agouti.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Trouble in the tropics – How veterinary medicine informs conservation of marine and terrestrial wildlife in tropical island ecosystems

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Abstract

Most of the world's population lives near the coasts, and human activities will impose increasing stresses on health of coastal terrestrial and marine ecosystems. The issue will be particularly acute in the tropics, regions that hold considerable biodiversity. There is increasing recognition that human and environmental health are interlinked, most notably promulgated by the "one health" paradigm. However, "one health" is heavily weighed towards humans or agricultural animals, whilst the environment gets lip service, and wildlife are mainly a threat (source of zoonoses). Veterinary medicine, with its emphasis on animals, can help balance this paradigm by focusing on wildlife and environmental conservation.

Tropical islands could serve as a good model for evaluating coastal health, because land and sea are closely interlinked. Because of their geographic isolation, tropical islands have evolved unique flora and fauna. As a result, human influences in islands are more immediately apparent than in the continents. Invasive species, habitat loss, and disease have led to extirpation of entire species. A good example is Hawaii that now has the highest per capita number of endangered birds in the United States and is experiencing declines of coral reefs.

However, not all is doom and gloom. There have been significant conservation successes in the Hawaiian and other Pacific islands, and in many cases, veterinary medicine has had an integral part. This is because veterinary medicine has at its core a systematic framework to evaluate animal health, and indirectly, ecosystem health. After all, if the wildlife can be deemed healthy, then likely that the ecosystem is too. Some examples of success stories include recovery of Laysan albatross on Midway and repatriation of endangered birds in their native range. Veterinary medicine has also played key roles in helping biologists understand the potential causes of declines of animal populations including birds, fish, and marine invertebrates. This is critical, because knowing the potential causes of animal declines allows managers to better focus recovery efforts. In the case of animals like corals, understanding why they are declining could also have profound ecological and economic implications, because if you lose corals, you lose entire ecosystems including fish and other invertebrates that depend on the coral habitat.



Systematically investigating causes of wild animal mortalities and declines poses particular challenges, particularly for those species of which little is known. A lot of the existing literature is not inspiring and so gives one little to go on for foundational knowledge. Thus, wildlife veterinarians are often “rolling their own” and have to develop de novo the tools to investigate animal disease. The downside is that this can be laborious and frustrating. The upside is that one can discover very cool phenomena, and this engenders a healthy respect for our forebears who developed many of the diagnostic tools we currently enjoy today. There is a real need for veterinarians to get out of their comfort zone, get involved, and interact with biologists to aid wildlife conservation. It is hoped that this presentation might inspire some to do so.



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ABSTRACTS

Cause for Concern: The potential threat to human health by vervet monkeys in St. Kitts and Nevis

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Abstract

The green vervet monkey (*Chlorocebus aethiops sabaues*) is one of the most behaviorally flexible African monkeys, with the ability to adapt to a wide variety of environments. Since its arrival in St. Kitts and Nevis between 1665 and 1690, there has been a rapid population increase resulting in a greater incidence of human-wildlife conflict, especially in the agricultural sector. This interface can act as a bridge for disease between wildlife and domestic species as well as humans. The objective of this paper is to highlight the potential indirect impact of human-vervet interaction through human consumption of crops contaminated by monkeys. From September 2010-August 2011, one-third of the registered farms in St. Kitts (N=65) were monitored monthly for evidence of crop loss by monkeys, and 53% of these farms experienced (34 farms) experienced monkey crop damage. The most preferred crops were fruits (including pink grapefruit, orange, soursap, atney, papaya, and passion fruit), followed by squash, eggplant, cucumber, corn, and watermelon. Qualitative data collected since this time indicate that many more farmers are presently affected by monkey crop damage, and that many farmers have since abandoned farming all together as a result of challenges dealing with monkeys. Vervet interaction with crops poses a threat to humans, as many field fruits (i.e. tree fruits, cucumber, and watermelon) are not cooked prior to consumption and may be contaminated by monkeys through fecal droppings, urine and ecto parasites. Our results indicate increasing levels of vervet-crop interaction over the last seven years and highlight how these patterns place the population at greater risk for contracting bacterial pathogens such as *Salmonella*, *E.coli* O157:H7, and *Campylobacter jejuni*. This potential risk poses a threat both to human health, and by extension, food security for St. Kitts.

Keywords: Vervet Monkey, Wildlife Conflict, Agriculture, Disease



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Human Dimensions of Wildlife Health: Adapting social sciences and conservation frameworks for action based research

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Abstract

Science often has a “catch up role” rather than being the “frontrunner” for tackling environmental and conservation problems. The timeframe for decision-making for preventing ecological changes is incompatible with the timeframe needed for science to fully understand those changes. Therefore, there is growing recognition from wildlife health-related fields that a pragmatic approach for problem-solving is needed. In response, crisis disciplines and multidisciplinary approaches actively advocate for a socio-ecological approach. However, the social component of this approach has largely been neglected in fields such as Conservation Medicine and One Health. Contrary to scientific data, peoples’ beliefs, attitudes, norms, motivations and emotions are more influential in convincing people to act. Further, knowledge or information used in educational campaigns alone, doesn’t necessarily translate into action. Therefore, human dimensions have to be incorporated in wildlife health research to promote action towards changing behaviors that will benefit wildlife and ecosystems. We propose an action framework based on the Health Belief model that merges key concepts from other change behavior theories and models (Theory of Reasoned Action, Theory of Planned Behavior, Motivation-Satisfaction, Emotions). This framework is being applied in a project for reducing waste production (plastics and Styrofoam primarily) in a higher education institution in the Caribbean. In short, the framework has three main components: a threat, specific actions and cues for action, and each of these components is intended to identify how to best relate to people to change, modify or adopt a new behavior for reducing waste products. The overall goal of the project is to create a new norm (composting, reusing/reducing, recycling), because social norms have a strong influence of guiding behavior. We suggest this action framework can be tailored to wildlife health professionals and represents a set of steps and core competencies that researchers/practitioners must have to approach complex socioecological challenges that affect humans, animals and the environment. In this presentation, we will show how the components of the framework (threat, action, and cues to action) are being applied to this specific setting in the Caribbean.



Second Caribaea Initiative Research and Conservation Workshop

ABSTRACTS

Tourist Attitudes and Practices Regarding Contact with Primates in the Caribbean

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Abstract

Contact with wild primates places those species, as well as ourselves, at risk of anthroponotic and zoonotic pathogen exchange. Primate-based entertainment involving animal exhibitions is popular in many different regions, yet the potential for pathogen exchange remains equivocal. To investigate the willingness of tourists to engage in risky animal contact, 1399 surveys were collected from visitors on the beaches of Cockleshell Bay and South Friars on the Southeast peninsula of the island of Saint Kitts, Federation of Saint Kitts and Nevis, West Indies. This island is home to approximately 30,000 African green monkeys, and touching and feeding these animals are encouraged by locals that solicit tourists for money. Almost all respondents were cruise ship passengers visiting the island for only a few hours. Despite the fact that 87.5 percent and 77.7 percent of respondents reported belief that humans can get/give diseases from/to wild monkeys and apes, 56.1 percent would still touch or feed one. 666 people touched a wild primate (mostly on the island itself), and 53 people were bitten or scratched. Despite acknowledged health risks, the drive to bond with animals and explore our physical world through direct contact will continue to place ourselves and other species at risk.



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ABSTRACTS

Acquisition and Acclimation of Feral Caribbean Donkeys for Use in Reproductive Research

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Abstract

There are an estimated 41 million donkeys (*Equus asinus*) worldwide, 96% of which inhabit developing countries. Humane population management has become an important subject of concern in the Caribbean as uncontrolled breeding leads to depletion of food resources, poor body condition and ultimately starvation of donkeys. Information regarding the reproductive cycles of donkeys in the tropics is anecdotal and incomplete to use in management protocols. The following describes the methodology used to capture and safely use donkeys in a population management research study.

Local farmers were contracted to locate and humanely capture twenty-five late-term gestation jennies, from the island of Nevis. Once captured, the donkeys were tethered until examination by research investigators. A safe environment to work with the feral donkeys was created by the utilization of commercially available transportable miniature horse stocks which were modified to accommodate an adult donkey. The height of the stocks was increased to 120cm on all four sides using common home framing lumber. The jennies were then moved into the modified stocks where they were examined and trans-abdominally ultrasounded to confirm gestational age of pregnancy.

Once on premises of the research facility, jennies were handled once a day to become accustomed to being led by a halter and lead rope. Grooming and treat training were used to acclimate the feral donkeys to human interaction. Once tolerant of their handlers, jennies were introduced to the stocks and allowed to acclimate while eating a complete equine pelleted feed within the confinement. Jennies were then monitored via trans-abdominal ultrasonography weekly for gestational changes. Fetal heart rate, aortic diameter, and presentation at time of examination was recorded for each donkey. One week after foaling the jennies were evaluated via trans-rectal ultrasonography. Donkeys were restrained only by the confines of the modified stocks and the distraction of pelleted feed. No complications were seen and all jennies were examined in the same manner at weekly intervals. Foals were separated during the time of the examinations and neither dams nor foals demonstrated outward behavioral signs of stress. Three jacks were used to detect estrus in a fenced paddock while females were restrained via halter and lead rope around the



outside perimeter of the paddock. Jennies' responses to the jacks were recorded on a scale of 0-3. Foals were weaned in pairs between the ages of 4 and 6 months without complications. The jennies' reactions to weaning were observed and varied from no signs of agitation to pacing the pasture, with the longest period of time being 2 hours before returning to the herd and resuming normal grazing behavior.

Although modifications were required, the feral donkeys quickly became very amenable research subjects. The researchers are confident that this method can be widely used for the acquisition and acclimation of feral donkeys for a large variety of research interests with minimal stress and risk to the donkeys.



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ABSTRACTS

Endemism Patterns in Terrestrial Arthropods, with a Focus on the Beetles of the Lesser Antilles (Insecta: Coleoptera)

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Abstract

The status of the West Indies as a biodiversity hotspot is well established, as is its unfortunate leadership in the loss of the majority of its once extensive and highly endemic vertebrate fauna to extinction. Concentration on the protection of the remnants of this fantastic fauna gives the impression at both the world and regional level that there is little left of global importance. This view, however, is incorrect.

The invertebrate fauna of the region is characterized by three factors: grossly incomplete and geographically unbalanced documentation, extensive taxonomic and geographic errors in the existing literature, and a preponderance of undescribed/undiscovered biodiversity. A fourth factor is a very high number and percentage of regional, local and single-island endemism.

Using the beetles (Insecta: Coleoptera), the West Indian Beetle Fauna Project has been trying to address these issues, and we have discovered that the fauna of the region is far more highly endemic than the literature would indicate, and that the patterns of endemism are indicative of far more conservation challenges than is appreciated.

However, uneven documentation remains a huge problem. For instance, the Guadeloupe Archipelago is very well studied, and from the literature, would seem to have dozens of endemic genera, as well as species. Most of those species and genera occur in the large national park on Basse-Terre, and thus seem well protected. Martinique, on the other hand has had only a fraction of the work done on Guadeloupe, and seems to be endemic poor. Much less conservation concern is therefore needed on Martinique. Both appearances are incorrect.

Next, the fauna of the historically French and British islands in the Lesser Antilles seem to have totally different faunas. Rather than being a biological phenomenon, this is the result of national-based workers and natural history museums that have worked in isolation from each other.

Traditionally, these issues are corrected by periodic revisions of a genus of similar group for the entire fauna, either regionally or globally. However, the number of systematists doing this work is small, and those working on the West India fauna are even more limited. A revision may take a



decade to complete. There is simply not enough time to use that traditional method to discover and document species of conservation importance.

Recent work by our lab and others have shown the patterns of endemism to be far more complex than what the published literature would indicate. The result is an emerging realization that the region is in need of much more nuanced conservation actions. The process of comparing island-to-island faunae is in its infancy, a process we call rationalization. We are developing interisland rationalization “maps” using both described and undescribed species, with the support of specialists around the world that can stand in for revisional work. These methods greatly increase the number of conservation-critical areas of global importance.



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ABSTRACTS

Soil biodiversity and ecosystem services in various agroecosystems of Guadeloupe (French West Indies)

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Abstract

The soil is a complex living environment hosting a huge biodiversity. Soil organisms play a major role in the maintenance of ecosystem services. These ecosystem services (recycling of soil organic matter, soil maintenance, food supply, disease and climate regulations), are the benefits that human get from ecosystems and especially from biodiversity.

Agriculture is vital for human activity, because it is an irreplaceable source of food. However, intensive agriculture has a negative impact on some ecosystem services. Thereby, agro-ecological practices are recommended for preservation and the restoration of biodiversity in the soil.

A study is being carried out on the territory of Guadeloupe. The aims of this study are the following:

- i) To measure the impact of agricultural practices (intensive versus agro-ecological) on soil biodiversity and ecosystem keys services in market-gardening agrosystems of Guadeloupe.
- (ii) To test the impact of several agro-ecological practices based on the restoration of soil biodiversity on soil ecosystem services.

These researches will allow us to highlight the existing interactions between soil biodiversity and environmental performance in a tropical environment.

We analyzed 49 plots, representing the regional diversity of market-gardening in Guadeloupe (tomatoes, cucumbers, watermelons...). For each plot, a survey was conducted and allowed us to highlight the agricultural practices. At the end of these investigations, a principal component analysis and a hierarchical ascending classification was effected to highlight a typology of systems of cultures throughout the territory. This typology allowed a better understanding of the diversity of production systems (tillage, phytosanitary treatment, organic input, combined crops). This analysis highlighted a predominance of market-gardening systems in Grande-Terre (west part of Guadeloupe); these systems are developed under vertisols. In addition, a more in-depth study on macrofauna, chemical and microbiological analyses are in progress 5 agroecological plots and 5 conventional plots.



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ABSTRACTS

Fossil bats from the Lesser Antilles: diversity, endemism, and anthropisation

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Abstract

In the Lesser Antilles archipelago, the modern populations of bats are attested by at least 25 species, including 11 endemics from the Lesser Antilles, including 5 endemics to a single island. The high speciation and endemism rates in this oceanic archipelago explain partially the modern diversity. However, fossil deposits containing osteological remains provide information about the extinct faunas and their wider diversity.

As Chiroptera bone remains are frequently found in the archaeological excavations in the Lesser Antilles, both pre-Columbian archaeological remains and fossil natural accumulations were identified for this study: 30 sites from St Martin, Barbuda, Antigua, Guadeloupe and Martinique. An identification key based on osteological criteria from Museum specimens has been created in order to identify these remains, allowing the determination at a specific level, thanks to the morphological description of osteological criteria for the skulls, mandibles, teeth and long bones), introducing a new complete nomenclature of the teeth for these micro-regional species. Consequently, the determination of 53000 remains of bat fossil remains allowed the identification of 4500 bones at the level of Family, *Genus* or *species*.

Indeed, at least 25 taxa of fossil bats (including 14 extinct or vanished ones) were identified on these islands, and new morphotypes were listed. The large diversity of insectivorous species from the Late Pleistocene were replaced by frugivorous and ubiquitous species. Finally, only 10 taxa are still present since the Pre-Columbian times. Some of fossils insular species are still present in the Greater Antilles or the South American Continent.

These preliminary results indicate also that the modern populations outcome from the fragmentation of the initial populations. The causes were multiple, including the marine regressions during the Late Pleistocene, the Holocene-Pleistocene climate transition, the insular fragmentation, and mostly the human colonization and anthropisation of the islands since 6000 years. Consequently, the distribution of species within the islands from the Anegada passage to the Koopman's line was updated.

Keywords: Chiroptera, Caribbean, pre-Columbian, diversity, endemism, anthropisation



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ABSTRACTS

Impact of hunting and road disturbance on fruit consumption and seed dispersal by frugivores in a tropical rain forest

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Abstract

Ecological processes in tropical forests are being affected at unprecedented rates by human activities. Yet, the continuity of ecological functions like seed dispersal is crucial for forest regeneration. It thus becomes increasingly urgent to be able to rapidly assess the health status of these processes in order to take appropriate management measures. Using a new method that we developed to rapidly assess the level of seed removal and frugivore activity (Boissier et al. 2014), we aimed at evaluating the effect of a national road opened and paved in 2005 on the health status of the nearby mature forest in French Guiana. We studied the level of fruit consumption and seed dispersal for four animal-dispersed tree species in forest corridors and further away from the road. We counted fallen fruits, fruit valves, and seeds of each focal fruiting tree (N = 30 per genus) in a single 1 m² quadrat, and calculated two indices: the proportion of fruits opened and the proportion of seeds removed by arboreal and terrestrial mammals. In addition to direct visual sightings during samplings, we used automatic remote camera to identify the ground-dwelling wildlife during 6-10 days. Our results showed that the proportion of fruits opened and the level of seeds removed in the forest within the vicinity (< 1-2 km) of the road are comparable to the least impacted site of reference. Our indices also confirm that birds and small body-sized primates are the main consumers and seed dispersers remaining in the forest nearby the new road. Therefore, despite effort to preserve forest continuity (vegetation bridge over the asphalted road), hunting pressures is the main driver of defaunation which has affected ecological processes such as seed dispersal less than a decade after the road was opened to traffic. Repeated measures at the same trees within 5-10 years will allow to evaluate how the forthcoming opening of the bridge over the Oyapoque river, the France-Brazil frontier, and the expected greater human pressures, will impact the forest. These findings are of general interest to evaluate the health status of forest in the Caribbean islands with a long history of defaunation and loss of large frugivores due to insularity and human presence.



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